Transportation Megatrends and Efficiency Opportunities

International Workshop on Green Freight Initiatives
Sharing, Learning and Co-Creating Toward a Sustainable Ecosystem

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US EPA

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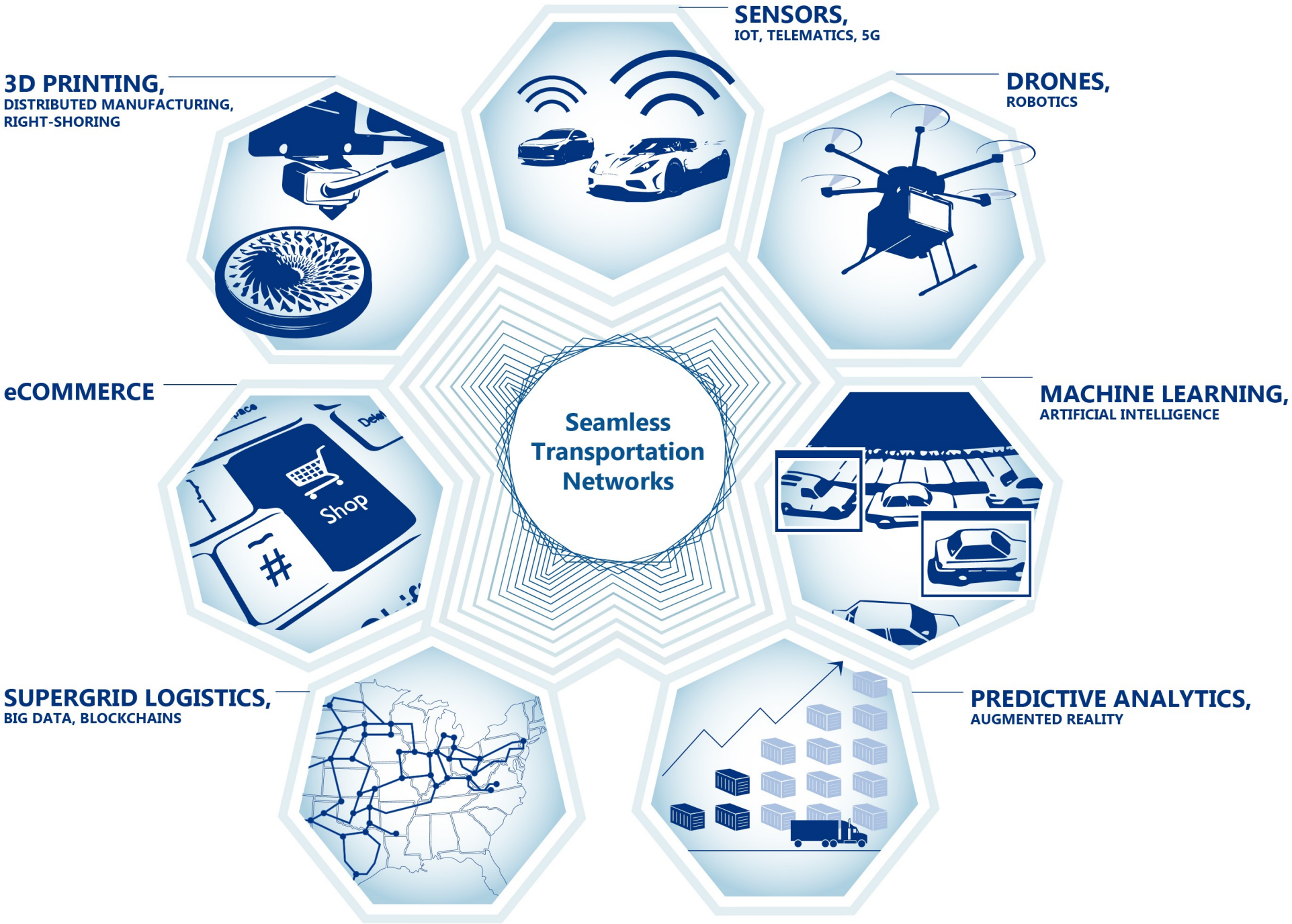
OVERVIEW

- **Megatrends & Key Enablers**
- **Strategies for Efficiency Improvements**
- **Subsector Opportunities**
- **Intermodal Concepts**

AUTOMATION & DIGITALIZATION



STRATEGIES

- Biofuels
- Hydrogen Fuel Cell
- Battery Electric
- Natural Gas
- Petroleum

Equipment

AERODYNAMICS
LIGHTWEIGHTING
ENGINE EFFICIENCY
LRR TIRES (NOTE: STANDS FOR "LOW ROLLING RESISTANCE")

