UTILITIES REPORT

PERIOD AUGUST 2009 TO JULY 2010

University of Aberdeen

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Utilities Report in Numbers – This separate document contains the breakdown of the utility consumption by individual buildings.

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1 Executive Summary

During the financial year 2009/2010, for the Academic and Campus Services buildings, the University purchased 92,333,041 kWh[1] of energy at a cost of £4,204,395 resulting in emissions of 25,661 tonnes of Carbon Dioxide. Further the University used 265,714 m^3 of water at a cost of £653,110. The overall cost for utilities for the year was £4,857,505. The University observed a large increase in on site gas use of 8.1%, and this was caused in part by the coldest winter for 30 years, and in part by an incorrect conversion factor being applied to the main gas meter. More positively the electricity consumption by buildings reduced for the first time in 4 years. Overall there was a net increase in energy consumption at the University.

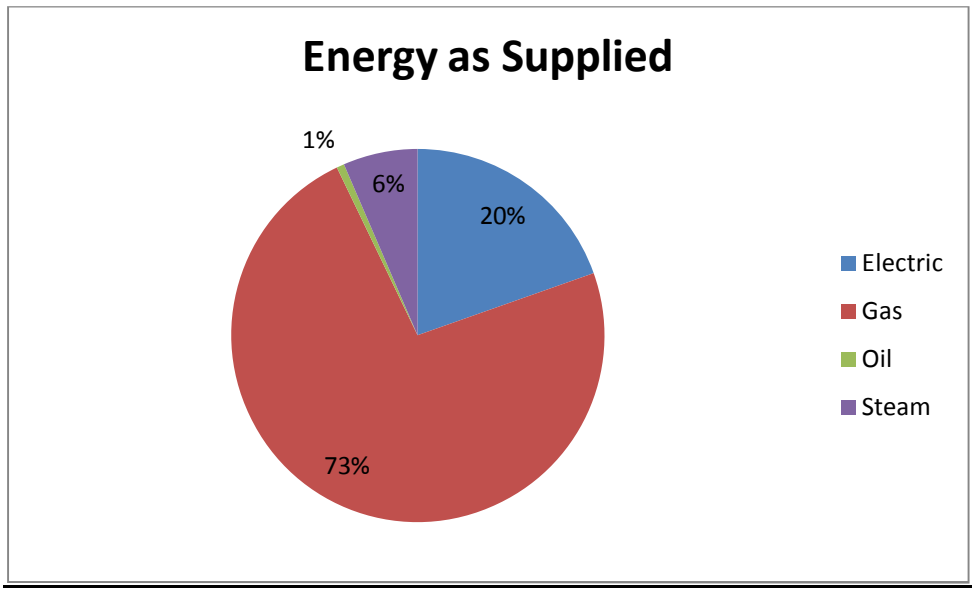
2 Energy as Supplied Summary

The information on energy is reported on two separate bases. The first is the energy supplied to the University. The second is the actual energy use on site. The reason for this is because the University uses a Combined Heat and Power station to generate electricity on site. Therefore some of the gas supplied to the site is used to generate electricity. The result is that there is less apparent gas use for the energy used by buildings than that supplied to site, while at the same time there is more apparent electricity use. The table below details the energy as supplied to the site. The actual energy use within buildings is detailed in the separate document Utilities Report in Numbers. Overall energy consumption as supplied increased by 7%, but the actual cost of energy reduced by11%.

Table 1 Energy as Supplied

Energy	Consumption, kWh	Cost, £
Electricity	18,060,456	1,779,532
Gas	67,704,651	2,065,304
Oil	605,834	42,028
Steam	5,962,100	317,531
Total	92,333,041	4,204,395

Figure 1 Energy as Supplied



[1] kWh equates to Kilo Watt Hour

3 Carbon Dioxide Emissions – Actual for 2009/2010

There is an increasing focus on the need to reduce carbon dioxide emissions. In line with this the University has developed a 5 year Carbon Management Plan. Arising from developing the plan it was identified that energy use in buildings contributes over 80% of the University's carbon dioxide emissions. Based on the energy as supplied to site the associated Carbon Dioxide emissions for 2009/10 are calculated as per the table below. (Note these emissions figures do not include the Rowett Institute which was taken over in 2008.)

