



NORWEGIAN USE OF AVIATION BIOFUELS

Energy Lab – The Future of Norwegian Biofuels
Bergen, 08 feb 2017



46 airports



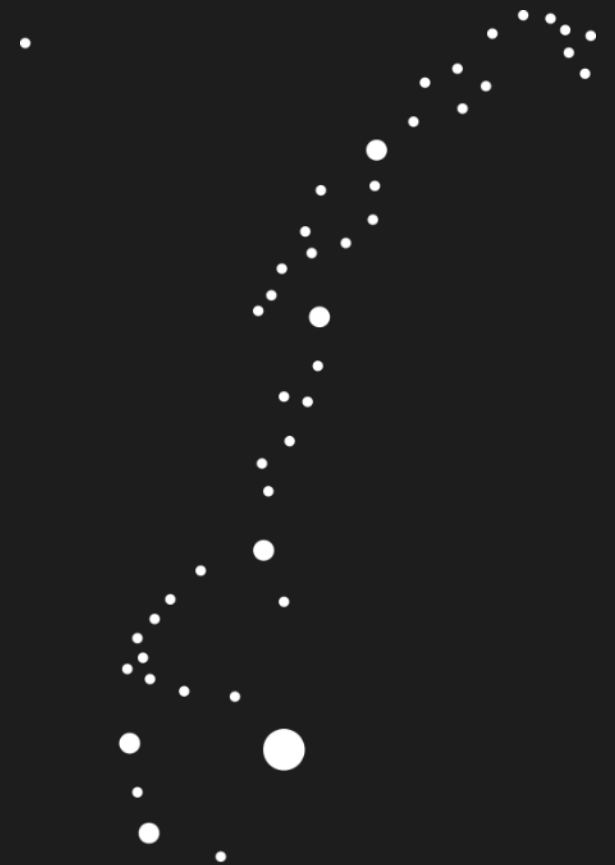
Norway's Air Navigation Service
Provider (ANSP)



50 000 000
Terminal pax

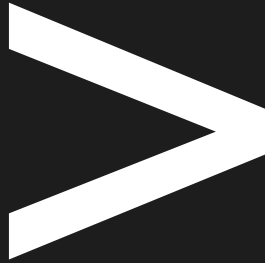


667 000
Movements



WHY?