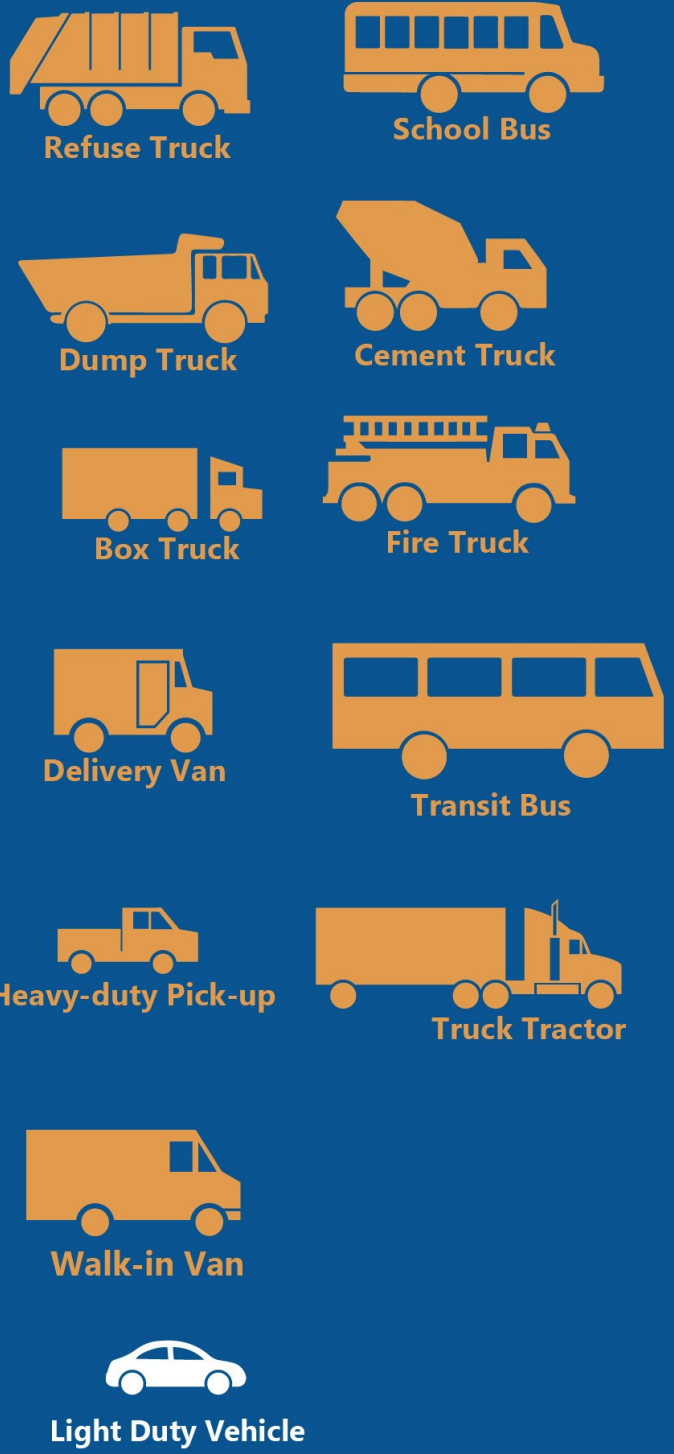
Fuels

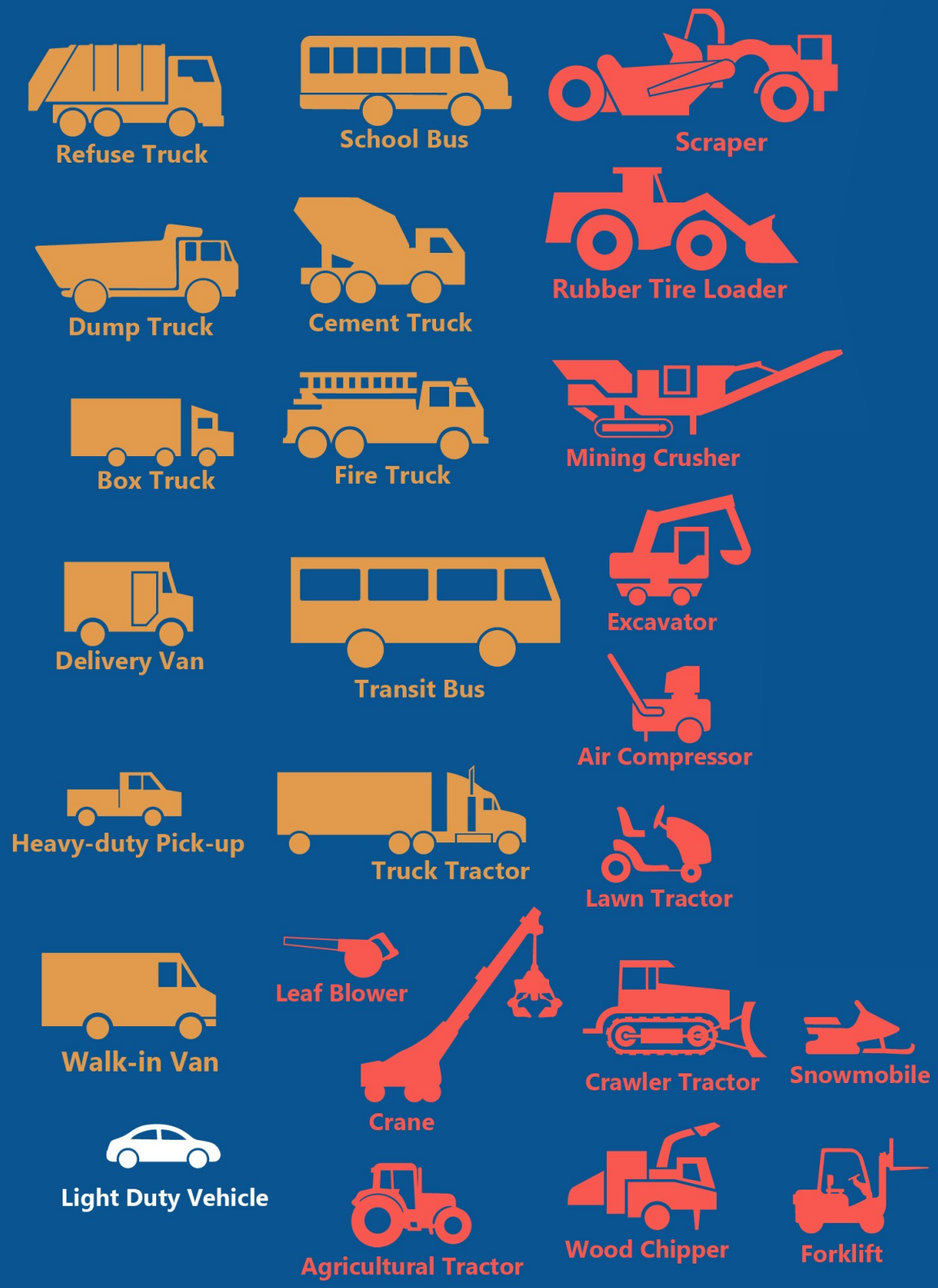
ELECTRICITY
HYDROGEN
HYBRIDS & RANGE EXTENDERS
BIOFUELS

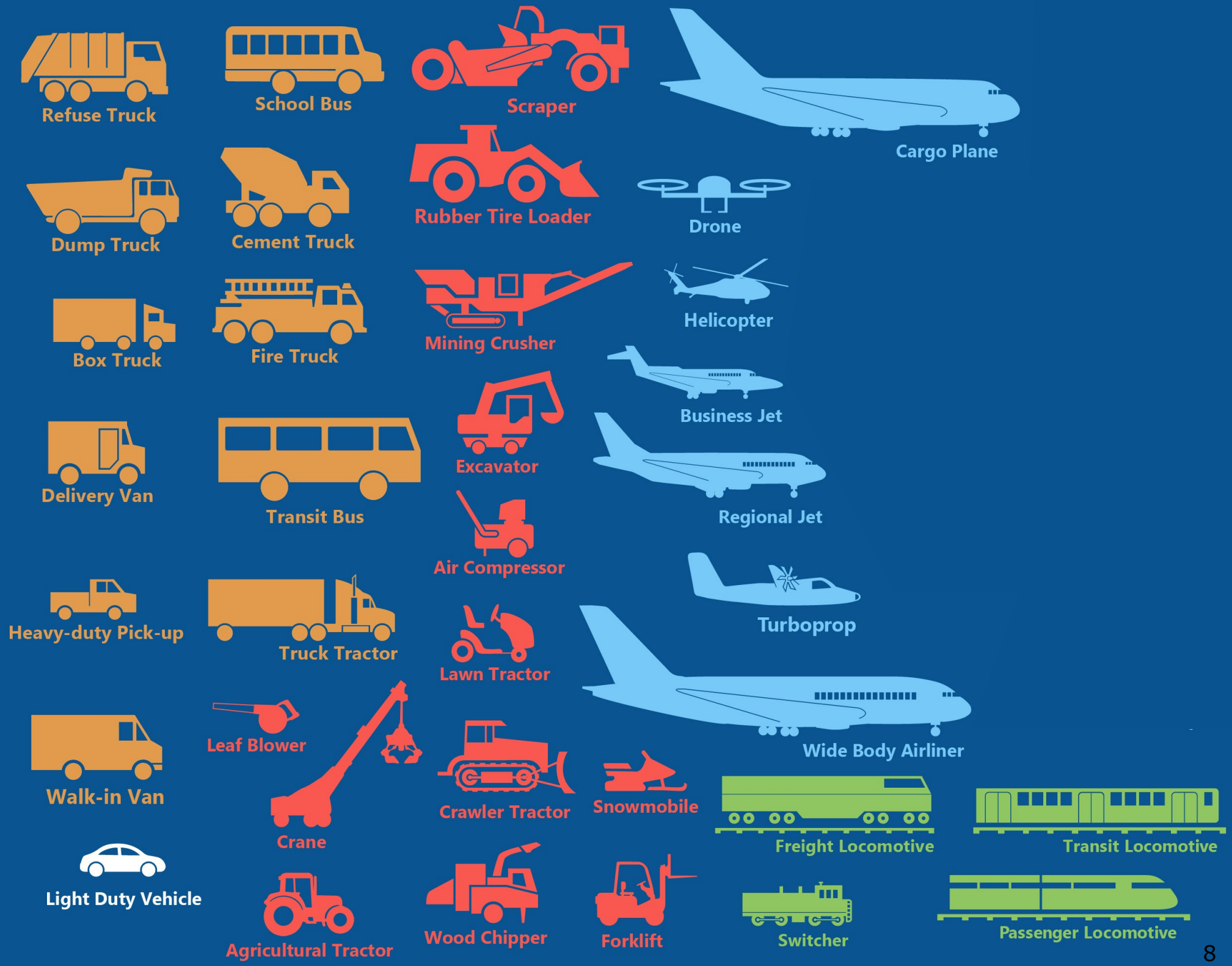
Operations

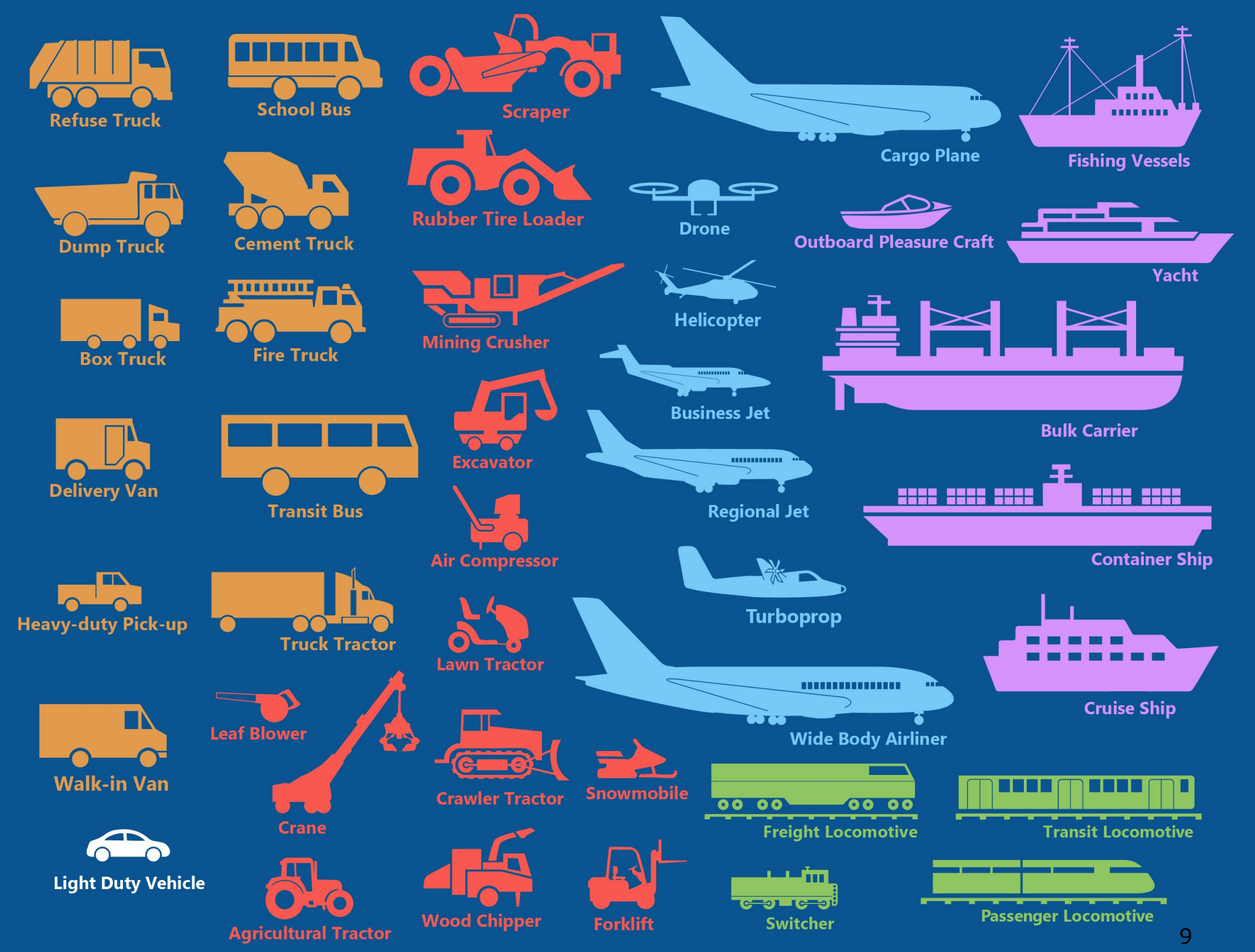
AUTOMATION
V2X COMMUNICATION
BIG DATA & LOGISTICS
MODE-SWITCHING

Light Duty Vehicle


Refuse Truck
School Bus
Dump Truck
Cement Truck
Box Truck
Fire Truck
Delivery Van
Transit Bus
Heavy-duty Pick-up
Truck Tractor
Walk-in Van
Light Duty Vehicle


Refuse Truck
School Bus
Scraper
Dump Truck
Cement Truck
Rubber Tire Loader
Box Truck
Fire Truck
Mining Crusher
Delivery Van
Transit Bus
Excavator
Air Compressor
Heavy-duty Pick-up
Truck Tractor
Lawn Tractor
Leaf Blower
Walk-in Van
Crane
Crawler Tractor
Snowmobile
Light Duty Vehicle
Agricultural Tractor
Wood Chipper
Forklift


Refuse Truck
School Bus
Scraper
Cargo Plane
Dump Truck
Cement Truck
Rubber Tire Loader
Drone
Box Truck
Fire Truck
Mining Crusher
Helicopter
Business Jet
Delivery Van
Transit Bus
Excavator
Regional Jet
Air Compressor
Heavy-duty Pick-up
Truck Tractor
Turboprop
Lawn Tractor
Wide Body Airliner
Leaf Blower
Walk-in Van
Crawler Tractor
Snowmobile
Crane
Freight Locomotive
Transit Locomotive
Light Duty Vehicle
Agricultural Tractor
Wood Chipper
Forklift
Switcher
Passenger Locomotive


Refuse Truck
School Bus
Scraper
Cargo Plane
Fishing Vessels
Dump Truck
Cement Truck
Rubber Tire Loader
Drone
Outboard Pleasure Craft
Yacht
Box Truck
Fire Truck
Mining Crusher
Helicopter
Bulk Carrier
Business Jet
Delivery Van
Transit Bus
Excavator
Regional Jet
Container Ship
Air Compressor
Heavy-duty Pick-up
Truck Tractor
Lawn Tractor
Turboprop
Cruise Ship
Wide Body Airliner
Leaf Blower
Walk-in Van
Crawler Tractor
Snowmobile
Crane
Freight Locomotive
Transit Locomotive
Light Duty Vehicle
Agricultural Tractor
Wood Chipper
Forklift
Switcher
Passenger Locomotive

