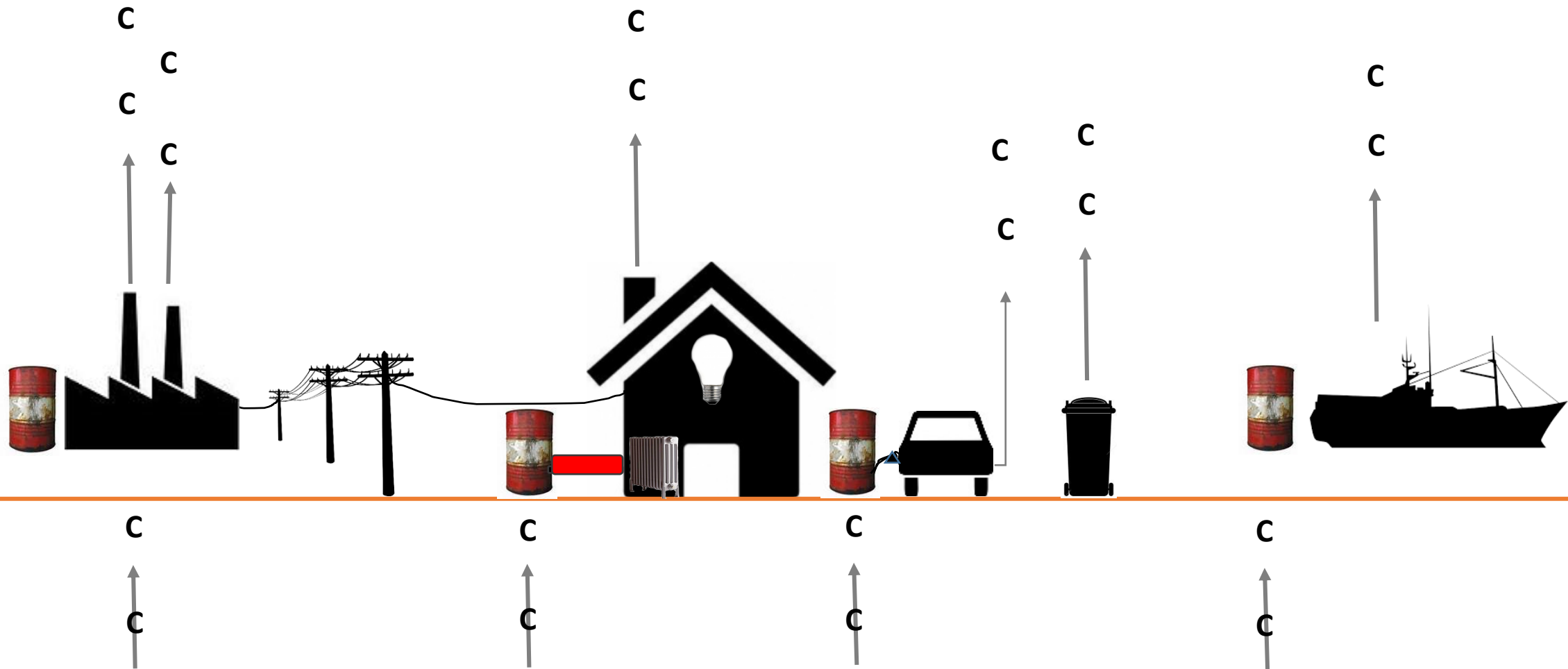
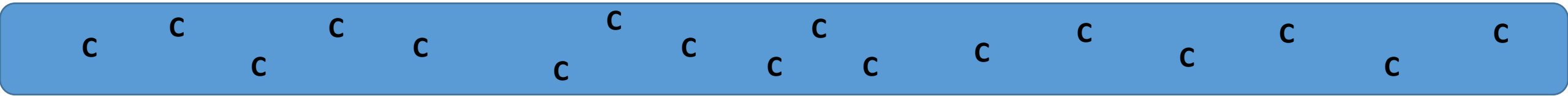
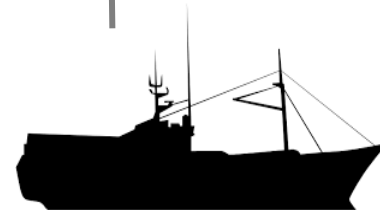
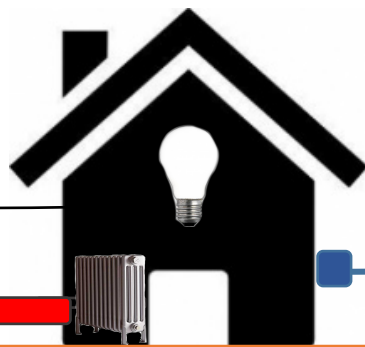
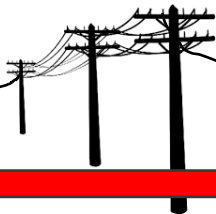
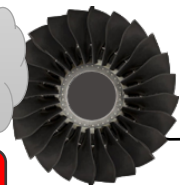
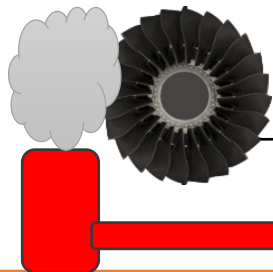
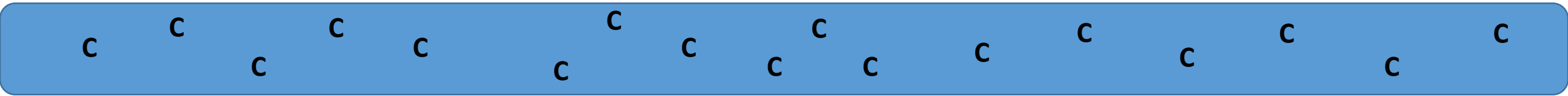


