North Central Texas Council of Governments

Dallas-Fort Worth CLEAN CITIES

Waste to Fuel Tour

Savana Nance

January 23, 2023

Dallas-Fort Worth International Airport

Thank You to Our Dallas-Fort Worth Clean Cities Sponsor

IMPOWER CONNECTION

EV Charging Solutions

Interested in Sponsoring DFWCC? Visit https://www.dfwcleancities.org/sponsorships!

Who We Are

North Central Texas Council of Governments

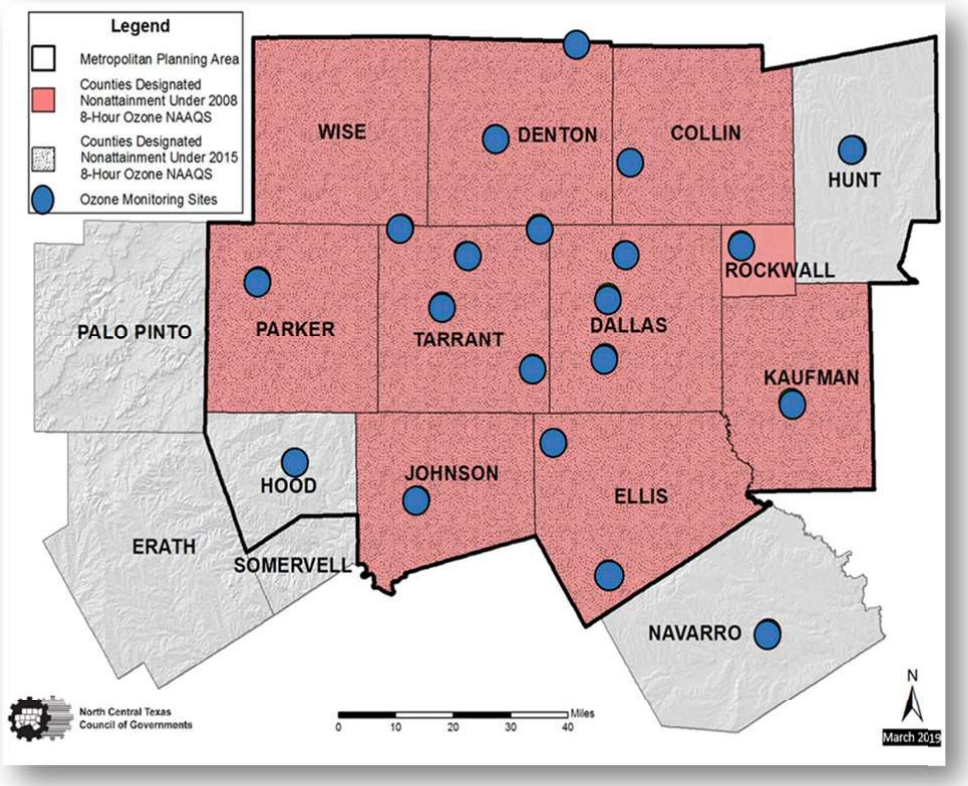
Regional Planning Agency

Regional Transportation Council

Metropolitan Planning Organization (MPO)

Dallas-Fort Worth CLEAN CITIES

Local Clean Cities Coalition



What We Do

Funding Support

Assist with Developing Grant Applications

Administer Funding

Technical Assistance

Hold Webinars, Workshops, Peer Exchange

Develop Best Practices and Template Resources

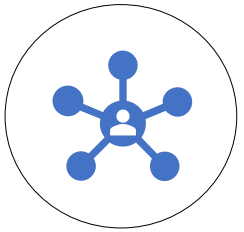
Planning the Future

Alternative Fuel Corridors

Texas EV Charging Plan

ZEV Infrastructure

Organic Waste to RNG Feasibility Study



Raising Awareness

Facilitating Relationships

National Drive Electric Week

Fleet Recognition

Success Stories and Community Events

Electric Vehicles (EVs)

In DFW Region:

City of Carrollton- 22 Light-Duty (LD) EVs Reduced:

- 5,188 gallons of Gasoline Gallons Equivalent (GGE)
- 27.9 tons of Green House Gases (GHG)

Trinity Metro - 6 Electric Transit Buses Reduced:

- 16,132 gallons of GGEs
- 103 tons of GHGs

No Tailpipe Emissions

Lower Vehicle Maintenance

Affordable and Consistent Fuel Price

Energy Security

High Performing, Instant Torque

Renewable Natural Gas (RNG)

Renewable natural gas (RNG) is chemically identical to conventional compressed natural gas (CNG). RNG is produced from decomposing organic matter: sewage, animal by-products, municipal solid waste, etc.

Benefits:

- Reduces Odor and Runoff
- Converts Waste to a Valuable Product
- Lower Green House Gas (GHG) than CNG
- Any CNG Vehicle or Infrastructure can Use RNG
- Federal Incentives for RNG Producers

In DFW Region:

Dallas Area Rapid Transit - 674 Transit Buses Reduced:

- 7,984,513 gallons of GGE
- ~36,900 tons of GHGs

Photo Source: National Renewable Energy Laboratory Image Gallery #37376

Biodiesel

Biodiesel is a renewable, biodegradable fuel manufactured from vegetable oils, animal fats, or recycled restaurant grease.

Benefits:

- Emissions reductions
- Non-toxic, non-corrosive, and non-carcinogenic
- Improves fuel lubricity and raises the cetane number of the fuel
- Can be used in most diesel engines without any conversion

In DFW Region:

City of Denton – 50 HD and 46 LD vehicles using a B20 biodiesel reduced:

- 45,651 gallons of GGEs
- ~400 tons GHGs

Photo Source: National Renewable Energy Laboratory Image Gallery #13531

Renewable Diesel

Primarily produced through hydrogenation of fats and oils, though is also produced through fermentation of sugar

Process is different from biodiesel and results in a renewable product chemically identical to conventional diesel

Benefits

- Emissions reductions
- Better performance compared to biodiesel
- No impurities or aromatics
- Any conventional diesel vehicle or infrastructure can use renewable diesel

Photo Source: National Renewable Energy Laboratory Image Gallery #34456.
Photo by Dennis Schroeder / NREL

DFWCC Impacts from 2021 Annual Survey

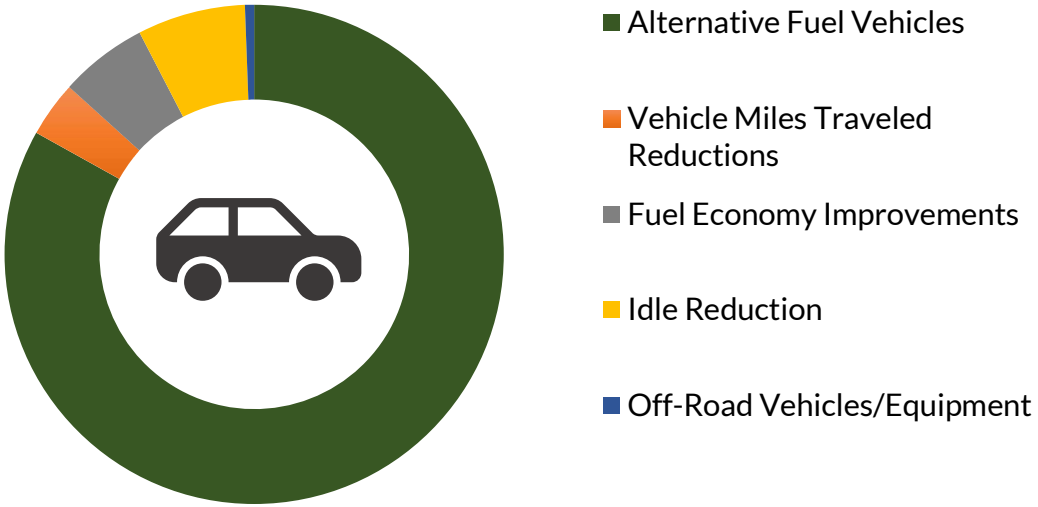
60 Fleets Reporting

12,286 Alternative Fuel Vehicles and Equipment

*Impacts Over Calendar Year 2021

dfwcleancities.org/annualreport

~24.19 Million Gasoline Gallon Equivalent (GGE) Reduced*



~27 Tons Ozone-Forming Nitrogen Oxides (NO_X) Reduced*

~0.074 Ton/Day

For Comparison: RTC Initiatives Credited in Conformity = ~2.12 Tons/Day

118,555 Tons Greenhouse Gas (GHG) Emissions Reduced*

Equivalent to Eliminating

Railcars Worth of Coal Burned

2022 DFWCC Annual Survey

2022 Survey - Coming Soon!

Survey will be available at

dfwcleancities.org/annualreport

Deadline: TBD

Regional Goals

28,056,667 GGE Reduced

(16% Increase Relative to 2021)

142,255 GHG Reduced

(20% Increase Relative to 2021)

Document Impact to Justice 40 Communities

Fleet Recognition

To Get Recognized, Complete ALL Survey Sections and Ensure Clean Fleet Policy Has Been Adopted

nctcog.org/fleetpolicy

Funding Opportunities

New Clean Vehicle Tax Credits - **Now Open**
Funds: Federal tax credit of up to $7,500 for the purchase of a LD plug-in electric or fuel cell vehicle or up to $40,000 for HD plug-in electric or fuel cell vehicle.

Energy Efficiency and Conservation Block Grant (EECBG) - **Now Open**
Funds: Energy efficiency and conservation, electric vehicles and electric vehicle infrastructure

Texas Natural Gas Vehicle Grant Program – **Now Open**
Funds: Replace medium and heavy-duty gasoline and diesel vehicles with natural gas vehicles.

Emissions Reduction Incentive Grants (ERIG) - **Expected to Open February 2023**
Funds: Repower or replace older locomotive, marine, stationary equipment, or select non-road equipment to reduce NOx emissions in ozone nonattainment areas

Governmental Alternative Fuel Fleet Grant Program (GAFF) - **Expected to Open Spring 2023**
Funds: Purchase or lease new alternative fuel or electric vehicles. Funding for vehicles is pre-determined by the Texas Commission on Environmental Quality. Up to 10% of award for purchase, lease, or install of refueling infrastructure or equipment, or refueling services

Resources

AFDC Alternative Fueling Station Locator

AFDC Vehicle Search

AFDC Natural Gas Webpage

AFDC Renewable Natural Gas Production

Argonne National Laboratory Renewable Natural Gas for Transportation

Environmental and Economic Transportation (AFLEET) Tool

Clean Fuels Alliance America

National Renewable Energy Laboratory (NREL) Renewable Diesel Presentation

NCTCOG AQ Funding

Contact Us

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dfwcleancities.org

cleancities@nctcog.org

NCTCOG – DFW Clean Cities Waste to Fuel Tour

DFW Airport Sustainability

January 2023

Sustainability North Stars

DFW's Aspirations for a Resilient, Future-Proof Airport

OUR VISION

A Sustainable Airport Ecosystem

DFW's Vision for a Resilient, Future-Proof Airport

Climate Action

Energy Performance

Circular Economy

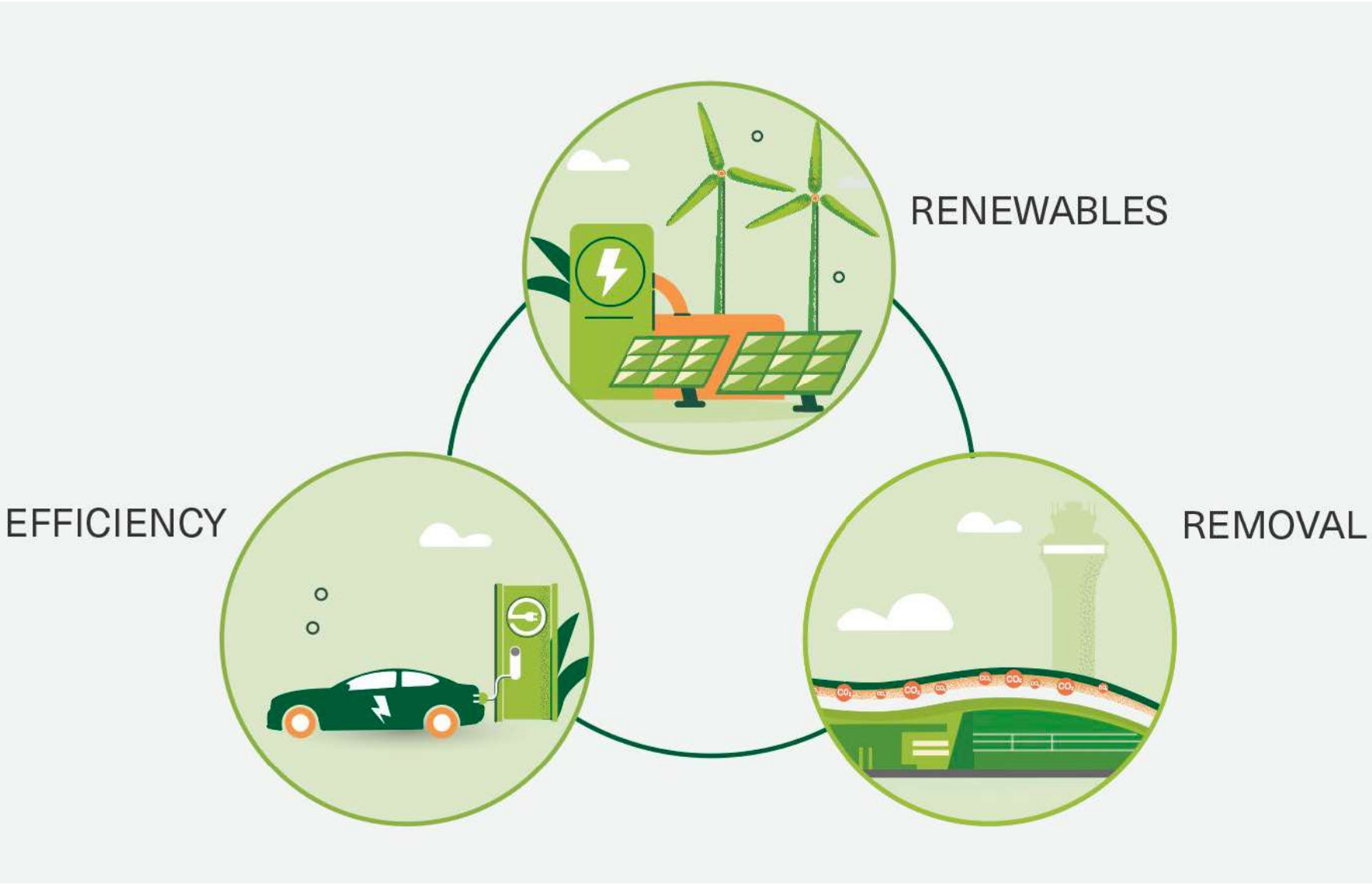
Water & Biodiversity

Equity

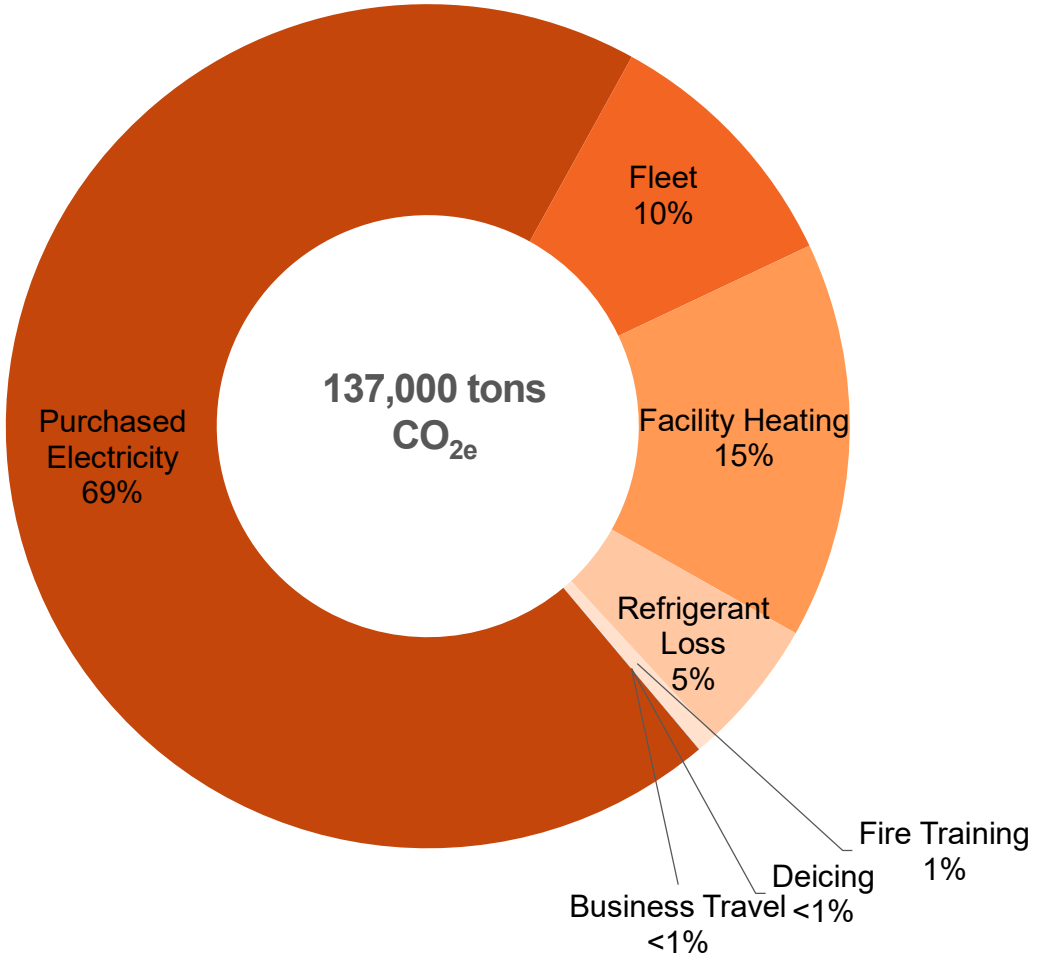
Health, Safety, & Wellness

DFW

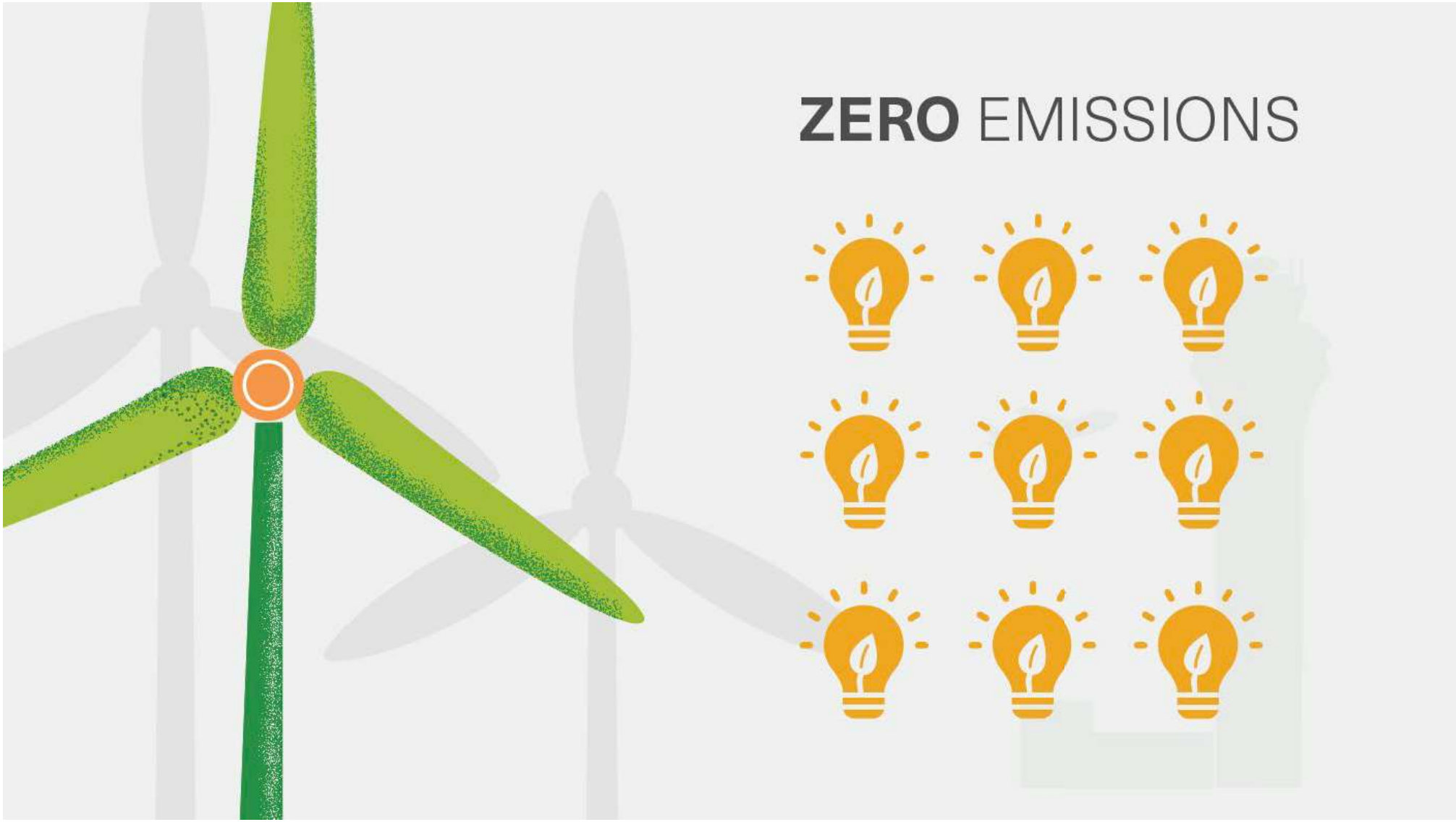

CO_2
CO_2
CO_2
CO_2
CO_2
CO_2
CO_2
NET ZERO
Carbon Emissions
2050
Aviation Industry