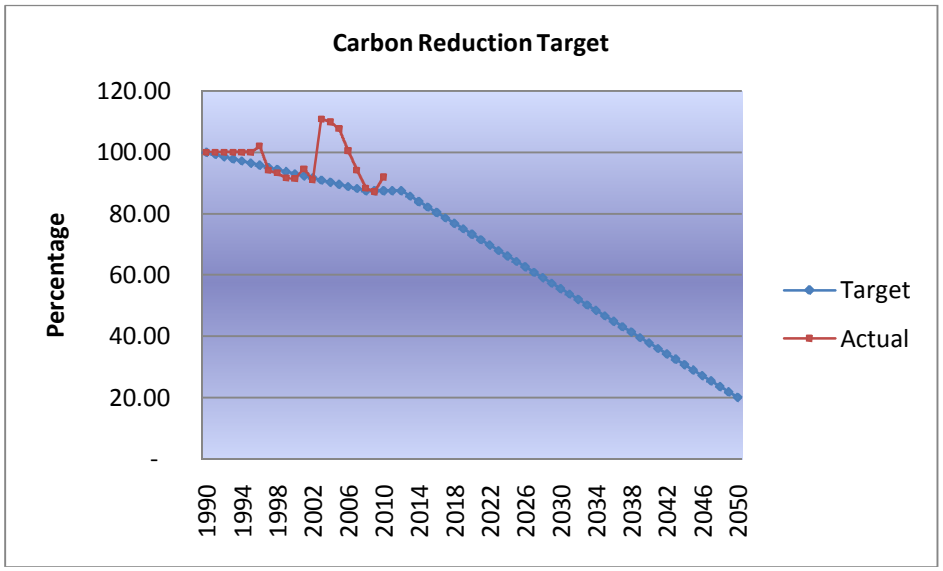
Table 2 Carbon Dioxide Emissions[2]

Energy	Consumption, kWh	$kgCO_2/kWh$	Tonnes CO_2
Electricity	18,060,456	0.537	9,699
Gas	67,704,651	0.206	13,947
Oil	605,834	0.265	161
Steam	5,962,100	0.294	1,754
Total	92,333,041		25,561

4 Carbon Dioxide Emissions – Performance against Targets

The new Carbon Management Plan sets targets reducing carbon emissions by 20% over 5 Years. This target aligns well and is in addition to those required under Kyoto protocol. The long term target is to reduce carbon dioxide emissions by 80% by 2050. Figure 2 below shows the target line for reducing emissions and the actual performance for the University. There has been an increase in carbon dioxide emissions for the current year of 1,330 tonnes. This is as a result of the coldest winter for 30 years, and an incorrect conversion factor being applied to the main gas supply.

Figure 2 Carbon Reduction Target[3]



[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 6,924 allowances (a 15% reduction). The reporting year under EU-ETS is annual.

- Historical Average Emissions 8,148 tonnes
- Actual Emissions 2008 7,515 tonnes
- Allowances 2007 6,924
- Excess Emissions 591 tonnes

The University target for EU-ETS allocations is to reduce emissions in line with the number of allocations received. For the calendar year 2008 the University exceeded the number of allowances by 591 tonnes. This still represents an improvement in performance compared with historic emissions of 7.8%. It was necessary to purchase allowances to make up the shortfall and this cost £6,800.