SMALLER
LIGHTER MODES/SHORTER DISTANCE

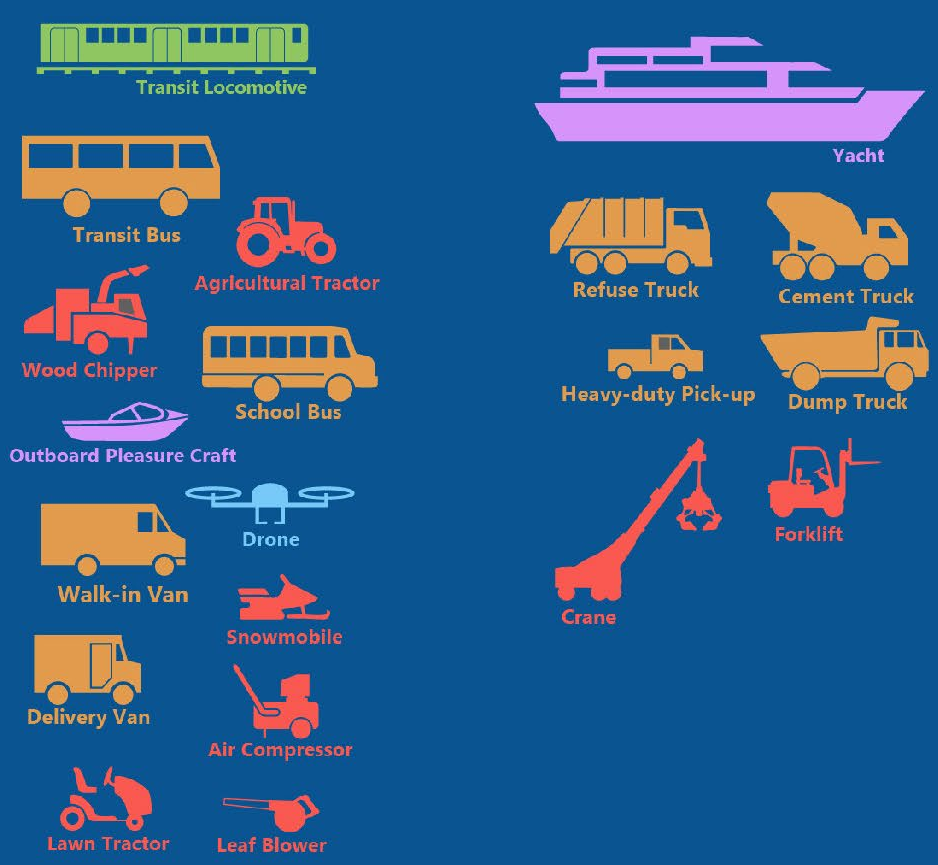
LARGER
HEAVIER MODES/LONGER DISTANCE

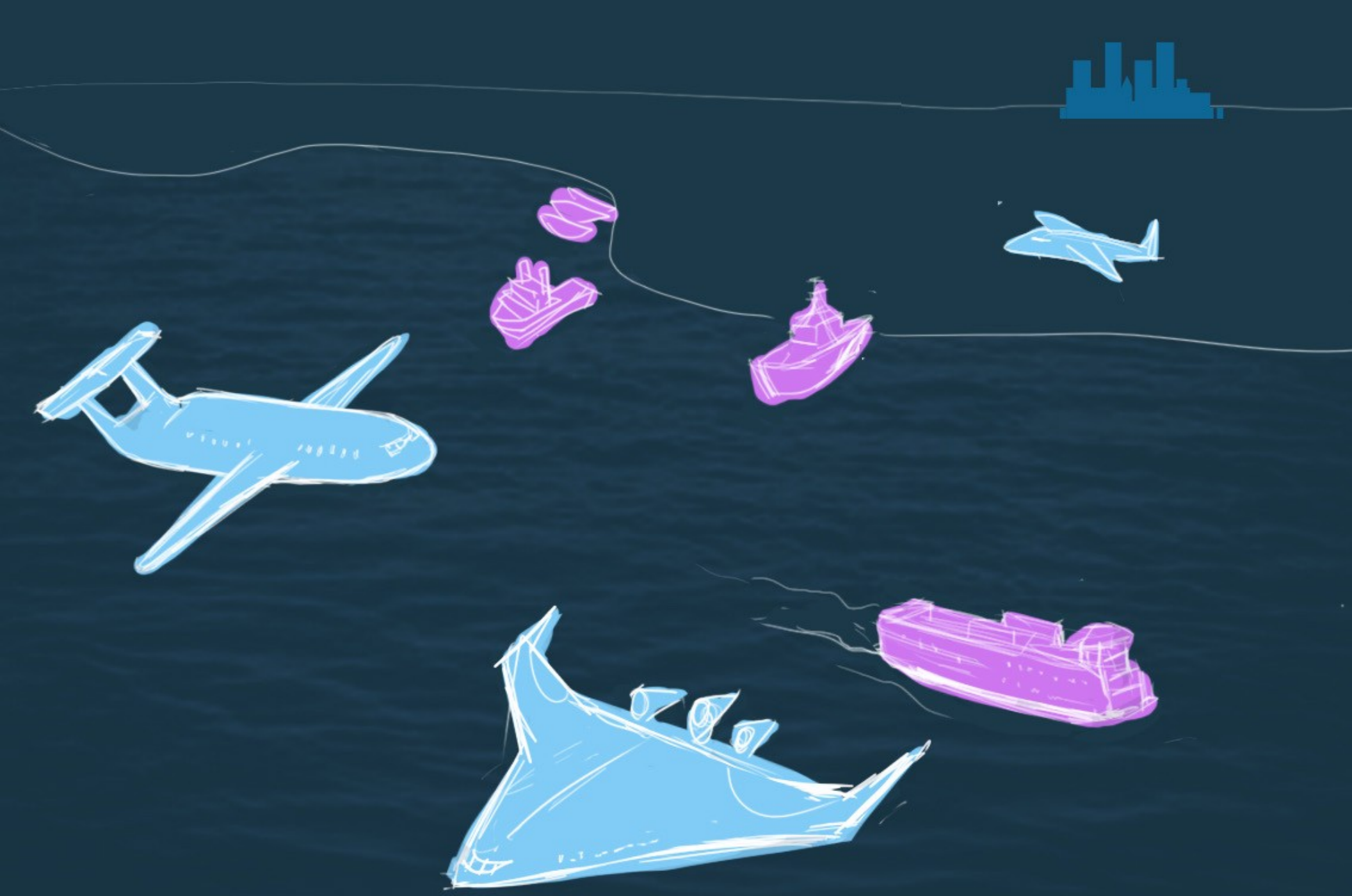
Battery Electric

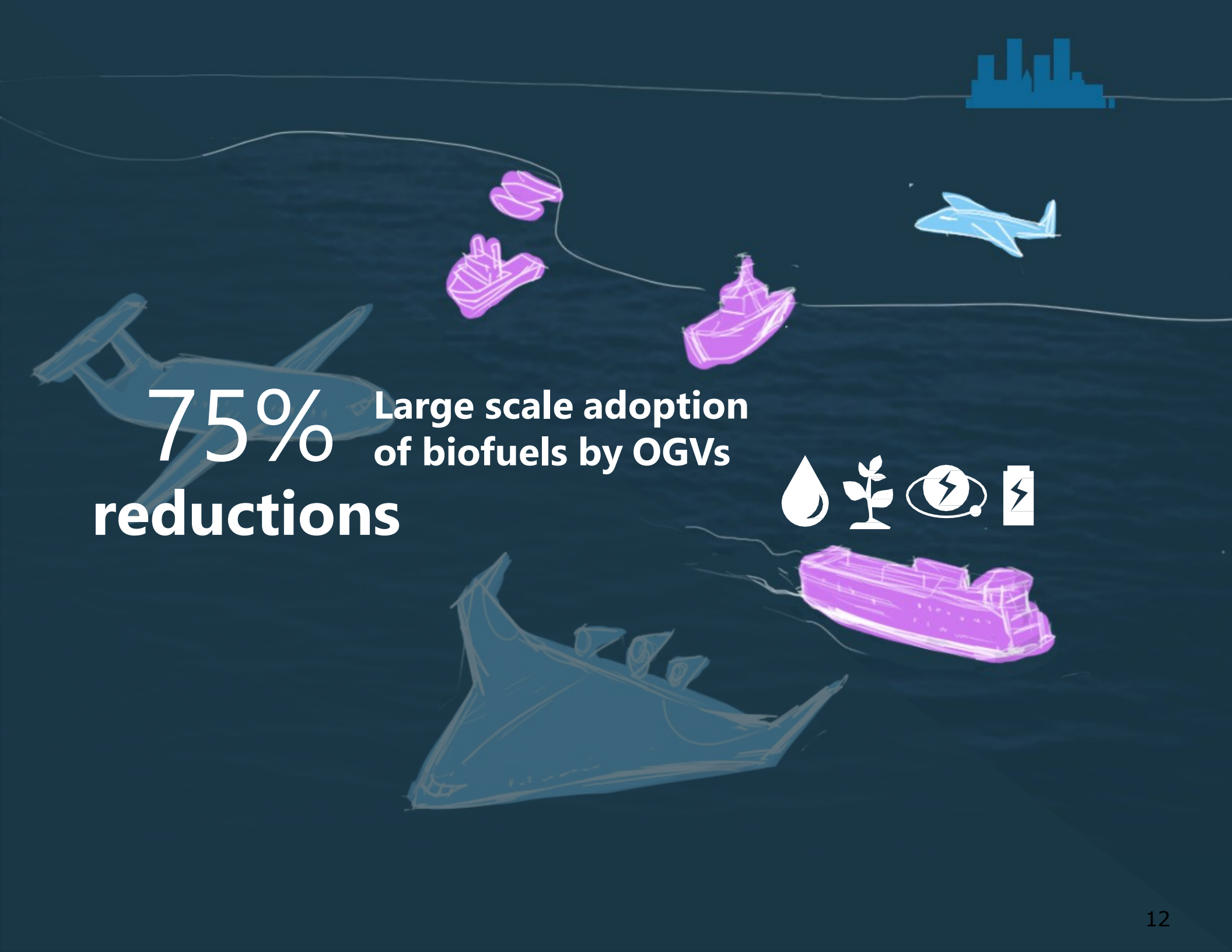
Hydrogen Fuel Cell Electric

Range Extenders, Hybrids, Diesel Electrics, Shorepower

Low-Carbon Biofuels, Legacy Fuels





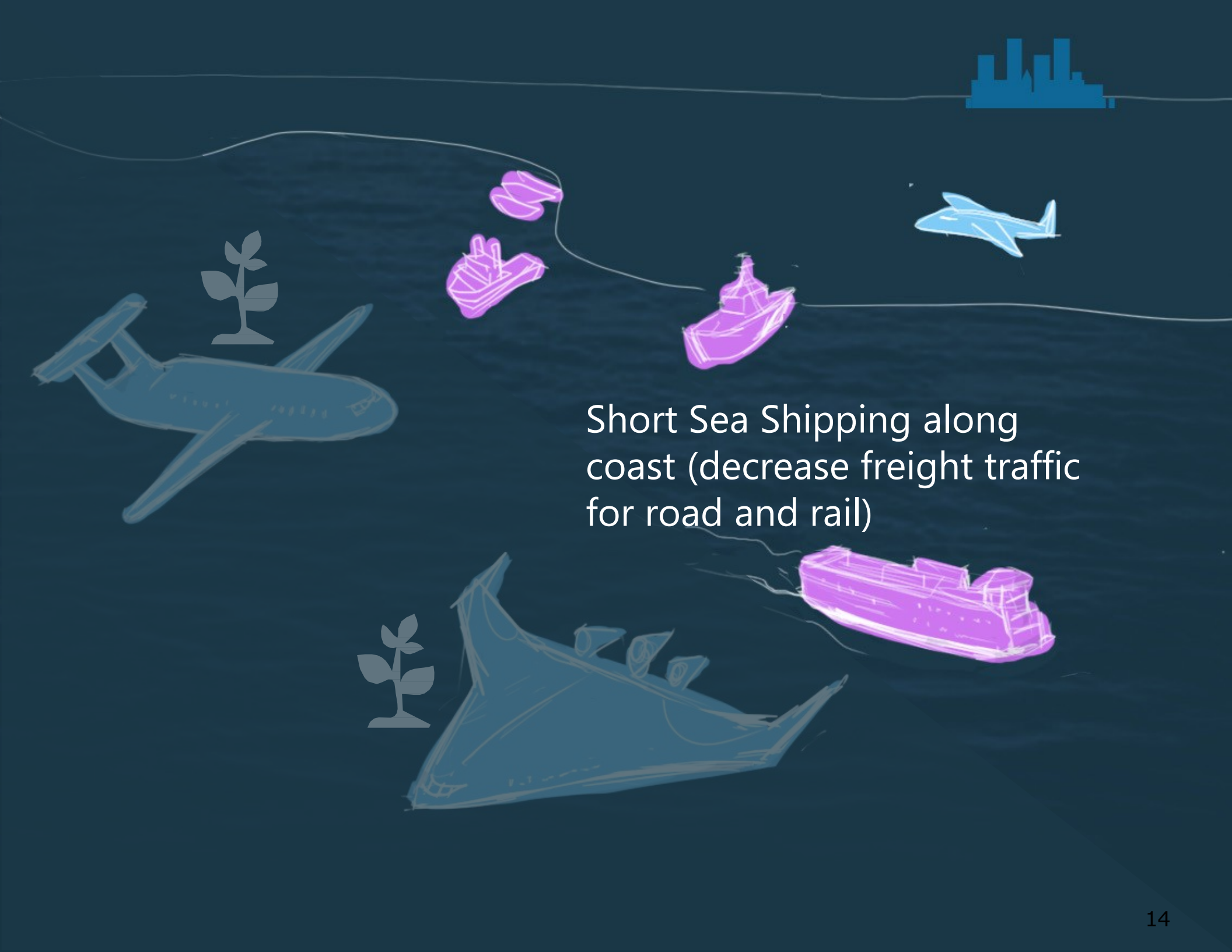

