



# The hydrogen fuelled Bristol ferry

Fuel Cells and Hydrogen for maritime  
and harbour applications

Venice

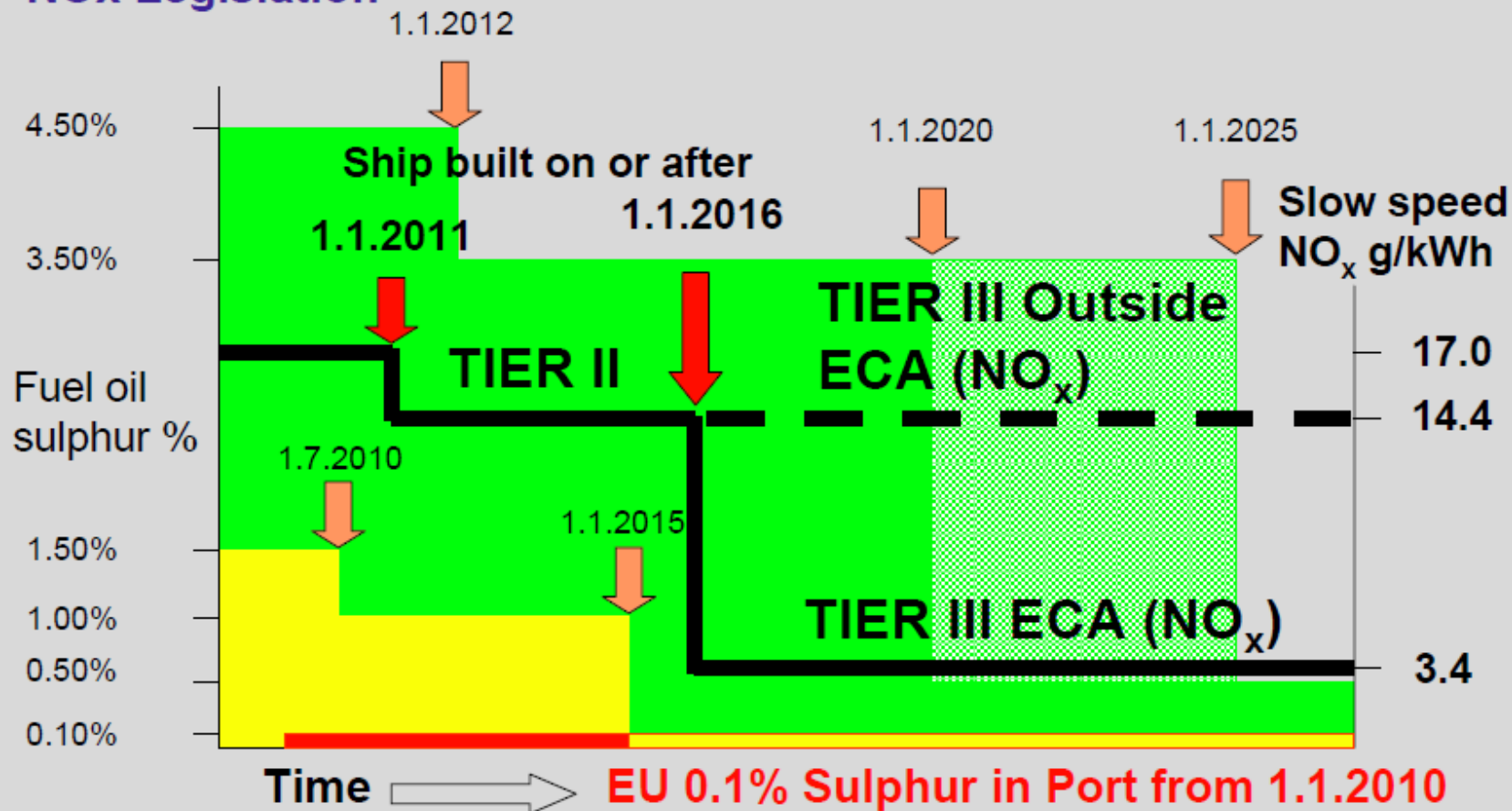
14 June 2013

# The drivers

- **Concern on Climate Change**
- **Levels of toxic pollution**
- **Ever increasing demand for energy**
- **Dependence on imported energy supply**
  - Price of oil & gas
- **Numerous governmental initiatives**
  - EU launched “post-industrial revolution” Jan 07
  - UK Climate Change Act 2008
    - Reduce carbon emissions by 34% by 2020, 80% by 2050
    - *BCC to reduce by 3% per year to 2020 (→40%)*
    - *London to reduce by 60% by 2025*

