

UTILITIES REPORT
PERIOD AUGUST 2007 TO JULY 2008
University of Aberdeen

Contents

| | | |
|----|--|---|
| 1 | Executive Summary | 3 |
| 2 | Energy as Supplied Summary | 3 |
| 3 | Carbon Dioxide Emissions – Actual for 2007/2008 | 4 |
| 4 | Carbon Dioxide Emissions – Performance against Targets | 4 |
| 5 | European Union Emissions Trading Scheme (EU-ETS) | 5 |
| 6 | Combined Heat and Power Station (CHP)..... | 5 |
| 7 | Energy as Used..... | 6 |
| 8 | Energy Saving – Using Technology..... | 7 |
| 9 | Energy Saving – Staff Awareness/Good Housekeeping | 7 |
| 10 | Installation of Renewable Energy Technology..... | 7 |
| 11 | Water Consumption | 8 |
| 12 | Water Saving – Using Technology..... | 8 |
| 13 | Water Saving - Staff Awareness/Good Housekeeping | 8 |
| 14 | Grey water/Rainwater harvesting..... | 8 |

Figures

| | | |
|----------|--|---|
| Figure 1 | Energy as Supplied | 3 |
| Figure 2 | Carbon Reduction Target | 4 |
| Figure 3 | Old Aberdeen Campus electricity consumption for period 07/08 | 6 |
| Figure 4 | Energy as Used | 7 |

Tables

| | | |
|---------|-------------------------------|---|
| Table 1 | Energy as Supplied..... | 3 |
| Table 2 | Carbon Dioxide Emissions..... | 4 |
| Table 3 | Energy as Used | 6 |

1 Executive Summary

During the financial year 2007/2008, for the Academic and Campus Services buildings, the University purchased 86,825,065 kWh¹ of energy at a cost of £2,915,817 resulting in emissions of 24,725 tonnes of Carbon Dioxide. Further the University used 279,202m³ of water at a cost of £654,480. The overall cost for utilities for the year was £3,570,297.