RENEWABLES
EFFICIENCY
REMOVAL

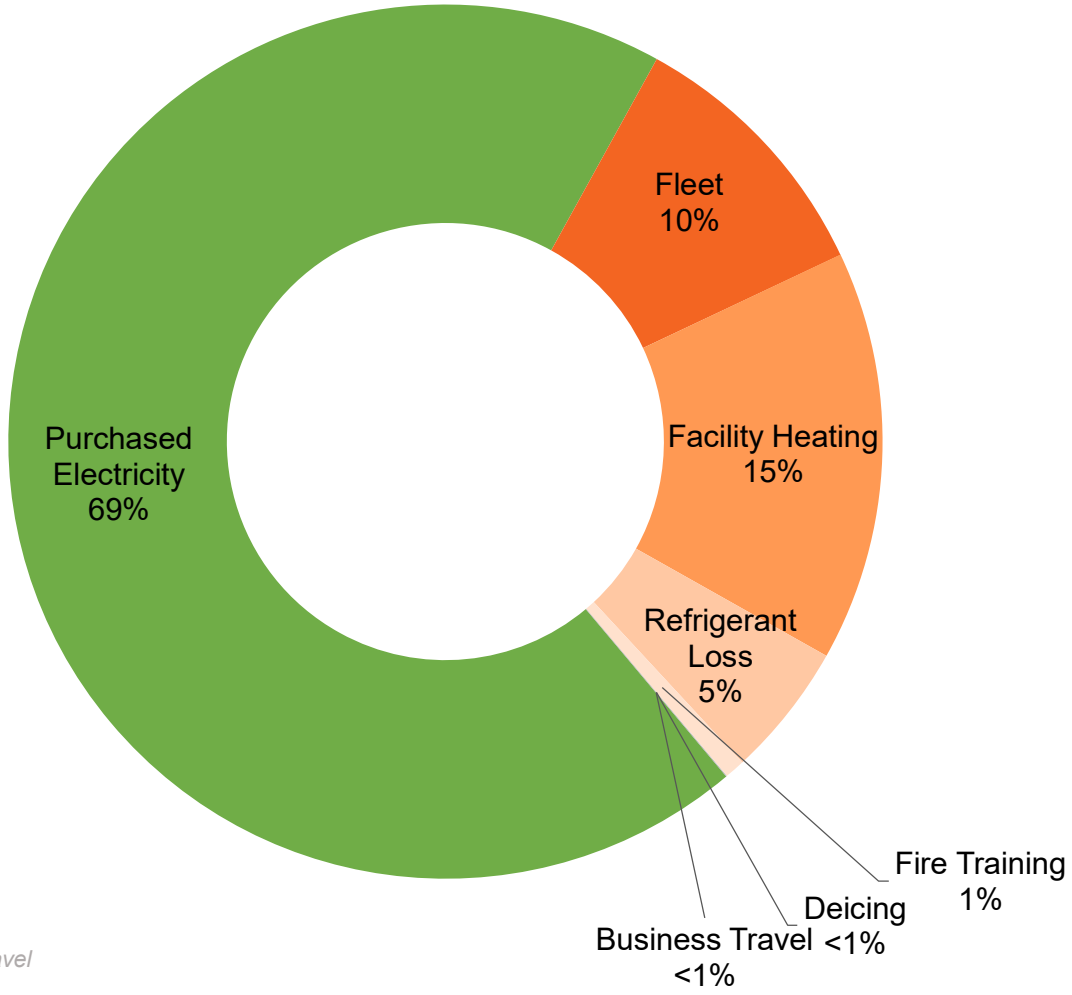
DFW Footprint Without Renewables



FY2021 Scope 1, Scope 2, Scope 3 business travel


ZERO EMISSIONS

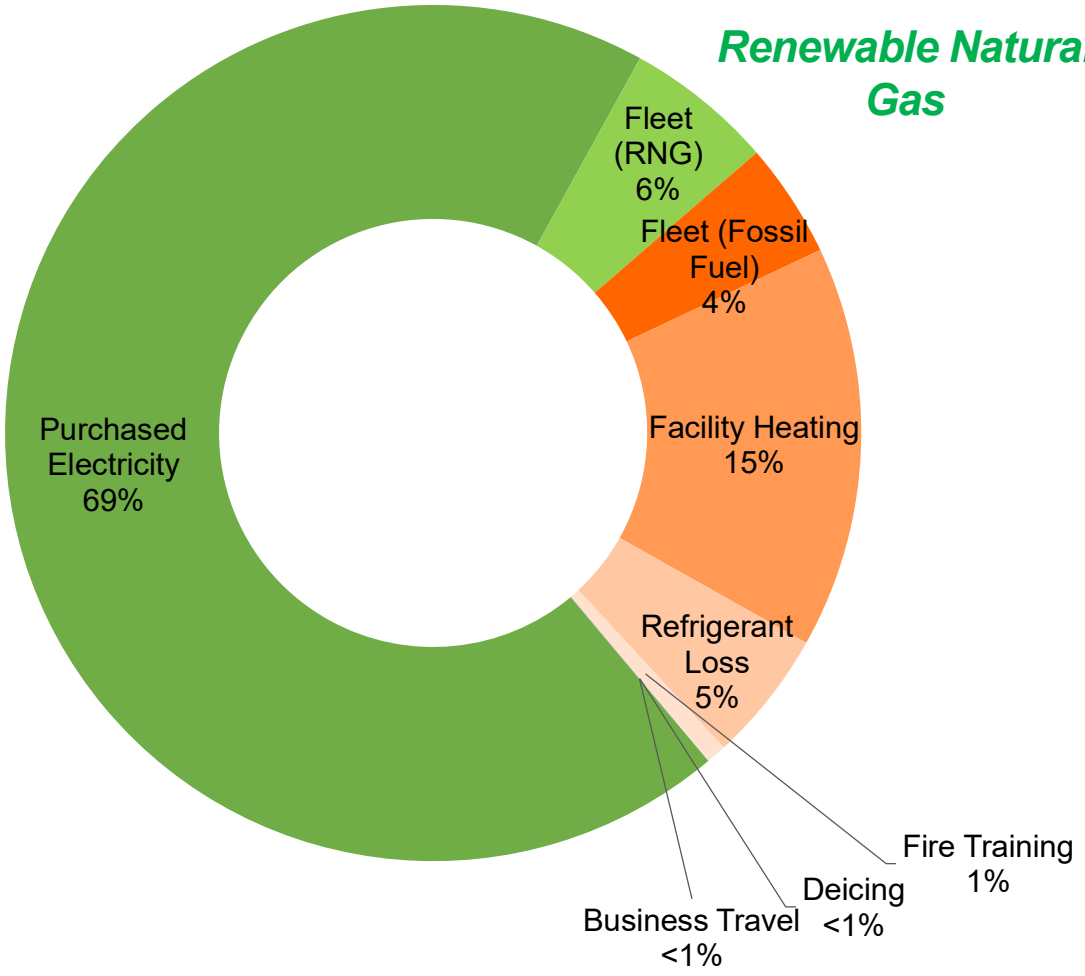
100% Renewable Electricity



FY2021 Scope 1, Scope 2, Scope 3 business travel

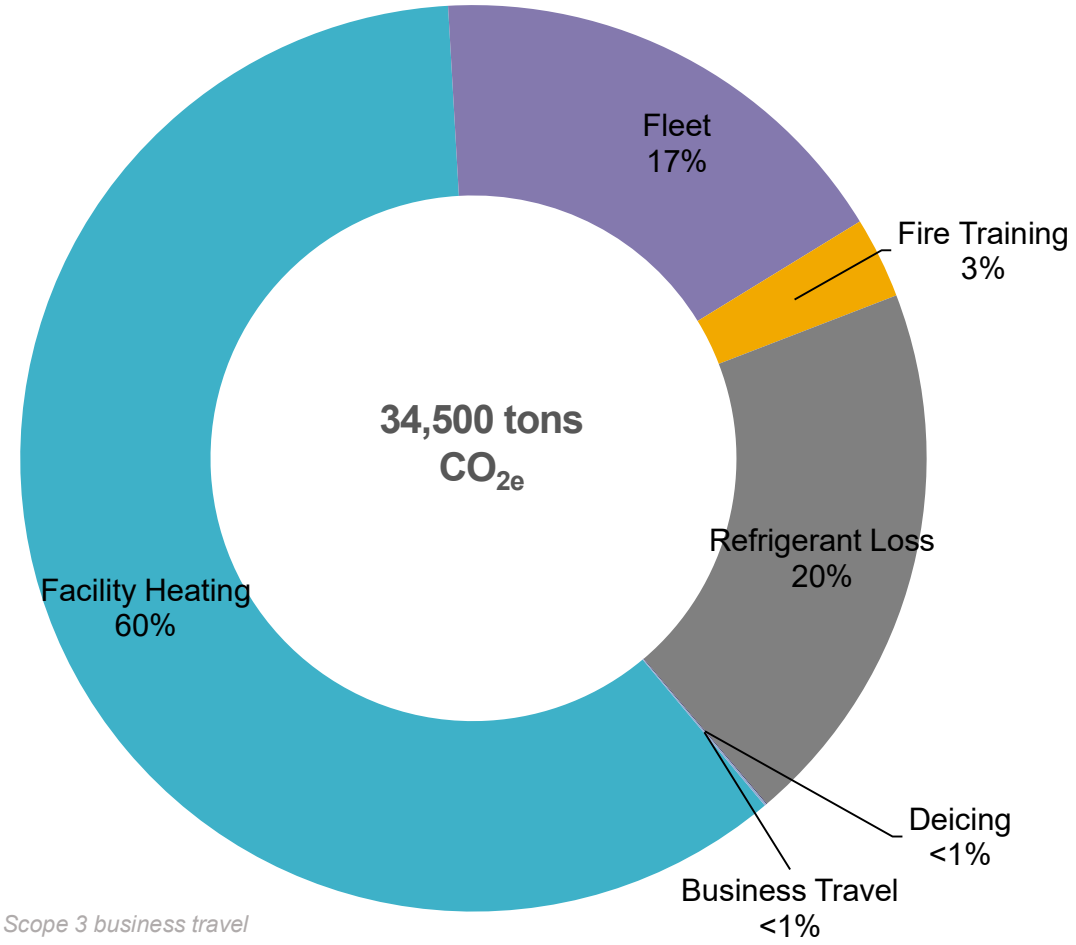

Natural Gas
for Vehicles
THIS SALE
$
64.36
26.280
GASOLINE GALLON EQUIVALENT
FILLING PRESSURE (PSI)
REFUELING INSTRUCTIONS
STOP ENGINE
NO SMOKING
FLAMMABLE GAS
Clean Energy
1-866-278-3674
DFW 22-6650
DISCOVER
VISA
Price Per
GGE

100% Renewable Electricity

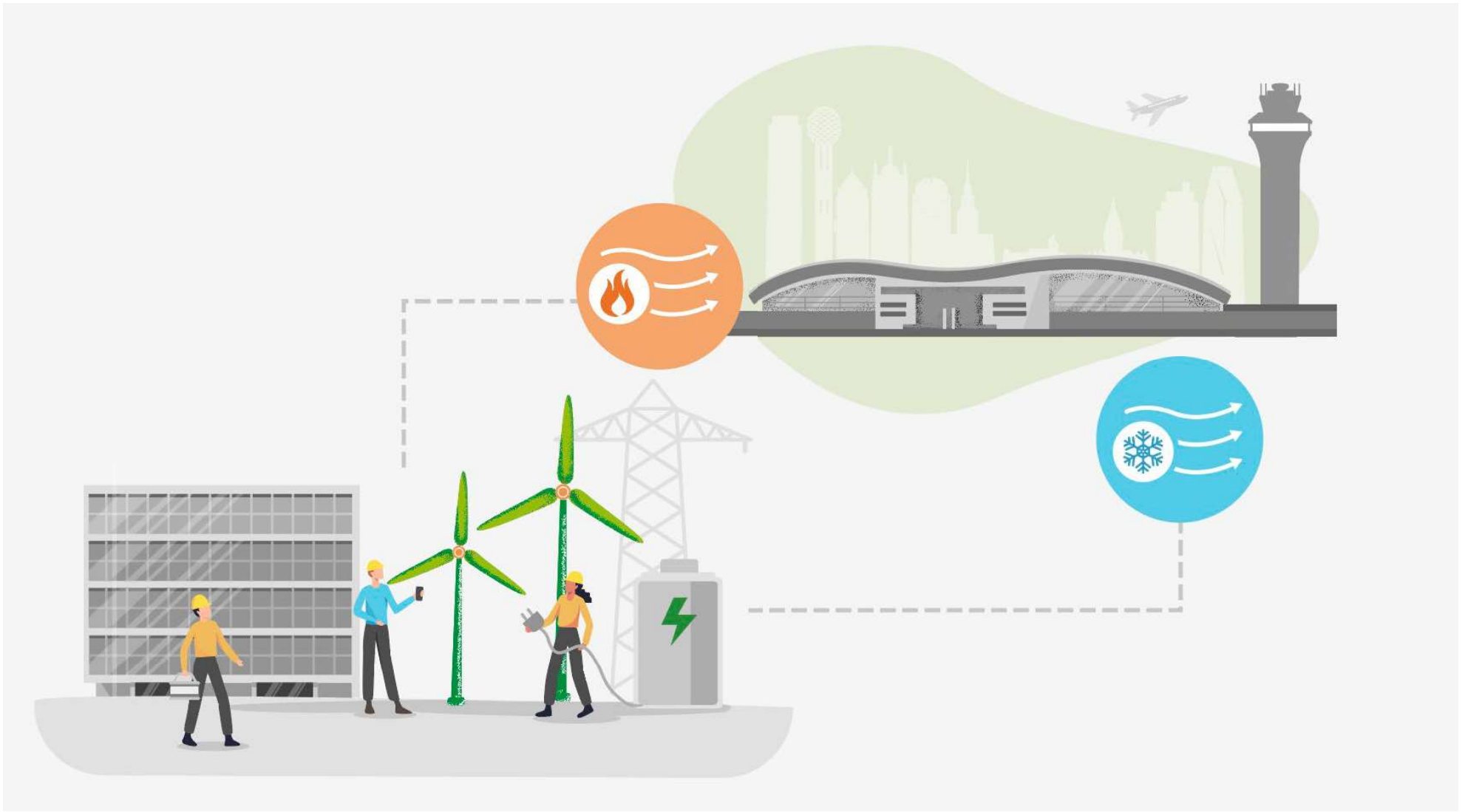


FY2021 Scope 1, Scope 2, Scope 3 business travel

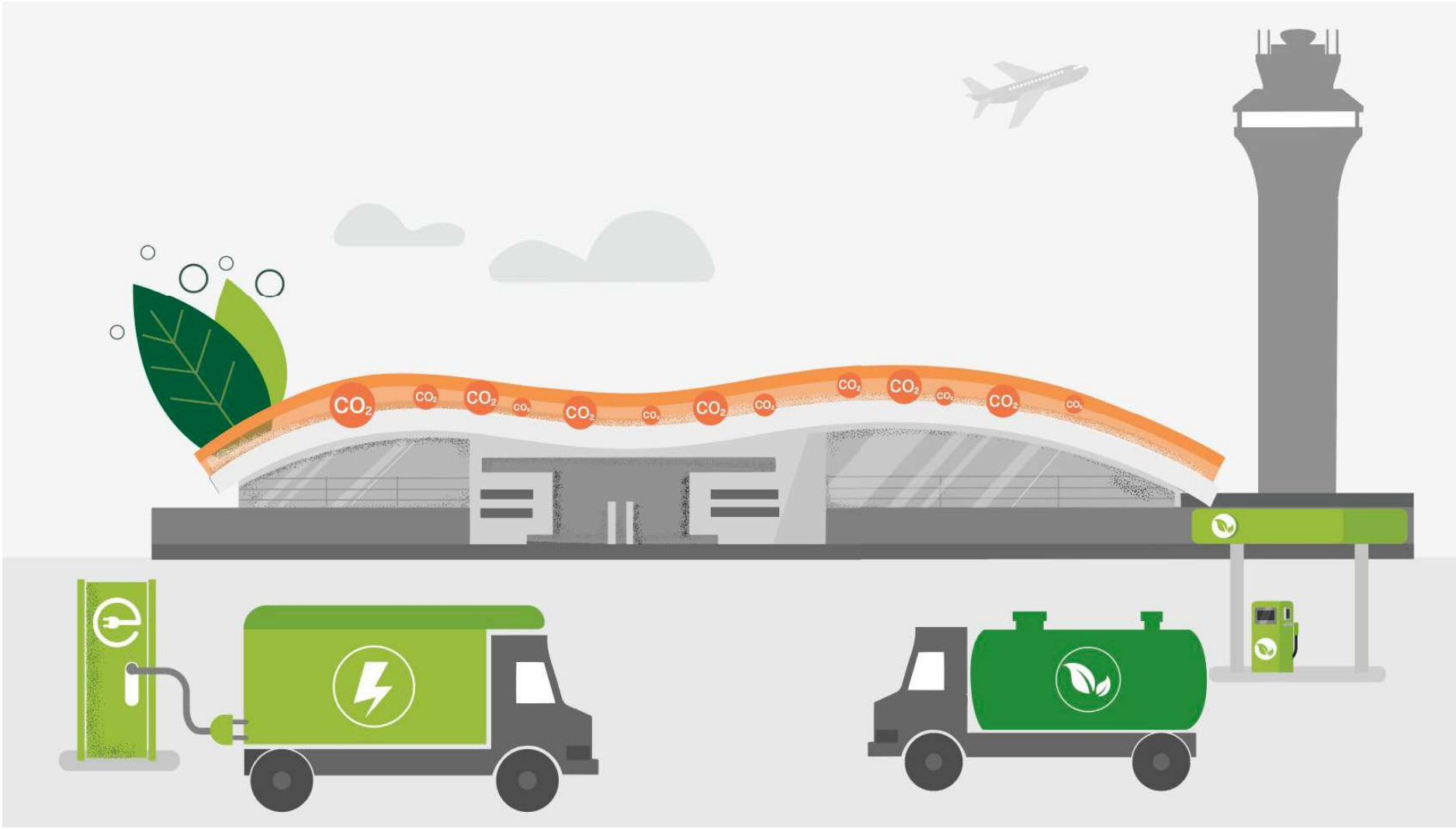
DFW Airport Carbon Footprint



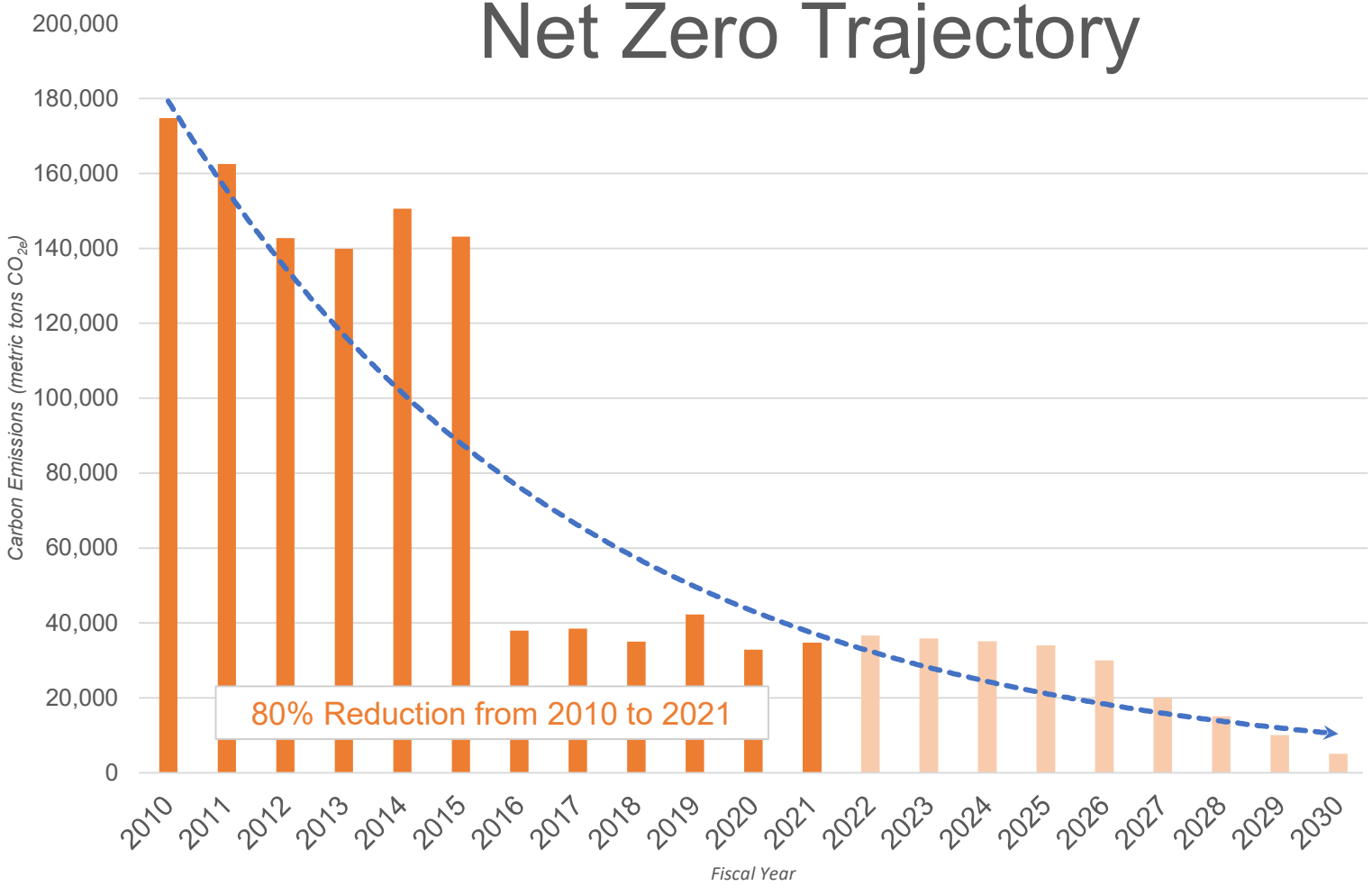
FY2021 Scope 1, Scope 2 (Market-Based), & Scope 3 business travel




COBUS | DFW
9976
Sustainability
Powered by
100%
Renewable
Energy
e.COBUS 3000


CO2

Net Zero Trajectory

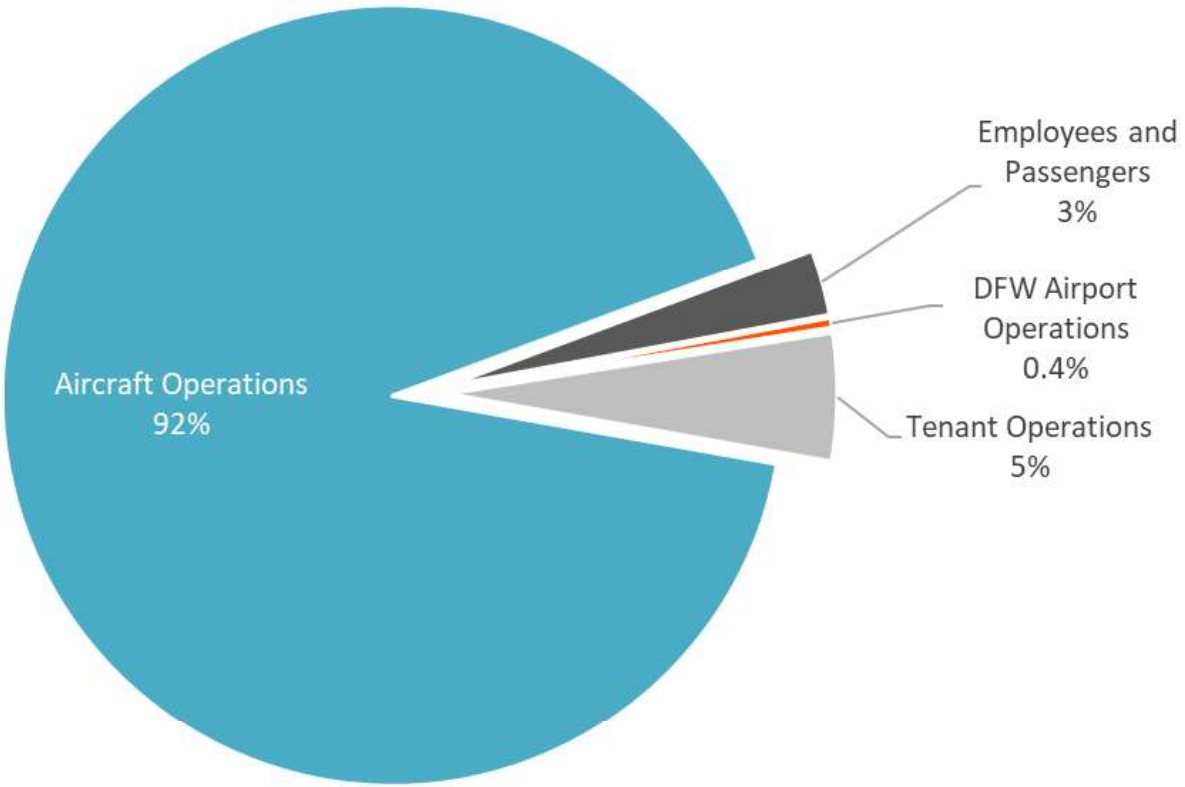


Residual emissions will be addressed through carbon removal technologies.