# Clean Maritime Transport

Sigurður Ingi  
Fridleifsson  
manager at Orkusetur  
Iceland





C  
C



C  
C



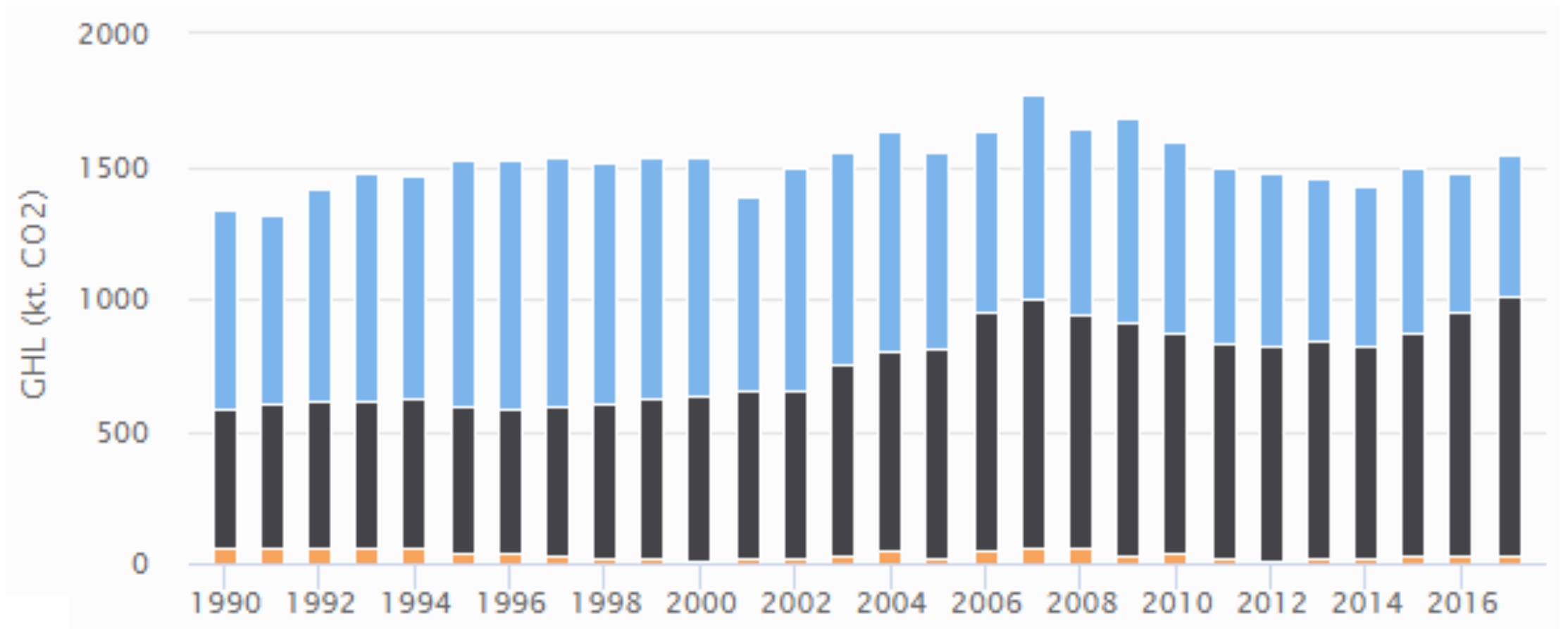


# National CO<sub>2</sub> goals

- Around 40% reduction for 2030
- Carbon neutrality 2040
- Fossil fuel phase out 2050