75%
reductions
Large scale adoption
of biofuels by OGVs

BATTERY ELECTRIC

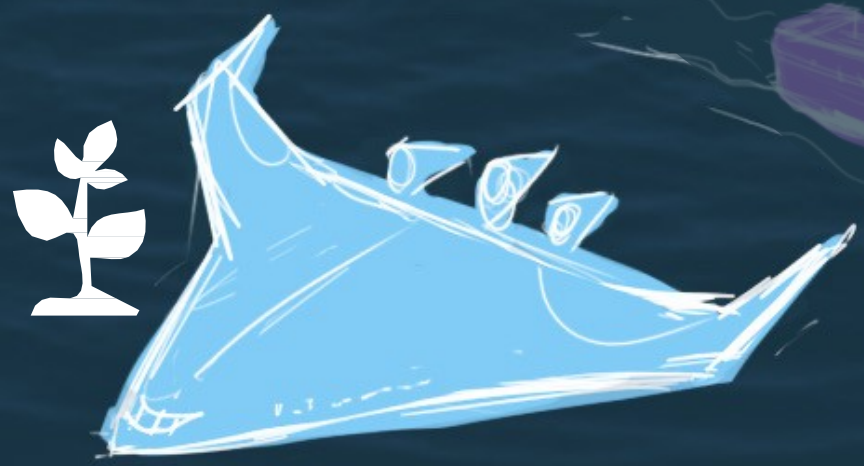
HYDROGEN FUEL CELLS

Recreational and smaller vessels switch to battery electric

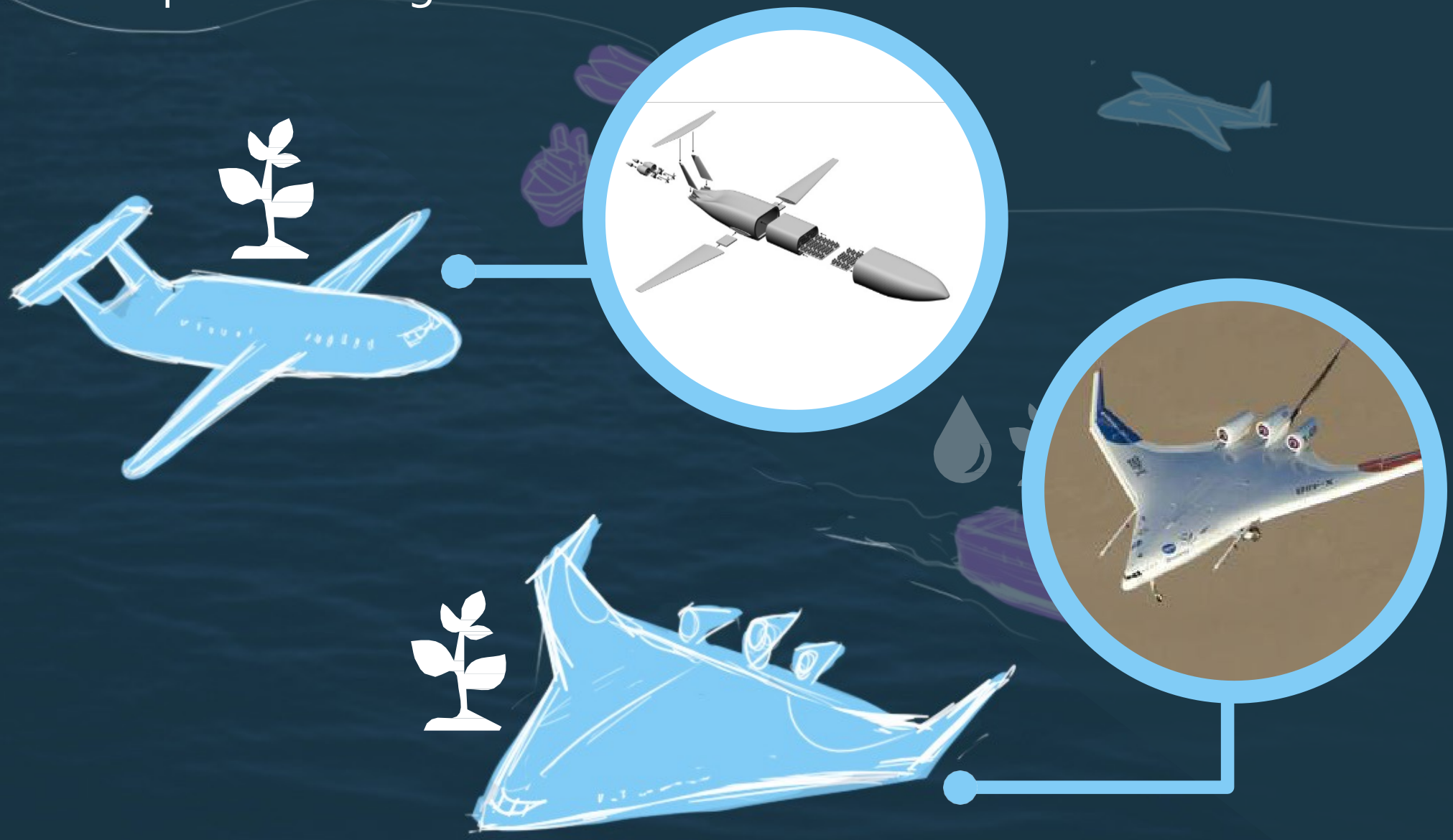
Hydrogen Fuel Cells for harbor craft and larger vessels


Short Sea Shipping along coast (decrease freight traffic for road and rail)