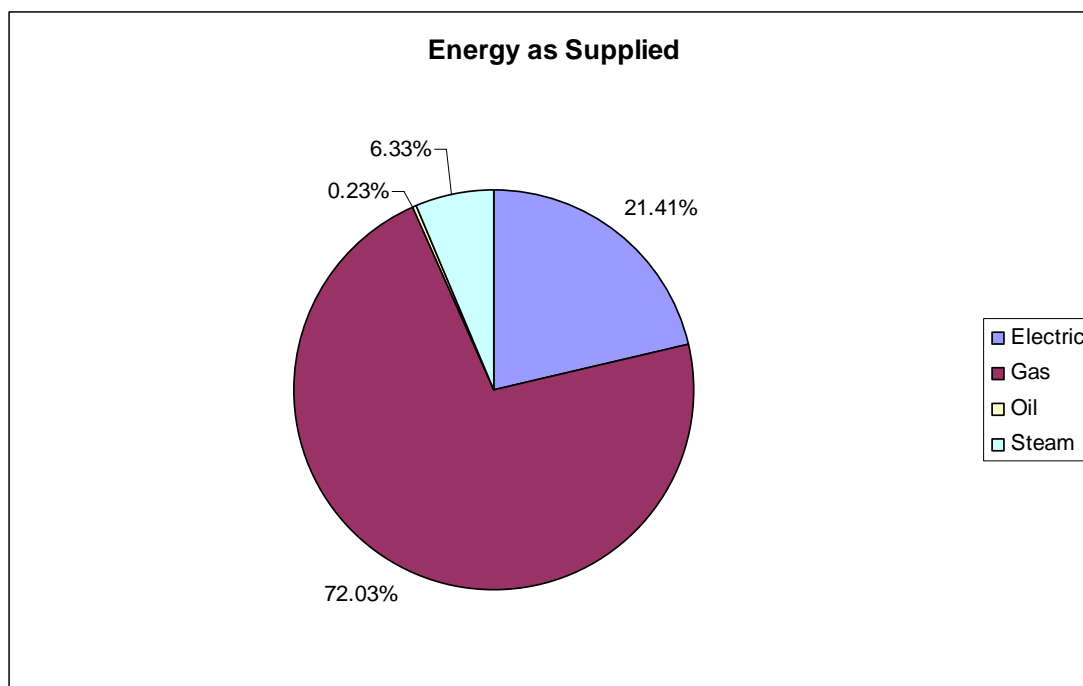
2 Energy as Supplied Summary

The University uses a Combined Heat and Power station to generate electricity on site. This means that some of the gas and oil supplied to the site is used to generate electricity. The energy supplied to the site will therefore not directly relate to that consumed by the end users in the buildings. The table below details the energy as supplied to the site. The actual energy use within buildings is detailed later in the report.

Table 1 Energy as Supplied

| Energy | Consumption, kWh | Cost, £ |
|-------------|------------------|-----------|
| Electricity | 18,587,935 | 1,503,823 |
| Gas | 62,542,843 | 1,126,604 |
| Oil | 198,720 | 19,253 |
| Steam | 5,495,567 | 266,137 |
| Total | 86,825,065 | 2,915,817 |

Figure 1 Energy as Supplied



¹ kWh equates to Kilo Watt Hour

3 Carbon Dioxide Emissions – Actual for 2007/2008

A key factor when assessing the University's performance is the amount of Carbon Dioxide emitted as a result of energy use within its buildings. Based on the energy as supplied to site the associated Carbon Dioxide emissions are calculated as per the table below.

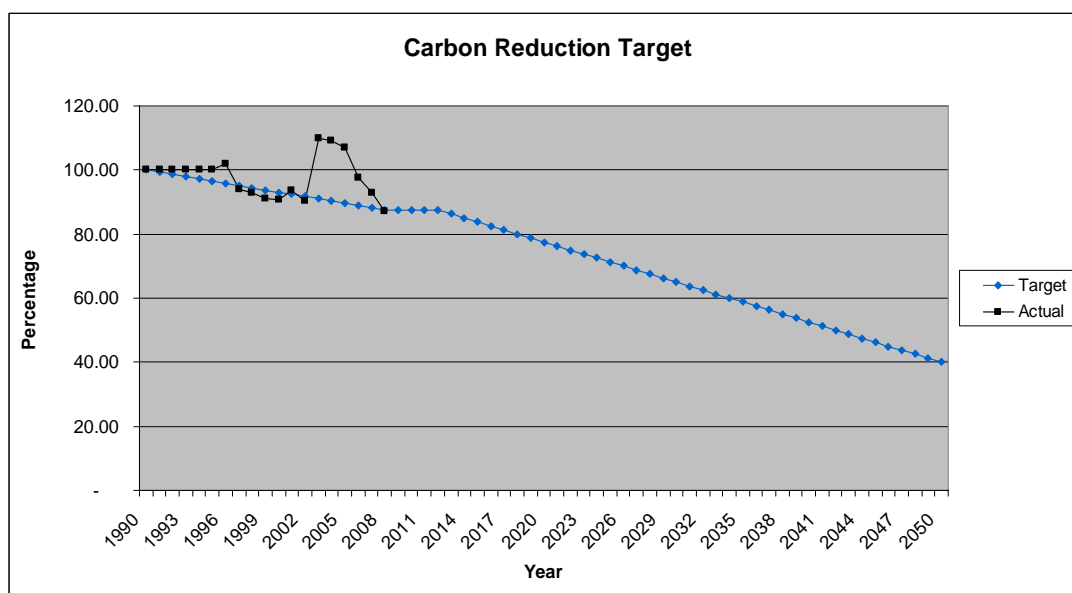
Table 2 Carbon Dioxide Emissions²

| Energy | Consumption, kWh | kgCO ₂ /kWh | Tonnes CO ₂ |
|-------------|------------------|------------------------|------------------------|
| Electricity | 18,587,935 | 0.523 | 9,721 |
| Gas | 62,542,843 | 0.206 | 12,884 |
| Oil | 198,720 | 0.265 | 53 |
| Steam | 5,495,567 | 0.294 | 1,617 |
| Total | 86,825,065 | | 24,275 |

4 Carbon Dioxide Emissions – Performance against Targets

As part of the Utilities Policy the University has set a target to meet or better the Kyoto protocol with regard to carbon dioxide emissions resulting from energy use in buildings. The original short term Kyoto protocol target for developed countries was to reduce emissions from 1990 levels by 5.2% by 2008-2012. Within this group the UK adopted a target to reduce emissions from 1990 levels by 12.5% by 2008-2012. During 2007/2008 the University achieved a 12.7% reduction from 1990 levels. The University has attained the short term target, primarily due to the development of a new Combined Heat and Power station. Figure 2 below shows the target line for reducing emissions and the actual performance for the University, with the long term target being to reduce emissions by 60% by 2050.