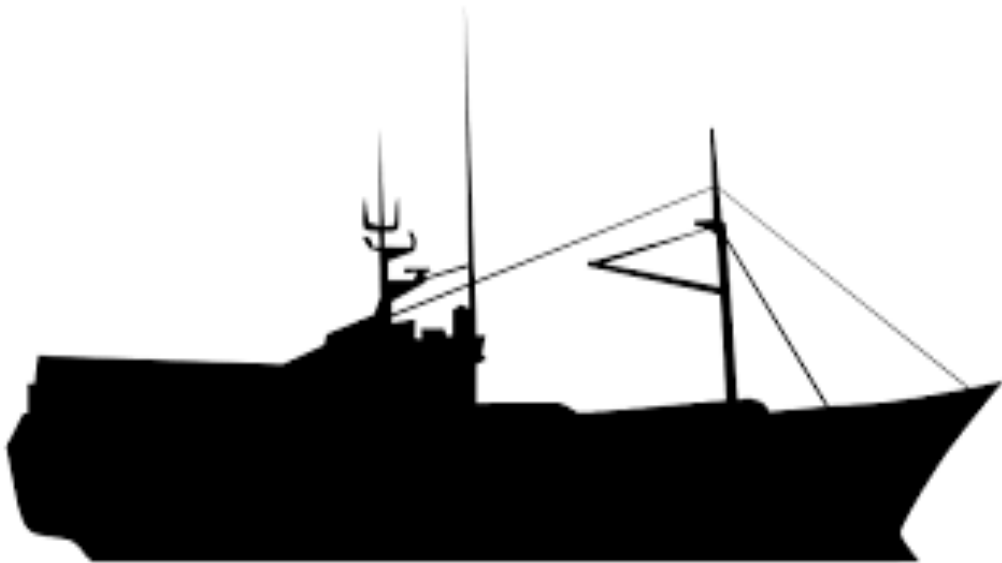
# CO<sub>2</sub> emission from oil



# Two different oil users

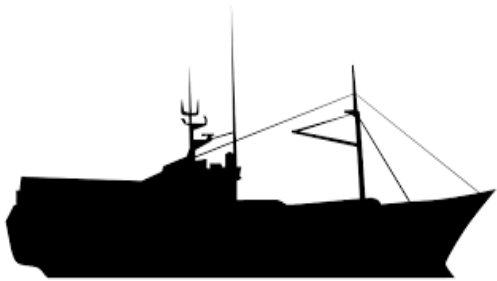


- Phase out time 10-15 years
- Number of different tax incentives opportunities
- Market ready



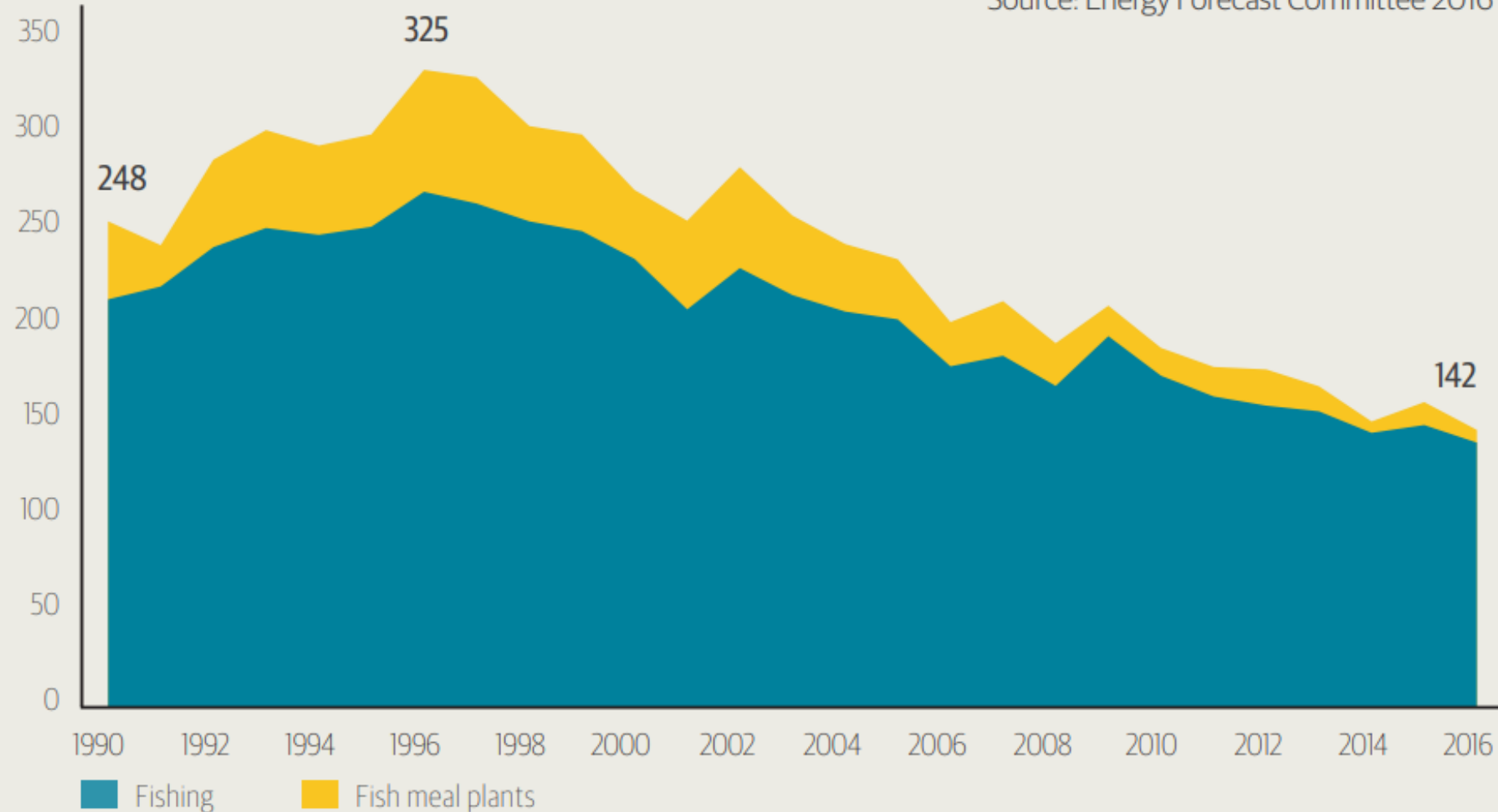
- Phase out time 20-40 years
- Only carbon tax on fuel
- Not market ready