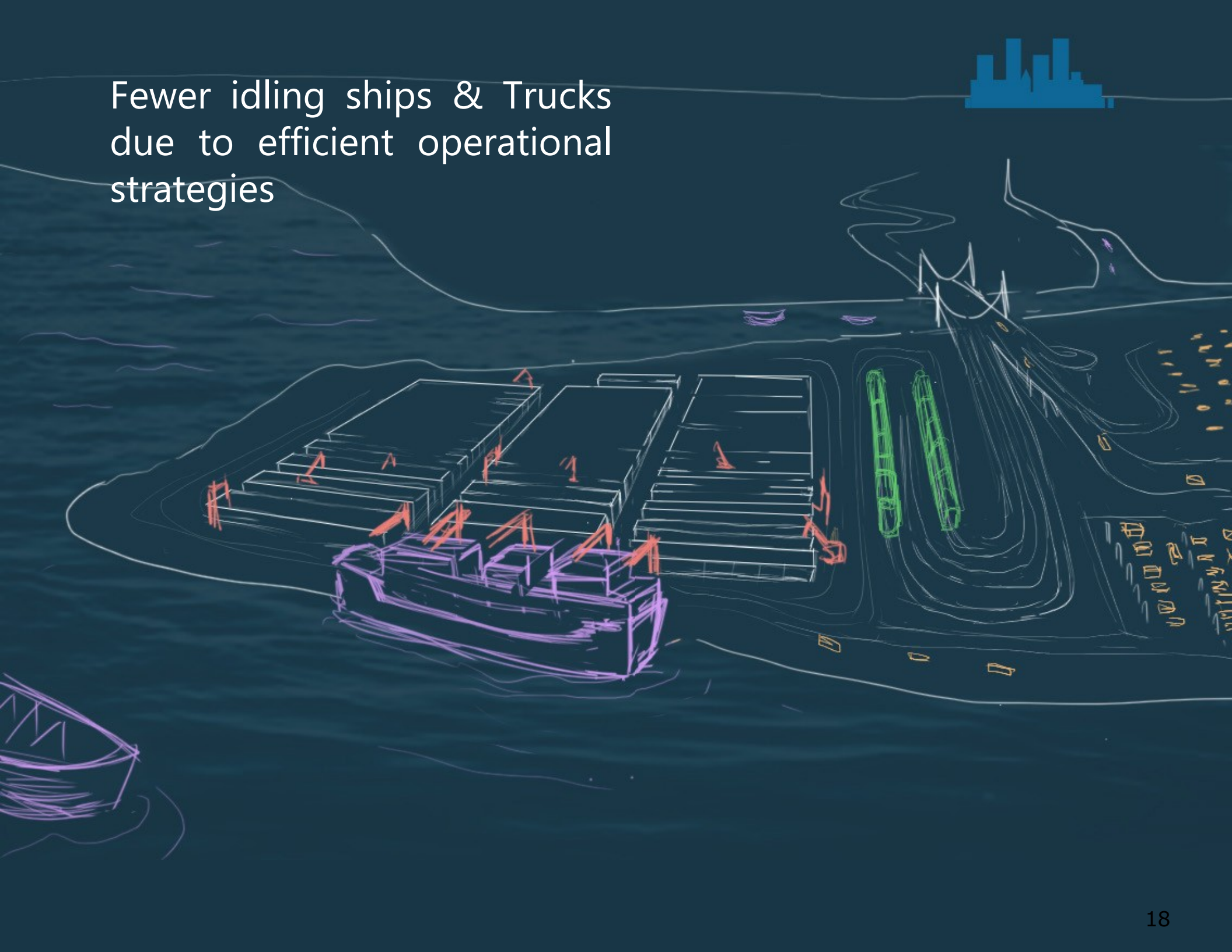
75% Biofuel Blend

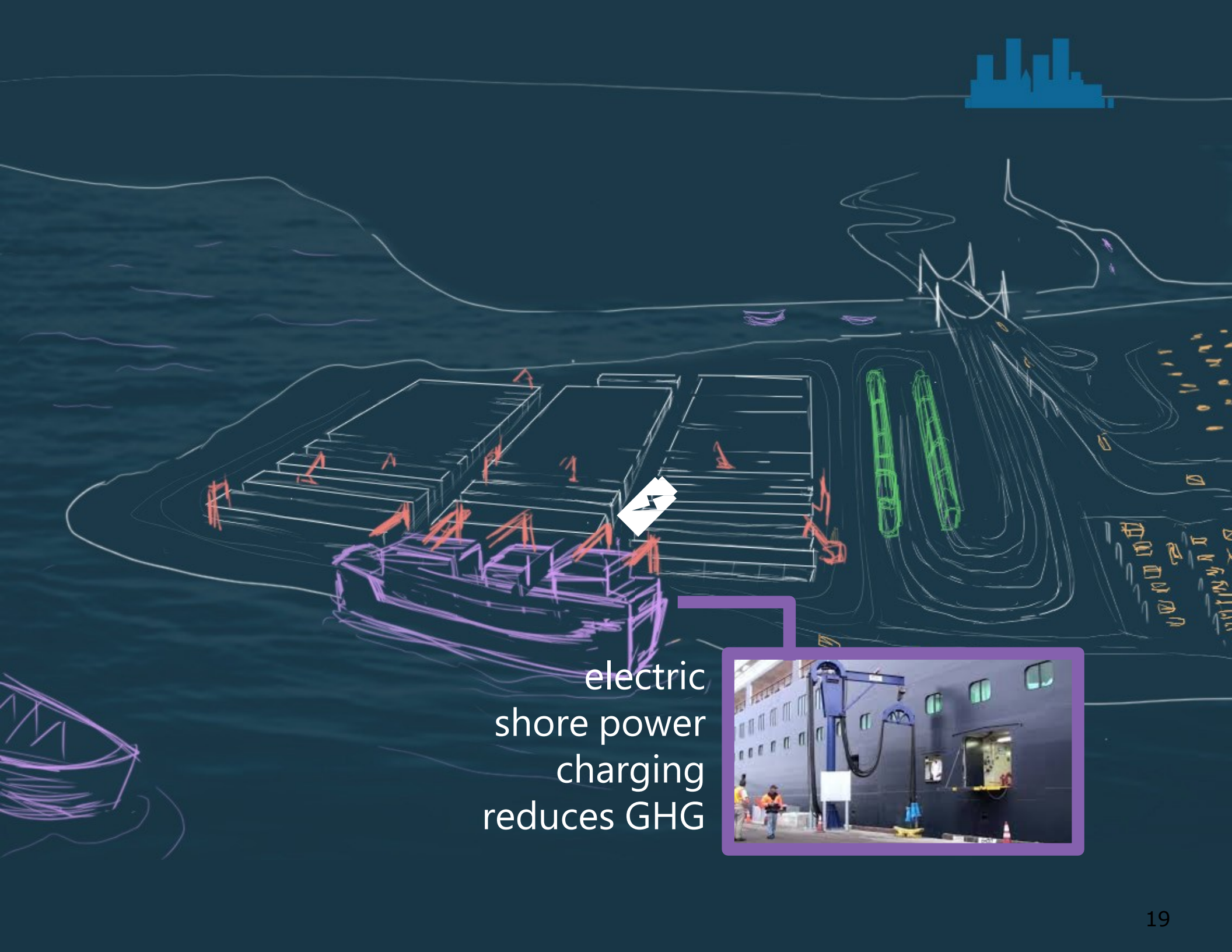


Emission reductions through improved designs

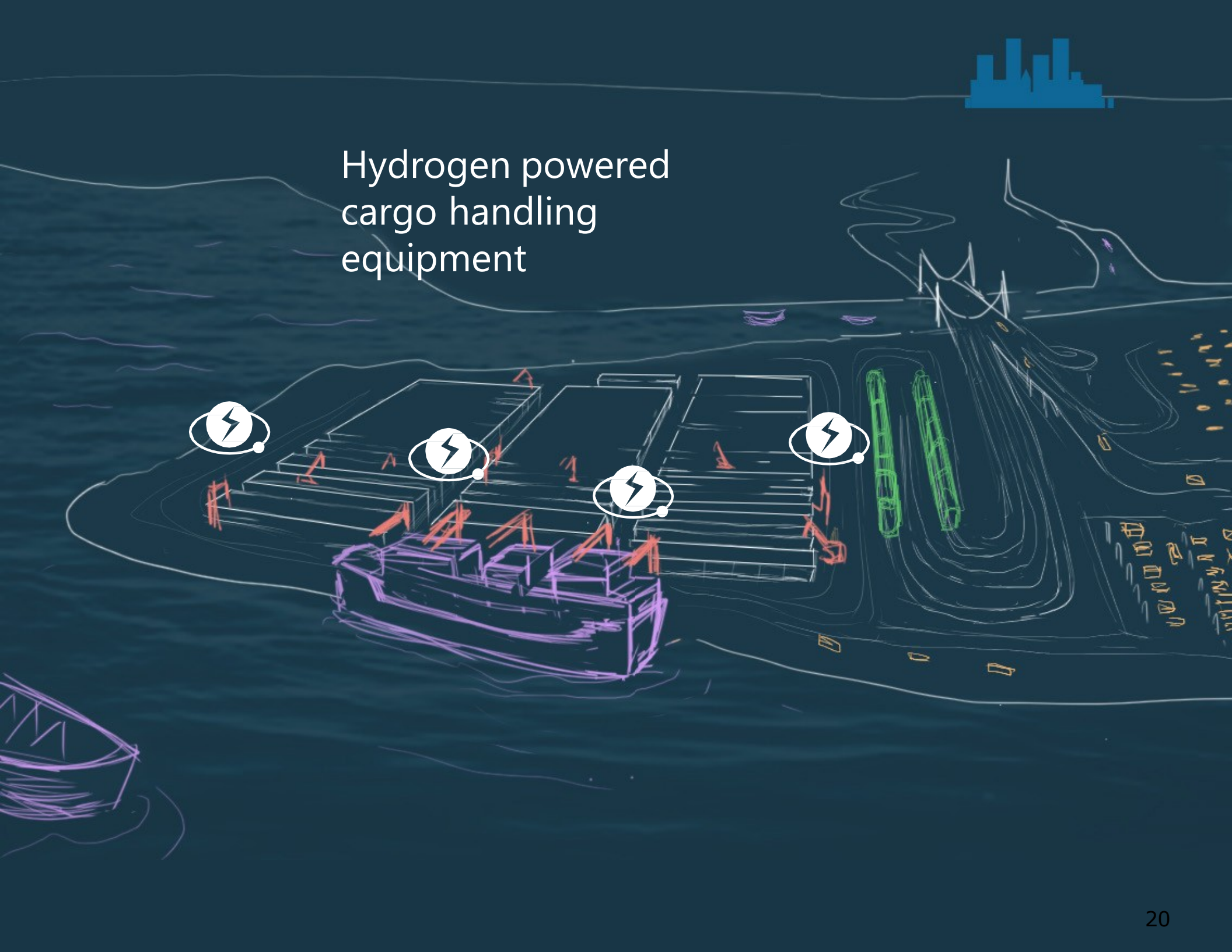


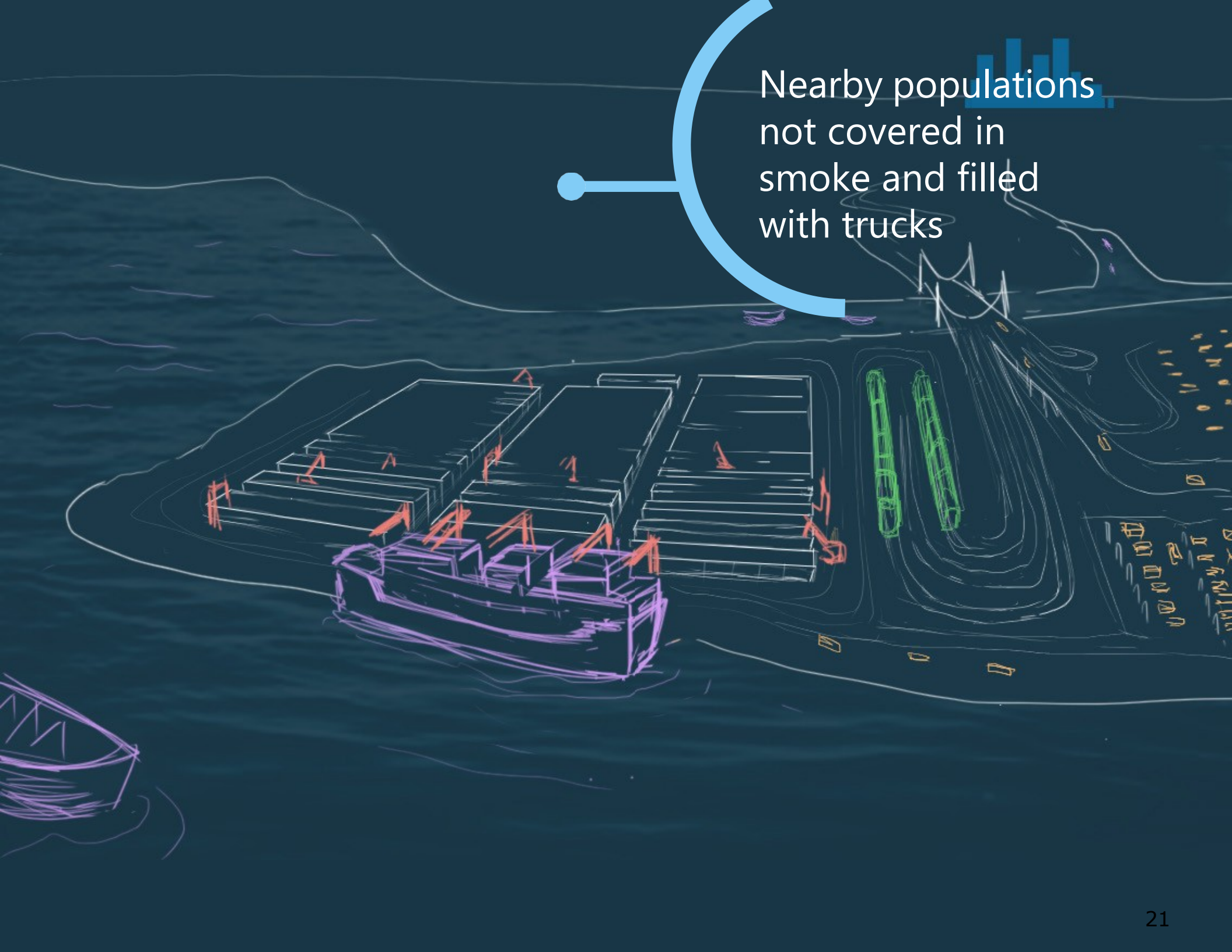
Fewer idling ships & Trucks due to efficient operational strategies

