EEP17 Input paper

Agenda item 10

Task Number 10.2

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Carbon footprint measurement process used at Trinity House

# Background

Over the last three decades, Trinity House has been conscious of its environmental responsibilities which have resulted in it endeavouring to reduce its impact in this area.

As was typical of Aids to Navigation providers of this era, a programme of solarisation of its offshore Navigation Aids was embarked on. This resulted in a reduction of diesel fuel and acetylene being used and a consequential reduction in shipping miles required to deliver the fuel and acetylene.

# Environment Management System

In order to embrace the concept of environmental responsibility fully, accreditation to an Environmental Management System was sought using the ISO 14001:2004 standard.

This has the following objectives;

* To identify and control the environmental impact of its activities, products or services; and
* To improve its environmental performance continually; and
* To implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved.

As is evident, adherence to such a standard requires an organisation to perform in this area a key part of setting objectives is to monitor current performance in order to identify if initiatives are being successful.

# What is Carbon Footprint?

A ‘carbon footprint’ measures the total greenhouse gas emissions caused directly and indirectly by a person, organisation, event or product.

The footprint considers all six of the Kyoto Protocol greenhouse gases: Carbon dioxide (CO2), Methane (CH4), Nitrous oxide (N2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF6).

A carbon footprint is measured in tonnes of carbon dioxide equivalent (tCO2e). The carbon dioxide equivalent (CO2e) allows the different greenhouse gases to be compared on a like-for-like basis relative to one unit of CO2. CO2e is calculated by multiplying the emissions of each of the six greenhouse gases by its 100 year global warming potential (GWP).

The main types of carbon footprint are:

* Organisational

Emissions from all the activities across the organisation, including buildings’ energy use, industrial processes and company vehicles.

* Product

Emissions over the whole life of a product or service, from the extraction of raw materials and manufacturing right through to its use and final reuse, recycling or disposal.

# Carbon footprint reduction techniques

In line with most organisations, a range of techniques can be employed to reduce the burning of fossil fuels and the carbon footprint of an Aid to navigation provider. These include

1. Use of renewable energy from Sun (PV and thermal), Wind and Waves.
2. Ground heat recovery.
3. Reduction in maintenance requirements be design, thus reducing the frequency of visits to each station.
4. Awareness of the carbon footprint of the whole life cycle of products being purchased.

# Measurement of Carbon Footprint

This can be a complex topic and caution in how to approach and sustain the measurement is advised as this can be time consuming, however any initiatives on how to reduce your carbon footprint will need a measurement of some form to assess their value.

Trinity House uses two methods to assess its impact on the environment by the amount of energy it consumes in order to deliver Aids to Navigation.

## Specific station analysis

This is used when analysing potential savings when considering an investment in the site. All fuel used on the station is analysed and converted into both Tonnes of Carbon and Tonnes of CO2 emitted per year.

This is compared to the predicted consumptions after the investment and a saving can be identified.

An example of this calculation (For Bardsea Lighthouse off the North Wales coast, UK) is attached for reference (Appendix 1).

The formula and the various conversion factors were gleaned from The Carbon Trust website, www.carbontrust.co.uk.

## Overall organisation consumption

When trying to measure the overall impact on the environment for the organisation as a whole, it was decided to take a more general approach and gather information from all the energy purchases over the last 5 years.

This included Electricity, Gas for heating, Marine fuel, Diesel oil, Helicopter fuel, Car fuel (petrol & Diesel) purchases.

Identifying this data can be complex in a large organisation and the accounts department proved to be the best area to identify spends which can be converted into consumptions.

The various fuels were then all converted into KWh (Kilo Watt Hours) as the common unit of consumption which was found to be simpler than converting into Carbon or CO2 emissions. This decision was taken to simplify what was becoming an onerous exercise and considered to be related to Carbon and CO2 emissions but more relevant for users (consumers) to relate to.