# Energy Efficiency

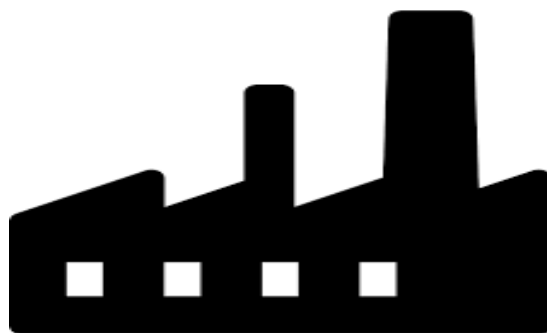
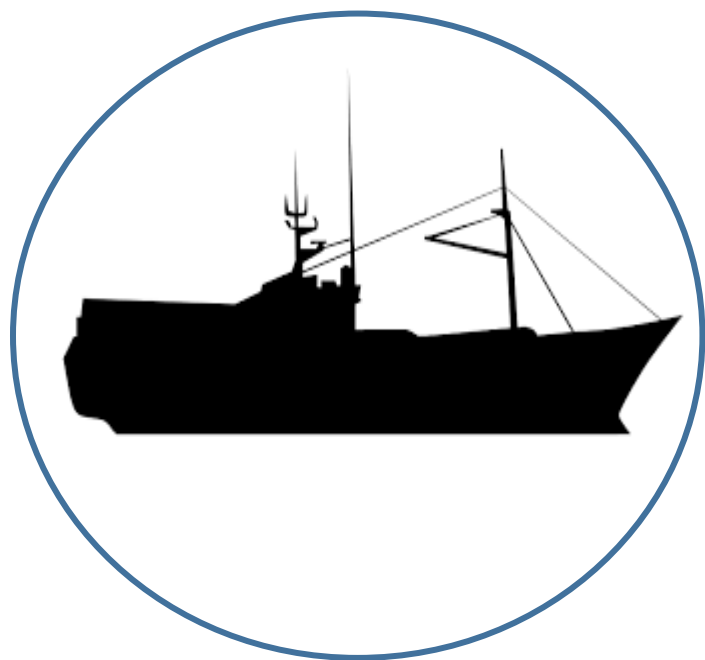
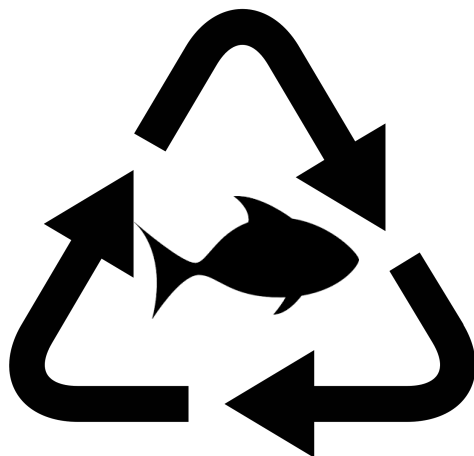


**Oil consumption in fisheries** (thousand tonnes)

Source: Energy Forecast Committee 2016







Carbon free ✓



Shared responsibility

# Icelandic priorities

- In general, the industry stress the importance of coupling research with deployment.
- Alternative fuels and blending. Production of so-called electrofuels provides an opportunity to blend with current marine diesel. Such fuels will have to comply with all standards and be cost-competitive. Pathways for such production and use need to be researched, taking production pathways and quantity into account
  - This includes electrofuels like methanol and other alcohols, ammonia, methane, DME, hydrogen and also biodiesel
- Digitalization, focussing on delivering comprehensible overview and management options for all energy use, resource use and waste, to reduce all emissions for any ship and/or entity in marine operations

# Icelandic priorities

- Developing and deploying innovative technical solutions for drive train and or auxiliary systems utilising any or all potential alternative fuels – based on renewable sources and new technologies for higher efficiency.
- Electrification of harbours. Research the potential set up of high voltage shore power connections at port and the potential standardisation of equipment. In this case a joint Nordic study might strengthen the project as it is important that larger vessels such as cargo ships and/or cruise ships can use harmonized connections in various Nordic ports.