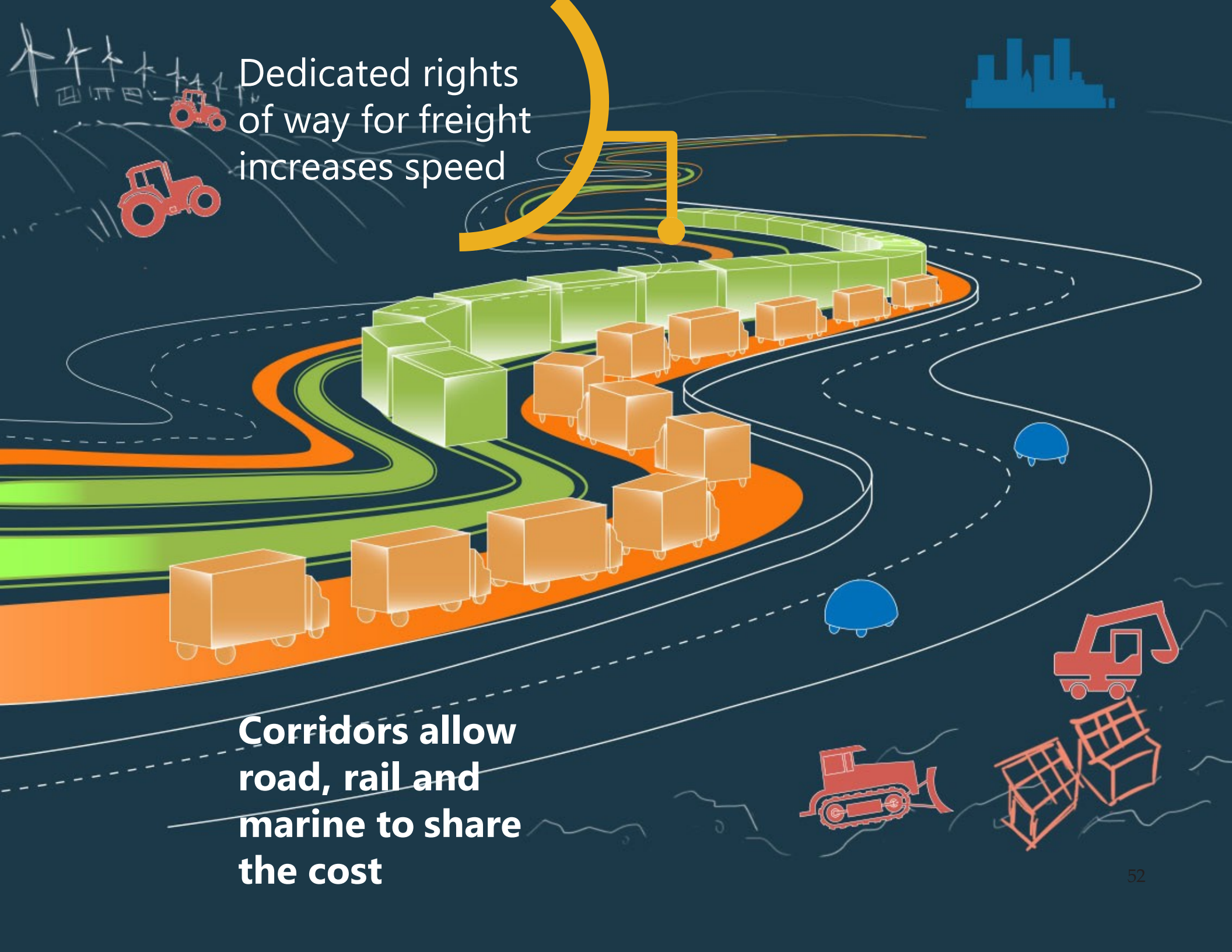


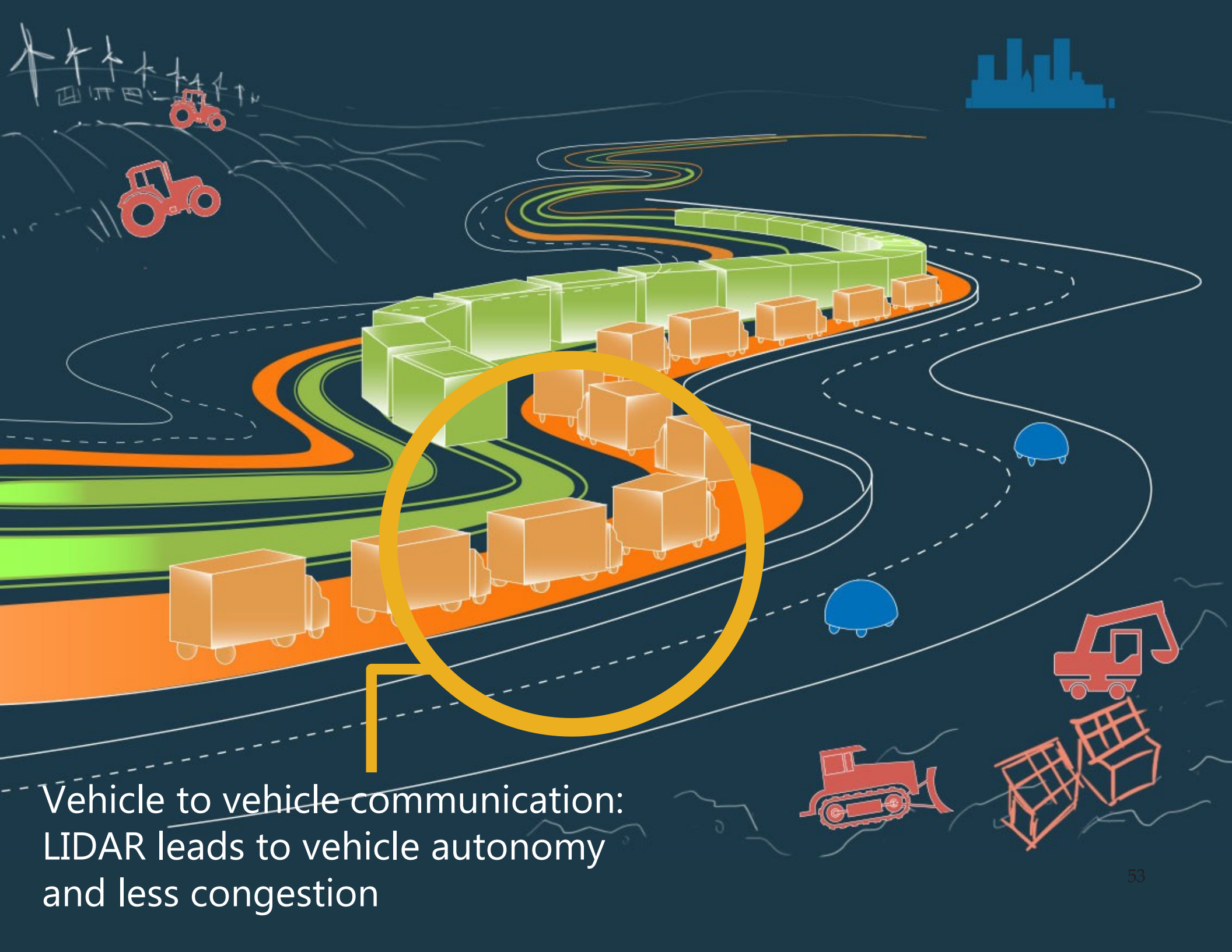

electric
shore power
charging
reduces GHG

Hydrogen powered cargo handling equipment

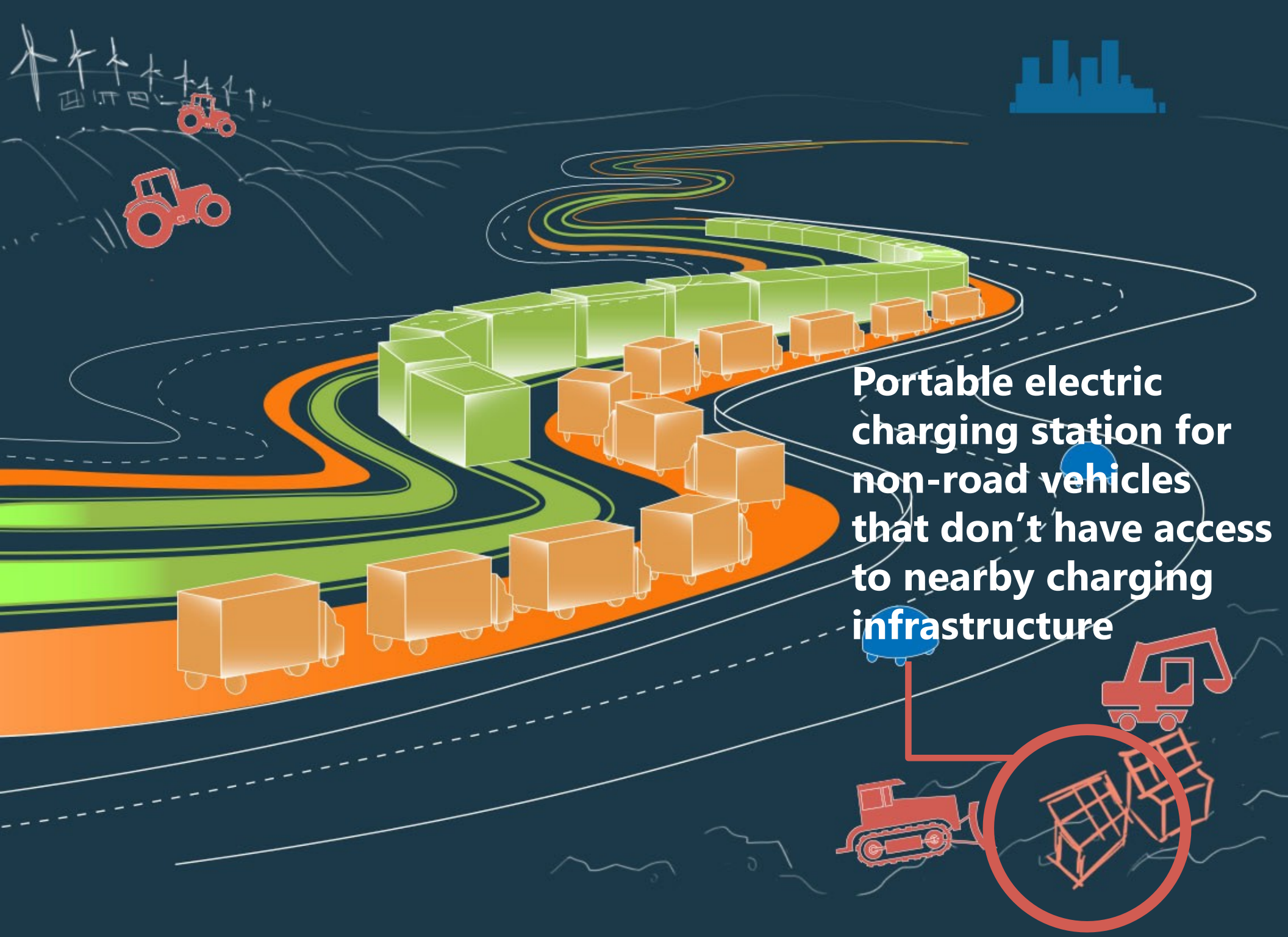


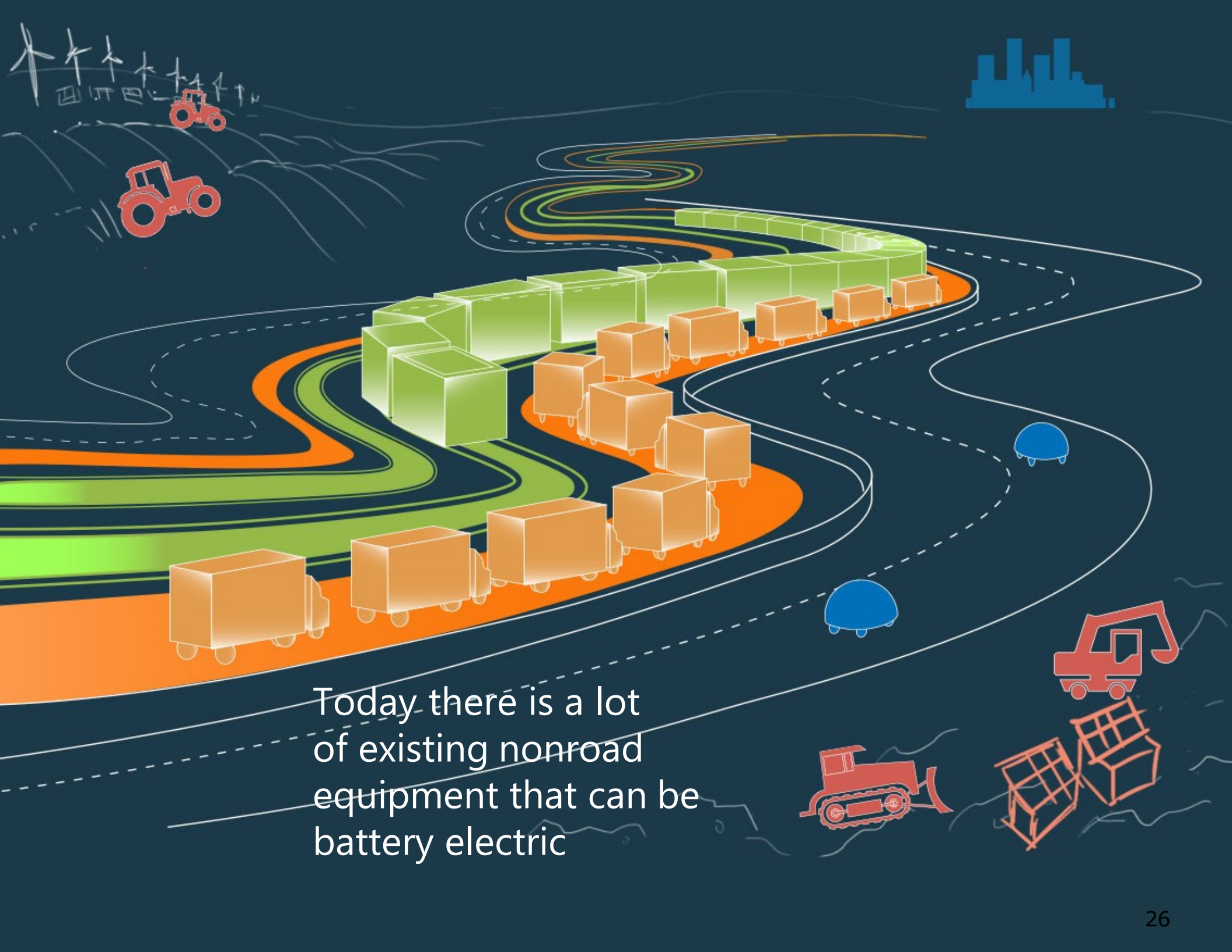

Nearby populations not covered in smoke and filled with trucks