Traffic-
growth %



Emission
reductions %



NATIONAL
GLOBAL

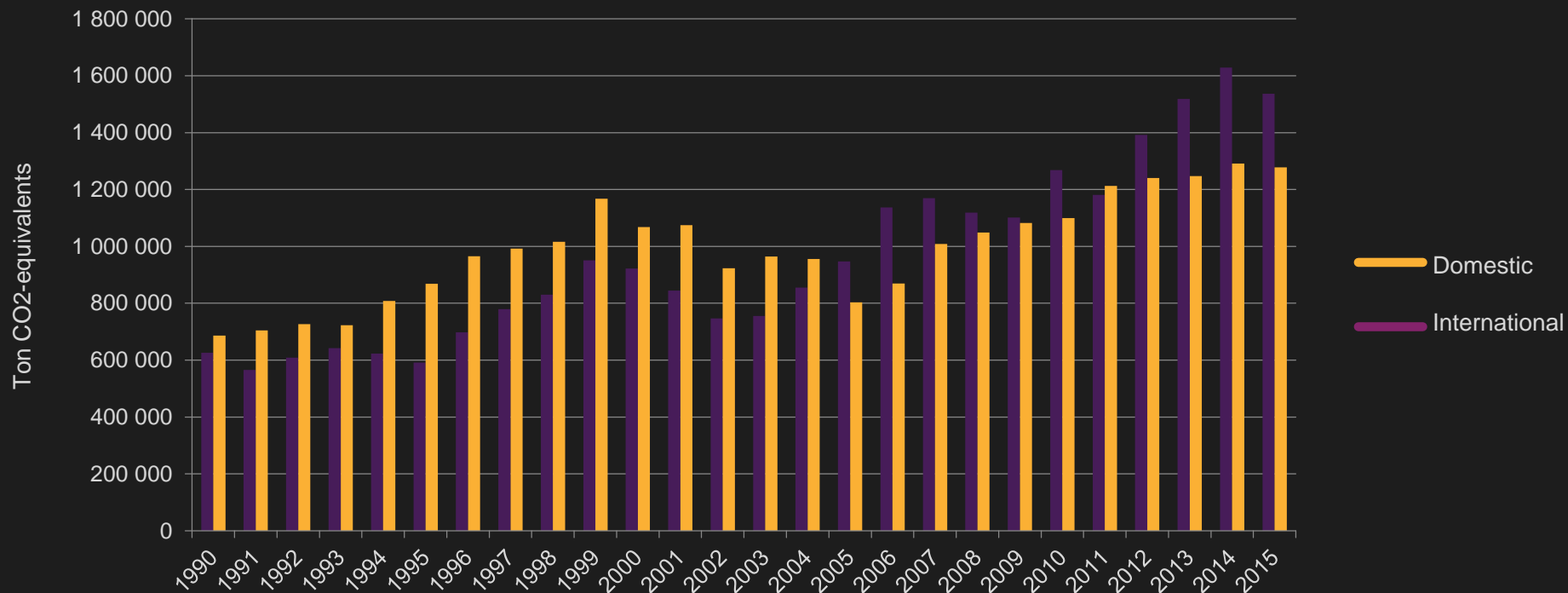
CO₂

EMISSION

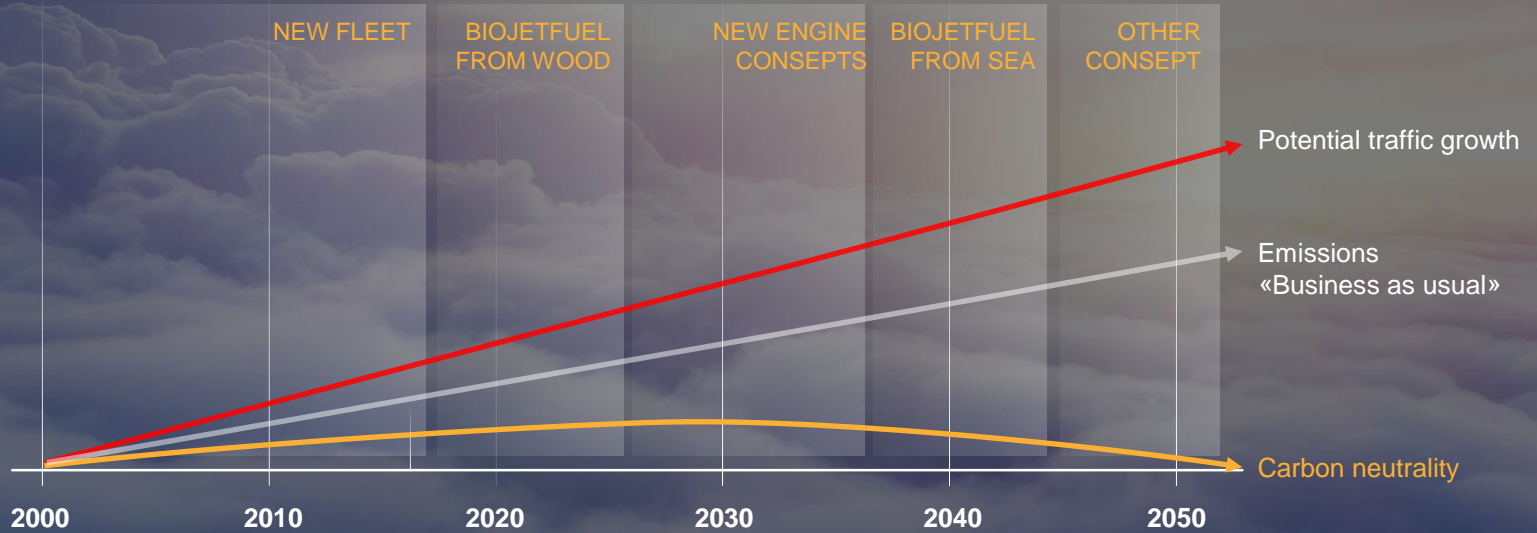
Oil & gas	27%
Industry	22%
Road	19%
Ship/fish	9%
Agriculture	8%
Other	6%

2,4%

EMISSIONS FROM CIVIL AVIATION IN NORWAY 1990-2015



Is carbon neutral aviation possible?