1. Bardsey Lighthouse Carbon Footprint Measurement

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Discharge Before Modernisation** | | |  | |  | |  | **Discharge After Modernisation** | | | | | |  | | |  | | |  | | |  | | | | |
|  |  |  |  |  | |  | |  |  | | |  | | |  | | |  | | |  | | |  | | | | | |
| Due to the engine running | |  |  |  | |  | | Due to the engine running | | |  | | |  | | |  | | |  | | |  | | | | |
|  | TS3 Fuel consumption = | 2.2 | litres per hour | | | | |  | TS3 Fuel consumption = | | | 2.2 | | | litres per hour | | | | | |  | | |  | | | | | |
|  |  |  |  |  | | |  |  |  | | |  | | |  | | |  | | |  | | | |  | | | | |
|  | Operational hours per day = | 24 | hours |  | | | In automatic mode the number of runs = | | | 0 | | | 12 | | | hour run a year | | | | | | | | | |
| Engine fuel consumption per day = | | 52.8 | litres |  | | | Total automatic run hours per year = | | | 0 | | | hours | | |  | | |  | | |  | | | |
|  | Consumption per year = | 19272 | litres |  | | |  |  |  | | |  | | |  | | |  | | |  | | | |  | | | | |
|  |  |  |  |  | | |  |  | When people visit site = | | | 2 | | | 0 | | | hour run per day | | | | | | | | |
|  |  |  |  |  | | |  |  | Based on | | | 6 | | | visit per year | | | | | |  | | | |  | | | | |
|  |  |  |  |  | | |  |  | Run hours per year due to visits = | | | 0 | | | hours run per year | | | | | |  | | | |  | | | | |
|  |  |  |  |  | | |  |  |  | | |  | | |  | | |  | | |  | | | |  | | | | |
|  |  |  |  |  | | |  |  | Total hours run per year = | | | 0 | | | hours | | |  | | |  | | | |  | | | | |
|  |  |  |  |  | | |  |  | Consumption per year = | | | 0 | | | litres | | |  | | |  | | | |  | | | | |
|  |  |  |  |  | | |  |  |  | | |  | | |  | | |  | | |  | | | |  | | | | |
| Due to helicopter fuel delivery | |  |  |  | | |  | Due to the boiler running | | |  | | |  | | |  | | |  | | |  | | | | | |
|  | Helicopter Fuel consumption = | 200 | litres per hour | | | | |  | Boiler fuel consumption = | | | 0.7 | | | litres per hour | | |  | | |  | | |  | | | | | |
|  | Quantity of flights per year = | 55 | bags |  | |  | |  |  | | |  | | |  | | |  | | |  | | |  | | | | | |
|  | Flight duration return = | 10 | minutes |  | |  | |  | Operational hours in automatic mode | | | | | |  | | |  | | |  | | |  | | | | | |
|  | Total flying time = | 9.2 | hours |  | |  | |  | Nov, Dec, Jan, Feb = | | | 4 | | | hours per day which = | | | | | | 480 | | | hrs | | | | | |
|  |  |  |  |  | |  | |  | Mar, Apr, May, Jun = | | | 1 | | | hours per day which = | | | | | | 122 | | | hrs | | | | | |
|  | Positioning time = | 120 | minutes |  | |  | |  | July, Aug = | | | 0 | | | hours per day which = | | | | | | 0 | | | hrs | | | | | |
| Total positioning time if > 8 hours = | | 4 | hours |  | |  | |  | Sept, Oct = | | | 2 | | | hours per day which = | | | | | | 122 | | | hrs | | | | | |
|  | Total flying time = | 13.2 | hours |  | |  | |  |  | | |  | | | Total hours run = | | | | | | 724 | | | hrs | | | | | |
|  |  |  |  |  | |  | |  |  | | |  | | |  | | |  | | |  | | |  | | | | | |
|  | Fuel consumption = | 2635 | litres |  | |  | |  | When people visit site = | | | 6 | | | visit per year | | | | | |  | | |  | | | | | |
|  |  |  |  |  | |  | |  | When the boiler runs for | | | 24 | | | hour per day | | | | | |  | | |  | | | | | |
|  |  |  |  |  | |  | |  | Total hours run = | | | 144 | | | hours | | |  | | |  | | |  | | | | | |
|  |  |  |  |  | |  | |  |  | | |  | | |  | | |  | | |  | | |  | | | | | |
|  |  |  |  |  | |  | |  | Total boiler run hours = | | | 868 | | | hours | | |  | | |  | | |  | | | | | |
|  |  |  |  |  | |  | |  | Total boiler fuel consumption = | | | 607.6 | | | litres | | |  | | |  | | |  | | | | | |
|  |  |  |  |  | |  | |  |  | | |  | | |  | | |  | | |  | | |  | | | | | |
|  |  |  |  |  | |  | |  | Total fuel consumed on station = | | | 607.6 | | | litres | | |  | | |  | | |  | | | | | |