Note: FY2019-FY2021 = actuals; FY2022-FY2030 = projection


CO_2
CO_2
CO_2
CO_2
CO_2
REMOVED

Overall Carbon Footprint Sources



CLIMATE ACTION

Sustainable Aviation Fuel (SAF) Pilot

11 November 2021

Sustainable aviation fuel delivery at Dallas Fort Worth International Airport marks industry's first demonstration of circular economy in the United States

Published in Releases and news under Aviation

Neste Corporation, Press Release, 11 November 2021 at 6.05 p.m. (EET)

NORTH STAR 1

Climate Action

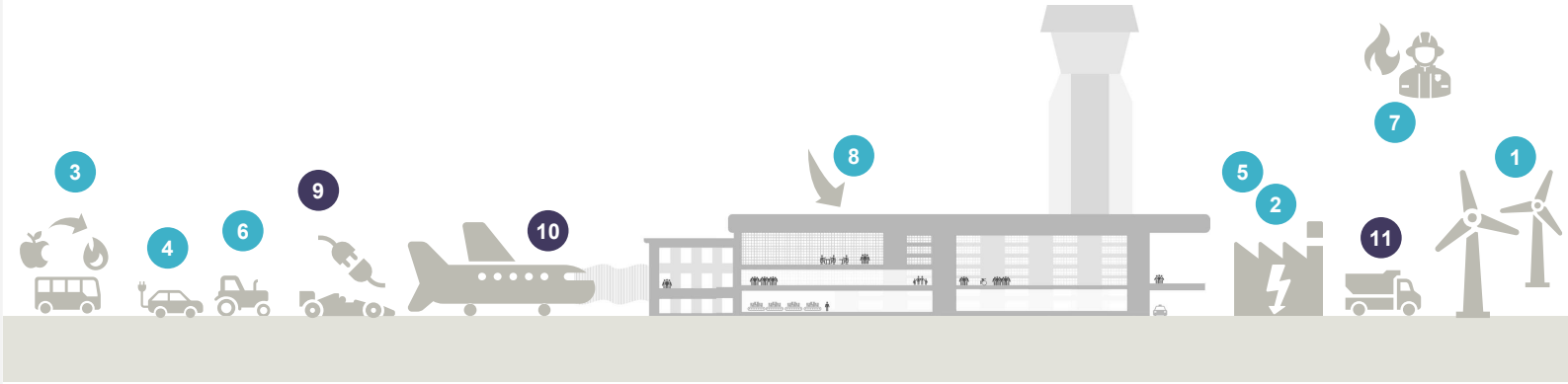
Net zero carbon by 2030

KEY STRATEGIES

01 Electric central utility plant

02 Renewable fuels and fleet electrification

03 Carbon removal



Our Emissions

(Scope 1 and 2)

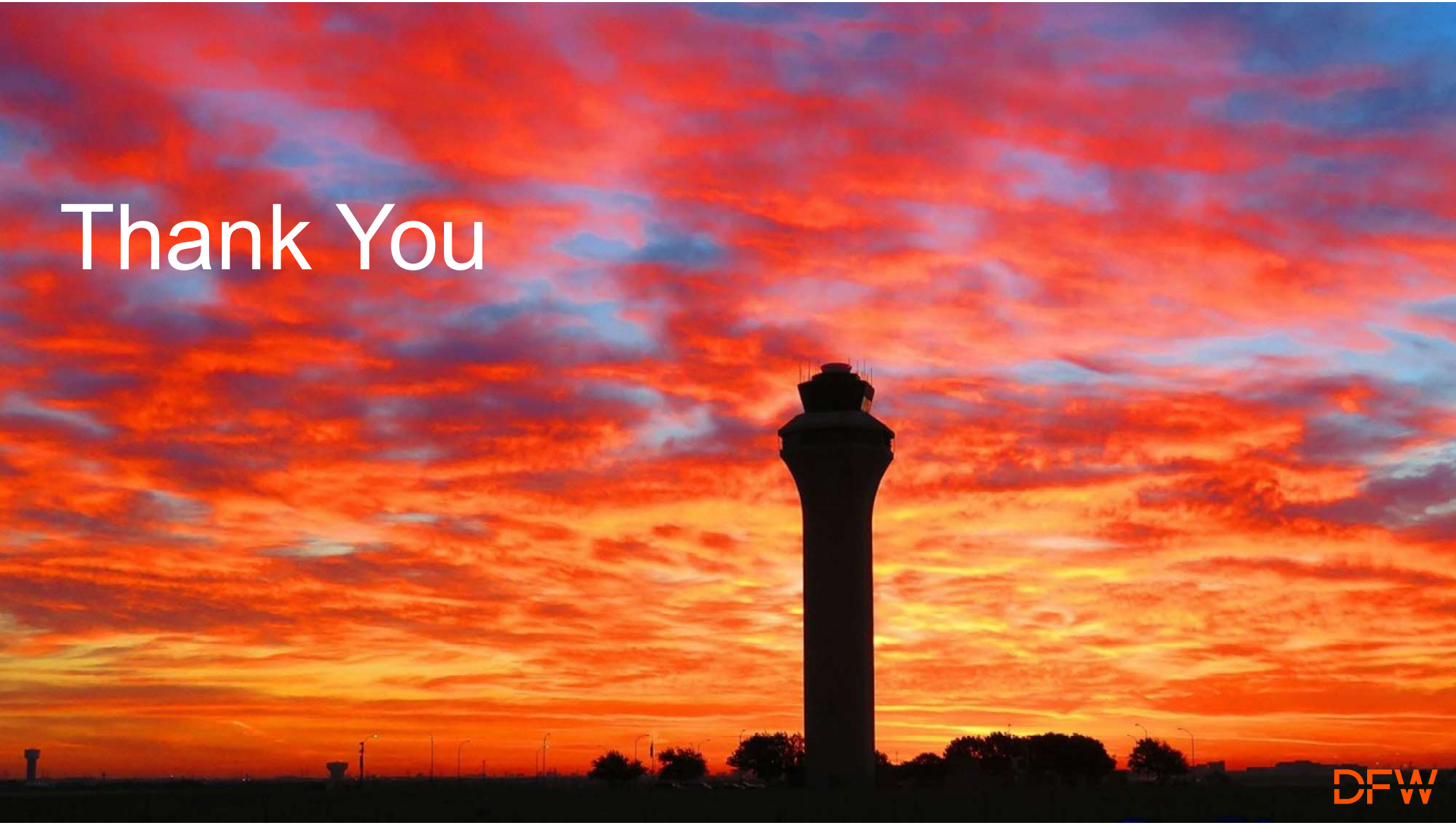
1. 100% Renewable Electricity
2. Electric Central Utility Plant
3. Renewable Natural Gas (RNG)
4. Fleet Electrification
5. Refrigerant Transition
6. Renewable Diesel for Heavy-Duty Fleet
7. Renewable Propane for Fire Training
8. Carbon Removal

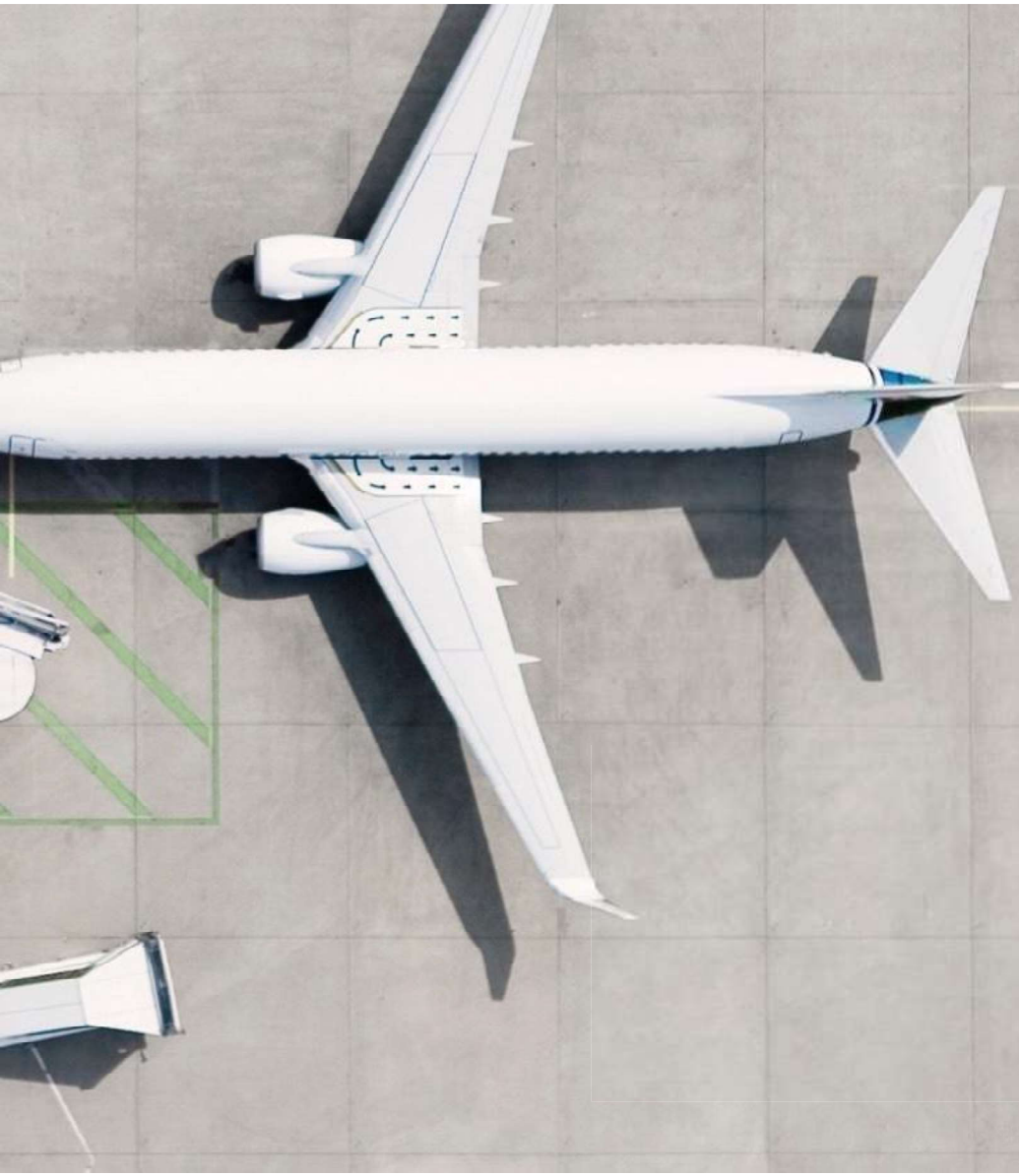
Our Partners' Emissions

(Scope 3)

9. GSE Electrification
10. Gate Electrification
11. Grease Recycling as Feedstock for Sustainable Aviation Fuel (SAF) Production

DFW


Thank You
DFW



NESTE

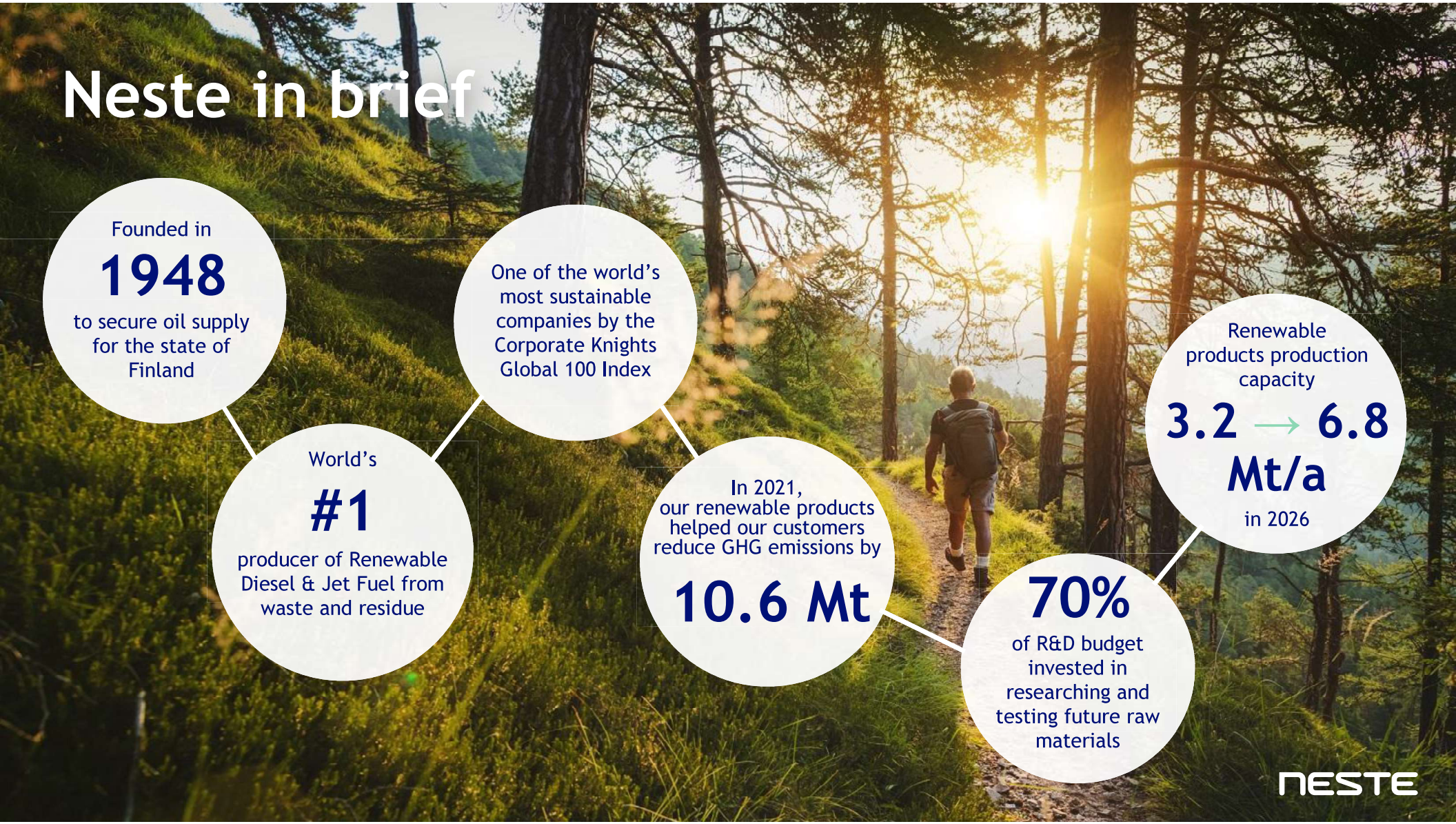
Change runs on renewables

Waste to Fuel DFW

Lana Van Marter, AAE, IAP
Manager | Renewable Aviation

Matt Leuck
Technical Manager
Renewable Road Transportation

23 January 2023


Neste in brief
Founded in
1948
to secure oil supply for the state of Finland
One of the world's most sustainable companies by the Corporate Knights Global 100 Index
World's
#1
producer of Renewable Diesel & Jet Fuel from waste and residue
In 2021, our renewable products helped our customers reduce GHG emissions by
10.6 Mt
Renewable products production capacity
3.2 → 6.8
Mt/a
in 2026
70%
of R&D budget invested in researching and testing future raw materials
NESTE

Our approach

Waste & Residue feedstocks

World-class technologies and know-how

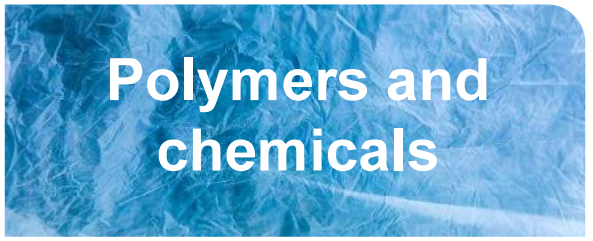
High quality drop-in solutions

We are set to become a global leader in renewable and circular solutions with a strong focus on innovation

CARBON SOURCES

- Fatty acids (NEXBTL) — Now
- Recycled waste plastic — 3–5 years
- Ligno-cellulosics — 5–10 years
- Municipal solid waste — 5–10 years
- Algae — > 10 years
- Power-to-X — > 10 years

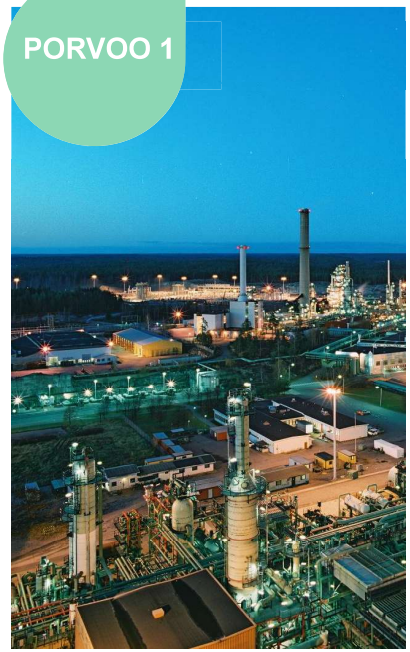
RENEWABLE AND RECYCLED HYDROCARBONS

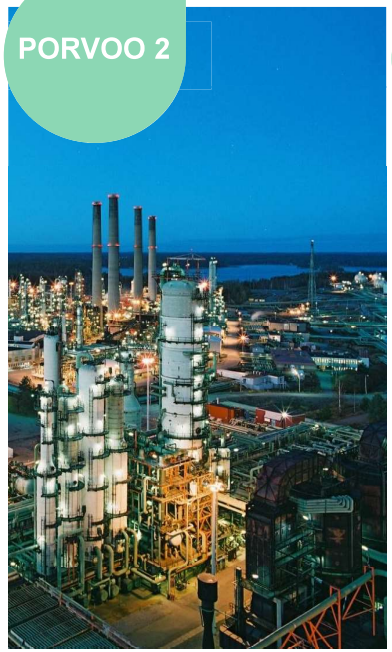


NESTE

Committed to creating a healthier planet for our children

Annual production capacity of renewable products is now over 3 million tonnes… and growing





NESTE

NESTE MY
Sustainable Aviation Fuel

What is SAF?

- A next generation synthetic jet fuel
- Reduces life cycle GHG emissions by up to 80% compared to fossil fuels
- Neste's SAF is made from 100% sustainably sourced, waste and residue raw materials
- Burns cleaner with existing jet engines, reducing non-CO_2 emissions, including particulate matter
- Compatible with existing airport infrastructures and aircraft

NESTE

Neste's Sustainable Aviation Fuel capacity will reach 1.5 Mt by end of 2023, and 2.2 Mt by 2026

Our virtuous, circular cycle

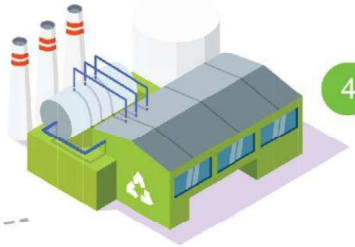
NESTE MY Renewable Diesel

NESTE MY Sustainable Aviation Fuel

1 Existing carbon molecules from the atmosphere are stored in plants and animals

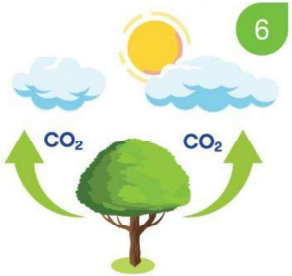
2 Plants and animals are used by people for many things. Whatever the process, waste materials are left over. This is what Neste is after.

3 Neste collects these waste materials from across the country. Regulators have approved them for making renewable fuels.



4 Neste processes these waste materials into renewable fuels, a process that incudes stripping away oxygen and adding in hydrogen.

5 The finished products are renewable diesel, sustainable aviation fuel, and renewable raw materials that can be used to make plastics and other chemicals.