Figure 2 Carbon Reduction Target³



² The conversion factors used (kgCO₂/kWh) are based on those quoted in the "Guidelines to Defra's Greenhouse Gas (GHG) conversion factors for company reporting".

³ The reason for the peak in the graph was due to the following factors 1) The merger with Northern College, 2) the start of operation of the MRF, and 3) the start of operation of Oceanlab.

The target for reducing carbon dioxide emissions is an absolute target and changes to the size of the estate, either increase, or reduction will affect the actual emissions, but will not result in a change to the target.

5 European Union Emissions Trading Scheme (EU-ETS)

The Combined Heat and Power station exceeds 20MW capacity and is covered by the EU-ETS . As a result the University reports on emissions arising from use of gas and oil at the Old Aberdeen Campus. Under this scheme a number of allowances are allocated to the University for this site each year, with one allowance being equivalent to one tonne of carbon dioxide. To establish the allocation, an average of 4 years emissions was assessed, this came to 8,148 tonnes. The allocation received under the scheme was 6,707 allowances (a 16% reduction). The reporting year under EU-ETS is annual.

- Historical Average Emissions 8,148 tonnes
- Actual Emissions 2007 6,419 tonnes
- Allowances 2007 6,707
- Excess Emissions - 288 tonnes

- Historical Average Emissions 8,148 tonnes
- Projected Emissions 2008 7,207 tonnes
- Allowances 2008 6,707
- Excess Emissions 500 tonnes

The University target for EU-ETS allocations is to reduce emissions in line with the number of allocations received. For the calendar year 2007 the University achieved emissions less than the number of allowances, but this figure was affected by the fact that the main heating station was being changed out.

For 2008 the University emissions are projected to exceed the number of allowances by 500 tonnes. This corresponds to a reduction of 941 tonnes or 11.5% when compared with the historical average of 8,148 tonnes. This represents a substantial improvement in performance of the Combined Heat and Power station, together with reduced losses from the new distribution mains. To make up the shortfall in allowances the University has to purchase additional allowances through carbon trading. As at 15th October the price of one carbon allowance was 23 Euros or £18 per tonne, the cost for purchasing allowances for 500 tonnes therefore corresponds to £9,000.

6 Combined Heat and Power Station (CHP)

The Combined Heat and Power station commenced operation in May 2007 and was operational for the full financial year 2007/2008. This has been reported on in some detail previously⁴, and a summary is included here. There have been several benefits from the development of this scheme at the Old Aberdeen Campus. These include:

