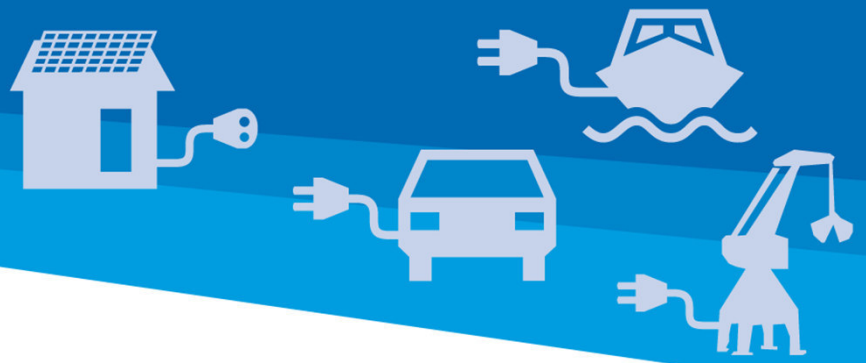
e-harbours electric



Small to Medium Sized Harbours

E-Label for Fish Products

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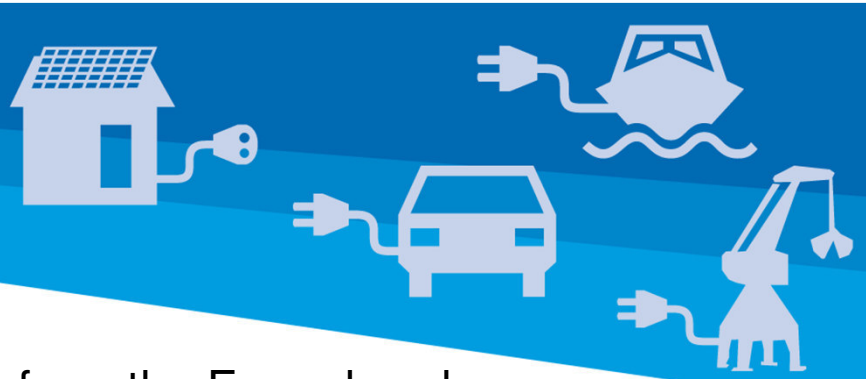

Aim:

Create an energy label for fish products from the Fraserburgh area, with the view to developing more sustainable fishing practices and encouraging sustainable consumer behaviour

Work Completed:

- ✓ Chart supply chain for fish products in the Fraserburgh area
- ✓ Select case study product representative of Fraserburgh produce
- ✓ Collect data on the amount of energy consumed at different stages of the fish production process
- ✓ Research on the information management aspects of the labelling system, the labelling architecture and how consumers read and respond to the labels