6 Our renewable products release only the same, existing carbon used to make them back into the atmosphere. Those carbon molecules can be turned into renewable products over and over again.

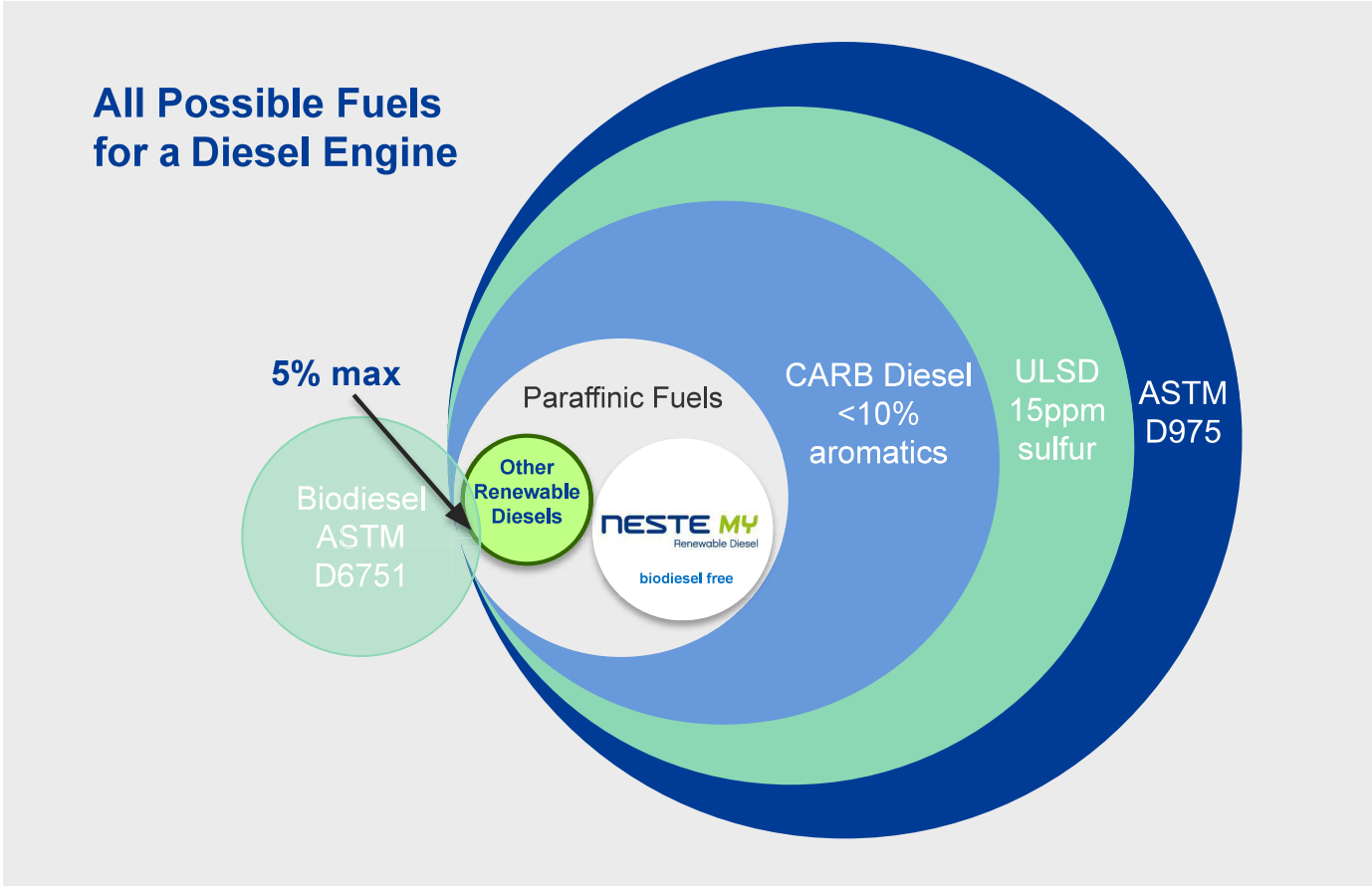
NESTE

What is diesel fuel?

This is where Neste MY is differentiated.

Neste elects to sell pure renewable diesel without allowing any blending of biodiesel into the finished product.

This allows complete control of every fuel molecule from production through consumption.



Everything in Neste MY is in Petroleum Diesel - Neste MY meets and exceeds D975, ULSD and CARB Specifications

What is renewable diesel?

- Renewable diesel is ULSD - a direct drop-in fuel replacement that meets ASTM D975 and EN 15940 standards
- Renewable diesel is not biodiesel
- Produced from renewable and sustainable raw materials
- Near zero contaminants
- Can be used at 100% rate, requires no blending
- Premium quality, high cetane, colorless, odorless, cleaner burning, and very stable
- **Approved for use by major OEMs**


TALL OIL
PITCH
ENT BLEACHING
EARTH OIL
WASTE
FISH FAT
USED
COOKING OIL
ANIMAL
FAT
ACID OI
RESIDU
TECHNICAL
CORN OIL

Bio-based diesel production

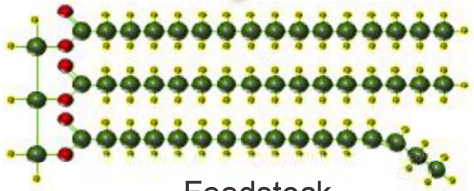

Used cooking oil


Waste animal fat


Waste fish fat

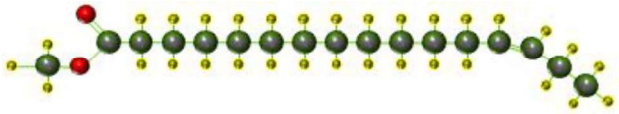

Vegetable oils


Residue oils


Feedstock
(fats & oils)

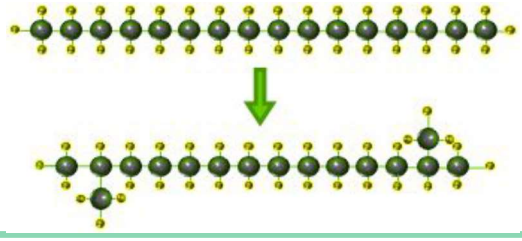
Biodiesel

Through the transesterification process, feedstocks are converted into **fatty acid methyl esters (FAME)**



Renewable diesel

Through hydrotreating and isomerization, feedstocks are converted into **pure diesel hydrocarbons**



NESTE

Consistent fuel quality

Clear and bright every time

- D975 still has variability
- Neste MY is consistent

Product purity

- Samples are taken from every vessel before loading in Singapore, before unloading in CA, and after unloading in CA
- Random samples are also taken from the distribution network
- Neste MY is never transported by pipeline or railcar and is never blended with other products

Processing

Inputs
Hydrogen and renewable feedstocks

Pretreatment
Renewable raw materials are sent through a pre-treatment unit for purification and removal of all metals and contaminants prior to the Neste MY production process

Hydrotreatment Unit (HDO)
is used to remove oxygen and break the feedstock into hydrocarbons

Isomerization Unit
allows for precise adjustment of cold properties down to arctic grade diesel fuel grades

Outputs
- Neste My RD
- Neste MY Renewable Naphtha
- Renewable LPG
- Water to wastewater treatment

Multi-point Quality Testing

Transport
RD-specific vessel criteria

Storage
Multiple water-borne terminal locations – dedicated RD storage

Distribution
- Distributor model
- Selling only neat Neste MY (R99)
- No-blending

Fueling benefits

- **Aromatic-free** is less harmful to employees, handlers & environment
- **High flash point** improves safety for fueling operations and maintenance, and meets marine regulations

Handling and storage

- Almost zero risk of water absorption or microbial growth
- Good oxidative stability = long shelf life
- Minimal to zero risk of filter blocking
- Non-polar, will not clean out debris in older fuel tanks

CARB ULSD

4,000 mile
maintenance interval

Neste MY

4,000 mile
maintenance interval

Fuel purity

Vista Unified School District

> We perform regular preventative maintenance every 4,000 miles on our buses and **this has really been eye-opening**”

Bill Weisberg,
Director of Transportation

NESTE

Engine benefits

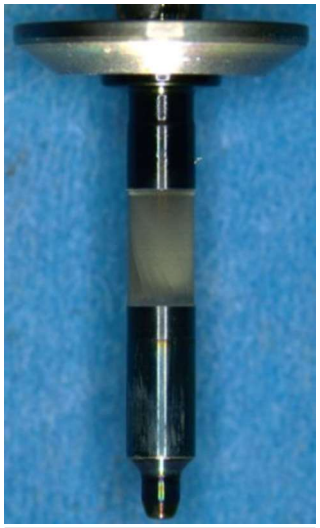
- **Premium performance** compared to petroleum diesel
- **High cetane** for greater pick up and improved cold start
- **33% less soot to plug DPFs** and reduce fuel economy
- **Less oil contamination** and breakdown
- **Better lubricity** than CARB ULSD
- **Reduced injector deposits** means reliable operation and consistent performance
- **Maintenance intervals & costs can be reduced** (fuel injectors, after treatment systems, high pressure pumps)

Injector deposits

Fuel injectors

- Example from Detroit Diesel engine testing
- Test artificially aged fuel similar to real-world, longer term storage applications
- Demonstrated much lower risk of deposits in injectors which lead to failures
- Purity and lack of oxygen in RD showed no injector failures on Neste test where others failed

Simulated Harsh Environment Testing

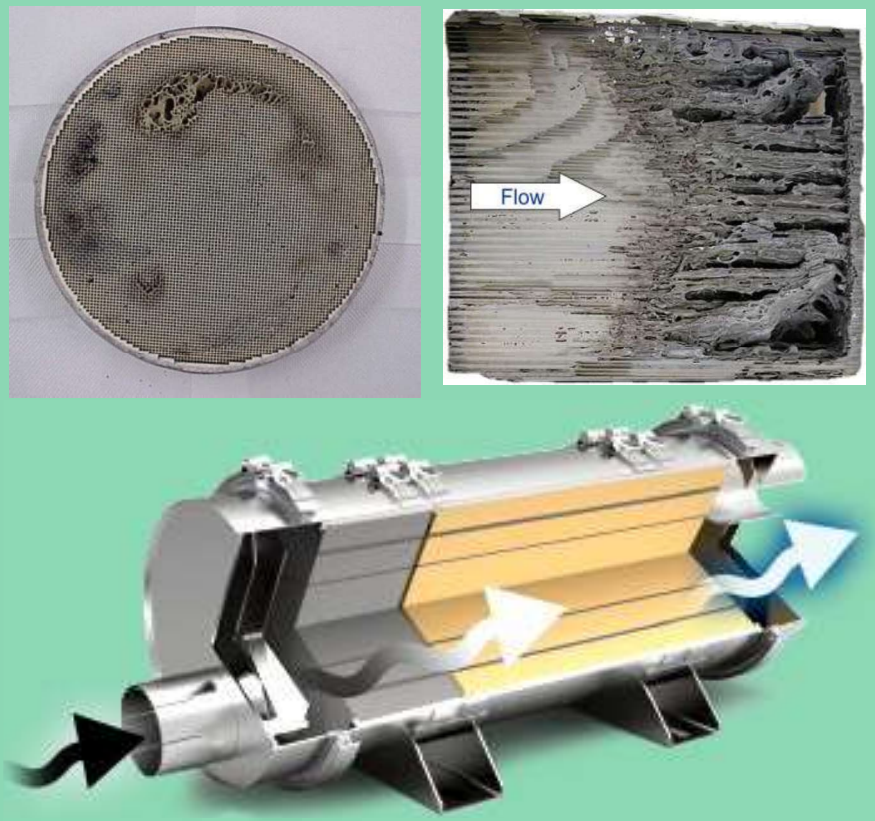
B5 Blend	ULSD	Neste MY
		
Injectors failed after 13 test cycles. Armature showed heavy deposits & corrosion, had to be hammered out of the body.	Injectors ran for 49 test cycles, but showed carboxylate deposit build up on armature and required significant force to remove.	Injectors ran for 60 test cycles without incident. Although discolored, the armature fell out injector body upon disassembly.

NESTE

Exhaust gas system benefits

- **Burns cleaner** due to high cetane number and zero aromatics
- **Less soot** can lead to fewer regenerations and lower backpressure, improving fuel economy
- **Improved DPF safety** due to reduced soot load and less risk of overtemp
- **Near zero ash-forming components** reduce ash accumulation extend cleanout intervals

Completely Plugged DPF



NESTE

TITAN Freight Systems

- Using renewable diesel in all vehicles
- $20,000 in cost savings per year
- **$0.02 per mile savings** due to reduced DPF maintenance and extended oil change intervals
- Kept 1,300 metric tons of carbon pollution from entering the atmosphere
- Drivers and mechanics prefer renewable diesel

By reducing emissions, we're improving the environment

Average **30%** lower hydrocarbons (HC), which can cause eye and lung irritation

Average **24%** lower carbon monoxide (CO)

Near-zero polyaromatic hydrocarbons (PAH), which cause health problems

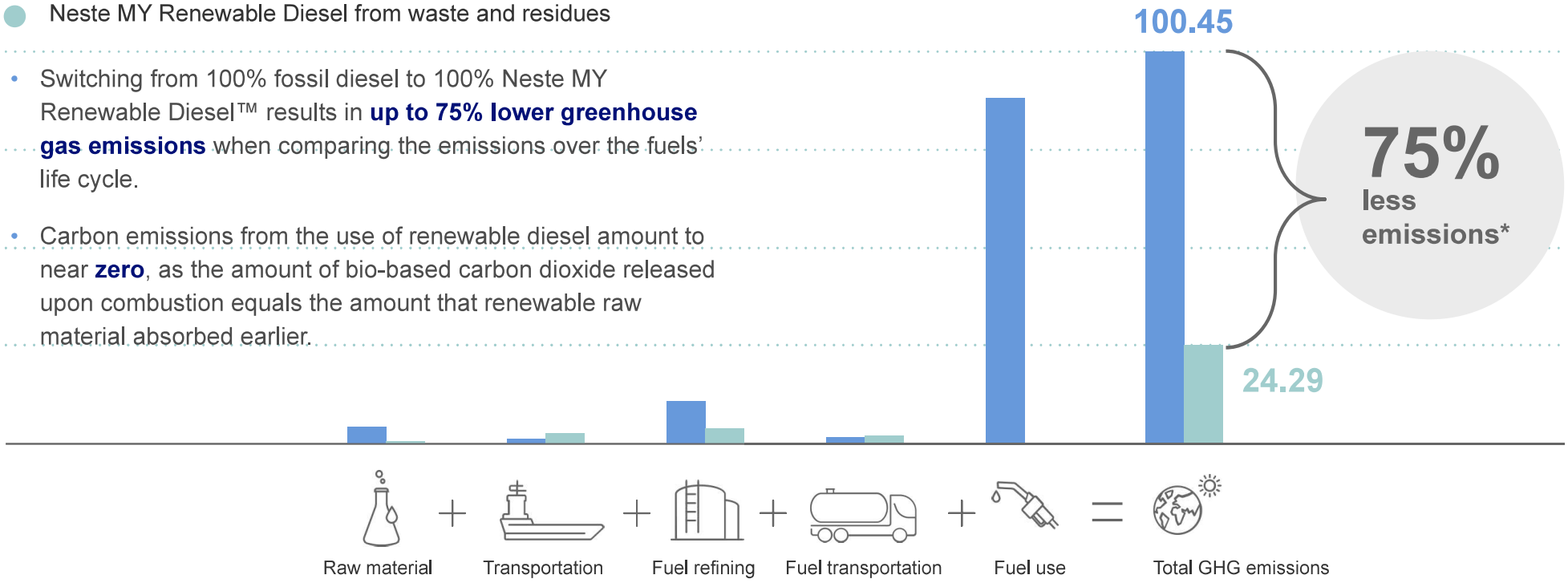
Up to **75%** reduction in life cycle greenhouse gas (CO_2) emissions

Neste MY Renewable Diesel helps reduce greenhouse gas (GHG) emissions up to 75% when emissions over the fuel's life cycle are compared with fossil diesel.

(GHG, gCO_2eq/MJ)

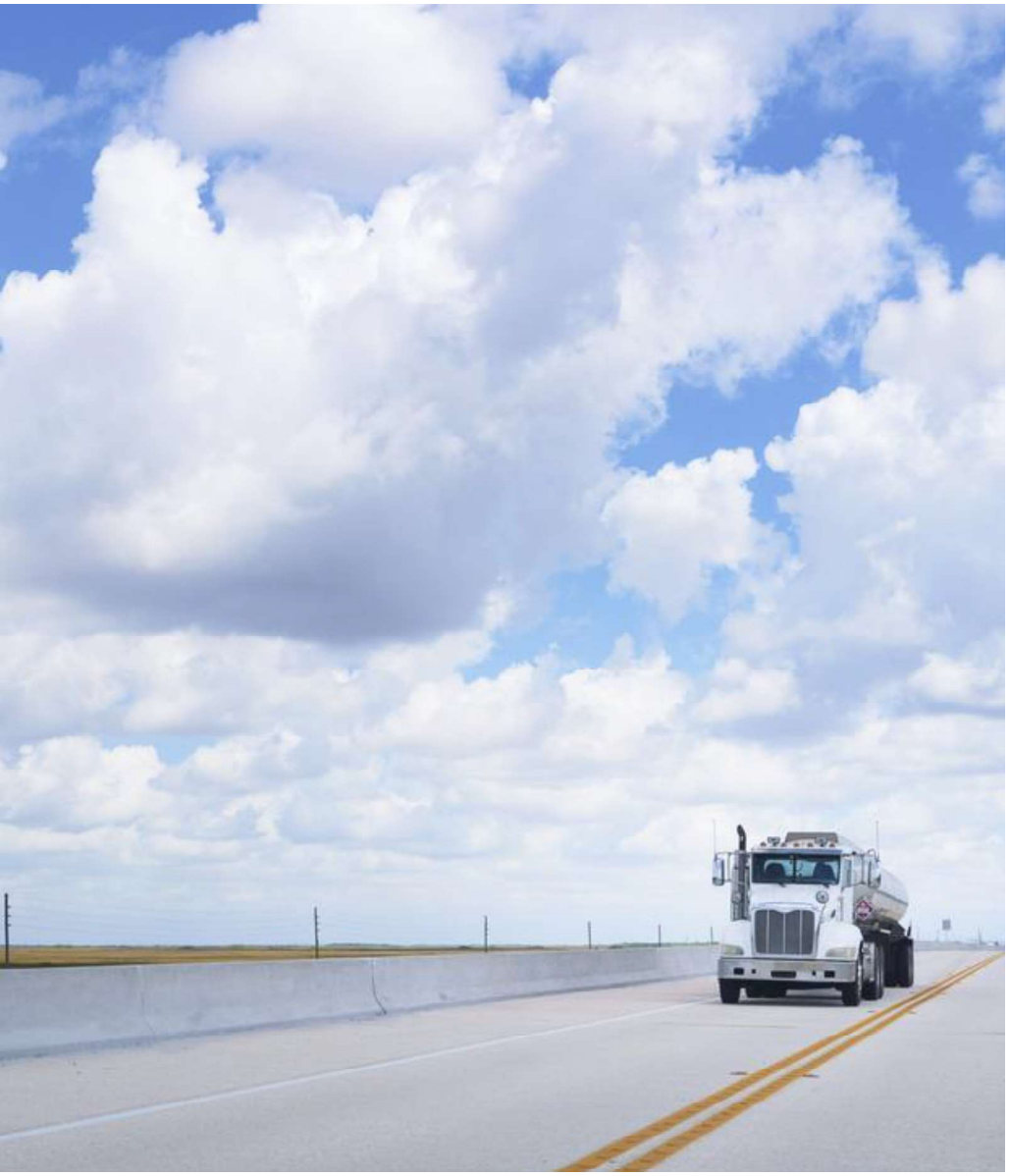
- Fossil diesel from crude oil
- Neste MY Renewable Diesel from waste and residues

- Switching from 100% fossil diesel to 100% Neste MY Renewable Diesel™ results in **up to 75% lower greenhouse gas emissions** when comparing the emissions over the fuels' life cycle.
- Carbon emissions from the use of renewable diesel amount to near **zero**, as the amount of bio-based carbon dioxide released upon combustion equals the amount that renewable raw material absorbed earlier.