6 Combined Heat and Power Station (CHP)

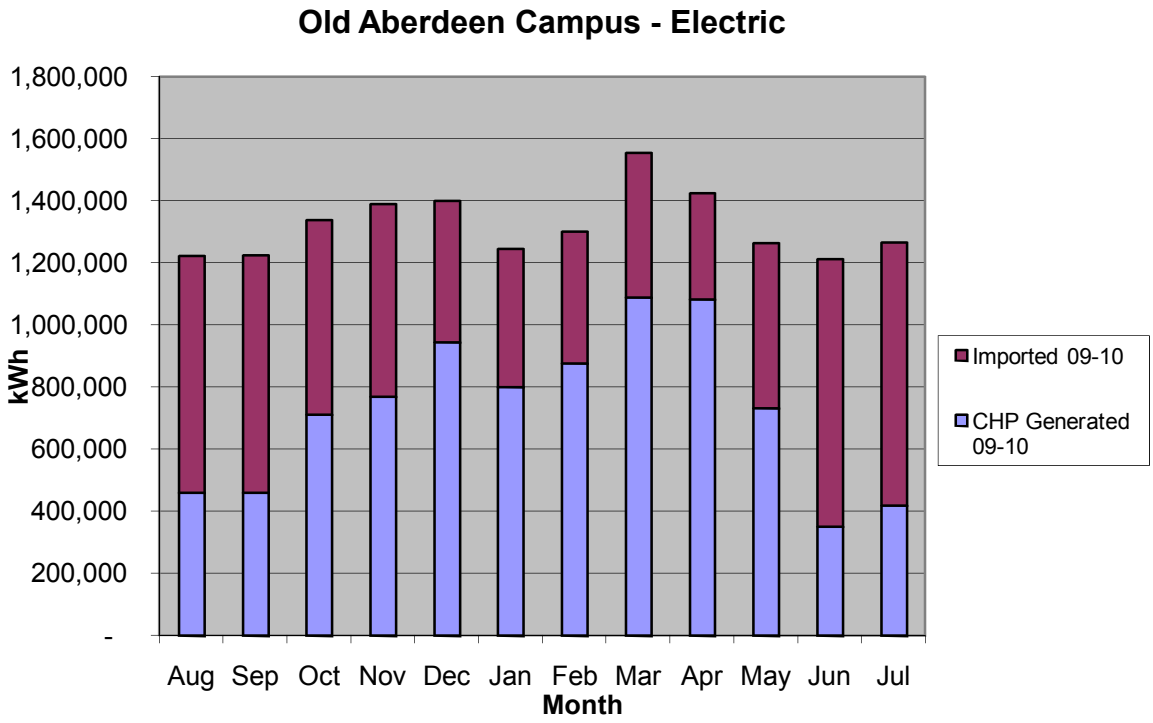
The Combined Heat and Power station commenced operation in May 2007 and has been fully operational during the 2009/2010 financial year. There are two main benefits from having the CHP station.

Reduction in Carbon Dioxide Emissions
A power station typically operates at an efficiency of about 40%, whereas while the CHP engine generates electricity at about 40%, the heat that would otherwise be wasted, is used to provide heating and hot water for University buildings. This means that the CHP engine has an overall operating efficiency of nearly 80%.

Reduction in Costs
The CHP engine generated 52% 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 reduce the average overall price for electricity at the site from 10.12p/unit to 8.26p/unit.

Overall the implementation of the CHP scheme has resulted in a cost saving of £288,000, and a reduction in emissions of approximately 2,000 tonnes, for the year. Part of the cost savings are due to the fact that the CHP station qualifies as good quality CHP under the CHPQA scheme, and is exempt from CCL for gas used.