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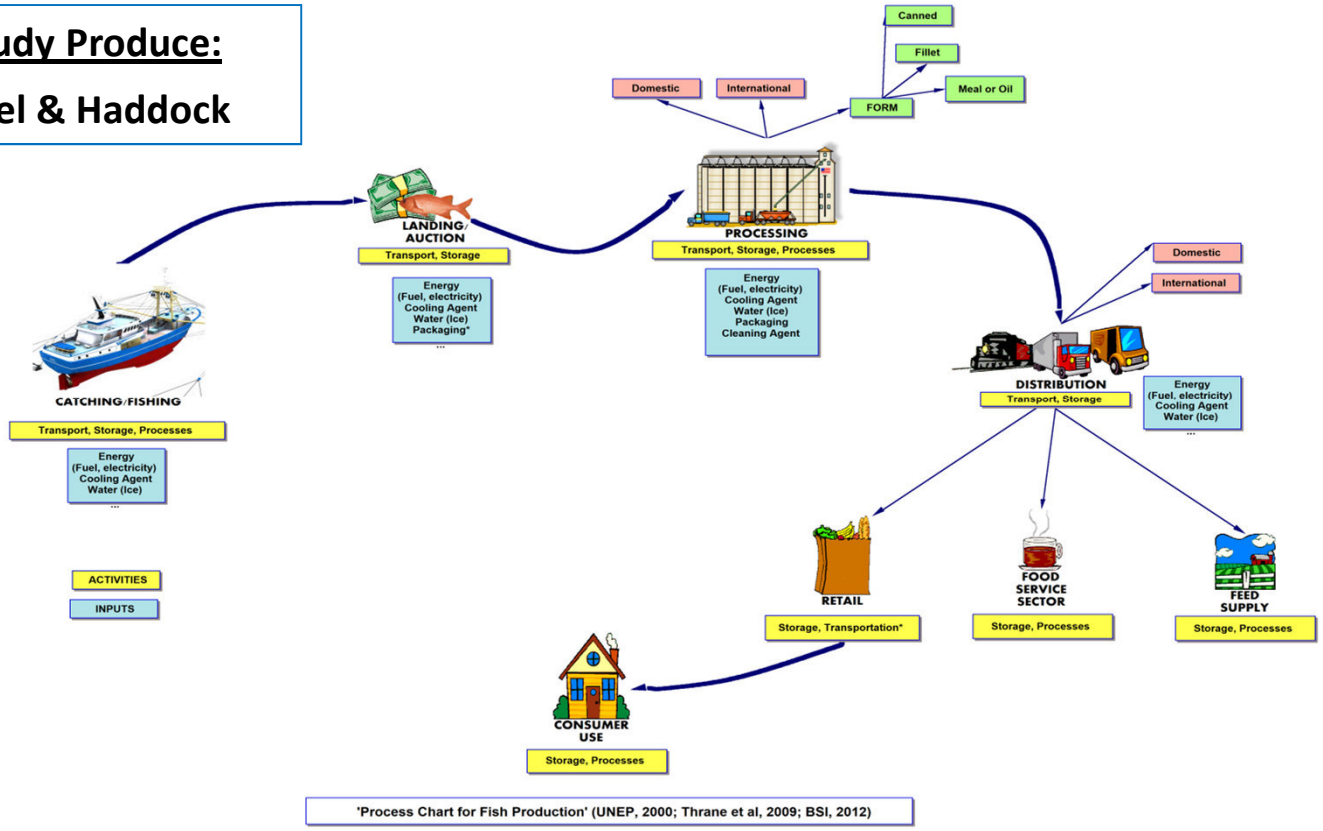
Case Study Produce:

Mackerel & Haddock



'Process Chart for Fish Production' (UNEP, 2000; Thrane et al, 2009; BSI, 2012)

Figure 1: Supply Chain Process Chart for Fish Products

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Label to be compliant with international standards (e.g. ISO 14025 Type III Environmental Declarations

Four viable design options investigated:

- Stamp of Approval
- Absolute Numbers
- Traffic Lights
- Sliding Scale

Traffic Lights have high consumer preference, and may be based on either Stamp of Approval or Absolute Numbers formats

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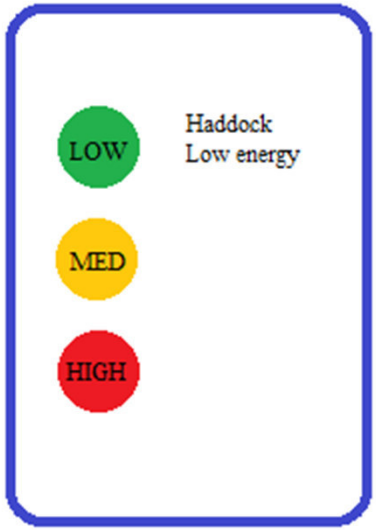
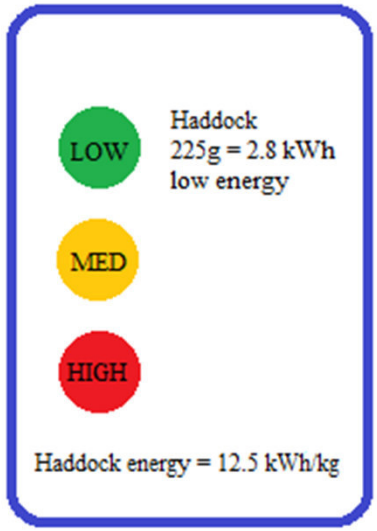


Traffic Light:

Stamp of Approval



Traffic Light:

Absolute Numbers

Next steps

1. Complete energy modelling of the 'supply chain'
2. Consult with producers and retailers
3. Test proposed designs with consumers
4. Finalise label design based on previous points
5. Consider additional information requirements: On pack , External (e.g. Website)