** The methodology for calculating life cycle emissions and emissions reduction complies with the European Union's Renewable Energy Directive II (2018/2001/EU)*

NESTE



Zero change or disruption to your fleet operations

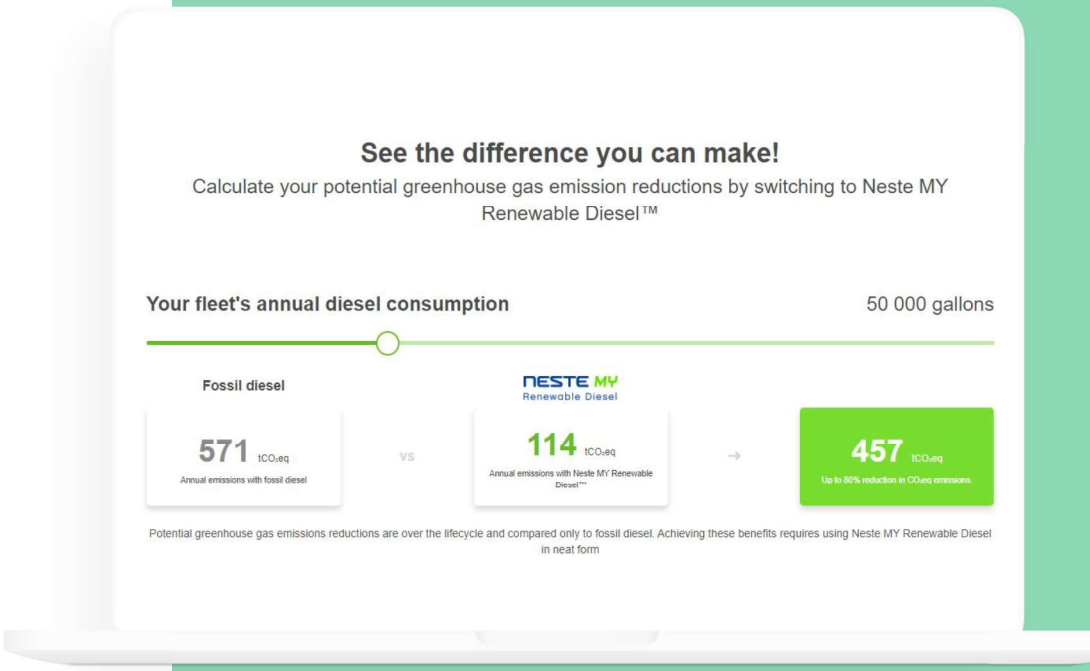
What do you need to do to switch from fossil alternatives to renewable diesel or propane overnight? **NOTHING!**

- No change in vehicle purchase price
- No specialized fueling or recharging infrastructure
- No change in maintenance or parts stocking
- No retraining and certifying of maintenance personnel
- No compatibility issues with fossil alternatives
- No regulatory issues

NESTE

For more information, visit

nesteMY.com




Thank you
NESTE

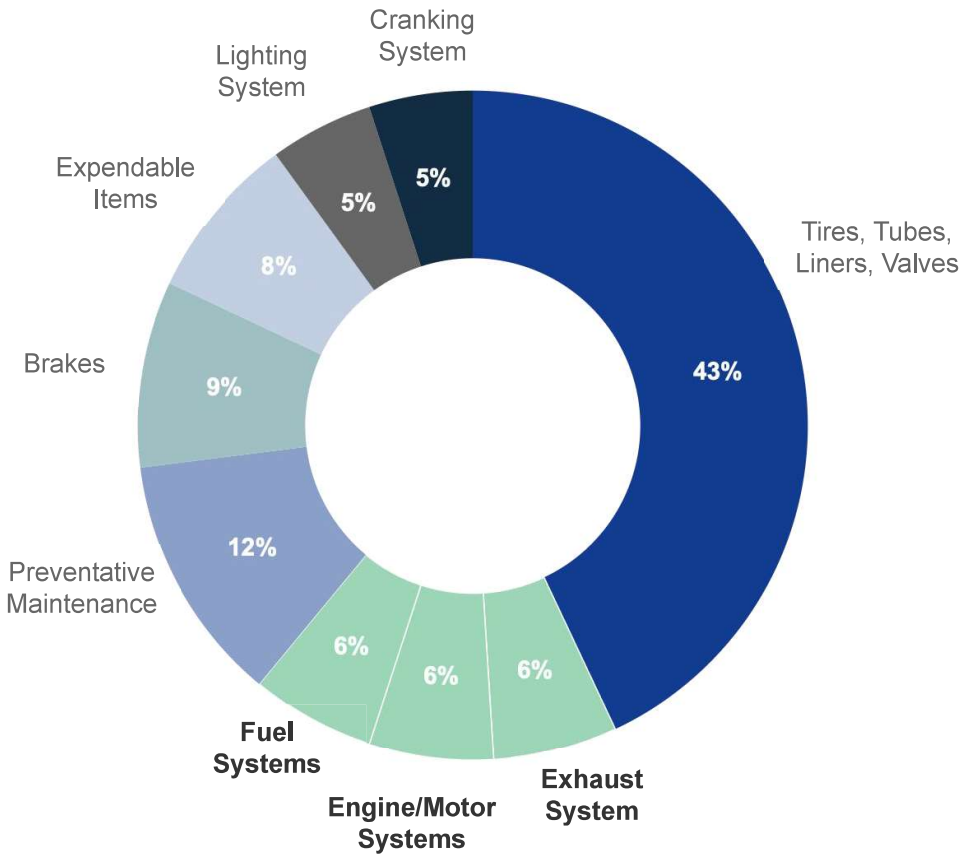
Fleet maintenance costs

- Fuel-related maintenance is the second largest maintenance cost
- Using Neste MY Renewable Diesel can lead to savings

Poor fuel quality increasingly causes more vehicle maintenance costs and downtime due to its negative impacts on engine performance, fuel, filters, and fuel injection systems."

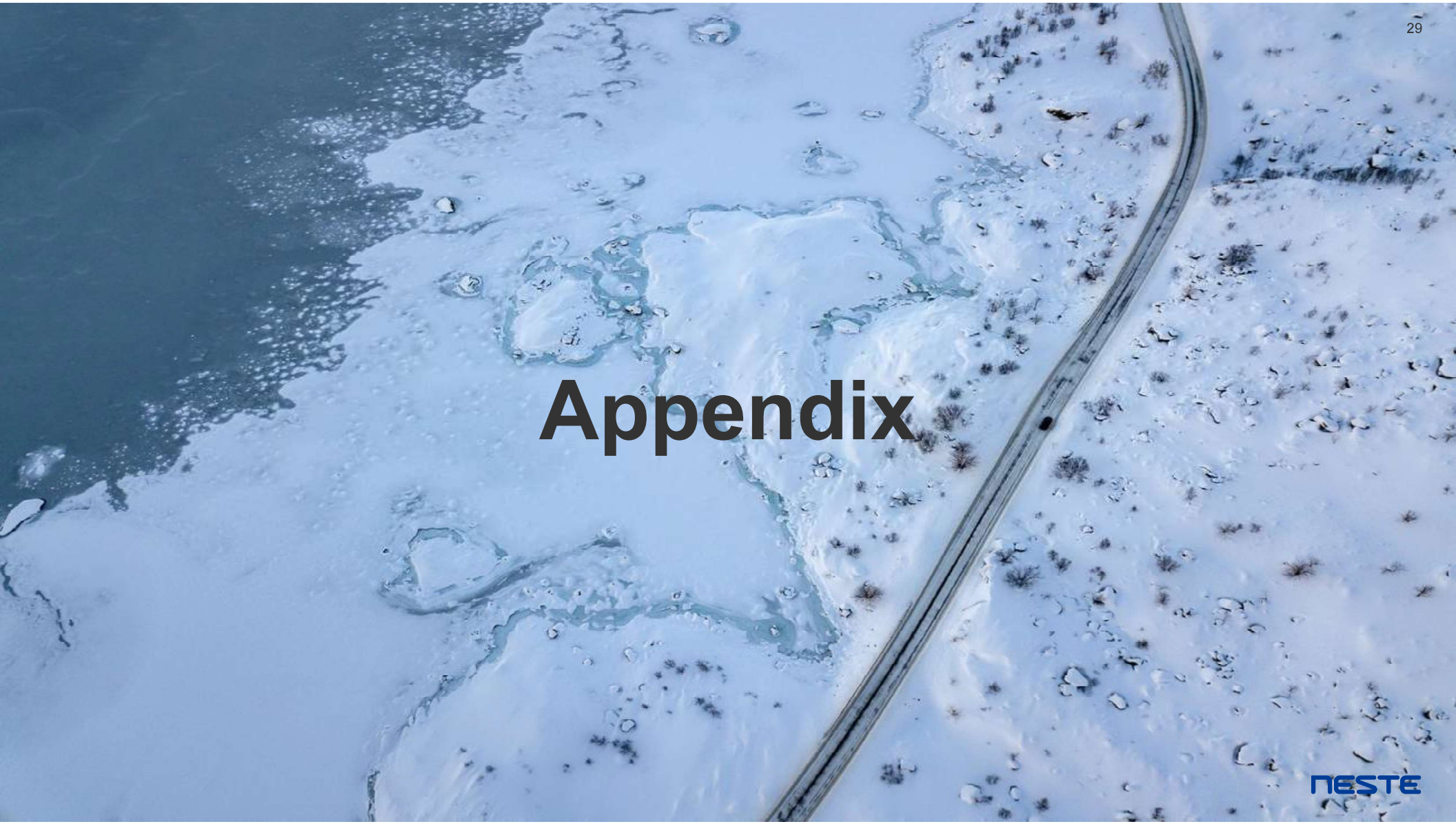
- *Fuels Institute, Diesel Fuel Quality Council*

Percent of Total Maintenance and Repair Cost



"Mitigating Rising Maintenance & Repair Costs for Class-8 Truck Fleets" white paper - *Fleet Advantage*

NESTE



Appendix

Renewable Diesel in Locomotives

"Cummins is ready to assist customers on the decarbonization journey. By working together, we can effect change for today's climate crisis," states Cummins General Manager

– Cummins GM Rail and Defense, Regina Barringer

PRESS RELEASE RAIL

mtu A Rolls-Royce solution

ROLLS-ROYCE RELEASES *mtu* RAIL ENGINES FOR SUSTAINABLE FUELS

Posted on September 22, 2022

Progress Rail
A Caterpillar Company

CN and Progress Rail Advance Sustainability Efforts with a Renewable Fuels Partnership

Renewable fuel blends present immediate opportunity to further reduce greenhouse gas emissions

MONTREAL, November 3, 2021

Neste has ongoing relationships with locomotive engine experts

- Cummins
- Progress Rail
- MTU
- Wabtec
- Southwest Research Institute

Scott Files - Cummins, Inc
Director, Global Freight Rail Market and Next Generation Engine New Product Marketing

A highlight last week for me: riding on the Knoxville Locomotive Works new 4400-ACT4 powered by the low carbon100% renewable diesel Cummins QSK95 Tier 4 emission power system. This is a great first step in decarbonizing linehaul fleets. Its also one that will evolve with you as low/no carbon power technology advances and becomes ready for prime time.

Technical Data Sheet

Neste MY Renewable Diesel

Neste Renewable Diesel is a bio-based paraffinic diesel fuel defined in ASTM D975 and EN 15940 specifications.

Properties	Unit	Neste MY Renewable Diesel		ASTM D975 Diesel limits			EN 15940 Paraffinic Diesel Ilimits		
		min	max	min	max	Test Method	min	max	Test Method
Cetane number	-	70	-	40	-	ASTM D6890	70	-	EN 15195
Sulfur content	mg/kg	-	5	-	15	ASTM D5453	-	5	EN ISO 20846
Flash point	°C	61	-	52	-	ASTM D93	55	-	EN ISO 2719
Carbon residue (on 10% distillation residue)	% (m/m)	-	0.1	-	0.35	ASTM D4530	-	0.3	EN ISO 10370
Ash content	% (m/m)	-	0.001	-	0.01	ASTM D482	-	0.01	EN ISO 6245
Water and sediment	% (m/m)	-	0.02	-	0.05	ASTM D2709	-	0.02	EN ISO 12937
Copper strip corrosion (3h at 50°C)	rating	Class 1		Class 3		ASTM D130	Class 1		EN ISO 2160
Oxidation stability	g/m³	-	25	-	25	ASTM D2274	-	25	EN ISO 12205
Lubricity, corrected wear scar diameter (wsd 1.4) at 60°C	µm	-	460	-	520	ASTM D6079	-	460	EN ISO 12156-1
Viscosity at 40°C	mm²/s	2	4	1.9	4.1	ASTM D445	2	4.5	EN ISO 3104
Distillation 90% (V/V) recovered at	°C	282	338	282	338	ASTM D86	-	-	-
Distillation 95% (V/V) recovered at	°C	-	360	-	-	-	-	360	EN ISO 3405
Cloud Point	°C	-20*C Winter / -12*C Summer		-	-	ASTM D7689	-	-	EN 23015 & EN 116
Appearance		Clear and bright		-	-	Visual	-	-	Visual
Total aromatics content	% (m/m)	-	1.1	-	35	ASTM D1319	-	1.1	EN 12916
Conductivity	pS/m	50	-	25	-	ASTM D2624	-	-	-
Total acid number	mg KOH/g	-	-	-	-	-	-	-	-
Oxidation stability	mg KOH/g	-	-	-	-	-	-	-	-

The supplier guarantees no FAME is added in the product.

NESTE

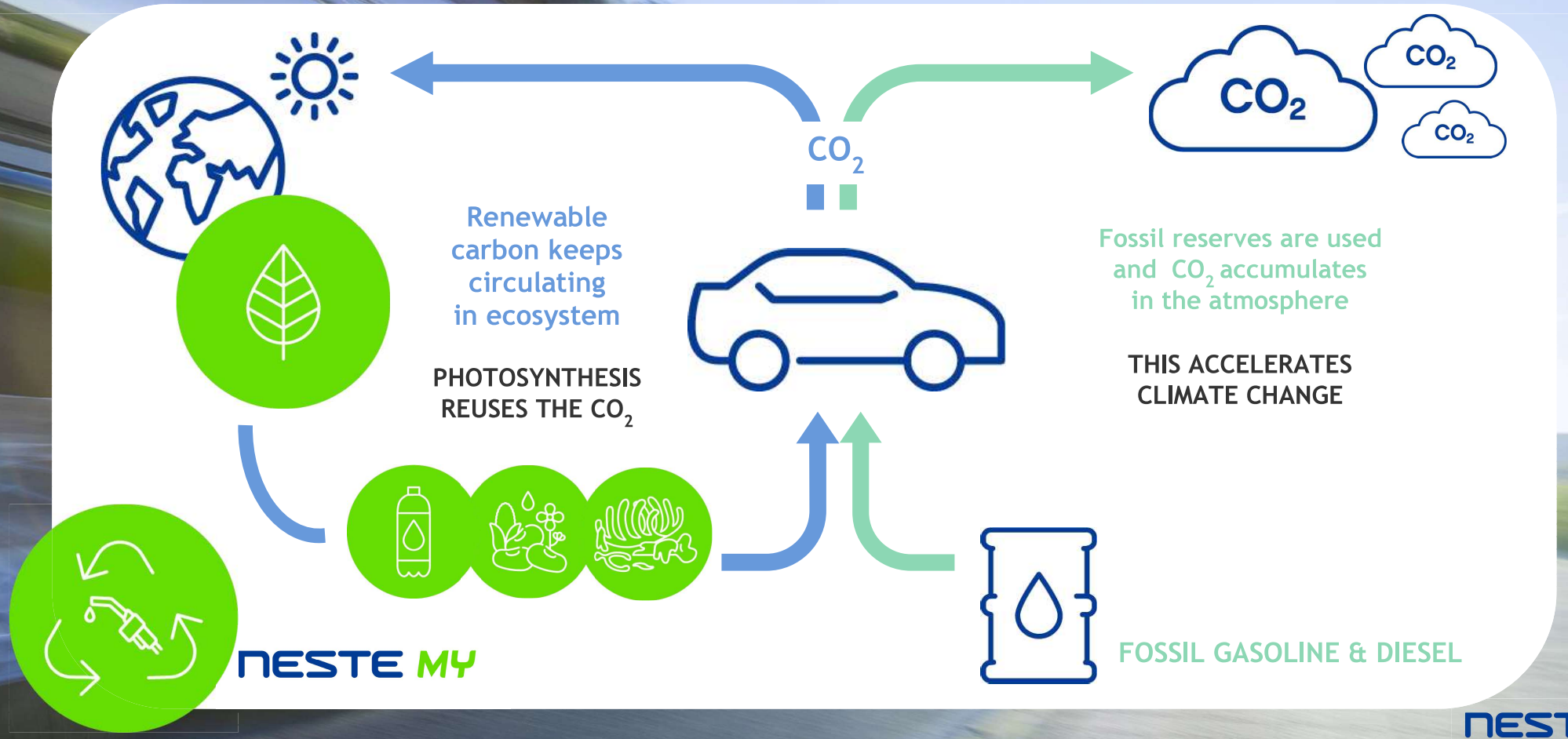
California LCFS carbon intensity scores

Fuel	Fuel Pathway Code	Carbon Intensity Score	Effective Start Date	Effctive End Date	Pathway Desciption	Active	Neste Company	Provisional	Feedstock
Diesel	ULS000L00072019	100.45		Effective until further notice - annual verification	**ULSD** based on the average crude oil supplied in California refineries and average California refinery efficiencies	TRUE	N/A	No	Crude Oil
Renewable Diesel	RND003B01790700	36.43	1-Jan-21	Effective until further notice - annual verification	**North America Sourced Corn Oil** transported by Truck, Rail, and Ocean Tanker to Renewable Diesel plant in Singapore; Natural Gas, Grid Electricity, and Hydrogen; Renewable Diesel produced in Singapore and transported by Ocean Tanker to California.	TRUE	Neste Singapore	No	TCO
Renewable Diesel	RND001B01790400	32.83	1-Jan-21	Effective until further notice - annual verification	**Globally Sourced Used Cooking Oil** transported by Truck, Rail, and Ocean Tanker to Renewable Diesel plant in Singapore; Natural Gas, Grid Electricity, and Hydrogen; Renewable Diesel produced in Singapore and transported by Ocean Tanker to California.	TRUE	Neste Singapore	No	UCO
Renewable Diesel	RND001B01790600	28.64	1-Jan-21	Effective until further notice - annual verification	**North America Sourced Used Cooking Oil** transported by Truck, Rail, and Ocean Tanker to Renewable Diesel plant in Singapore; Natural Gas, Grid Electricity, and Hydrogen; Renewable Diesel produced in Singapore and transported by Ocean Tanker to California.	TRUE	Neste Singapore	No	UCO
Renewable Diesel	RND001B01790500	24.29	1-Jan-21	Effective until further notice - annual verification	**South East Asia Sourced Used Cooking Oil** transported by Truck, Rail, and Ocean Tanker to Renewable Diesel plant in Singapore; Natural Gas, Grid Electricity, and Hydrogen; Renewable Diesel produced in Singapore and transported by Ocean Tanker to California.	TRUE	Neste Singapore	No	UCO
Renewable Diesel	RND002B01790100	42.77	1-Jan-21	Effective until further notice - annual verification	**Globally Sourced Rendered Animal Fat** Oil transported by Truck, Rail, and Ocean Tanker to Renewable Diesel plant in Singapore; Natural Gas, Grid Electricity, and Hydrogen; Renewable Diesel produced in Singapore and transported by Ocean Tanker to California.	TRUE	Neste Singapore	No	AF/ (all FF despite CoO)
Renewable Diesel	RND002B01790200	40.1	1-Jan-21	Effective until further notice - annual verification	**North America Sourced Rendered Animal Fat** Oil transported by Truck, Rail, and Ocean Tanker to Renewable Diesel plant in Singapore; Natural Gas, Grid Electricity, and Hydrogen; Renewable Diesel produced in Singapore and transported by Ocean Tanker to California.	TRUE	Neste Singapore	No	AF
Renewable Diesel	RND002B01790300	38.26	1-Jan-21	Effective until further notice - annual verification	**Oceanic (AUS/NZ) Sourced Rendered Animal Fat** Oil transported by Truck and Ocean Tanker to Renewable Diesel plant in Singapore; Natural Gas, Grid Electricity, and Hydrogen; Renewable Diesel produced in Singapore and transported by Ocean Tanker to California.	TRUE	Neste Singapore	No	AF

Neste Renewable Propane

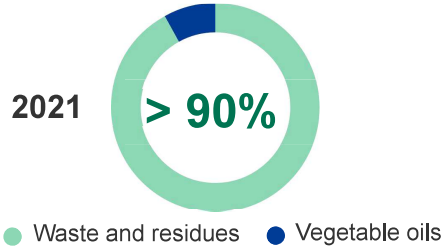
- **100% Renewable -** Produced from renewable bio-based feedstocks.
- **Drop-in solution -** Can be transported and commingled through the same infrastructure as fossil-based propane. No modifications by end-users are required. Spec: HD5
- All the **same benefits** as Neste Renewable Diesel including Environmental, Climate CO2 Reduction, Sustainability, Supply Security and Circularity Opportunities.
- Available FOB Martinez Refinery to Rail.

In the case of Neste renewable diesel, renewable carbon keeps circulating in the ecosystem



Neste renewable raw materials

Neste has focused on waste and residues for over a decade. They represent **more than 90% of our global renewable raw material inputs.**



Our **3 largest raw material categories** based on their current and estimated shares of Neste's total annual renewable raw material inputs are:

Used cooking oil

Animal fat from food industry waste

Vegetable oil processing waste & residues

Thanks to our patented NEXBTL refining technology, Neste can use a **wide variety of oils and fats**, even lower-quality wastes and residues, to produce products with consistent high quality.

Fish fat from fish processing waste

Technical corn oil

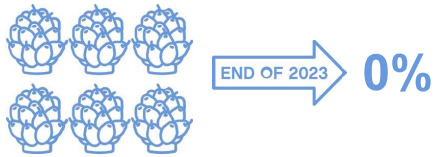
Tall oil based raw materials

Palm oil (0% by end 2023)

Rapeseed oil

Soybean oil

The role of sustainably-produced conventional vegetable oils in Neste's global raw material inputs has decreased significantly over the past decade, including conventional palm oil. 100% certified and 100% traceable conventional palm oil represented 7% of our global renewable raw material inputs during the first year-half of 2021.



Our target is to reduce its use to 0% by the end 2023.

We continuously work on **increasing the availability of lower-quality waste and residue raw materials**, while developing technologies to diversify our portfolio with new types of raw materials.

New types of lower-quality waste and residues such as **brown grease or acid oils**

Lignocellulose from agricultural and forestry waste

Organic fractions of **municipal solid waste**

Cultivation of CO2 **absorbing microalgae**

Combining CO2 with **green hydrogen** to produce e-fuels

Novel vegetable oils based on advanced, more sustainable agricultural concepts, that do not create additional demand for land

In addition, we have started **using waste plastics as a refinery raw material** to turn it into high-quality feedstock e.g. for new plastics.

NESTE

Sustainably produced and globally sourced

= **40 Mt**

The availability of waste and residue oils and fats suitable for Neste's current NEXBTL refining technology expected to grow **to 40 Mt/a by 2030**

We are exploring **several technologies** to tap into new types of raw material sources to grow the availability of raw materials

Neste produces a wide variety of renewable products **at three refineries in three countries.**

3.3 Mt
Renewables production capacity today

4.5 Mt
Expected 2023 renewables production capacity

A series of acquisitions and partnerships, and continuously strengthened sourcing capability will ensure the future availability of raw materials.