Dedicated rights of way for freight increases speed
Corridors allow road, rail and marine to share the cost



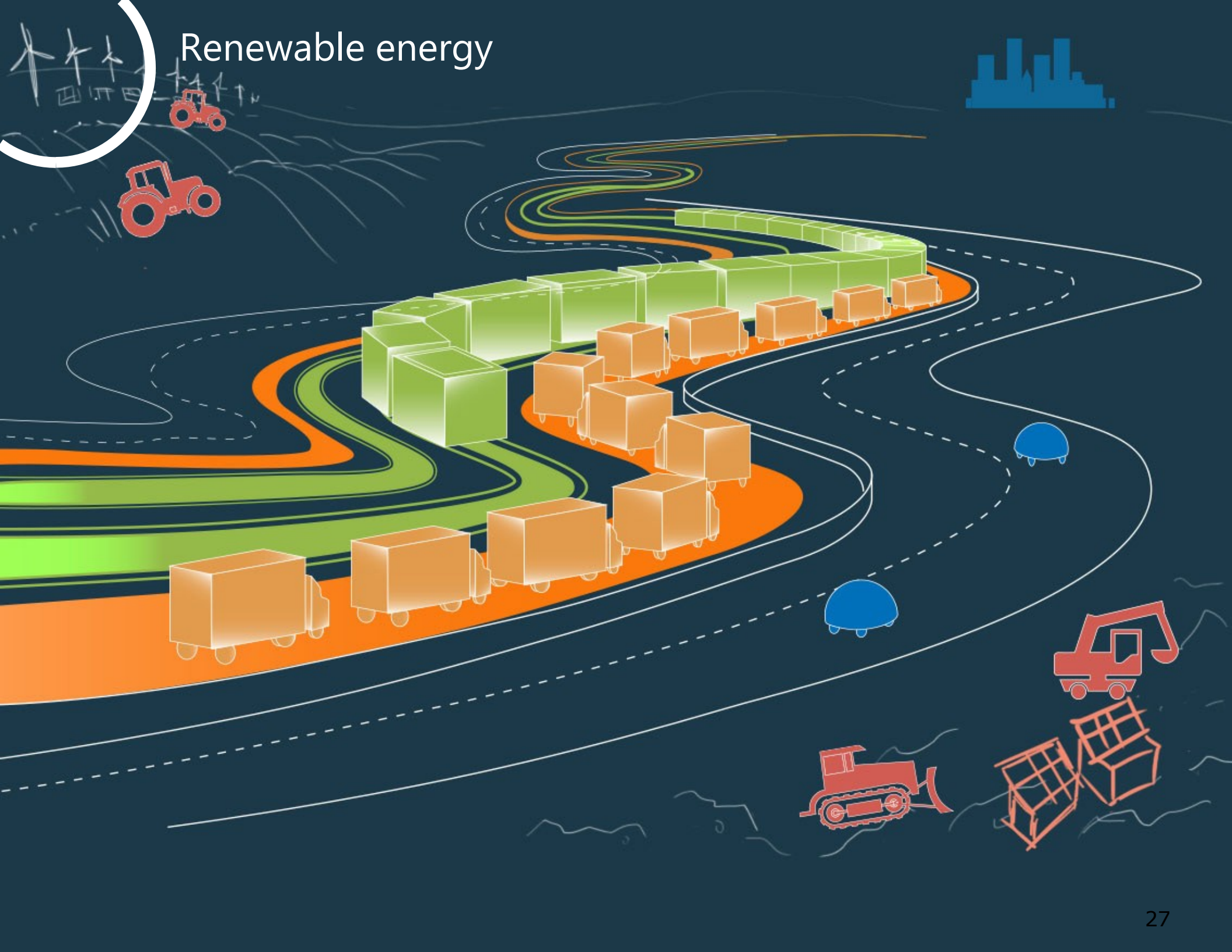
Vehicle to vehicle communication:
LIDAR leads to vehicle autonomy
and less congestion


Portable electric charging station for non-road vehicles that don’t have access to nearby charging infrastructure