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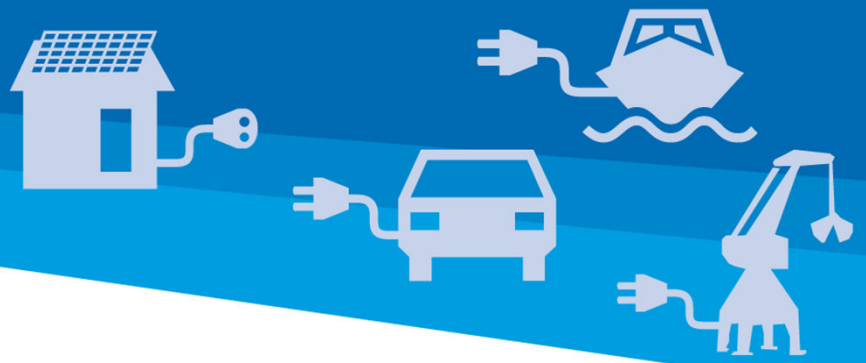

Fraserburgh Harbour and Orkney Islands

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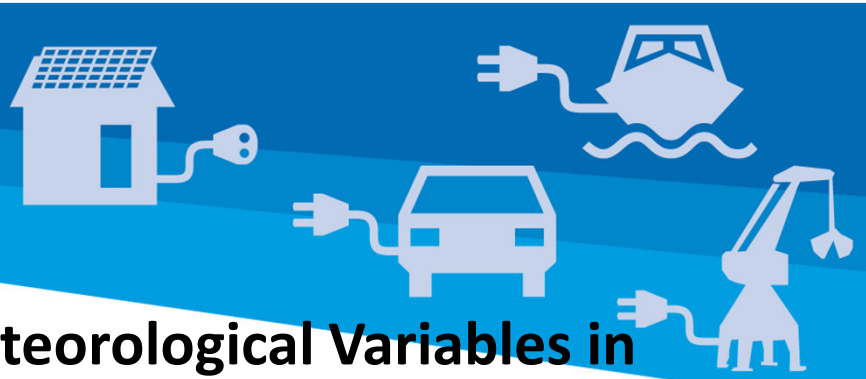

Monitoring Energy Usage and Meteorological Variables in Fraserburgh

Aim:

Capture energy use and meteorological variables in small to medium sized harbour area to look for flexibility and efficiency based business cases

Objectives:

- Monitor energy usage and availability of renewable energy
- Estimate contribution of other system parameters
- Identify areas to improve or cut down energy usage
- Test model on data from another harbour
- Promote increases production and use of renewable energy in Fraserburgh
- Promote reuse of industrial waste and dissipated heat

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Summary of Work Done

Monitoring energy usage involved:

- Pre-study of harbour businesses (and their energy use
- Installation of data loggers in business plant-rooms
- Collection of utility bills
- Analysis of energy consumption & identification of periods of high consumption and flexibility

Instrumentation used for energy measurement:

- Pico-current monitoring kits (CM3)
- Power quality analyser(PQA)

Fig.1 : Picture of CM3 installed in one of the plant rooms

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Summary of Work Done

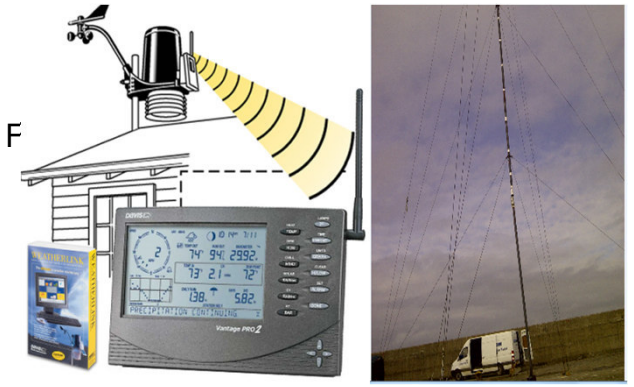

Fig.2 : Picture of installed PQA in the plant room

•Weather station installed besides light house in Fraserburgh harbour with weatherlink software and linked to a computer in the harbour office

Data recoded for wind speed, temperature, wind direction, dew point, humidity and solar energy