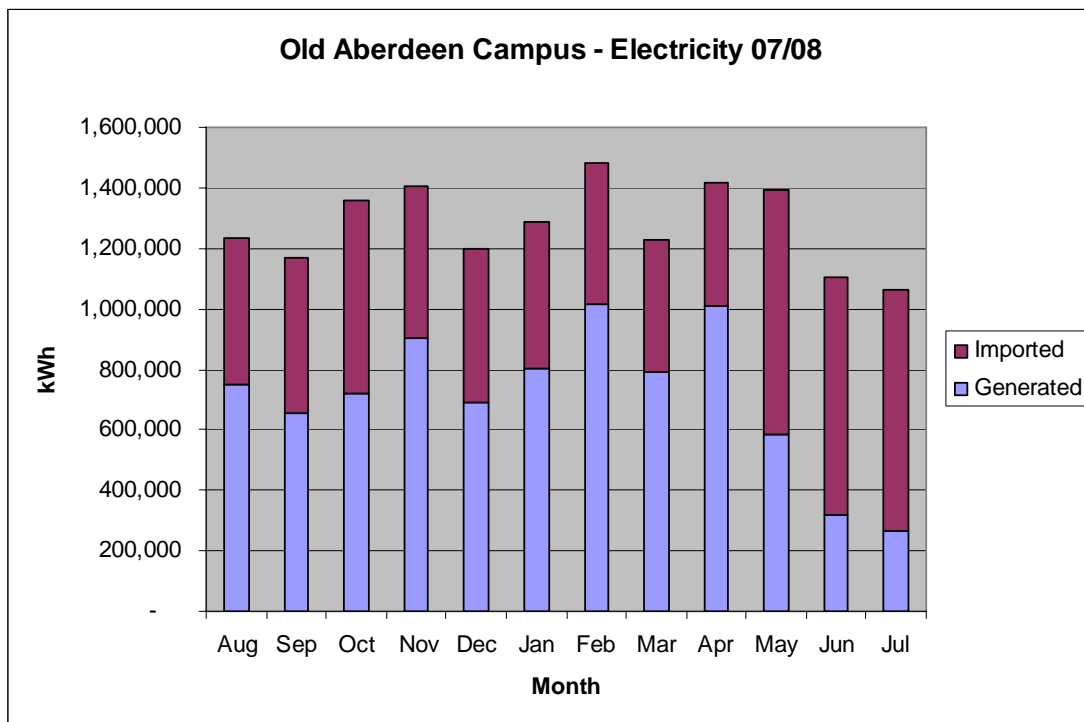
- The ability to use the waste heat from electricity generation to provide heating and hot water, improving the overall effective efficiency of the system from approximately 40% for a typical power station to approximately 80% for the CHP engine
- Reduced heat loss from the heating distribution system
- Improvement in boiler efficiency from the old boilers at approximately 70%, to the new boilers at over 80%.

The CHP engine generated 55% of the electrical load for the Old Aberdeen Campus as shown in the figure 3. The effect of generating electricity using the CHP engine was to reduced the average overall price for electricity at the site from 9.2p/unit to 6.0p/unit.

Overall the implementation of the CHP scheme has resulted in a cost saving of £490,000, and a reduction in emissions of 3,713 tonnes, for the year. Further to this the CHP station has now qualified as a good quality CHP under the CHPQA scheme.

⁴ The CHP Actual Performance Report 4/4/08

Figure 3 Old Aberdeen Campus electricity consumption for period 07/08



7 Energy as Used

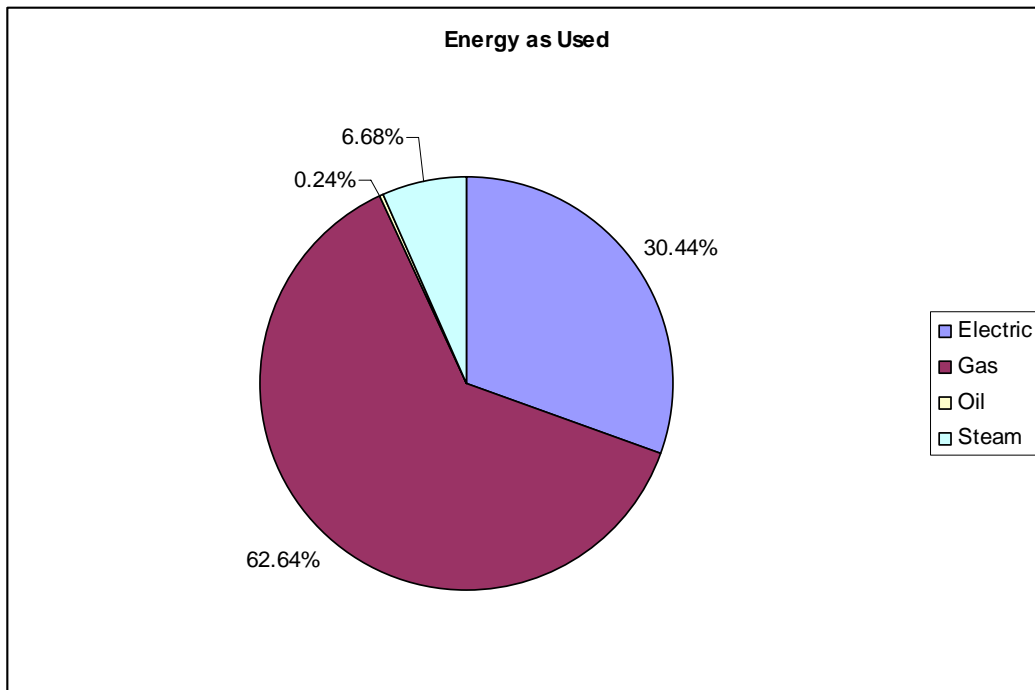
The actual energy used within the buildings is assessed using meters for each of the various utilities.