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|  |  |  |  |  |  | Due to helicopter fuel delivery | | |  | | |  | | |  | | |  | | |  | | |
|  |  |  |  |  |  |  | Helicopter Fuel consumption = | | | 200 | | | litres per hour | | | | | |  | | |  | | |
|  |  |  |  |  |  |  | Quantity of flights per year = | | | 2 | | | bags | | |  | | |  | | |  | | |
|  |  |  |  |  |  |  | Flight duration return = | | | 10 | | | minutes | | |  | | |  | | |  | | |
|  |  |  |  |  |  |  | Total flying time = | | | 0.3 | | | hours | | |  | | |  | | |  | | |
|  |  |  |  |  |  |  |  | | |  | | |  | | |  | | |  | | |  | | |
|  |  |  |  |  |  |  | Positioning time = | | | 120 | | | minutes | | |  | | |  | | |  | | |
|  |  |  |  |  | Total positioning time if > 8 hours = | | | 2 | | | hours | | |  | | |  | | |  | | |
|  |  |  |  |  |  |  | Total flying time = | | | 2.3 | | | hours | | |  | | |  | | |  | | |
|  |  |  |  |  |  |  |  | | |  | | |  | | |  | | |  | | |  | | |
|  |  |  |  |  |  |  | Fuel consumption = | | | 458 | | | litres | | |  | | |  | | |  | | |

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| Using Carbon Trust Method | |  |  |  |  | Using Carbon Trust Method | |  |  |
| **Diesel** |  |  |  |  |  | **Diesel** |  |  |  |
| Convert Fuel quantity into Energy Content | | |  |  | a) | Convert Fuel quantity into Energy Content | | | |
|  | Diesel Conversion Factor = | 10.672 | KWh / Litre |  |  |  | Diesel Conversion Factor = | 10.672 | KWh / Litre |
|  | Total KWh per year = | 205670.8 | KWh |  |  |  | Total KWh per year = | 6484.3 | KWh |
|  |  |  |  |  |  |  |  |  |  |
| Convert KWh into Carbon Discharge | |  |  |  | b) | Convert KWh into Carbon Discharge | | |  |
|  | Diesel Conversion Factor = | 0.068 | kg C / KWh | |  |  | Diesel Conversion Factor = | 0.068 | kg C / KWh |
| **Carbon discharge per year =** | | **13.99** | **Tonnes** |  |  | **Carbon discharge per year =** | | **0.44** | **Tonnes** |
|  |  |  |  |  |  |  |  |  |  |
|  | Diesel Conversion Factor = | 0.25 | kg CO2 / KWh | |  |  | Diesel Conversion Factor = | 0.25 | kg CO2/KWh |
|  | **CO2 discharge per year =** | **51.42** | **Tonnes** |  |  |  | **CO2 discharge per year =** | **1.62** | **Tonnes** |
|  |  |  |  |  |  |  |  |  |  |
| **Jet A1** | |  |  |  |  | **Jet A1** |  |  |  |
| Convert Fuel quantity into Energy Content | | |  |  | a) | Convert Fuel quantity into Energy Content | | | |
|  | Diesel Conversion Factor = | 10.267 | KWh / Litre |  |  |  | Diesel Conversion Factor = | 10.267 | KWh / Litre |
|  | Total KWh per year = | 27057.95 | KWh |  |  |  | Total KWh per year = | 4700.9 | KWh |
|  |  |  |  |  |  |  |  |  |  |
| Convert KWh into Carbon Discharge | |  |  |  | b) | Convert KWh into Carbon Discharge | | |  |
|  | Diesel Conversion Factor = | 0.066 | kg C / KWh | |  |  | Diesel Conversion Factor = | 0.066 | kg C / KWh |
| **Carbon discharge per year =** | | **1.77** | **Tonnes** |  |  | **Carbon discharge per year =** | | **0.31** | **Tonnes** |
|  |  |  |  |  |  |  |  |  |  |
|  | Diesel Conversion Factor = | 0.24 | kg CO2 / KWh | |  |  | Diesel Conversion Factor = | 0.24 | kg CO2/KWh |
|  | **CO2 discharge per year =** | **6.49** | **Tonnes** |  |  |  | **CO2 discharge per year =** | **1.13** | **Tonnes** |
|  |  |  |  |  |  |  |  |  |  |
|  | Carbon discharge = | 15.76 |  |  |  |  | Carbon discharge = | 0.75 |  |
|  | CO2 discharge = | 57.91 |  |  |  |  | CO2 discharge = | 2.75 |  |