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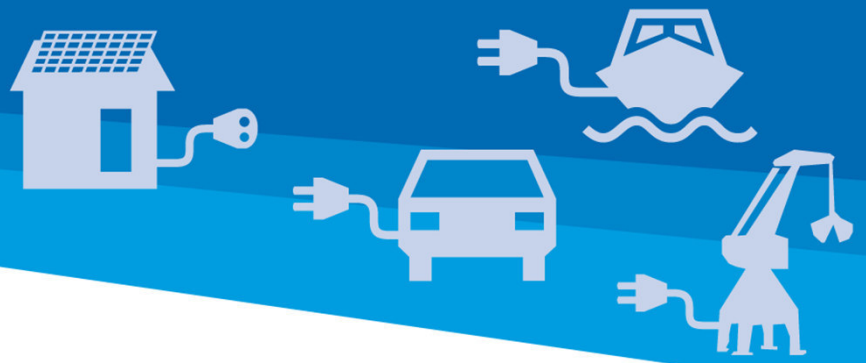

Findings

- Constant power consumption profile by most businesses
- Use of peak and off peak period meters to cut down energy bills by most businesses
- Lack of the use of heat dissipated by refrigeration systems to warm premises - therefore energy is wasted.
- Primary motivation of stakeholders to reduce energy consumption is to reduce expenditure
- Data recorded from weather station show high wind speed (so potential to incorporate renewables

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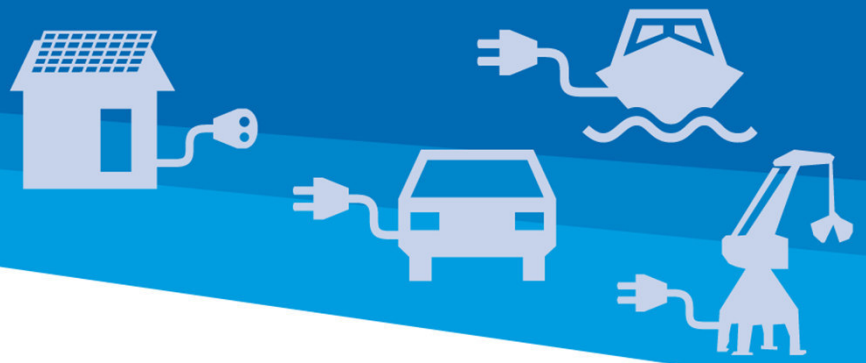

Conclusions

Potential for reducing energy use by:

•Using renewable energy

• Using heat dissipated for space heating

Work to be completed:

•Complete analysis of data recorded

•Estimate contributions of other system parameters using models developed from available data

•Test model on data from another harbour

•Develop an analytical model that can be used to predict energy use in small or medium harbour

•Identify areas where improved metering or monitoring can improve or cut down energy usage

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Orkney Islands

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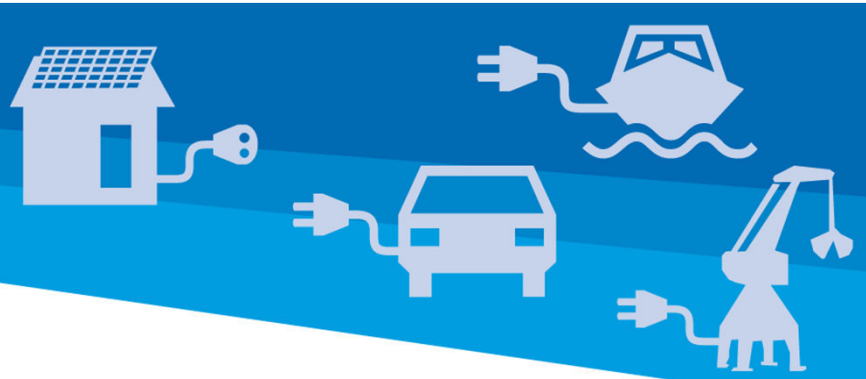

Orkney Islands

- Orkney islands have semi-independent energy grid
- The grid is operating close to full capacity
- There are 4 MW of micro-renewables which cannot be accommodated by the energy grid at off peak times.
- The turbines have to be switched off remotely by the utility company at off peak times when it is windy
- Orkney Islands Council and SSE (utility company) are keen to identify flexibility 'business cases' within the system...
- ...that will allow the micro-renewables to be balanced into the grid
- A microcosm of e-harbours project