We are also **growing our global aggregation network** by creating regional aggregation hubs and expanding our terminal network globally

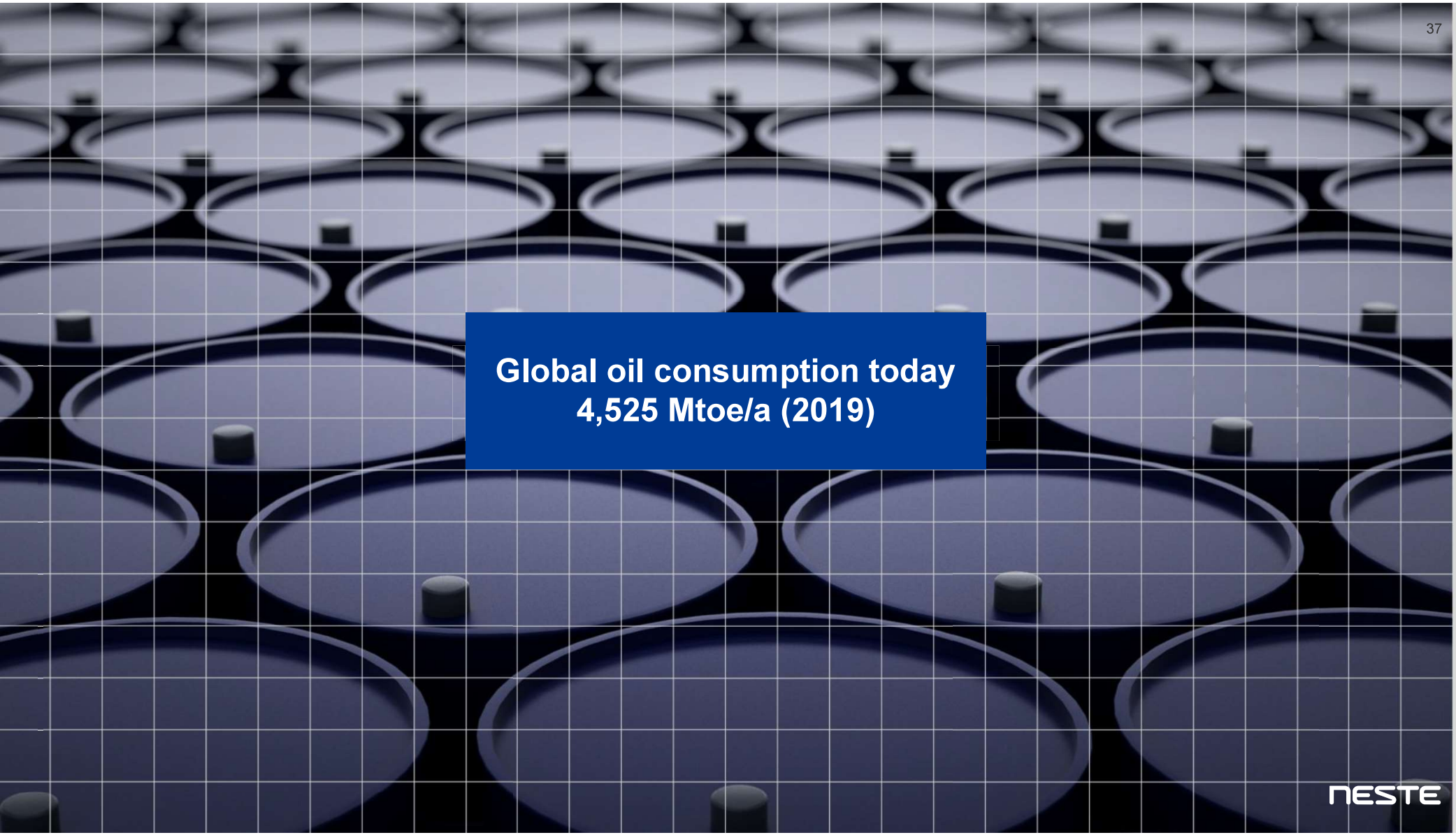
All our globally sourced raw materials are sustainably-sourced and traceable to the point of origin. Our renewable raw materials meet all the legal requirements in our markets. Our suppliers are expected to continuously comply with with **Neste Supplier Code of Conduct.**

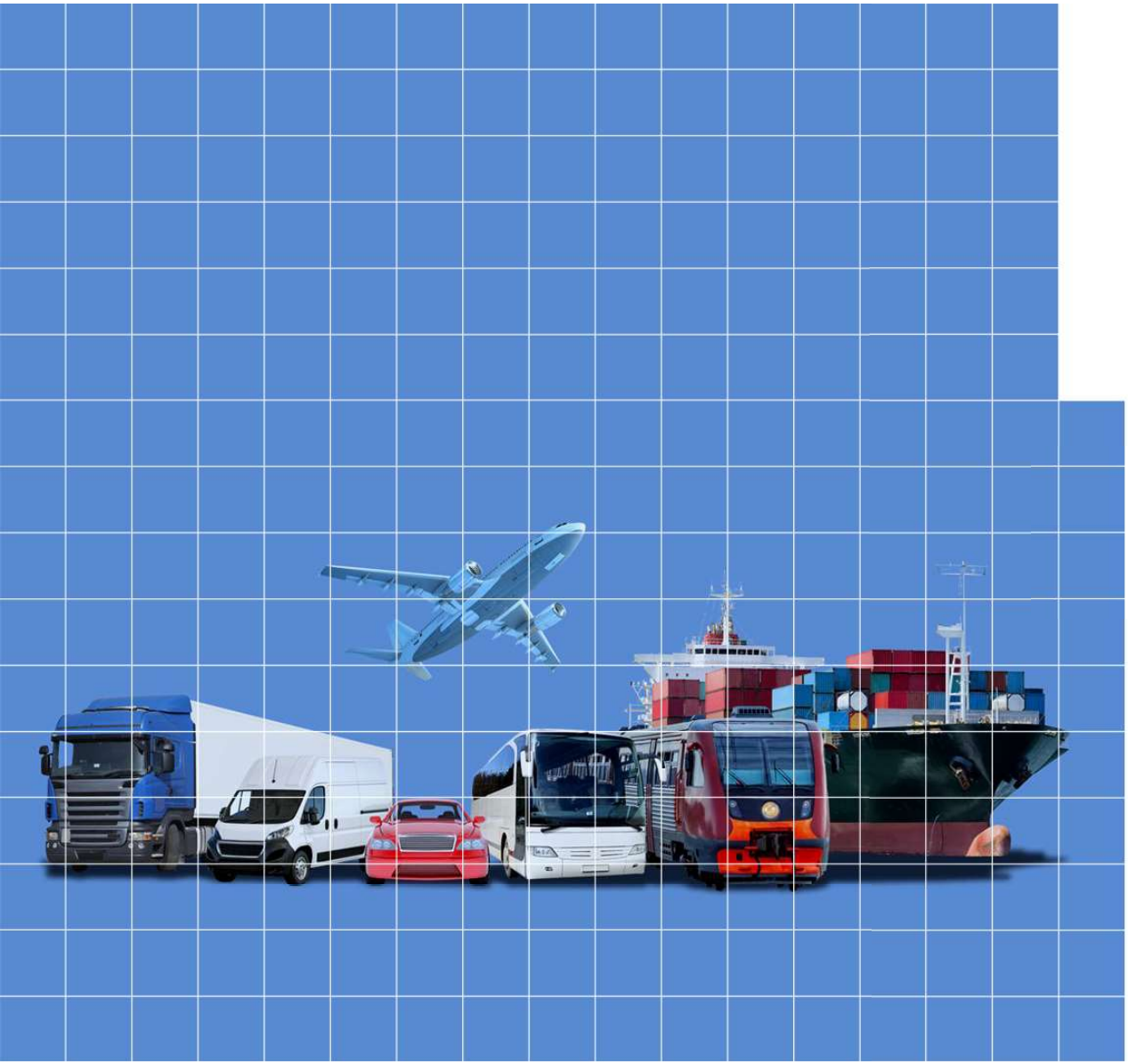
Globally sourced

Traceable to the point of origin

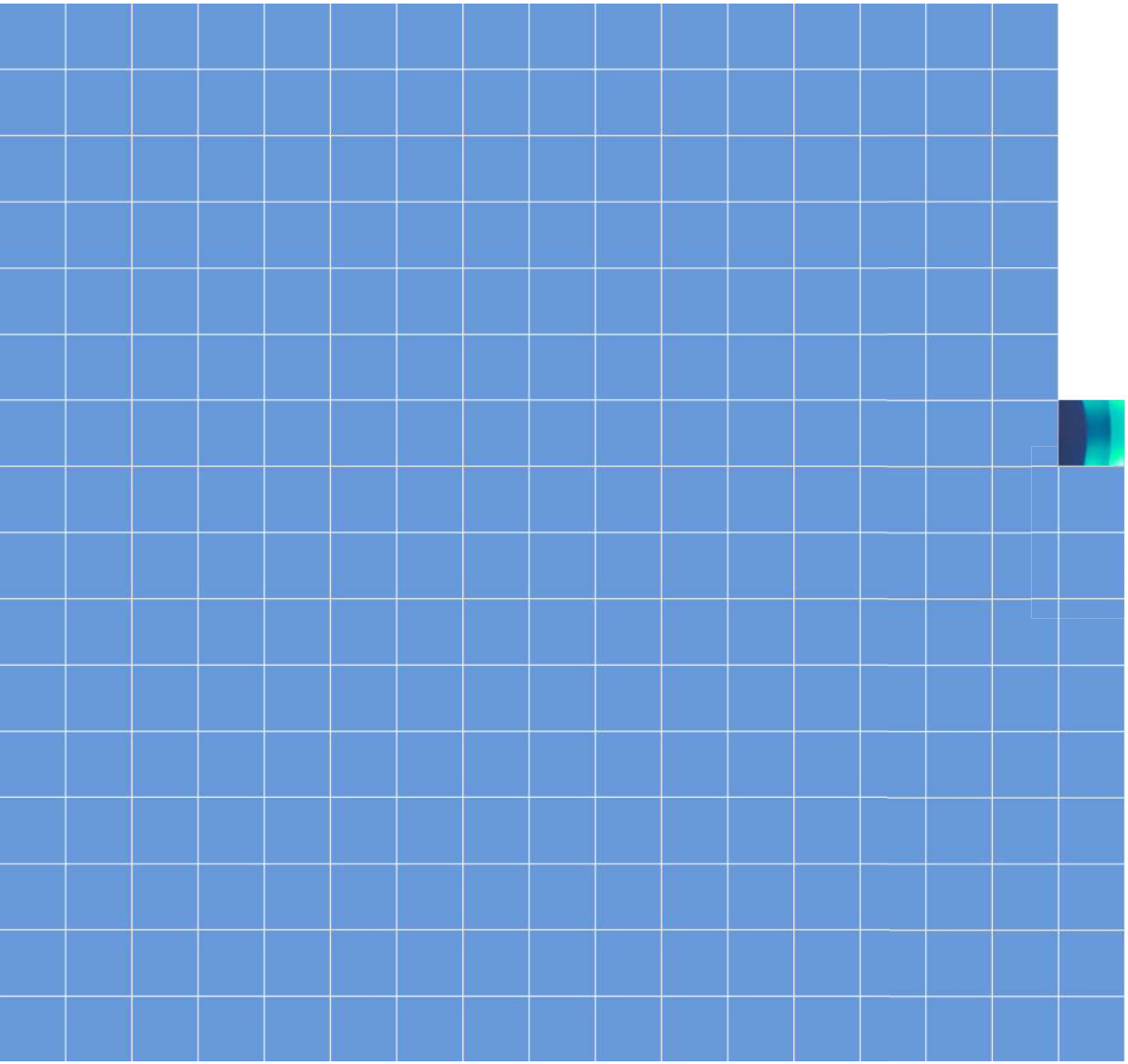
Continuous screening & monitoring

Enable significant emissions savings when refined into renewable products


Global oil consumption today
4,525 Mtoe/a (2019)



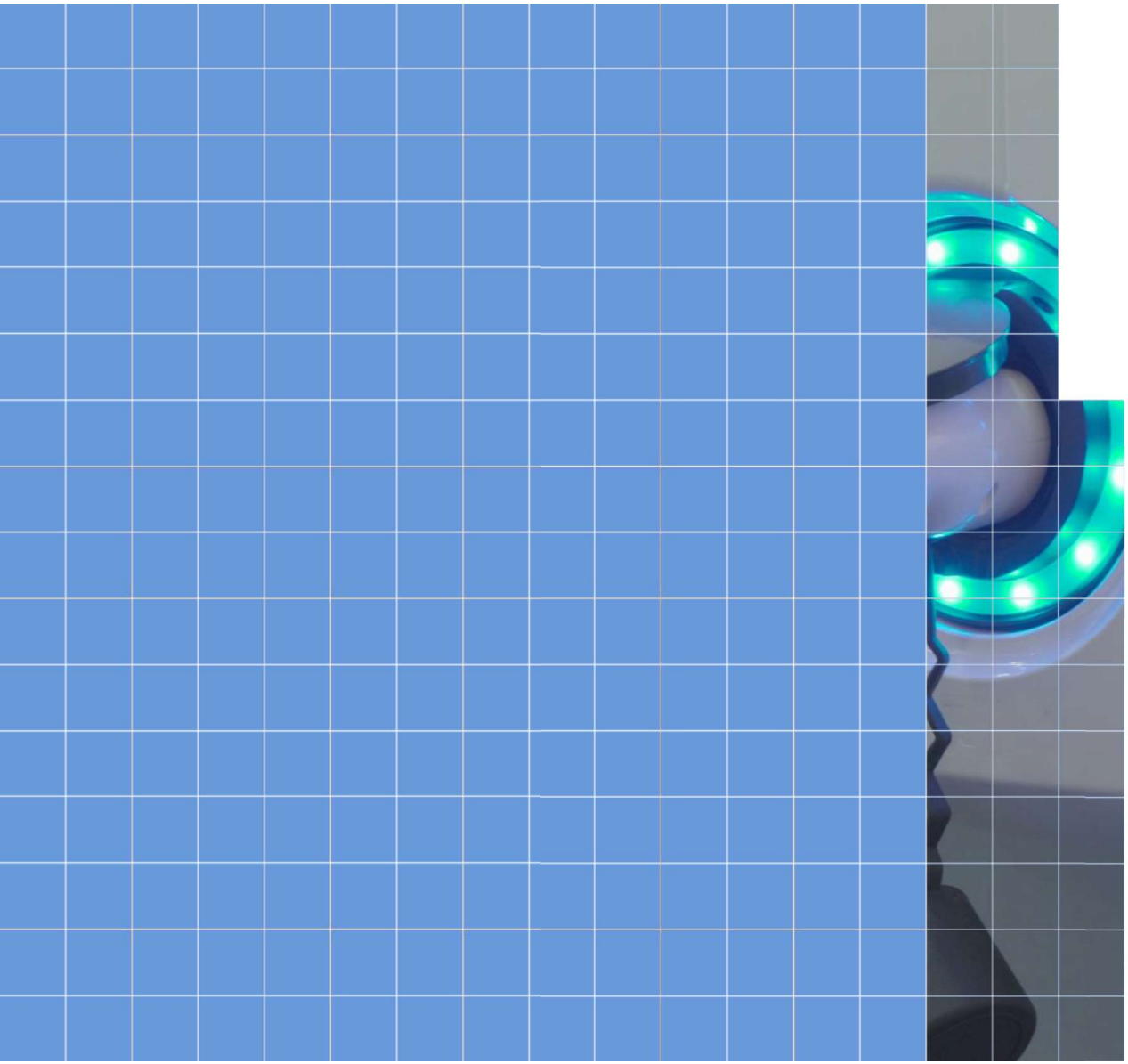
Global oil demand for transport 2,668 Mtoe/a (2019)



2020

10 million electric vehicles
6 Mtoe/a oil displacement

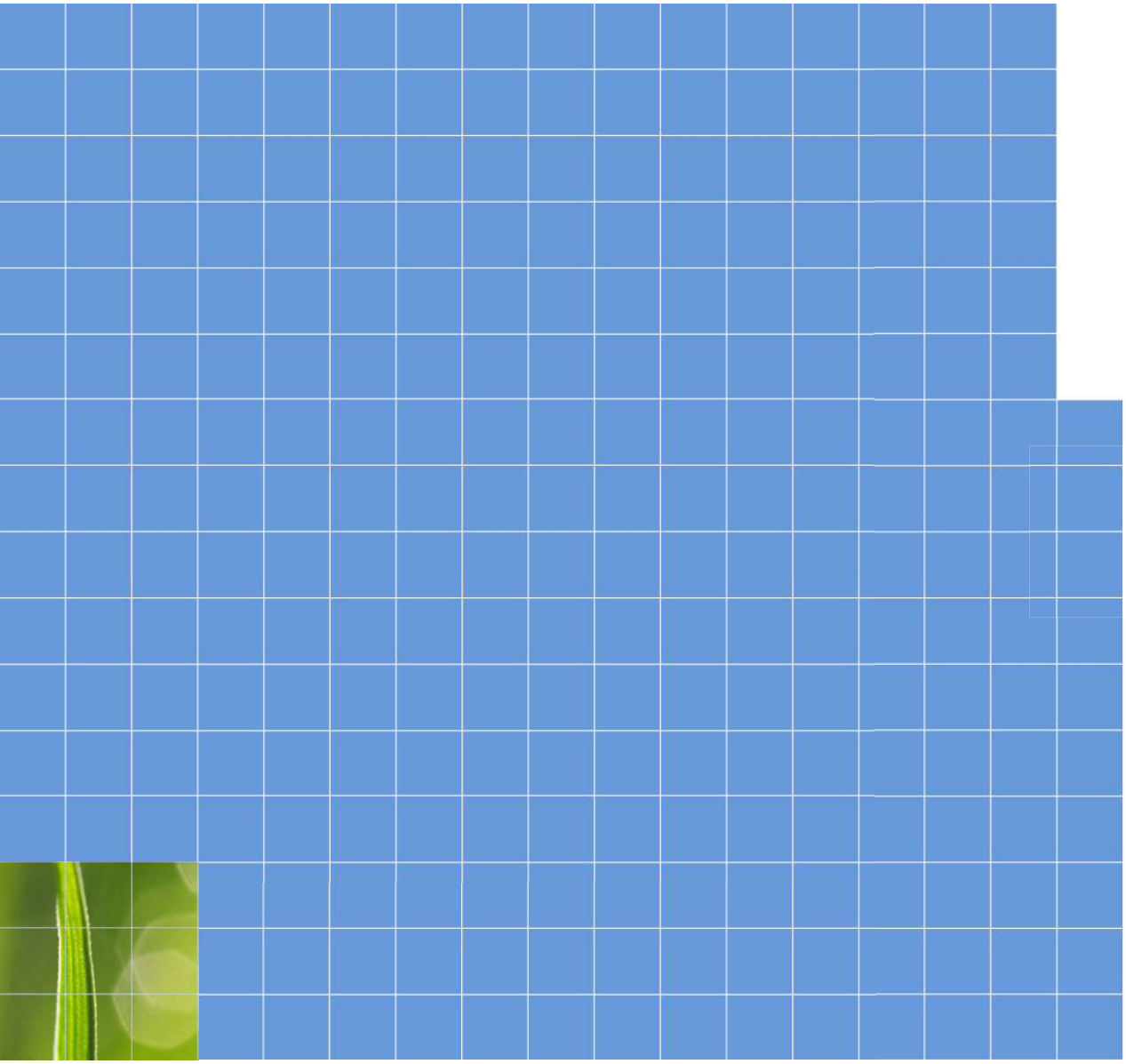
NESTE



2040

600 million electric vehicles
360 Mtoe/a oil displacement

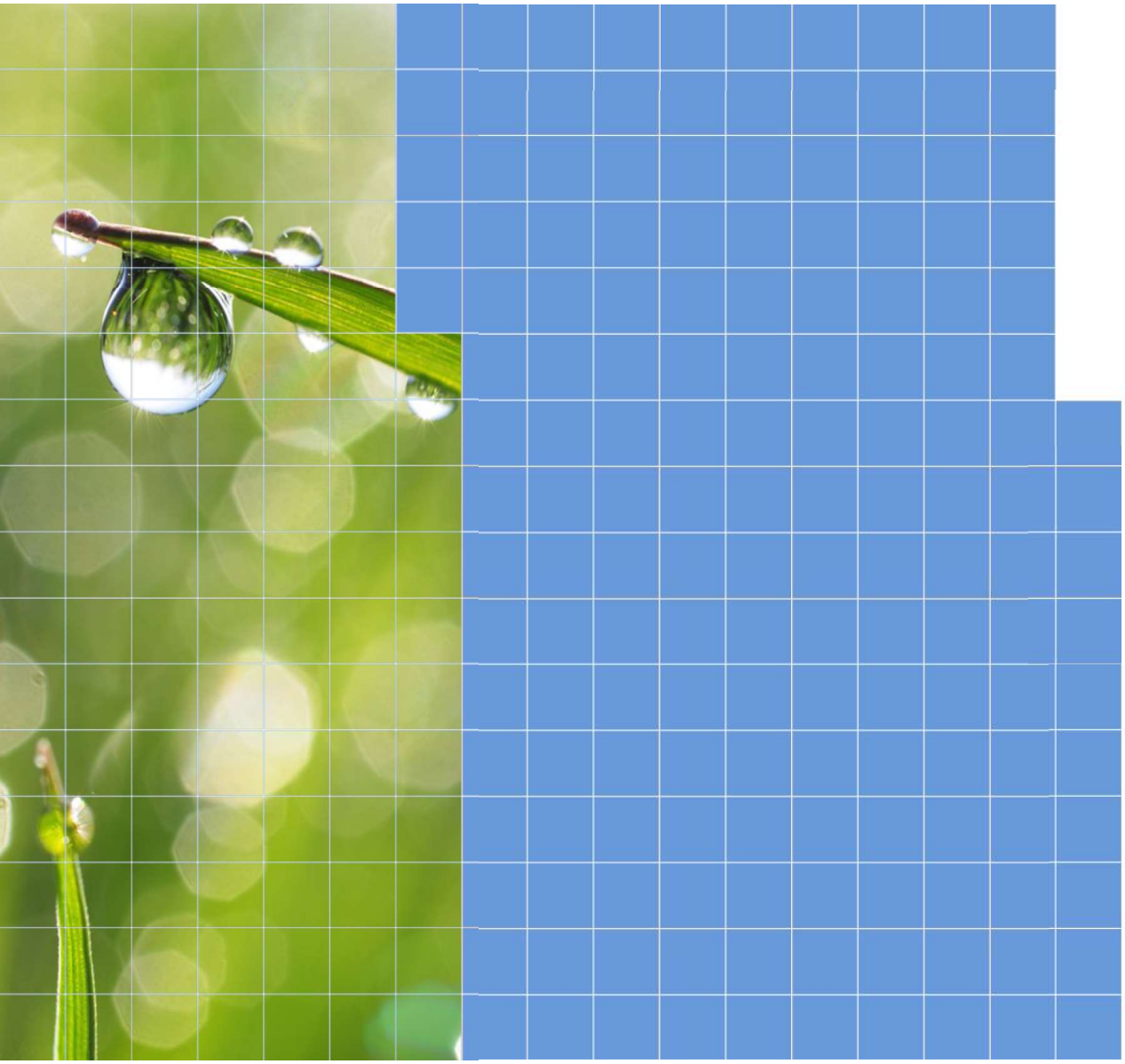
Source: Neste based on IEA World Energy Outlook 2019,