# Exhaust Emissions NOx Legislation

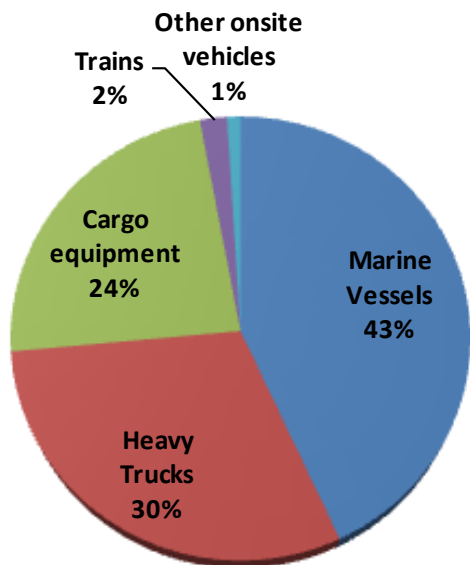
## MARPOL Annex VI SOx Certification



# Fishing fleet looking for cheaper fuel

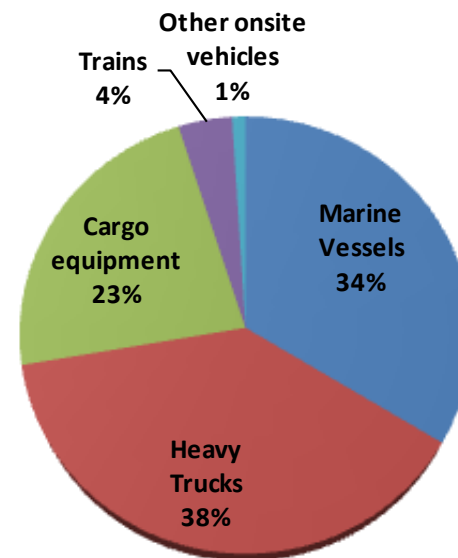
- **The Press and Journal, Aberdeen, 22/03/2011:**
  - SCOTTISH fishermen may be about to beat the rising cost of diesel.  
A trial, the first of its kind in the world, is to take place off the Outer Hebrides to convert fishing boats to run on hydrogen after receiving European money.