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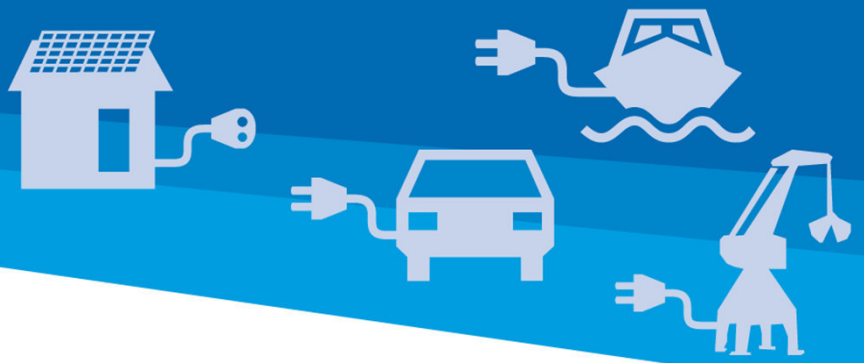

RGU work

- Orkney islands Council & Scottish Community Resembles providing:
  - energy supply data
  - Energy demand data
  - Weather data
- RGU to analyse and model data to look for potential flexibility to look for business cases around:
- Energy efficiency
- Smart grids
- Electric or other alternative propulsion/ storage technology

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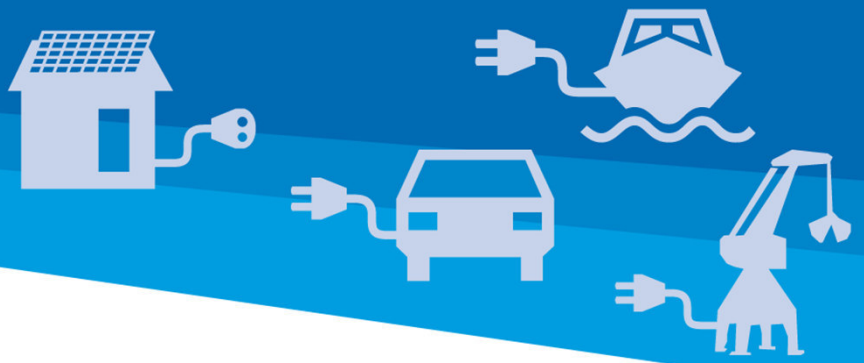

RGU work

- Data to arrive this week
- Analysis and identification of business cases to be completed by end of December
- E-harbours seminar to be held in Orkney in January

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Energy Usage in Fraserburgh Harbour

Leontine Kansongue
25/02/2014

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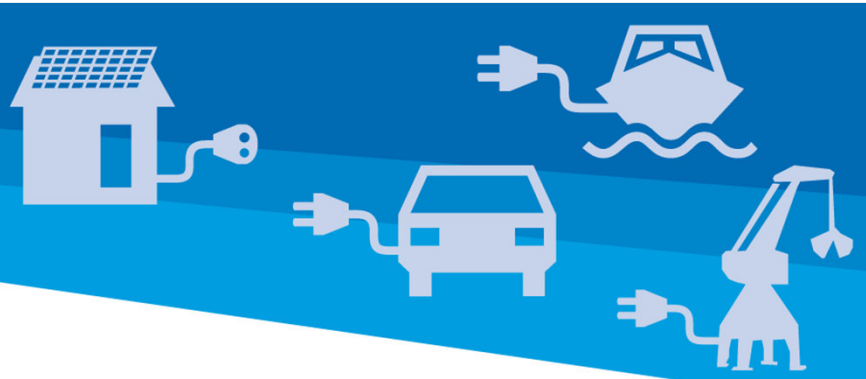

Aim:

Monitor energy usage in harbour area with the view to promote the use of renewable energy to improve efficiency and encourage a more sustainable environment.

Objectives:

- Monitor energy usage around the Harbour
- Estimate the contributions of other system parameters
- Identify methods to improve or cut down energy usage
- Develop a model to predict energy use in other harbours
- Increase the production and use of renewables
- Promote reuse of industrial waste, heat dissipated

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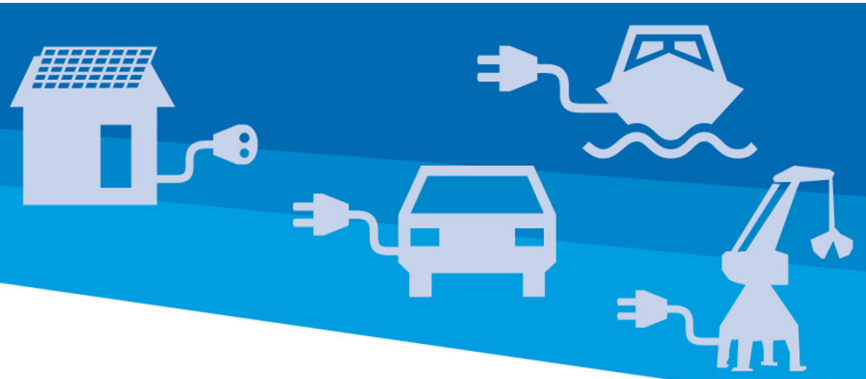