2019

Global renewable consumption 98 Mtoe/a oil displacement

Source: Neste based on IEA World Energy Outlook 2019,

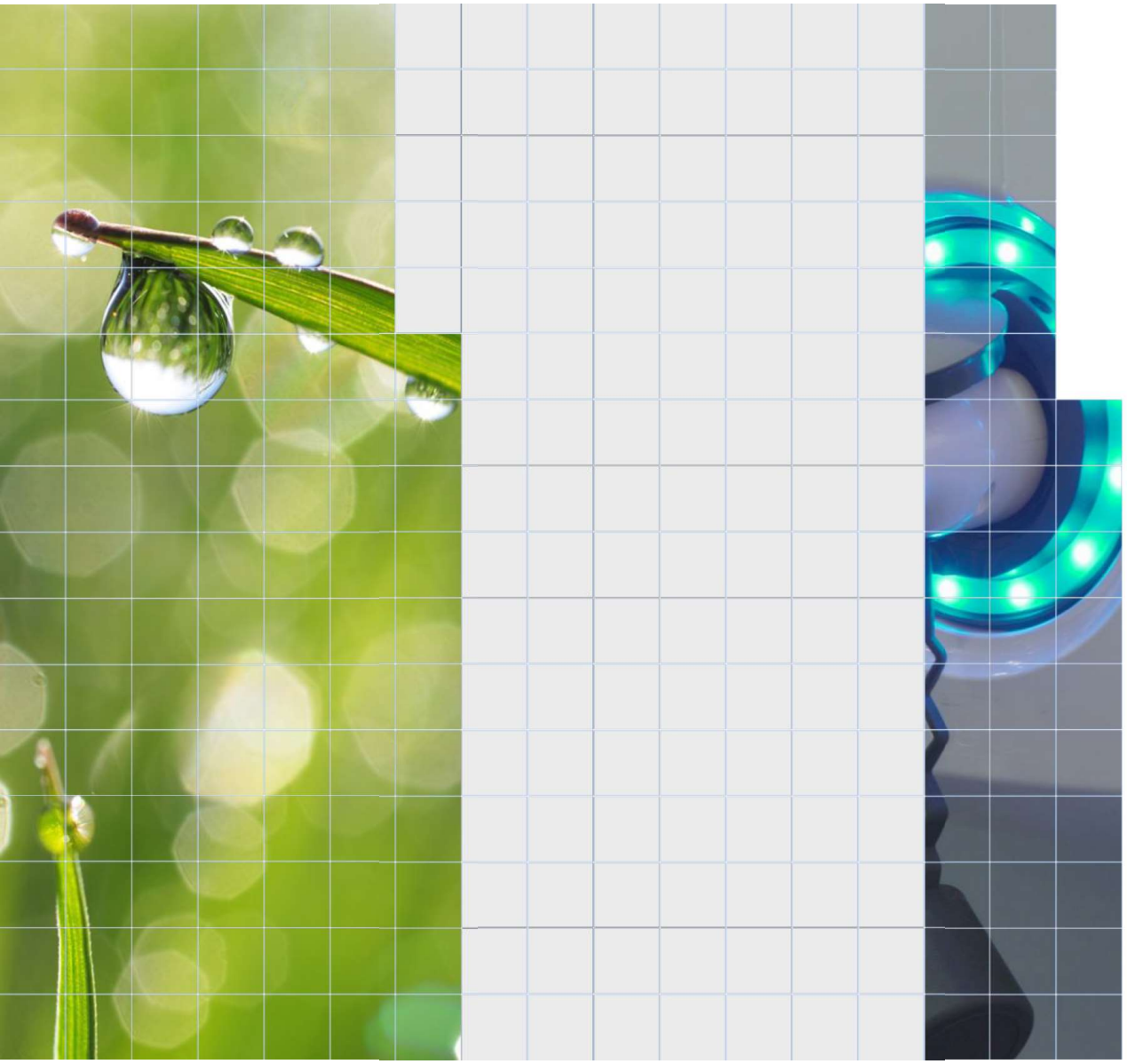


2040

Feedstock* availability for renewable fuel production 1071 Mtoe/a oil displacement

Source: World Economic Forum / McKinsey (2020)
*Fatty acids, cellulosic, municipal solid waste

NESTE



2040

EVs and renewable fuels* can substitute more than 50% of crude oil in transportation

Smart regulation is needed to make it happen!

Source: Neste based on IEA World Energy Outlook 2019, World Economic Forum / McKinsey (2020)
*Fatty acids, cellulosic, municipal solid waste based

NESTE

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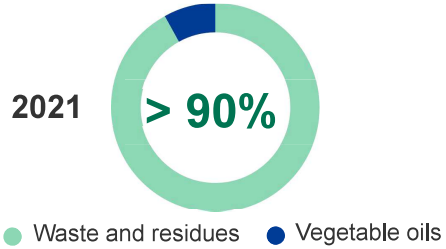

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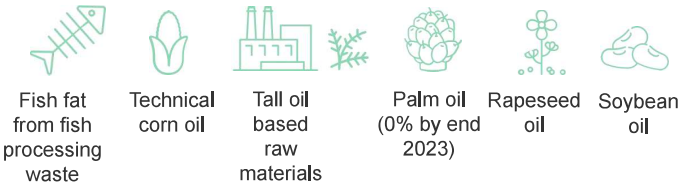

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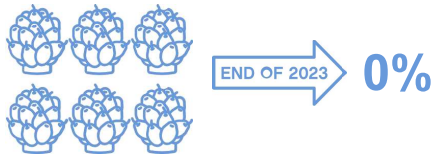

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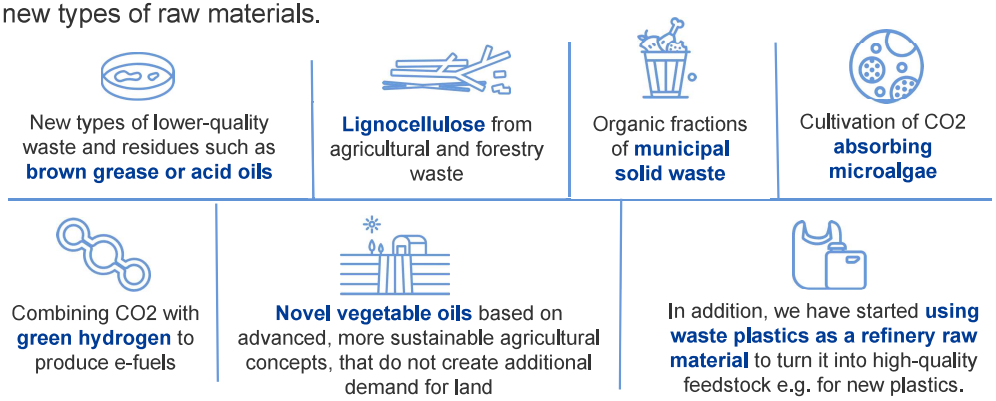

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Globally sourced

Traceable to the point of origin

Continuous screening & monitoring

Enable significant emissions savings when refined into renewable products

Neste MY benefits

Appearance
- Clear and bright every time
- Product not variable like petroleum based fuels

Fueling
- **Aromatic-free** means Neste MY is less harmful to employees, handlers & environment
- **High flash point** improves safety for emergency vehicles, school buses other and mission-critical applications
- Flash point guaranteed >60°C

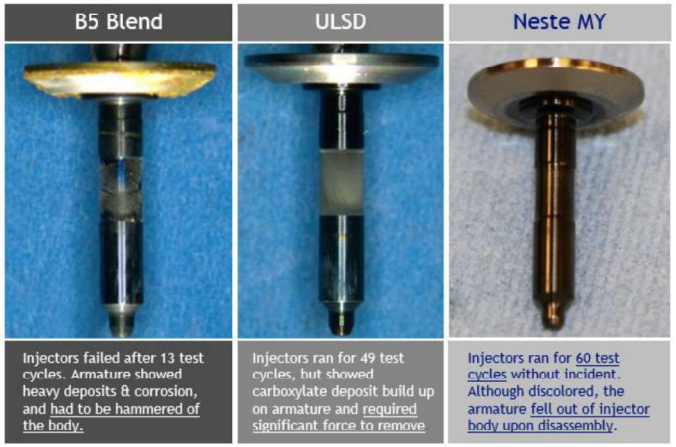
Handling and storage
- Almost zero risk of water absorption or microbial growth
- **Great oxidative stability** = indefinite shelf life
- Minimal to zero risk of filter blocking
- **Non-polar**, will not clean out debris in older fuel tanks
- Neste R&D has fuel from the first production in 2005. This fuel is tested annually, and in 15 years the stability properties have not changed

Combustion
- **High cetane (70+)** for more complete combustion, quicker cold start, and quieter operation
- **33% less soot** to plug DPFs and reduce fuel economy
- **Better lubricity** than CARB ULSD – 460 µm HFRR (EN590), compared to 520 HFRR for D975
- Maintenance costs can be reduced (fuel injectors, high pressure pumps, after treatment systems)

Fuel injectors
- Example from Detroit Diesel engine testing (pictured)
- Test artificially aged fuel similar to real-world, longer term storage applications or where fuel has broken down
- Demonstrated much lower risk of deposits in injectors which lead to failures
- Purity and lack of oxygen in RD showed no injector failures on Neste test where others failed

Exhaust system
- **Burns cleaner** due to high cetane number and zero aromatics
- **33% less soot** can lead to fewer regenerations and lower backpressure, improving fuel economy
- **Improved DPF safety** due to reduced soot load and less risk of over-temp
- **Near zero ash-forming components** reduce ash accumulation, extend cleanout intervals

Simulated Harsh Environment Injector Testing



Vista Unified School District

4,000 mile maintenance intervals

CARB diesel | Neste MY

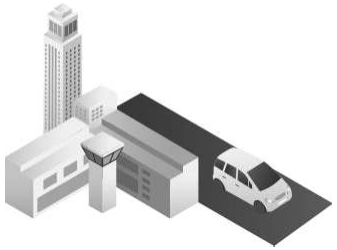
So what's stopping you?

The current vehicle CO2 regulation is not telling the whole truth

Life-cycle analysis

Raw Material Extraction

Material, Powertrain & Components Manufacture



Vehicle Manufacture

Well-to-Wheels

Fuel & Energy Cycle

Tank-to-Wheel

Fuel/Energy Use (Tailpipe Emissions)

End of Life Recycling and Disposal

US Legislation recognizes the GHG advantages of biofuels, and takes GHG of electricity generation into account.

European Vehicle Emissions Regulatory Focus

NESTE

Neste's climate commitments

CARBON FOOTPRINT

We are committed to reaching carbon neutral production by 2035.

We need to commit to reducing the direct climate impact of our activities. Reaching carbon neutral production by 2035 is an enormous undertaking, one which will require new ways of thinking, innovation and plenty of cooperation.

CARBON HANDPRINT

We will help our customers reduce their greenhouse gas emissions by at least 20 million tons annually by 2030.

Neste has focused on producing renewable fuels to replace fossil fuel use. Neste's renewable products help customers reduce their greenhouse gas emissions.

NESTE

Zero-aromatics benefits for fire departments

Fire fighters are continuously exposed to aromatics in exhaust when leaving and returning to fire houses

- Most vehicle operators are not concerned with this because their exhaust exits behind the vehicle as they drive, but operators of stationary equipment have higher exposure

Chronic exposure to polycyclic aromatic hydrocarbons is linked to cancer

- The earliest studies of PAH link to cancer were in 1936

Article: Are Fire Stations Contributing to Cancer Risk?

FAQ from California Professional Firefighters:

- **I am exposed to diesel exhaust on a daily basis while on duty. What are the regulations requiring the fire department to reduce my exposure to diesel exhaust?**
  Diesel exhaust is not on the list of known carcinogens. However, many of the particulates that make up diesel exhaust are. The Cal/OSHA regulation that regulates the amount of diesel exhaust is §5155. Airborne Contaminants.
  National Institute for Occupational Safety and Health (NIOSH) has documented extensive research on the carcinogenicity of diesel exhaust. That can be read as the NIOSH Carcinogenic Effects Of Exposure To Diesel Exhaust - originally written in 1988, updated in 1998.
  All members are encouraged to continue to record exposures to diesel exhaust. In the event that the IARC recognizes diesel exhaust as a carcinogen, those exposure records will help should a member develop cancer.

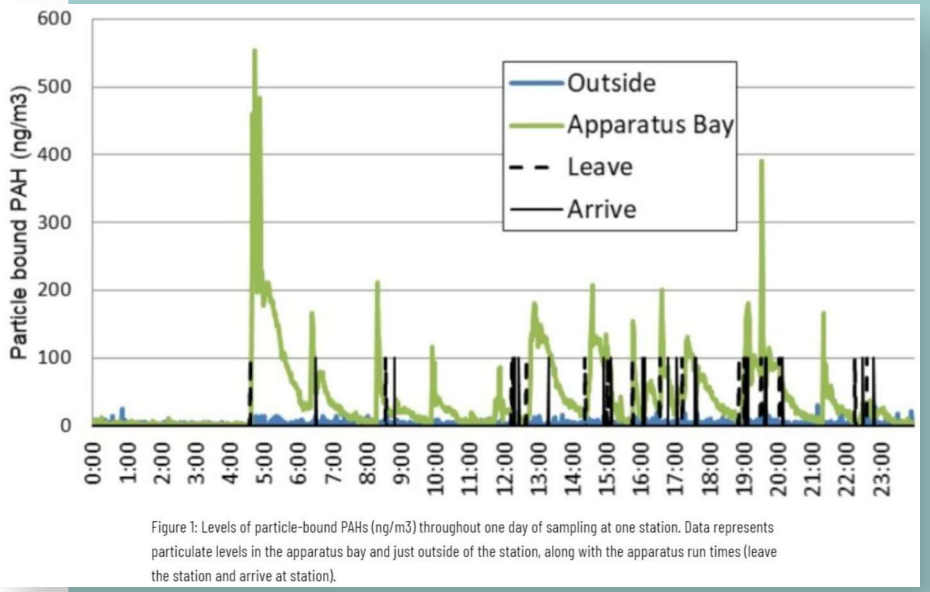
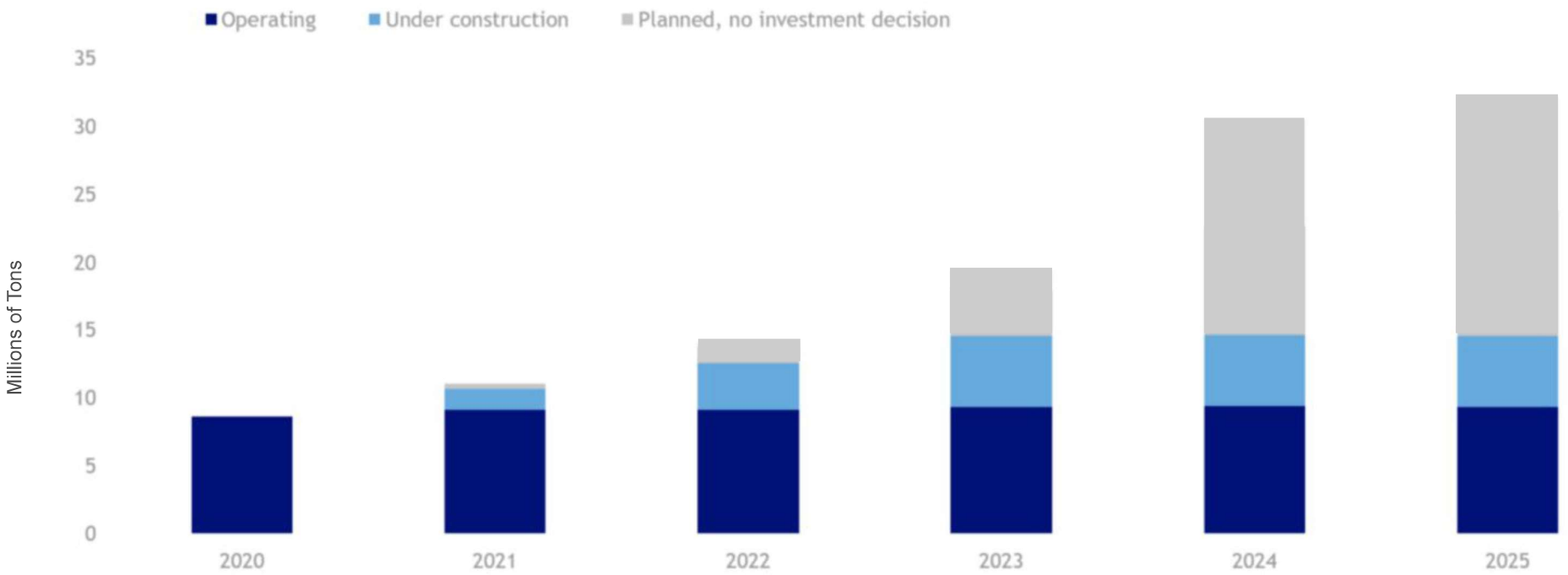


Figure 1: Levels of particle-bound PAHs (ng/m3) throughout one day of sampling at one station. Data represents particulate levels in the apparatus bay and just outside of the station, along with the apparatus run times (leave the station and arrive at station).

Renewable diesel capacity outlook

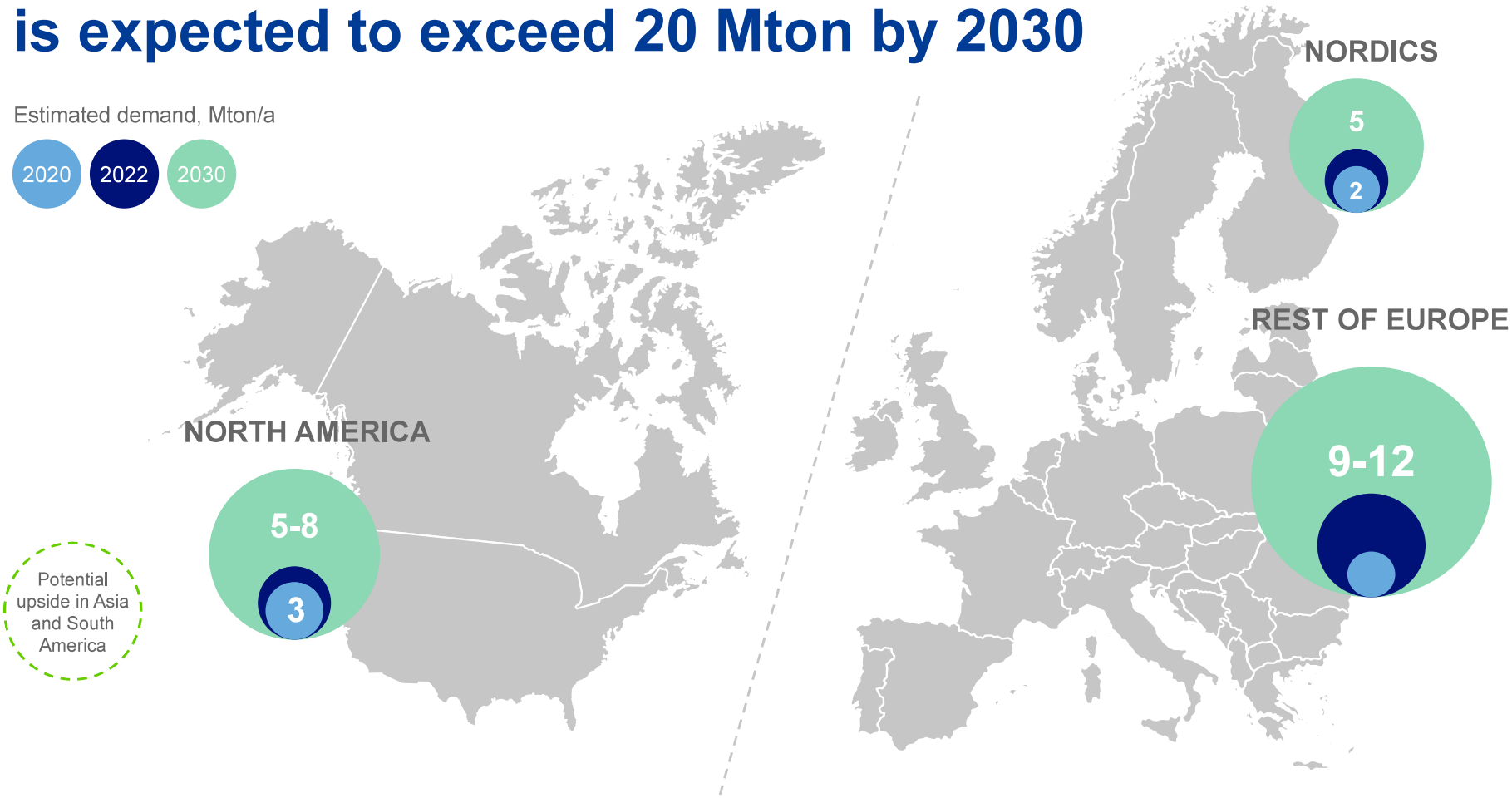
Global renewable diesel production capacity



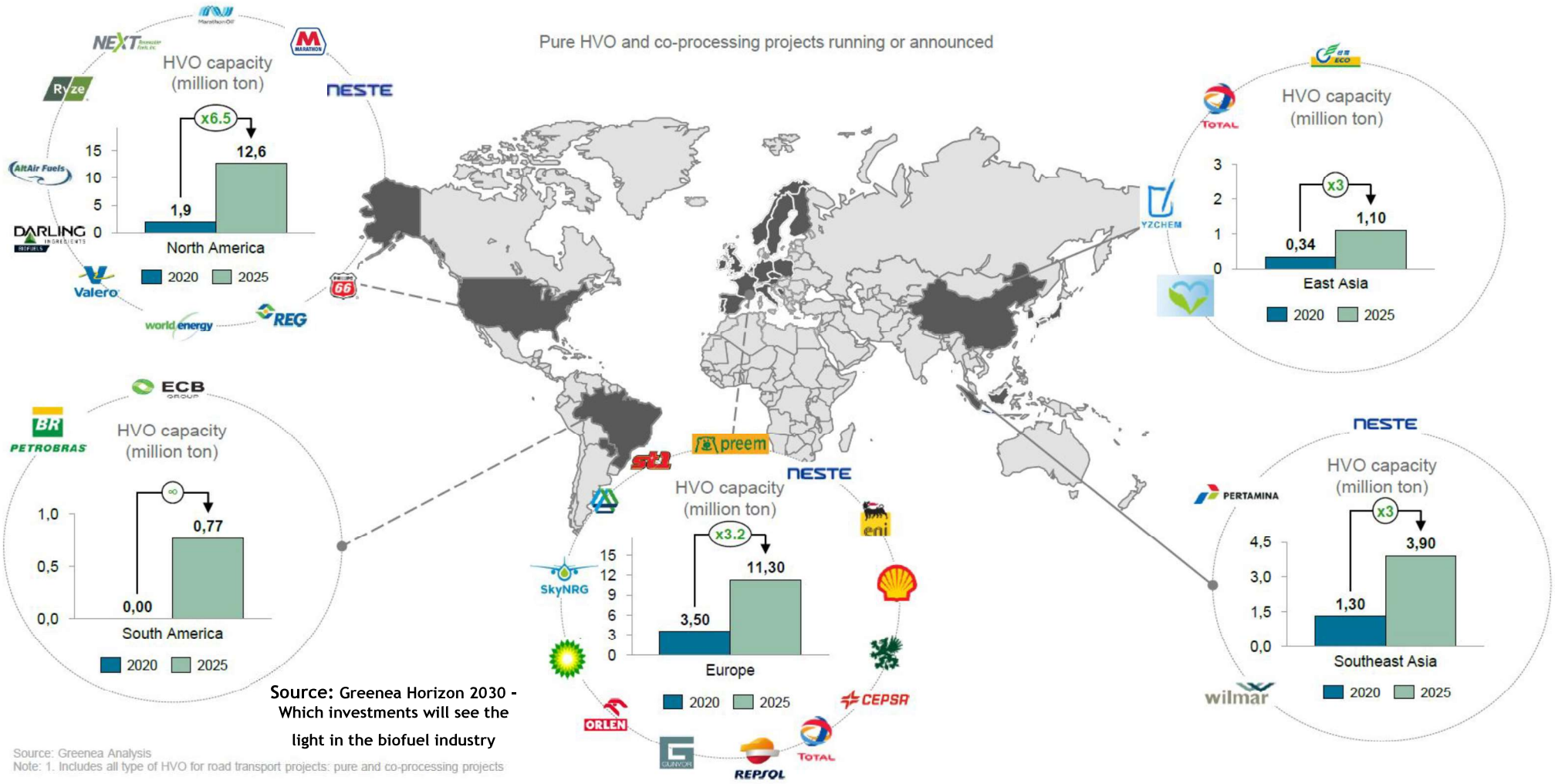
Note: Figure shows nameplate capacity. Actual production is typically lower, especially in the early years of production. Figure includes co-processing of fats, oils and grease feedstock in oil refineries producing a low-level RD-fossil diesel blend.