# Icelandic priorities

- From the Icelandic perspective it is vital that new R&D projects in this field will have to include potential deployment activities.
- The local knowledge of new fuels in maritime applications is limited and proof of concept activities need to be executed so that learning can be acquired and applied further within the maritime sector.
- The Icelandic vision is therefore that projects should not only be R&D project but should be able to include deployment, i.e. RD&D (research, development and demonstration).

# Various research and deployment opportunities:

## ✓ For shorter shipping routes/coastal fishing:

- ✓ Further electrification of ships
- ✓ Harbour infrastructure
- ✓ Hydrogen
- ✓ Methanol

## ✓ On longer shipping routes:

- ✓ Hybridisation
- ✓ Hydrogen
- ✓ Methanol
- ✓ Ammonia

## ✓ Various research is needed for both categories, for full implementation and commercialization

## ✓ Other relevant issues:

- ✓ Fishing gear
- ✓ Propeller/propulsion innovation
- ✓ Hull design
- ✓ Hull coating innovation





Biodiesel  
Biogas





ÍSLENSK



NY

ORKA ehf

ICELANDIC NEW ENERGY Ltd.

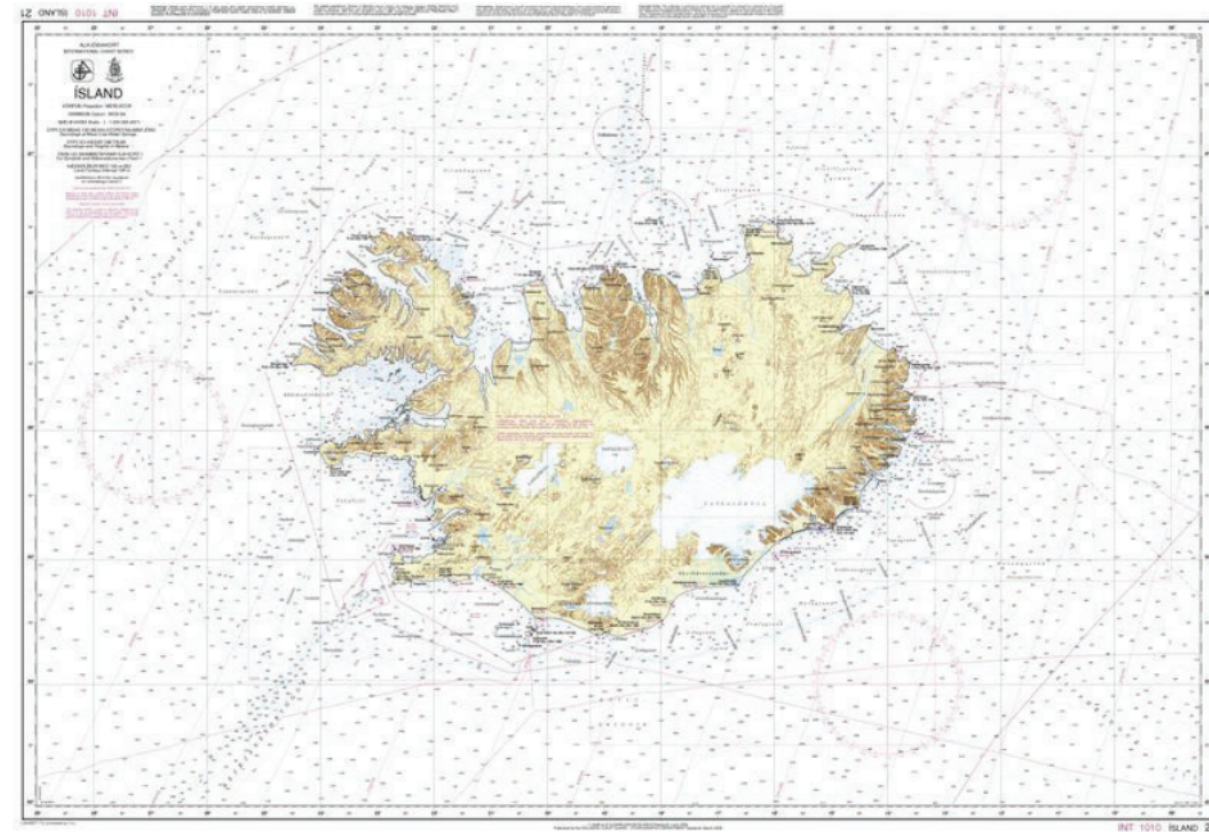




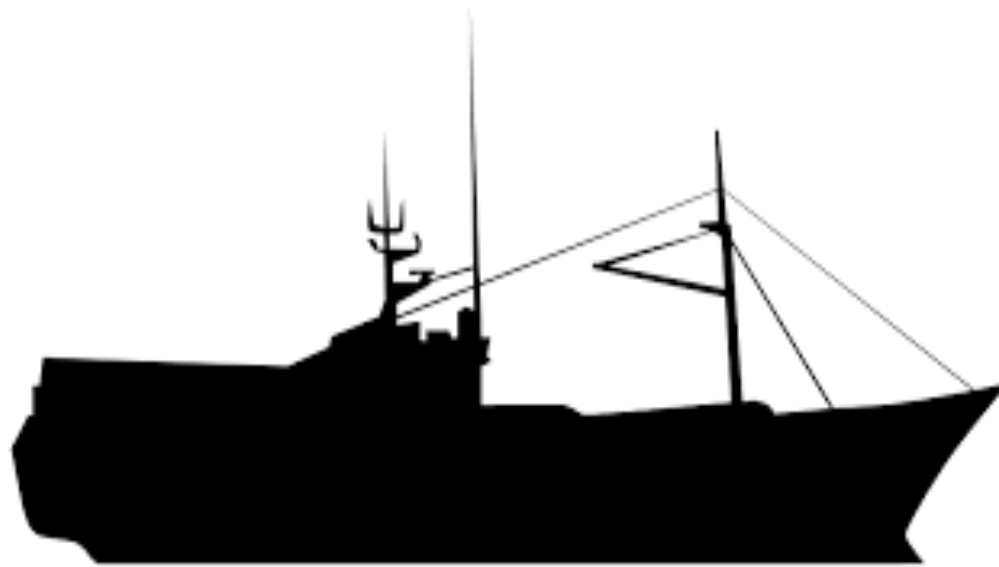


# Iceland: Fish industry

- ✓ Key player in Nordic (and European) collaboration
- ✓ Modern and high tech fish industry
- ✓ Strong links between innovation and industry, the users. Short communication lines
- ✓ Focus on deployment with research, „hands on“ experience
- ✓ Strong interest in innovation and fast uptake of new technology
- ✓ Public/private cooperation to facilitate introduction and deployment of clean tech solutions and identify and challenge framework obstacles







**Energy efficiency**

**Clean energy**

**Carbon binding**



# Industrial scale CCS integral part of operation since 2014

Reykjavík Energy injects about 25 million tonnes of geothermal brine into the rock each year at more than 700 m depth and 250 °C.

CO<sub>2</sub> and H<sub>2</sub>S gas mixture has been continuously injected into this “down going stream” since June 2014.