In the case of the buildings supplied with electricity and heat from the CHP station, it is necessary to discount the gas used to generate electricity, and add in the amount of electricity generated by the CHP station. The effect of this is detailed in the table 3 and figure 4:

Table 3 Energy as Used

| Energy | Consumption, kWh |
|-------------|------------------|
| Electricity | 25,053,519 |
| Gas | 51,557,503 |
| Oil | 198,720 |
| Steam | 5,495,567 |
| Total | 82,305,309 |

Figure 4 Energy as Used



By quantifying the energy as used by the buildings it is possible to generate performance indicators for each building (providing there is sufficient metering). This enables the buildings energy use to be directly compared with each other and against benchmarks. This information is then used to identify the priority areas for energy conservation projects.

8 Energy Saving – Using Technology

During 2007/2008 energy saving measures have been implemented in new build projects (Suttie Centre), and major refurbishments (Fraser Noble, Zoology). Some of the measures have included installation of high frequency T5 fluorescent lights, automatic lighting controls, variable speed drives for pumps/fans, thermostatic radiator valves. Going forward Salix funding has successfully been applied for, and will be available for implementing stand alone energy saving projects from October08.

9 Energy Saving – Staff Awareness/Good Housekeeping

General awareness information has been supplied via the Environment Office website, through the quarterly "Readable" magazine, working with the Environmental Champions, and by undertaking Environment Office events. Going forward more focussed energy awareness sessions will be undertaken with the Colleges, and information will be supplied on the energy performance in particular buildings.

10 Installation of Renewable Energy Technology

Given the need to reduce the Carbon Dioxide emissions the University is considering the feasibility of onsite renewables. As part of this a ground source heat pump is currently being installed at Oceanlab phase2.

Going forward the Grampian NHS Trust is planning to develop a CHP scheme including a biomass boiler at the Foresterhill site, and the University is evaluating the possibility of having electricity and heat supplied direct from this source.

11 Water Consumption

The target set in the Utilities policy was to reduce water consumption from 2006/2007 levels by 2% year on year.

Table 4 – Water Consumption and Cost

| Utility | Consumption, m ³ | Cost, £ |
|----------|-----------------------------|---------|
| Water | 279,202 | 207,488 |
| Sewerage | 0 | 446,992 |
| Total | 279,202 | 654,480 |

Water consumption 2006/2007 335,656 m³
Water consumption 2007/2008 279,202 m³
Reduction 56,454 m³ (16.8%)

The target has now been revised and going forward the new base year will be 2007/2008 with the aim of reducing consumption below this level by 2% year on year.

12 Water Saving – Using Technology

As with energy the areas where water saving technology has been fitted has been within the new builds, and major refurbishments. Going forward the University has made money available for stand alone water saving measures during 2008/2009.

13 Water Saving - Staff Awareness/Good Housekeeping

Staff are generally aware of the need for water conservation with things like dripping taps and overflows being reported. There are some specific areas where problems can occur, and one of these was identified where a recirculation pump was faulty and the system was changed from 95% recirculation to 100% flow through. The increased rate of water use would have resulted in excess use of 12,000 m³ a year at a cost of £22,000 if it had not been fixed. The pump was repaired once information on the effect of going to 100% flow through was provided.

14 Grey water/Rainwater harvesting

One method of reducing the consumption of treated water is to use grey water or rainwater harvesting for processes where treated water is not required like flushing toilets. The Suttie Centre has seen the first installation of a rainwater harvesting system in a University building.