Source: Neste estimate based on companies' announcements and other public information

Global renewable diesel demand is expected to exceed 20 Mton by 2030



Global HVO production is expected to reach 30 Mton by 2025



Source: Greenea Horizon 2030 - Which investments will see the light in the biofuel industry

Source: Greenea Analysis
Note: 1. Includes all type of HVO for road transport projects: pure and co-processing projects

It’s all about the feedstock...

Neste’s renewable raw material portfolio consists of over 10 different waste and residue oils and fats and vegetable oils.

Waste and residues account for approximately 80% of Neste’s total renewable raw material inputs globally.

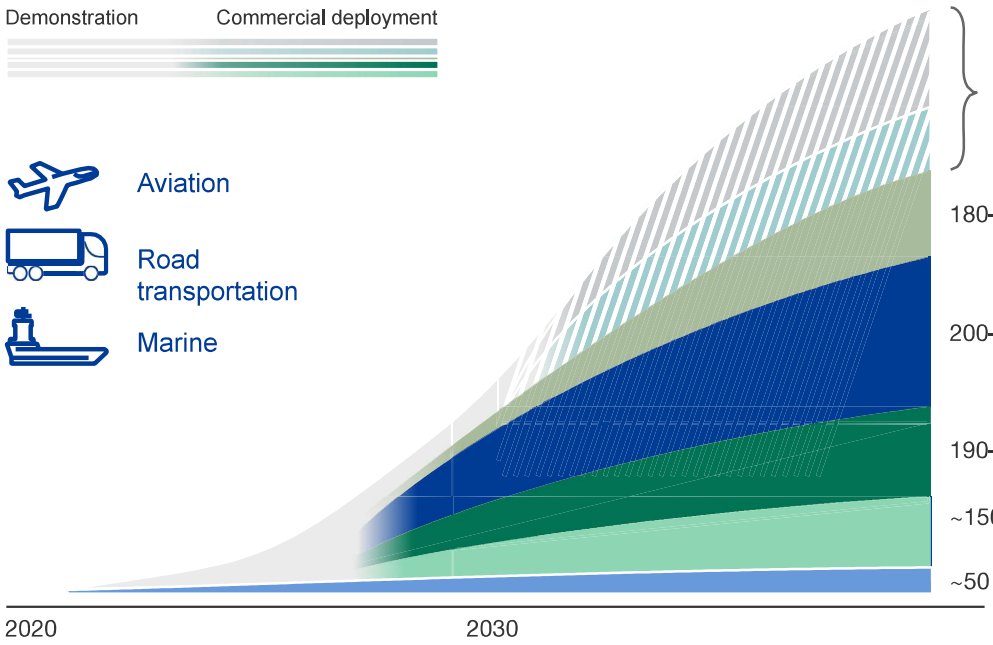
Neste only accepts feedstock from suppliers that meet our sustainability standards. We maintain a transparent and traceable supply chain.

25% of Neste’s workforce focused on innovation. Developing a new generation of feedstocks.

NESTE

Unlocking new raw material pools with innovation to accelerate emission reductions in transportation

Global raw material potential for renewable fuels (Mtoe)



Long-term fuel potential (Mtoe)

Significant potential for fuel production in the long term

180–275	Power-to-liquids Algae Cellulosic energy crops
200–400	Lignocellulosic residues (agriculture; forestry)
190–250	Municipal solid waste*
~150	Novel vegetable oils (cover crops; degraded land)
~50	Waste and residue fats and oils

Renewable raw materials hold significant potential to accelerate the reduction of CO_2 emissions, in particular in the transportation sector.
Regulators hold the key to enable a broad renewable raw material pool to unlock the full emission reduction potential in transport and beyond.

Source: Neste analysis based on WEF Clean Skies for Tomorrow and other sources. Biomass potential converted to fuel potential, using around 85% conversion efficiency (weight-based) for fats and oils and novel vegetable oils; around 25% efficiency for lignocellulosic biomass and municipal solid waste.
*80% organic waste, with 20% non-reusable, non-separable plastic waste

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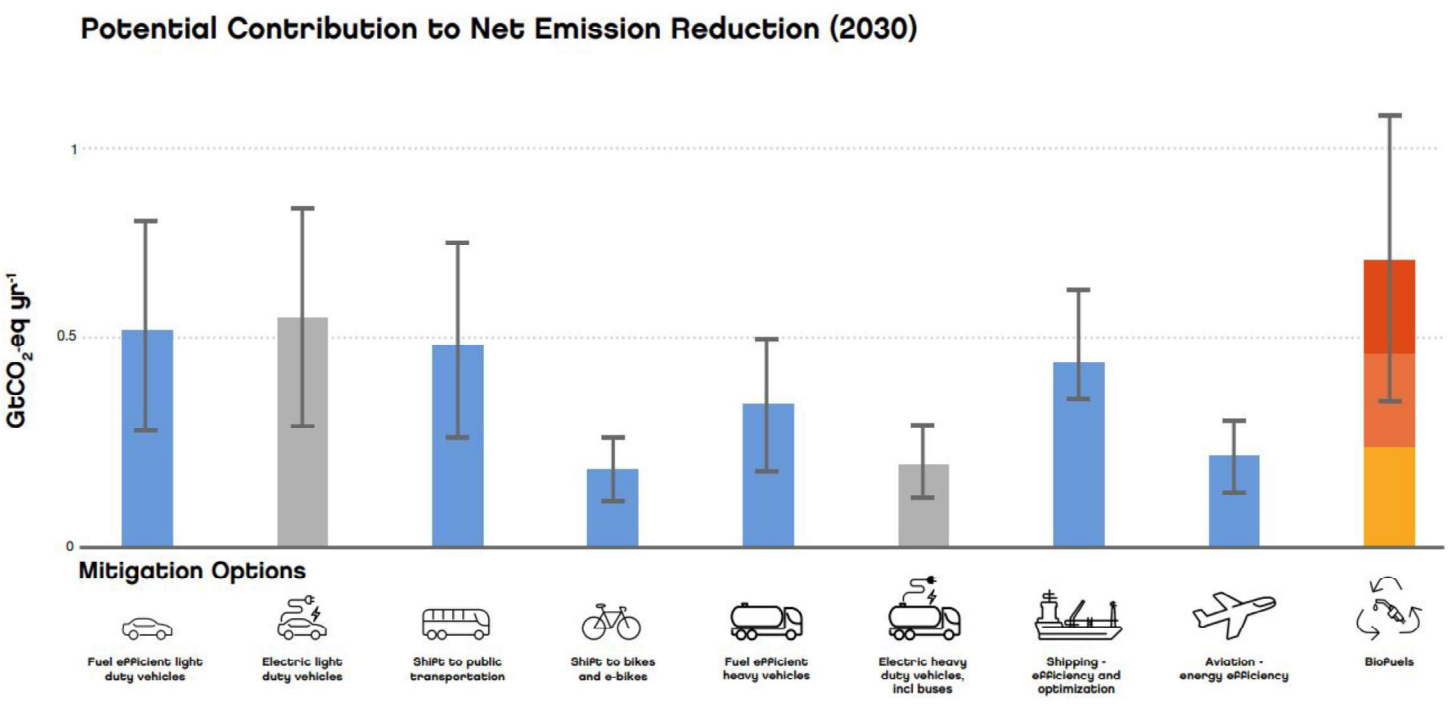
IPCC: Renewable fuels can deliver huge GHG emissions reductions for the transport sector



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Net lifetime costs of options:

- Costs are lower than the reference
- 0-20 (USD tCO_2-eq yr^{-1})
- 20-50 (USD tCO_2-eq yr^{-1})
- 50-100 (USD tCO_2-eq yr^{-1})
- Cost not available due to high variability or lack of data
- Uncertainty range applies to the total potential contribution to emission reduction. The individual cost ranges are also associated with uncertainty

NESTE

Today's low emission, renewable fuels

1

Biodiesel

- Blending requirements
- Less emission reductions
- Wider availability
- Liquid fuel that contains oxygen

2

Renewable diesel

- No blending requirements
- 80% emission reductions vs. fossil diesel over the lifecycle
- Growing supply, but some constraints
- Liquid fuel that does not have oxygen

3

Renewable natural gas

- Gas that can be liquefied used in an engine
- New engines / engine modifications required
- Growing industry
- Potential climate impact from methane leakage

Our collective opportunity

2020 IEA World Energy Outlook report predicts that trucks alone will consume 30 million barrels of oil per day.

NESTE

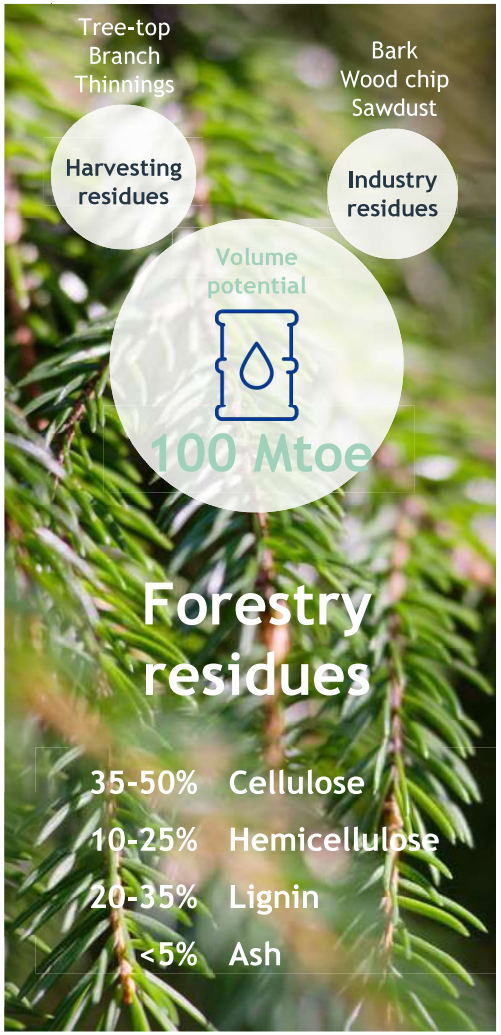
Our climate commitments

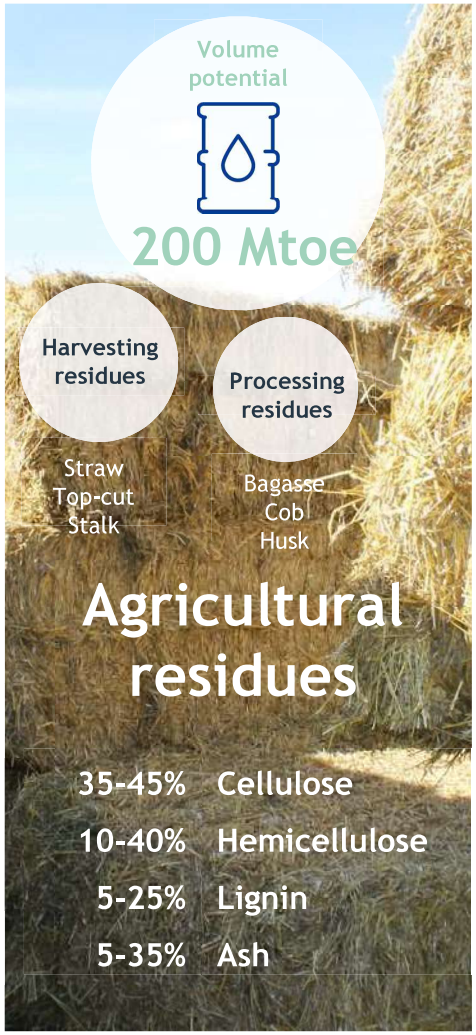
HANDPRINT

Neste to reduce customers' greenhouse gas emissions with its renewable and circular solutions by at least 20 million tons CO_2e annually by 2030

FOOTPRINT

Neste to reach carbon neutral production by 2035





Lignocellulosic waste and residue potential

- Scalable & sustainable raw material
- Not competing with agricultural land/food production
- Local processing promotes development of rural communities
- High GHG emission reductions (CO_2)

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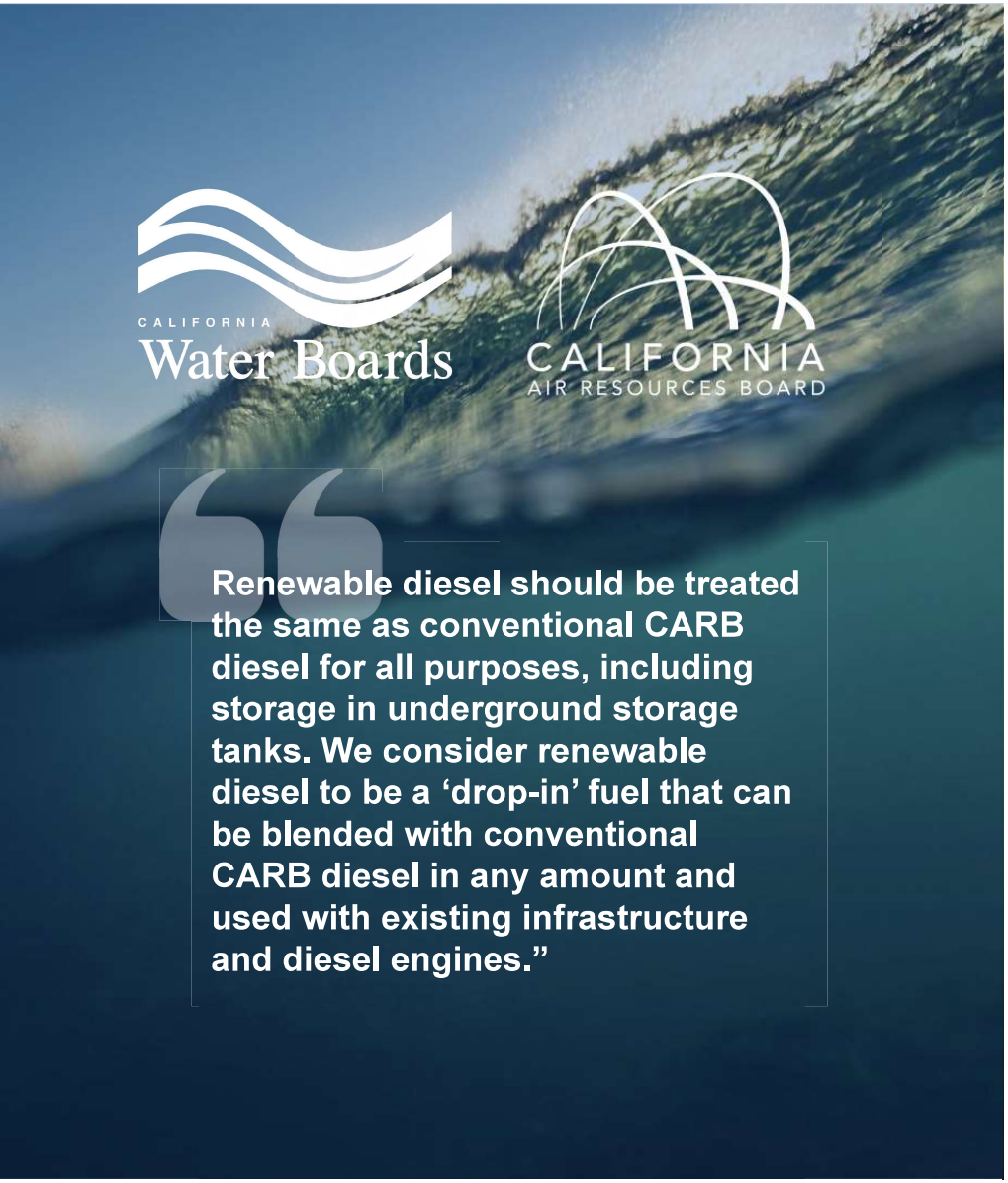
CARB diesel vs. biodiesel vs. renewable diesel

	CARB (ULSD) Diesel	Biodiesel (B5-B20)	Renewable Diesel
What is it?	Conventional, petroleum-based hydrocarbon fuel approved for use in California by the California Air Resources Board (CARB). Meets ASTM-D975 standard for diesel fuel oils.	Non-hydrocarbon fuel produced from the same feedstocks that Renewable Diesel is made from. Variability in source materials can impact cold properties and storage life of the final product. ASTM-D975 diesel fuel oil standard allows for blending of only 5% biodiesel (B5)	Premium-quality, non-petroleum hydrocarbon fuel made from 100% renewable raw materials. Every molecule in renewable diesel is found in CARB diesel; can be swapped into vehicles with no change in infrastructure. Meets ASTM-D975 standard for diesel fuel oils.
System Maintenance	Contains aromatics, which do not combust as easily as paraffins. Incomplete combustion products contaminate oil, foul injectors and clog DPF filters.	May contain soaps and metals which stick injectors and clog DPF filters. Biodiesel attracts water and may clog filters. Subject to microbial growth in storage. Poor cold temperature performance. Accumulates and dilutes motor oil.	Contains no aromatics or impurities, allowing fuel to combust with maximum efficiency while decreasing the frequency of injector maintenance and DPF filter regenerations.
Shelf Life	Can be stored for about 12 months at an ambient temperature of 68°F.	Should be used within six months	Can be stored for long periods of time in proper conditions with no change in quality
Environmental Impact	Generates nitrogen oxides (NOx),* which can increase the risk of respiratory conditions.	Generates more nitrogen oxides than CARB diesel*	Lower total hydrocarbons, lower methane, lower NMHC. Lower NOx output in pre-2010 engines.

NESTE



“Renewable diesel should be treated the same as conventional diesel.”

For purposes of this statement, conventional CARB diesel is petroleum-based diesel that meets specified aromatics, sulfur content, and lubricity standards, as well as ASTM international standard specification, ASTM D975-12a. Similarly, renewable diesel also meets the definition of ‘hydrocarbon oil’ and the physical and chemical properties specified in ASTM D975-12a.

Case Study

Parameters for testing:

- 5 vehicles with model years ranging from 2009 to 2016
- Operators were only told that “we are testing a new fuel additive”
- What was monitored - fuel mileage and how many times the trucks had to go thru the regeneration process
- Duration – 2 months

Findings:

- No adverse side effects noticed; no reportable issues with performance of the vehicles, nor any fuel system related issues
- **Not a single test truck** went into the shop for a forced regen during the two months of testing
- One unforeseen positive side effect was the operators noticed that the exhaust of the truck no longer burned their eyes while operating the equipment

Forward-thinking California agencies using Neste MY

We first tested Neste MY on one vehicle with lots of stops, lots of hill climbing, a very strenuous route. We wanted to put it in the one vehicle that got the most abuse, and it passed with flying colors. Now it fuels our entire fleet.”

- James Grimes,
  Fleet Maintenance Supervisor, WestCAT

We have received some very positive feedback from personnel. Firefighters and engineers have each reported a reduction in vapors they are exposed to while fueling the apparatus. This has been a huge step forward for the health and safety of our firefighters and community. Furthermore, our fleet mechanic has nothing but good things to report about Neste MY.”

- Richard Battersby,
  Fleet Manager for the City of Oakland

Ignorance is now the worst obstacle. Renewable diesel is continuously mistaken for biodiesel which it is not. It is also assumed that migrating to renewable diesel will result in infrastructure-related costs or that it would be more expensive. All these things are misunderstandings."

- Richard Battersby,
  Fleet Manager for the City of Oakland

We found absolutely no disruption to any aspects of our operation, from fueling procedures and maintenance intervals to vessel performance and costs. In addition, we have observed cleaner stack emissions and longer fuel filter life. The greatest operational benefit has been the reduction of soot which is a benefit to both our riders and our machinery."

- Joe Burgard,
  Executive Vice President, Red and White Fleet