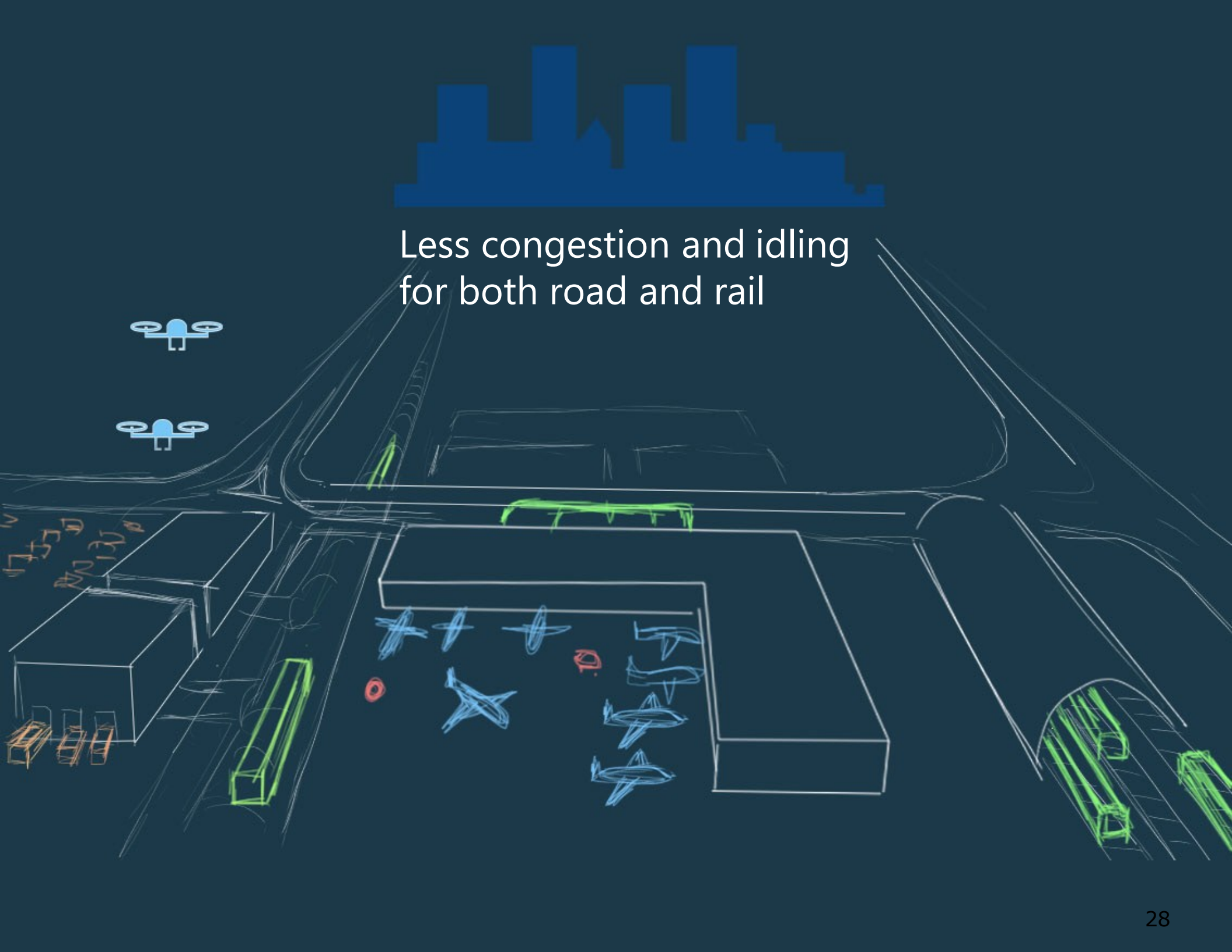


Today there is a lot of existing nonroad equipment that can be battery electric

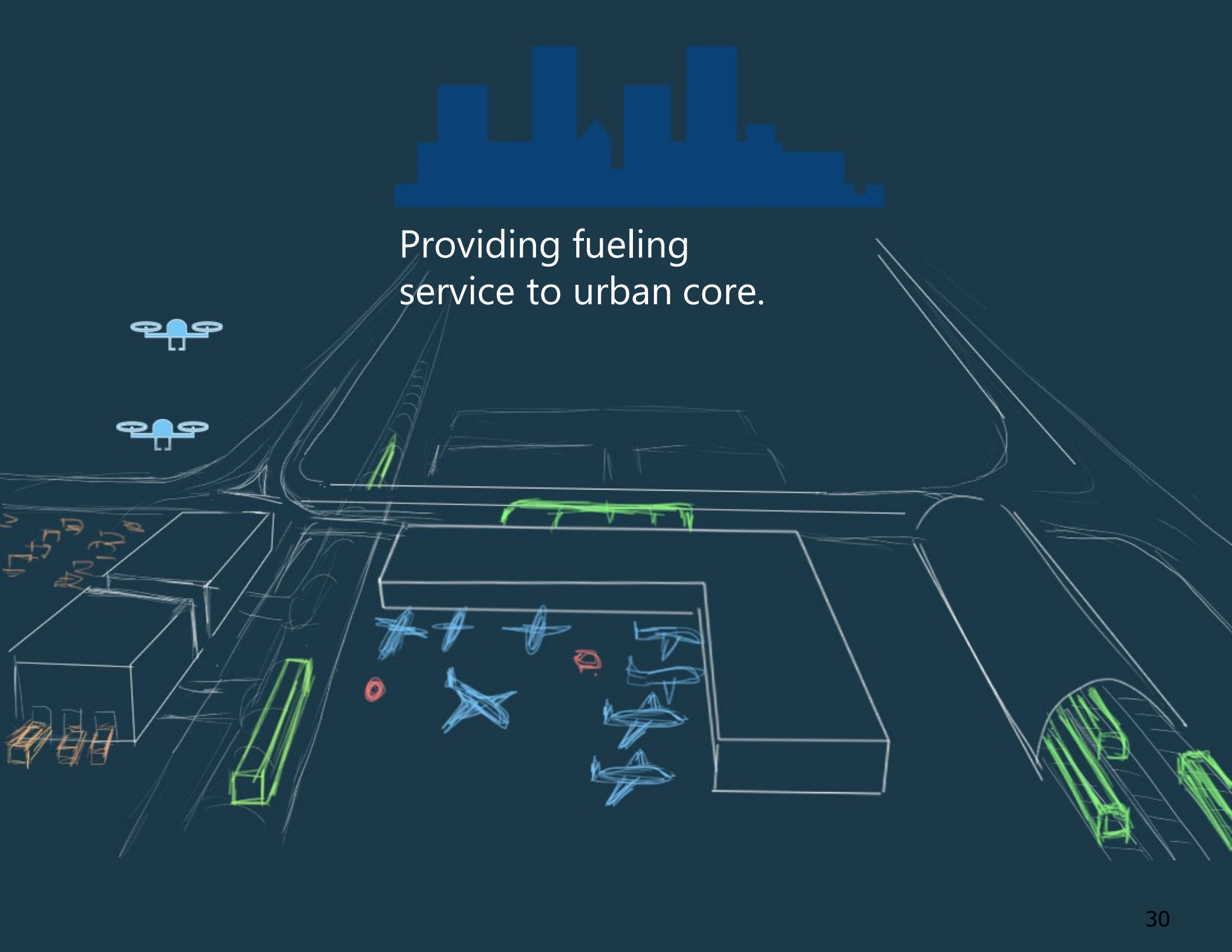
Renewable energy

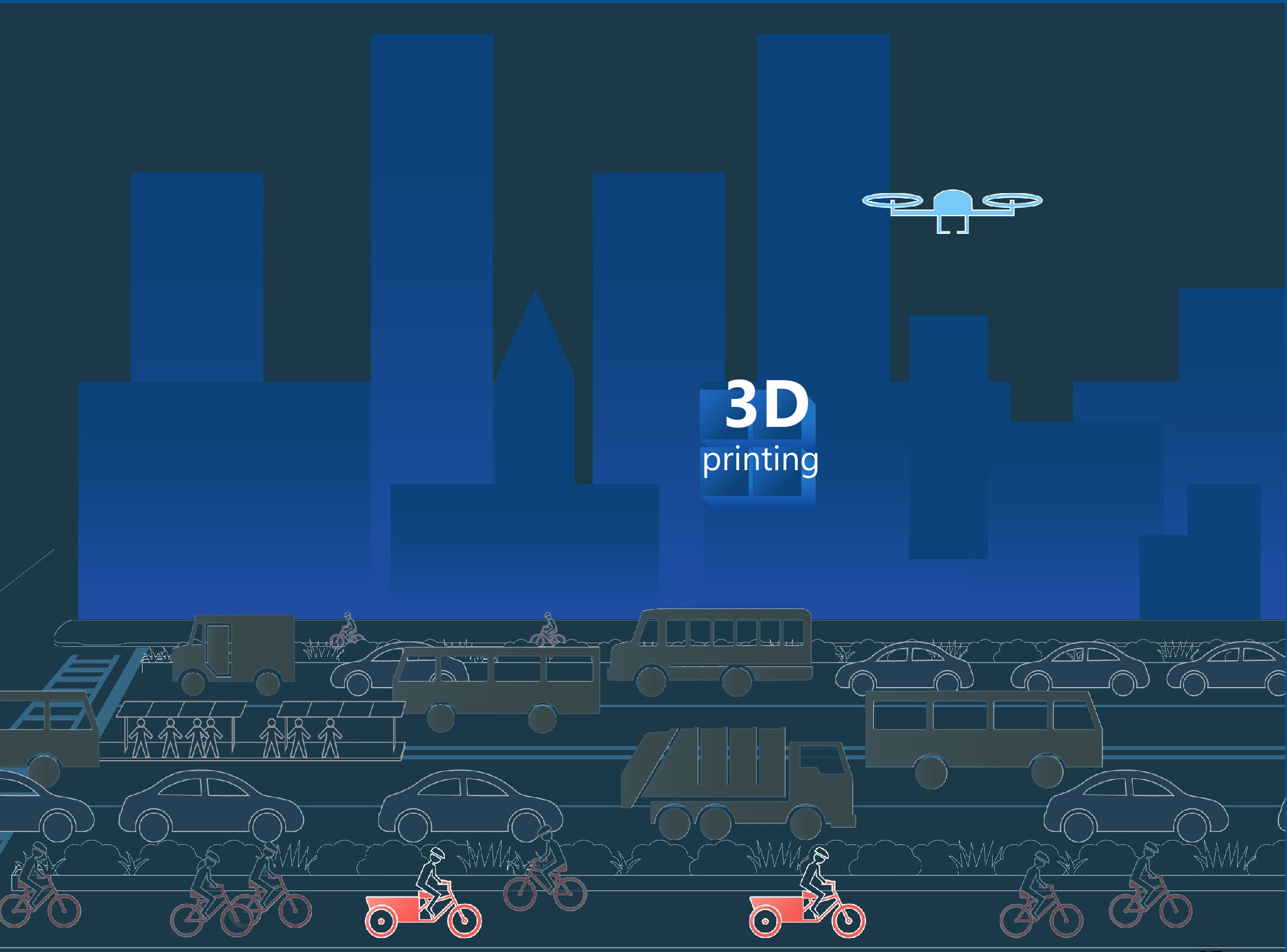


Less congestion and idling for both road and rail




Hyperloop and high speed rail moves people and cargo between regional hubs


Providing fueling
service to urban core.


3D
printing

WHAT CAN THE WORLD LOOK LIKE IN 2050?