**AVINOR'S INVOLVEMENT IS ETHICALLY SOUND
AND GOOD FOR BUSINESS**

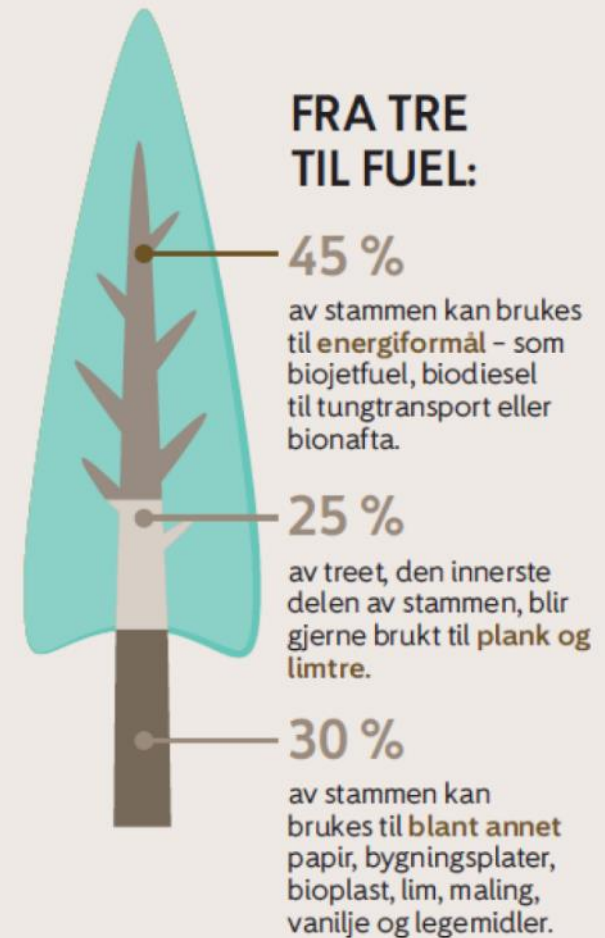
AVIATION BIOFUELS

- Certified since 2009 for up to 50 % drop in with fossil fuels
- Certified for use in all jet engines. No technical alterations needed
- Currently five technology pathways for fuel production certified. More in the pipeline
- Thousands of biofuel flights carried out



SUSTAINABILITY

- There are good and bad biofuels
- Avinor will only support development and use of sustainable fuels
- We are totally dependent on transparency, robust certification schemes and independent third party verification
- When discussing sustainability one must clarify:
 - “Pay Back Time”: CO2 from fossil fuel will stay in the atmosphere for hundreds of years. CO2 from biofuels will be recovered when the plant/tree grows in X years
 - Substitution: What is the biofuel replacing (fossil fuels or no travel)?



AVINOR'S LONG TERM APPROACH

- The Norwegian aviation industry have been looking into sustainable jet biofuel since 2007
- Several projects carried out
- Avinor to invest up to MNOK 100 in jet biofuels (2013-2022)
- Fruitful collaboration with academia, potential biofuel producers, AirBP, airlines and other stakeholders



PRODUCTION IN NORWAY FROM 2020?