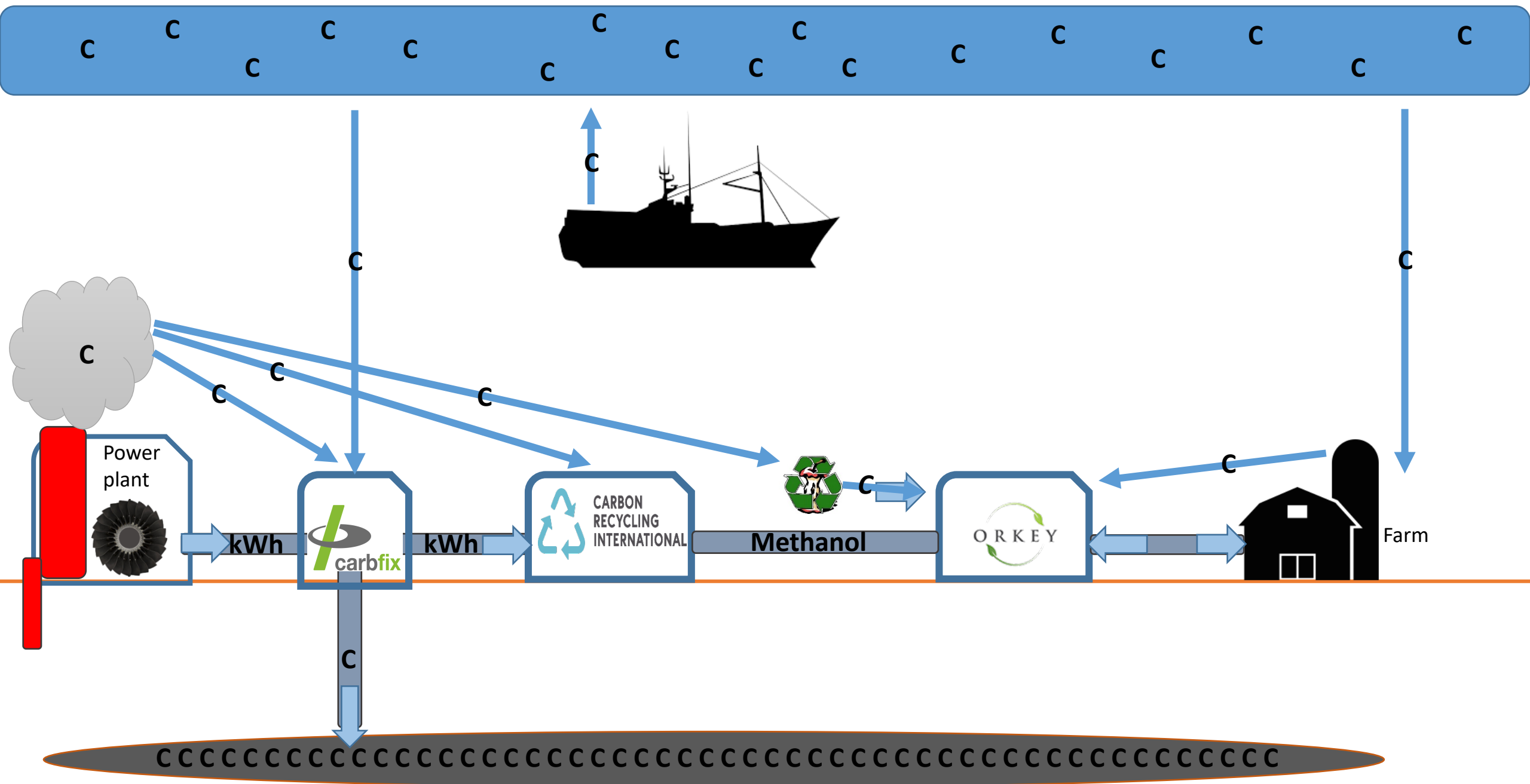


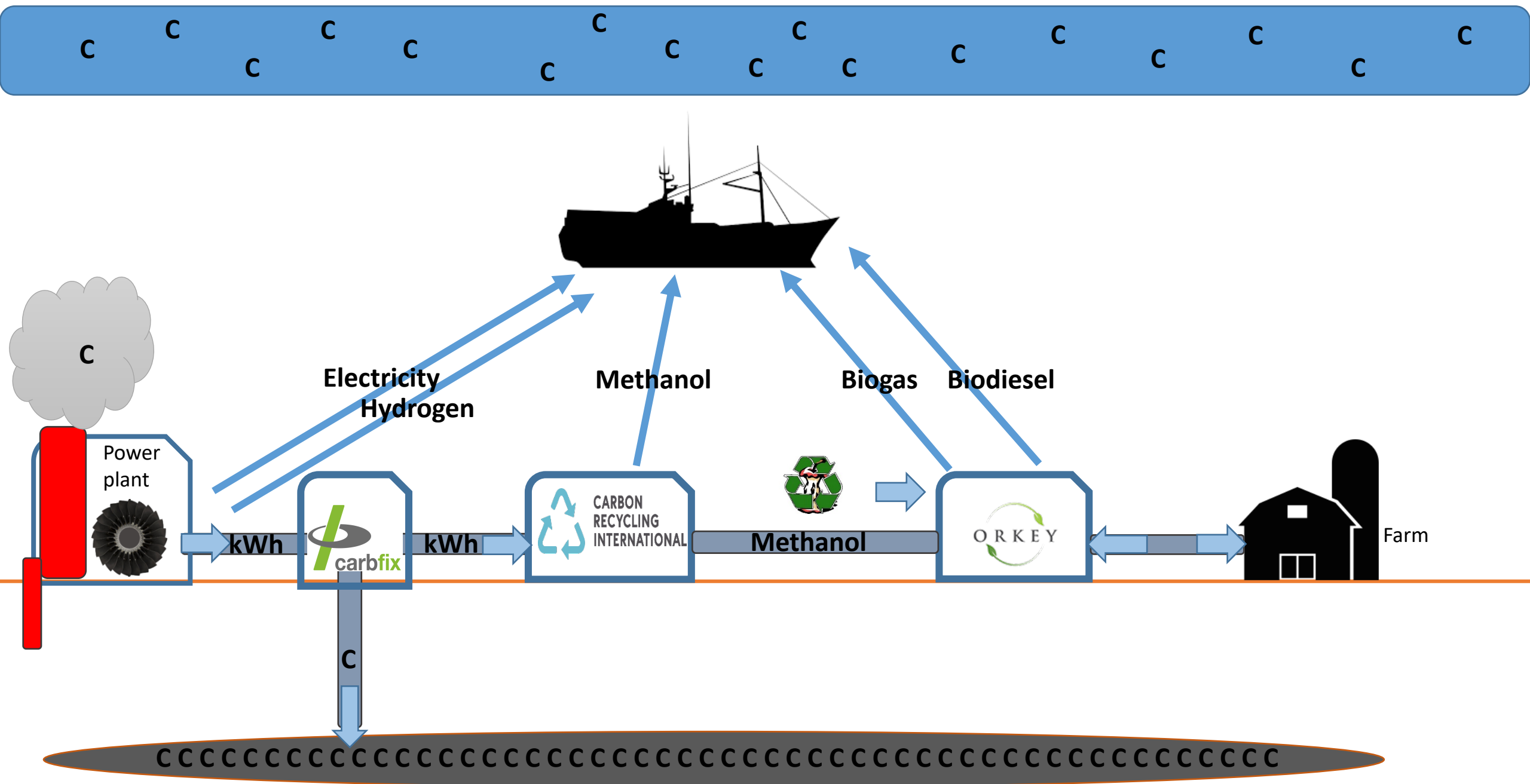
# Future of CarbFix

Link to Direct Air Capture and export method to new locations and industries

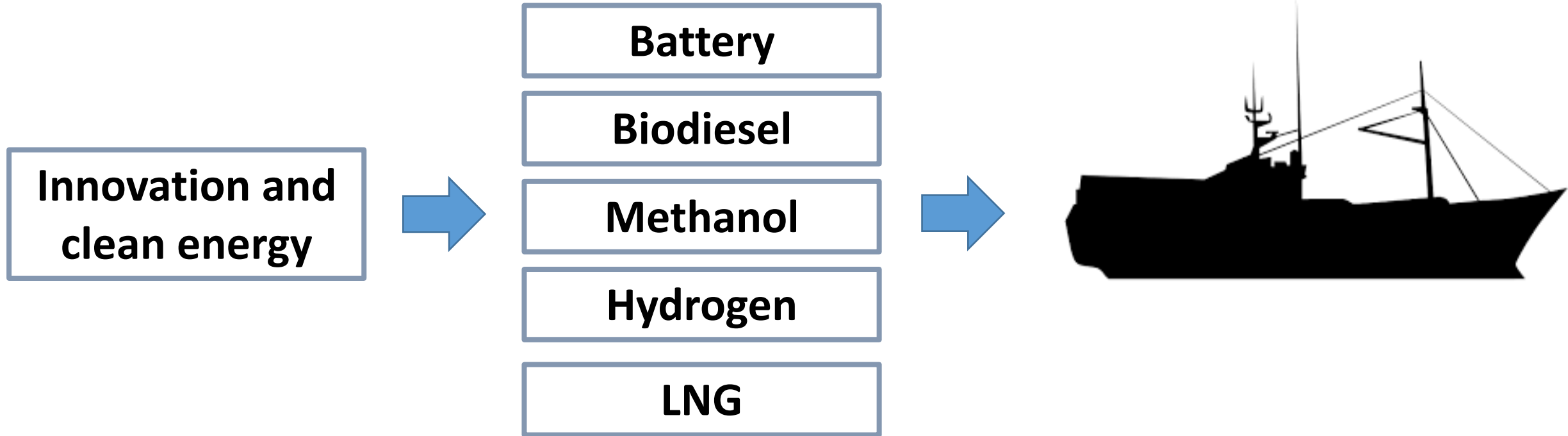


**CO<sub>2</sub>**

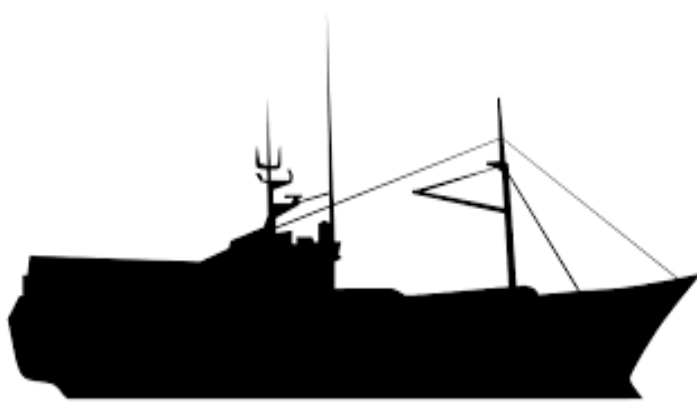




# Multiply solutions







100% Fossil fuel

100% Fossil fuel, more efficiency

Electrofuel

Battery

Biofuel

Battery

Electrofuel

Biofuel

Fossil fuel

Carbon capture

# The race for carbon low protein

## ATLANTIC SALMON

Farmed



1.6 - 2.9 CO<sub>2</sub> - eq/kg of fish

### GENERAL INFO

**Scientific Name:** *Salmo salar*

Atlantic salmon is the most commonly farmed salmonid species, and a widely commercially farmed species globally. They are typically farmed in marine net pens, although land-based recirculating and flow-through production also takes place. Products are sold fresh, frozen, or preserved.



## ATLANTIC COD

Wild



1.6 - 2.8 CO<sub>2</sub> - eq/kg of fish

### GENERAL INFO

**Scientific Name:** *Gadus morhua*

A heavily targeted groundfish species in the Atlantic Ocean, Atlantic cod is harvested using multiple gear types, particularly bottom trawls. After the collapse of the Canadian cod fishery, fisheries are primarily located in European waters. Products are commonly sold frozen or processed.



Data Certainty : Low Medium High

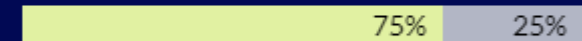
Breakdown :



■ Feed ■ Energy

Data Certainty : Low Medium High

Breakdown :



■ Fuel ■ Bait ■ Other