Figure 3 Old Aberdeen Campus electricity consumption for period 2009/10



7 Energy as Used

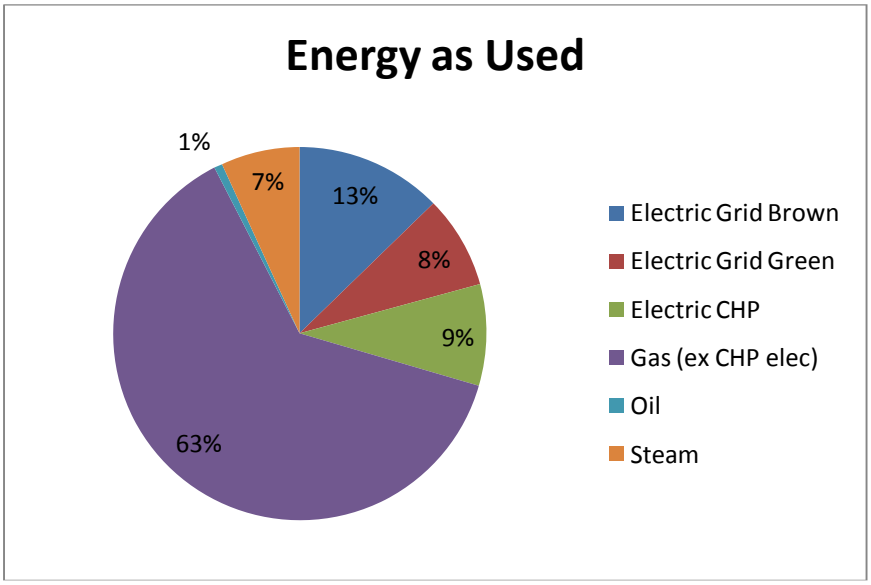
The actual energy used within the buildings is metered, and this information is recorded to generate consumption data on a monthly basis...

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 as Used	Consumption, kWh	Percent of Overall Consumption
Electricity Grid - Green	11,071,108	8%
Electricity Grid - Brown	6,989,348	13%
Electricity CHP – Generated On site	7,622,596	9%
Gas	54,824,687	63%
Oil	605,834	1%
Steam	5,962,100	6%
Total	87,075,673	100%

Figure 4 Energy as Used



By quantifying the energy as used by the larger buildings it is possible to generate energy consumption trends in the form of graphs for each building. These graphs can be used to raise awareness by demonstrating energy use in buildings to occupants. In addition this information can be used to identify areas that may benefit from energy conservation projects.

8 Energy Saving – Using Technology

The University incorporates energy saving features in it's new building projects, and major refurbishment projects as appropriate. This is very important for new builds as these increase the size of the University Estate and therefore result in a net additional increase in the University's energy consumption. By making new buildings more efficient this slows the rate of this increase. In addition to the ongoing work in new builds and refurbishments the University is undertaking more stand alone energy saving projects which are funded using Salix (a program operated via the Carbon Trust), and through core budgets. Measures completed during 2008/09 include:

Remote Switching of Computers
This project was concerned with improving the energy performance of computers installed at the University. Currently there are some 6,000 computers at the University. Previously it was necessary to have computers on overnight and at weekends to allow automatic updates to be installed. The installation of the power management software enables remote switching eliminating the need to have computers on. The Directorate of Information Technology has implemented this measure on 1,500 classroom p.c.s and it has been installed at University Office.

Projected Annual Savings 414,000 kWh, 222 tonnes CO2, £37,000
Installed Cost £70,000
Payback 1.9 years

Actual Performance – Electricity consumption has reduced in buildings where this measure has been applied in line with predicted savings.

Installation of Chillers with Free Cooling at Edward Wright
The Edward Wright building houses the main computer class rooms, and the main computer room, on the campus. There is a centralised air-conditioning system for these rooms. When 2 of the existing 3 units came up for replacement the decision was taken to install 2 replacement units with free cooling. The new units were more expensive to purchase, but have reduced energy consumption compared with conventional units. The free cooling works by eliminating the need to use the compressor when the outside air-temperature is low.

Projected Annual Savings 164,500 kWh, 88 tonnes CO2, £18,918
Installed Cost £92,151
Payback 4.9 years

Actual Performance – Electricity consumption has reduced at the Edward Wright building, but the savings overlap with the remote switching of computers measure, and there has been an increase in the data storage requirements making it difficult to give definitive confirmation.