- Residues from the forestry industry most relevant in Norway in short and medium term
- Amount previously used in pulp and paper industry can reduce Norwegian aviation emissions significantly...
- ...and provide road transport with sustainable 2nd generation biodiesel
- Biofuels can be an important part of the forestry industry value chain
- Solid household waste and algae (long term) could also be relevant
- Industrial actors «lining up»



OSL #1 AIRPORT IN THE WORLD TO OFFER JET BIOFUEL TO ALL AIRLINES

- JAN 2016: OSL became world's first hub to offer jet biofuel to all airlines on a commercial basis
- Dropped into the main fuel farm, and distributed in the hydrant and dispenser system
- Cooperation with Air BP, SkyNRG, Neste and airlines
- Premium cost split between the project partners
- Thousands of bio jet flights have been carried out
- This is the next step
- Important piece in the logistics puzzle for cost effective bio jet fuel distribution



Lufthansa



1.25 MILLION LITRES JET BIOFUEL AT OSL

First batch:

- Based on Camelina oil from the ITAKA project in Spain
- Refined by Neste in Finland

Second batch

- From AltAir, California
- Based on Used Cooking Oil (UCO)
- First time jet biofuel is imported to Europe

Both batches:

- Shipped to Gävle in Sweden. Blended 50/50 with fossil fuels
- Transported to OSL on lorries



Lufthansa



OSL #1 AIRPORT IN THE WORLD TO OFFER JET BIOFUEL TO ALL AIRLINES

Experience

- Works very well!
- No issues technically
- Administrative and legal issues sorted
- No issues with passengers or other airlines



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AVINOR

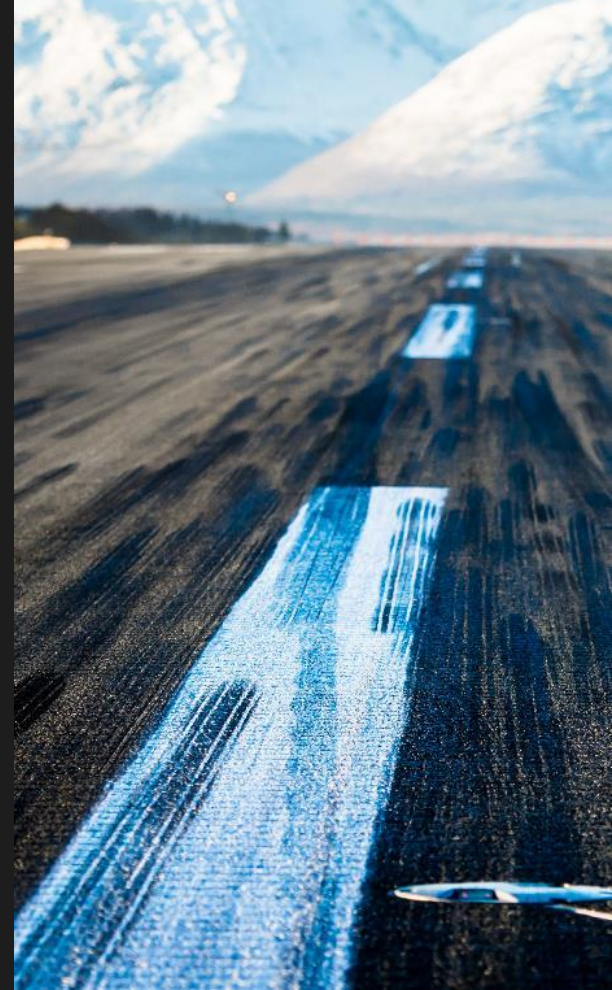
FUTURE OF AVIATION BIOFUELS IN NORWAY

- Limited production → No market price = Expensive
- Must scale up/start up production – also in Norway
- Biomass scarce
- Biofuels should be “reserved” for sectors without alternatives to liquid fuel (aviation and perhaps heavy road transport)
- Huge potential for production in Nordic countries



WAY FORWARD

- Avinor 2030 goal: 30 % of aviation fuel in Norway should be sustainable biofuel = Approx 400 mill litres
- Continued supply at OSL, Flesland from opening new terminal and possibly other airports
- Develop a broad portfolio of projects
- Support industrial scale production of sustainable jet biofuel
- Push and pull for jet biofuel in Norway on several arenas
- Alternative fuels industry in its infancy – collaboration crucial



RAPID EVOLVING TECHNOLOGY – WHEN SO MANY CLEVER HEADS GO GREEN...



THE AVIATION INDUSTRY HAS DONE AMAZING THINGS BEFORE – AND WILL DO IT AGAIN