Work Done

- Organised a site survey and meetings with stakeholders to gain an understanding of:
  - ✓ The equipment & plant in use on site, what it's used for & when
  - ✓ The availability of records, bills or other available historical data
  - ✓ The requirements for energy data acquisition
- Installed energy data loggers in plant rooms to record the power consumed.
- Analysed the data gathered to look at overall patterns of energy consumption and times of high peak and low peak demand.
- Identified gaps, opportunities and made recommendations that will help stakeholders reduce their energy bills.

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Instrumentation used for energy measurement

- Pico-current monitoring kits(CM3)

Figure1: Contents of the CM3

- Power quality analyser(PQA)

Figure 2: Chauvin Arnoux CA8335 Qualistar PQ Analyser with 4 x 50-6500A Flexi CTs

✓ Calibrated to log data every 10 min

Installed Kits

Figure 3: PQA installed in plant room 1

Figure 4 : CM3 installed in plant room 2

e-harbours electric

CM3 Sample Data

Date	Time	ch2				ch3				ch1			
		First	Average	Minimum	Maximum	First	Average	Minimum	Maximum	First	Average	Minimum	Maximum
14-Mar-13	11:40	24	21.9	19.9	24	67.4	71.1	67.4	74.9	25.4	23.5	21.7	25.4
14-Mar-13	12:00	13.1	8.8	7.9	13.1	84.8	61.7	51.2	84.8	25.1	19.8	17.3	25.1
14-Mar-13	13:00	8	20.7	8	30.1	64	68.1	62.2	73.5	25.3	26.3	17.5	39.3
14-Mar-13	14:00	12.5	20.1	12.3	36.8	65.9	65.7	50.8	84.6	22.5	30.8	22.5	41.9
14-Mar-13	15:00	12.6	19.8	12.2	35	49.5	54.3	49.5	62.4	23.3	26.2	23.1	32.7
14-Mar-13	16:00	58.8	29.6	12.2	58.8	95.6	68.8	50.4	95.6	61.1	38.4	23.5	61.1
14-Mar-13	17:00	26.1	19.4	12.3	26.1	66.1	53.9	48.2	66.1	36.3	26.8	23.7	36.3
14-Mar-13	18:00	12.2	19	12.2	27.5	59.1	59.7	53.3	66	23.9	40.4	23.9	50.4
14-Mar-13	19:00	23.5	36.7	23.5	53	58.8	68.8	58.8	82.5	60.3	71.3	60.3	84.6
14-Mar-13	20:00	32.8	32.6	32.2	33	72.1	68.9	66.3	72.1	56.3	57.4	54.7	62.5
14-Mar-13	21:00	30.1	33	25.9	44.4	66	68.5	64.6	81.7	55.2	58.1	55.2	71.5
14-Mar-13	22:00	26.3	36.7	25.9	74.7	65.2	73.9	64.2	107.2	54.8	63.9	53.6	98.4
14-Mar-13	23:00	79.4	71.5	51.1	89.3	111.7	99.9	85.2	111.7	102.6	91.5	76.2	102.6
15-Mar-13	00:00	117.4	99.9	79.2	129.2	151.8	133.3	112	164.8	134.2	120.8	101.6	149.7
15-Mar-13	01:00	53.9	57.6	39.8	67.5	88.5	89	75.2	102.3	78.4	78.2	65.2	90.7
15-Mar-13	02:00	43.8	48.3	28.9	66.7	79.1	84.6	69.1	99.5	68.7	75.2	58.3	91.5
15-Mar-13	03:00	61.1	48.9	27.4	65.3	93.2	77.5	60.5	96	88.1	73.8	57.2	91
15-Mar-13	04:00	40.8	78.5	40.8	108.9	74.1	102.2	74.1	127.5	69.1	97.4	69.1	123
15-Mar-13	05:00	78.3	71.9	41.3	95.1	95.9	94.9	70.4	112.7	90.8	89.6	67.1	105.9
15-Mar-13	06:00	87.4	65.9	53.7	87.4	114.1	103.6	88.6	136.7	109.4	85.8	69.1	109.4
15-Mar-13	07:00	48	28.4	19.9	48	121.3	77.4	60.8	121.3	63	40.2	34.7	63
15-Mar-13	08:00	19.8	21.2	19.8	26.7	60.7	62.4	60.5	64.9	35.3	36	34.6	40.9
15-Mar-13	09:00	26.5	21.5	14.7	27.9	62	63.2	61.1	65.5	43.7	41.2	40.7	43.7
15-Mar-13	10:00	14.7	19.2	14.7	22.6	54.7	61.8	54.7	67	40.8	35.3	28.5	40.8
15-Mar-13	11:00	24.5	25.6	15.1	33.4	57.5	58.5	56.1	65.9	28.7	30.4	28.5	34.3
15-Mar-13	12:00	9.6	7.5	7.1	9.6	68.5	61.6	55.9	68.5	20.5	20.3	17	25.6
15-Mar-13	13:00	7.3	14.2	7.1	25.2	65.6	68.7	62.4	77.4	28.7	22.1	17.1	28.7
15-Mar-13	14:00	7.2	7.3	7.2	7.5	51	53.8	47.3	59.5	28	18.9	17.1	28
15-Mar-13	15:00	7.2	11	7.2	20	50.7	52.5	49	55.9	24.7	19.6	17.1	24.7
15-Mar-13	16:00	7.6	12.5	7.3	20.1	61.3	51	39.8	61.3	25.1	30.9	23.4	45
15-Mar-13	17:00	20	24.1	20	32.8	53.9	52.8	52.2	53.9	31.4	31.5	31.2	32.1
15-Mar-13	18:00	20	23	20	29.7	51.9	55.2	51.9	57.8	31.9	41.5	30.8	48.1
15-Mar-13	19:00	30.2	31.3	28.3	37	55.2	57.1	55.2	59.3	48.1	49.4	48.1	51
15-Mar-13	20:00	28.6	24.6	23.1	28.6	56.6	56.9	55.6	58.5	53.2	53.2	48.6	60.8
15-Mar-13	21:00	23.1	27	23.1	36	55.9	55.8	55.5	56.6	48.5	48.3	47.9	48.7