# Port & waterway pollution



**Particulate Emissions**

Source: NRDC

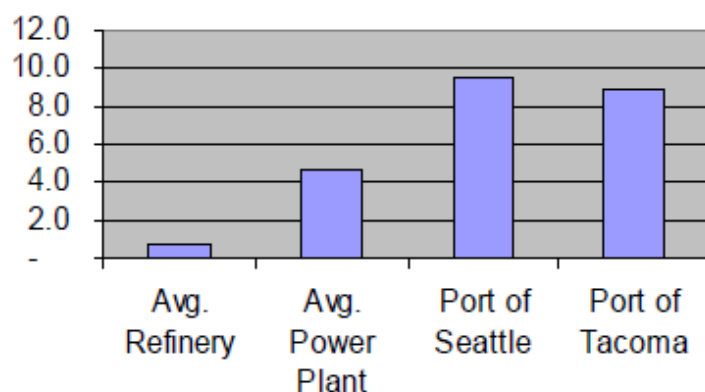


**NOx Emissions**

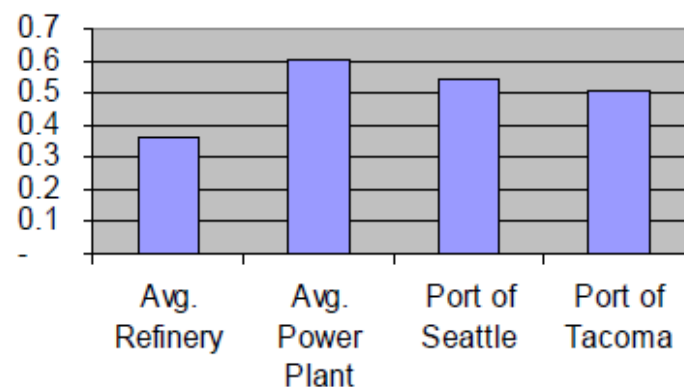


# Port & waterway pollution

**NOx Emissions  
(tons/day)**



**PM10 Emissions  
(tons/day)**



- **The 10 largest US container ports pollute the same as:**
  - 3.2 million cars worth of NOx
  - 8.1 million cars worth of PM<sub>10</sub>
  - 18.5 million cars worth of SOx
  - 182 thousand cars worth of VOC
  - 80 thousand cars worth of CO

Source: NRDC

# Products for global market

- **Auriga Energy modular hydrogen fuel cell systems applications:**

- Ferries/water taxis, canal boats
- UPS/back-up power
- Electric fork lifts
- Others to come



# Benefits

**This Technology is:**

- **Emission free**
- **Produces no toxic waste**
- **Virtually unlimited run time**
- **Reliable (no moving parts)**
- **Low maintenance**
- **Quiet**
- **Lighter weight**
- **Safe**
- **Provides the same versatility as legacy fuels**
- **No diesel waste or spillage problems**
- **Potential for local generation of hydrogen fuel**



# UPS/Backup Power

- **A single solution providing both UPS and backup generator**
- **Modular to allow growth**
- **Up to 10,000 hours operational time**
- **Operational runtime virtually unlimited**
  - Can be primary generator
- **Clean, quiet operation indoors or outside**
  - No planning permission required
- **Remote monitoring capability**
- **Wide operational temperature tolerance -20°C to 40°C**
- **Low Through Life Cost**
  - Reduced maintenance, repairs, transport and disposal



Award won by Auriga  
Energy's UPS partner  
Linnet Tech.

Select Electromechanical  
Awards:

**Best New Product 2012**



SELECT  
ELECTROTECHNICAL AWARDS  
2012

Linnet Technology Ltd  
Hydrogen Fuel Cell

**WINNER**

**Best New Product**

Newell McGuinness  
Managing Director, SELECT

this category is sponsored by

*DNM McGuinness*



# Bristol Hydrogen Ferry

- **Demonstrate the viability of hydrogen fuel cell technologies in ferry operations**
- **Help quantify potential CO<sub>2</sub> reductions**
- **De-risk the installation and operation of fuelling infrastructure**
- **Resolve certification and insurance issues**
- **Inform and educate the public**
- **Evaluate the commercial case for hydrogen ferry operations**



## A strong team

- **Bristol Hydrogen Boats Ltd.**
  - Consortium of Auriga Energy, No 7 Boat Trips and Bristol Packet Boat Trips
- **Air Products** supply the hydrogen and refueller