Replacement of Tungsten Lighting at Johnston Hall
There were over 300 light fittings in Johnston Hall that each had 2 x 100W tungsten bulbs in. This type of lighting is very inefficient and these light fittings were replaced with new ones that used 1 x 38W 2D light that give the same light output. This is an energy reduction of over 80%.

Projected Annual Savings 194,500 kWh, 102 tonnes CO2, £17,430
Installed Cost £23,050
Payback 1.3 years

Actual Performance – The work on installing the lights was completed towards the end of the year, and we are now starting to see the savings.

Installation of Thermostatic Radiator Valves at University Office
The University Office Building was heated by large heating zones with a number of radiators on each zone. The rooms on each zone had different heat losses and gains, with some areas being hot, and some cold. This resulted in the use of electric heaters. To overcome this problem it was decided to fit individual thermostatic radiator valves such that as each room gets up to temperature the radiators will switch off locally and not the entire circuit.

Projected Annual Savings 96,500 kWh, 30 tonnes CO2, £17,430
Installed Cost £23,050
Payback 1.3 years

Actual Performance – It was not possible to observe any reduction in heating consumption, even allowing for the very cold winter, it may be that the system was operating flat out because of how cold it was. The windows in University Office have since been changed from single to double glazing and this will combine well with this measure.

9 Energy Saving – Staff Awareness/Good Housekeeping

In addition to the general awareness raising there have been two main initiatives to promote energy conservation during the course of the year:

Building Energy Graphs
The major buildings at the University in terms of floor area and energy use have been identified. Currently energy graphs for these displaying monthly data for electricity and heating are produced for 29 of these buildings and a few further buildings are due to be added. These graphs are available for building users over the web at Energy Building Graphs. The graphs additionally summarise how the building is comparing against the previous year's consumption.

Switchoffable!
This is an update of the old "Save It" stickers, and are local stickers that are placed by light switches and local equipment switches. They are designed to act as a reminder for staff and students to switch off unnecessary equipment. The stickers were put up by Environment Office staff, and Environmental Champions.

10 Installation of Renewable Energy Technology

No new renewable energy technology was installed at the University during 2009/10

Looking forwards there will be solar photovoltaics fitted on the roof of the new library, and the planned connection to the Grampian NHS Trust CHP scheme including a biomass boiler at the Foresterhill site is being progressed.

11 Water Consumption

The University has set it's own target for reducing water consumption as part of the Utilities policy. The target is to reduce water consumption from 2007/2008 levels by 2% year on year.

Table 4 – Water Consumption and Cost

Utility	Consumption, m^3	Cost, £
Water	265,714	215,455
Sewerage	-	437,655
Total	265,714	653,110

Water consumption 2007/2008 267,924 m^3
Water consumption 2008/2009 265,714 m^3
Reduction 2,210 m^3 (0.8%)

The 2% target has not been achieved during 2009/2010. The installation of water conservation measures as part of new builds and major refurbishments has continued, but the only stand alone project completed was to prevent a future increase, and not to reduce an existing over consumption.

12 Water Saving – Using Technology

Installation of Electric Vacuum Pumps and Re-circulating Coolers
Estates were contacted about the development of the Marine Biology Lab at Meston. Departmental staff were keen to avoid using unnecessary water for undertaking certain of the lab processes, these included generating vacuum using a water jet vacuum pump, and using water for pass through cooling. As a result of this the decision was taken to install electric vacuum pumps, and re-circulating water chillers as part of the project. The costs and projected saving for this measure are as follows:

Projected Annual Savings 5,000 m^3, £9,000
Installed Cost £34,000
Payback 3.8 years

13 Water Saving - Staff Awareness/Good Housekeeping

The ongoing need to report leaks and minimise water use is included in Environment Office noticeboards and on the web pages.

14 Grey water/Rainwater harvesting

The University has installed a rainwater harvesting system at Suttie to reduce the requirement to use treated mains water at this site.