10 min | Hourly Detail | Cummulative reading | March Daily graphs | April graph | May graph | June graph | July graph | August graph | Septemb

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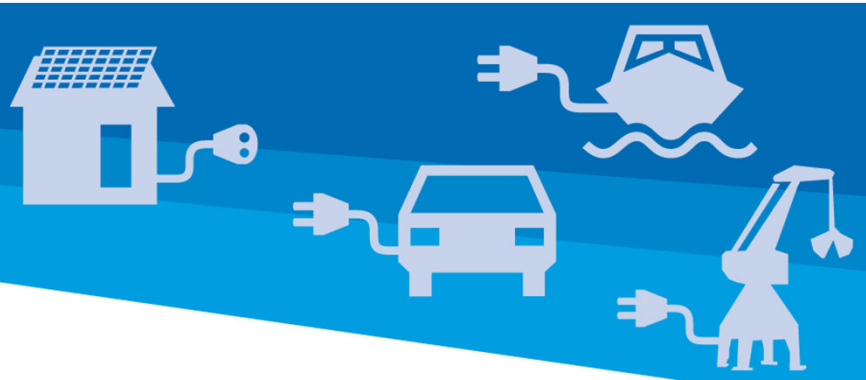

Key Findings

- Average of 1019421.4KWh/year was used per business
- In terms of harbour functions, the key energy users are:
  - ✓ **Harbour Administration** - 53674 KWh per month or **16%** of total consumption
  - ✓ **Buying/ selling fish** - 28500KWh per month or **8 %** of total consumption
  - ✓ **Maintaining vessels** - 18465.55KWh per month or **5 %** of total consumption
  - ✓ **Conservation of fish** (ice production) - 73253KWh per month or **22%** of total consumption
  - ✓ **Fish processing** - 165914KWh per month or **49%** of total consumption