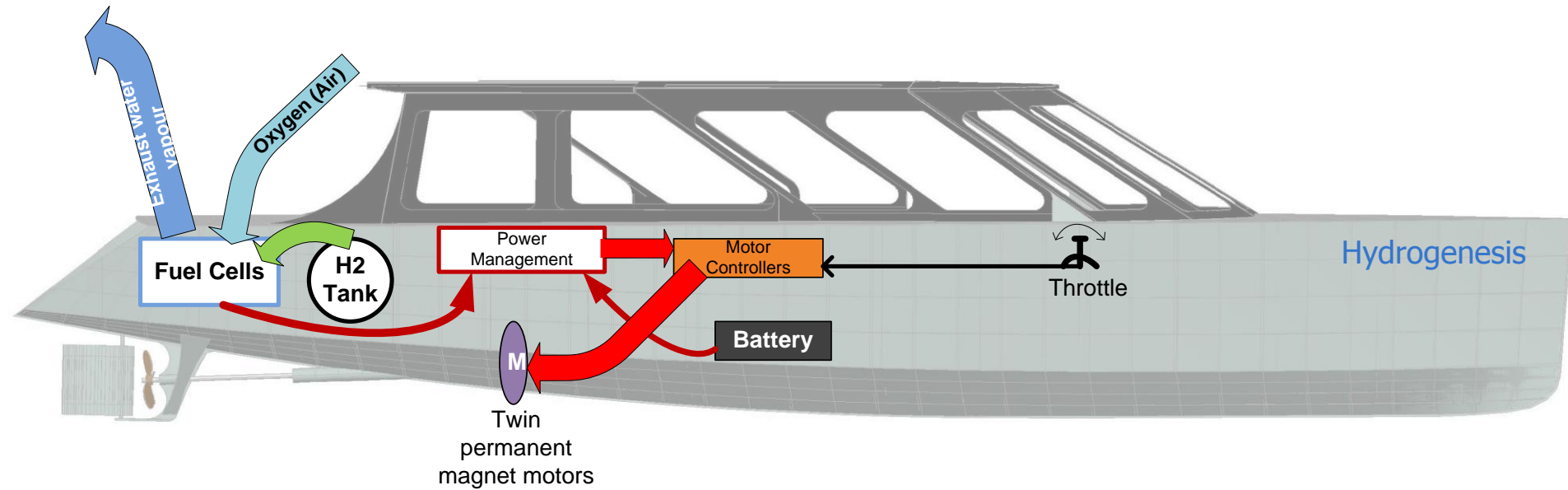


# Bristol Hydrogen Ferry

- **11m x 3.6m steel hull construction**
- **Glass panel top - partially retractable**
- **Sized for 12 passengers + 2 crew**
  - To allow quick MCA approval. Future builds can be bigger.
  - CE marked
- **12kW power via permanent magnet motors**



# Bristol hydrogen ferry



# Hydrogenesis





# BRISTOL HYDROGEN BOATS

The UK's First Hydrogen Powered Ferry  
**HYDROGENESIS**



45 minute trips leaving Arncliffe Steps with stop at  
ss Great Britain

Time				
11am	12noon	1pm	2pm	3pm

Return	£6:00
One Way	£4:00

## The Ferry Route



[www.bristolhydrogenboats.co.uk](http://www.bristolhydrogenboats.co.uk)

# BRISTOL HYDROGEN BOATS

Bristol Hydrogen Boats have developed the UK's first hydrogen-powered ferry. The ferry is set to run initially for six months in Bristol's harbour to stimulate enterprise in new technologies in the city.

Air Products have supplied the fuelling station and the hydrogen gas.

Clean and green, the ferry can carries 12 passengers and is a demonstration of this technology. As an alternative to petrol and diesel engines, hydrogen powered transport impacts significantly less on the environment producing zero emissions. The only waste product is water. This could mean lower CO2 emissions, reduced water and noise pollution when the technology is widely adopted.

Private Parties can be booked by the hour  
Bar and Buffet by arrangement  
Visit Website



[www.bristolhydrogenboats.co.uk](http://www.bristolhydrogenboats.co.uk)

Hydrogenesis  
running in  
Bristol



# BRISTOL HYDROGEN BOATS

## Award winning

- **Sustainable Shipping:**  
Environmental Innovation  
of the Year 2011
- **Royal Thames Yacht Club:**  
Winner Mansura Trophy:  
Lake and Inland Division  
Technology award 2012



## Refuelling location challenges

- In an area fully 'accessible' by the public
- By permission of the Harbour Master
- Planning Dept x 2 (general + listed buildings)
- Public right of way
- Tanker access
- Safety distances
- ***Good idea, but not here!***

# Refuelling stn: in a fully public location

**AIR  
PRODUCTS** 



# Its about a sustainable future

- **Permanent hydrogen operations in the harbour**
- **Permanent refuelling facility**
  - Marine plus road
- **Local renewable hydrogen generation**
  - Using wind, water power, waste recycling, solar.....
- **Public Local supply chain and servicing industry**
- **awareness + acceptance**
- **Jobs creation**

**Hydrogen is a plentiful and sustainable fuel that can be manufactured near the point of use.**





# Opening the gates to a sustainable hydrogen fuelled future

**Auriga Energy Limited**

**Bristol**

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