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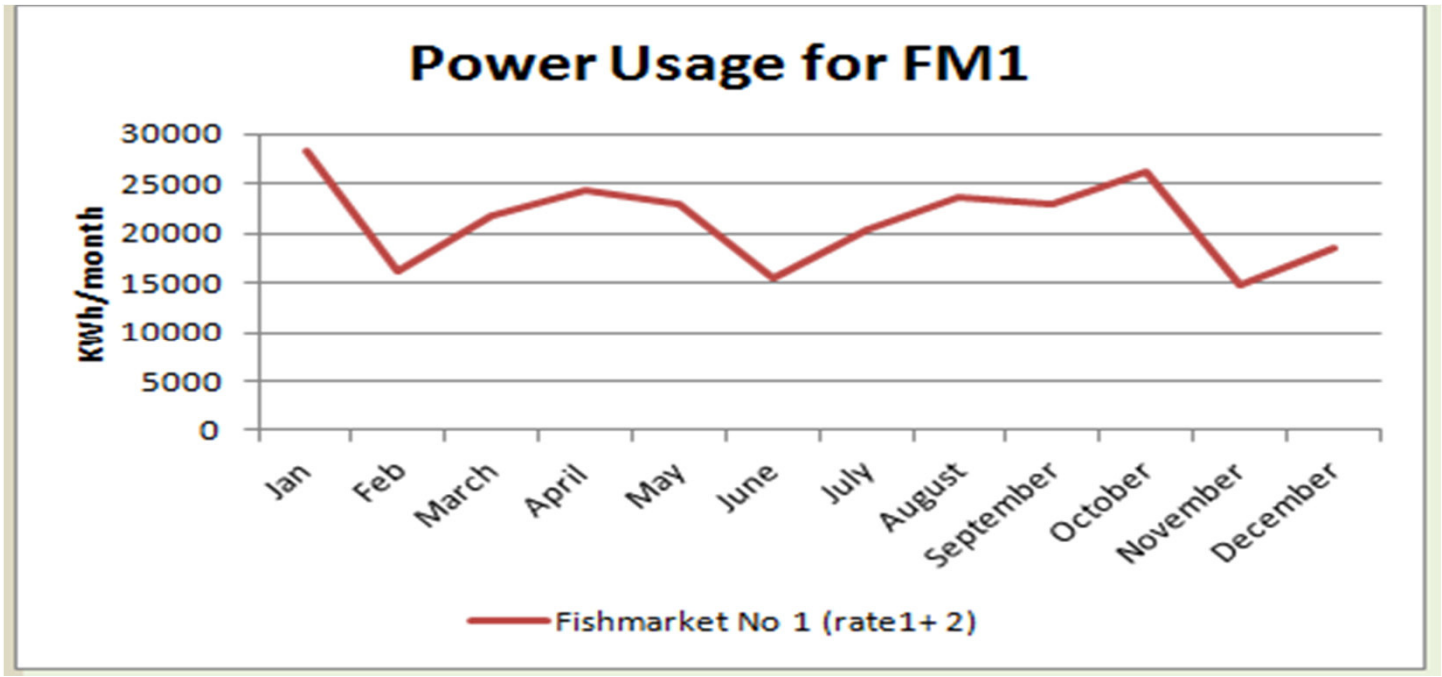
Power Usage for FM1
KWh/month
30000
25000
20000
15000
10000
5000
0
Jan
Feb
March
April
May
June
July
August
September
October
November
December
Fishmarket No 1 (rate1+ 2)

Flexibility Options

- Peak and off peak meters are already used
- Lightning represent a significant demand for energy
- But LED Flood light are not used
- If LEDs replace CFL lighting – the savings – in terms of energy and cost - will be about **50% of current levels**.

Flexibility Options

- Heat is not recycled
  - ✓ ~ 322.65 tonnes of ice/per year
  - ✓ ~ 13.5 GJ of heat dissipated/year
  - ✓ ~ 3.17GJ of energy used
- If a full heat recovery system was to be implemented, this will cover up to ~ **3 X** Energy; thus export excess heat to other factories...enough to cover **64% of the current energy demand of four businesses**
- Most plant and machines were old and energy inefficient- again potential for lower energy costs following significant investment.

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e-harbours electric

Recommendations

- All lights in Fraserburgh harbour should be replaced with LED units
  - ✓ Long term strategy for reducing energy and energy costs

- Use full heat recovery system and save money !!!

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Port of Antwerp

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Thank you

Any Questions?

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