**Caerwys Town Hall**

Initial assessment

Based on the survey carried out on July 20th, an initial appraisal of energy efficiency improvements has been carried out, base on the SAP 2005 method. The following assumptions have been made about the structural elements

i) the walls were constructed
ii) That the loft space is.

Below are the results of the analysis for the following improvements.

i) The walls: installing cavity wall insulation in the store at the rear and internal solid wall insulation throughout the rest of the building.
ii) The roof space: increasing the depth of the loft insulation from the current 100mm to 270mm
iii) Replacing the current passive ventilation with open vents with a pumped ventilation throughout the building with heat recovery (shown as remove ventilation)
iv) Heating using an air sourced heat pump (anticipated that this would circulate hot air and combine with heat recovery ventilation)

The cost of heating using mains gas (no available at site) is included for camparison.

| improvement | Heating require-ment (electric) kWh/y | heating require ment (gas) kWh/y | Power (20deg temp diff) kW | SAP value | SAP grade | $CO_2$ emissions tonnes /year | cost | % reduct ion energ y use | % reducti on cost | % reduction CO2 | income at 7.5p per unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| current | 40778 | 0 | 15.3 | 1 | G | 20.84 | £5,427.49 | 0% | 0% | 0% | |
| with CWI store | 40097 | 0 | 15.0 | 1 | G | 20.46 | £5,336.91 | 2% | 2% | 2% | |
| with upgrade loft | 38669 | 0 | 14.5 | 1 | G | 19.77 | £5,146.87 | 5% | 5% | 5% | |
| with internal wall | 27617 | 0 | 10.5 | 1 | G | 14.12 | £3,675.76 | 32% | 32% | 32% | |
| all improvements | 24414 | 0 | 9.5 | 1 | G | 12.48 | £3,249.47 | 40% | 40% | 40% | |
| plus remove ventilation | 24017 | 0 | 9.3 | 1 | G | 12.27 | £3,196.60 | 41% | 41% | 41% | |
| if gas used | 131 | 27997 | 9.3 | 45 | E | 5.44 | £1,058.40 | 31% | 80% | 74% | |
| for heat pump | 6861 | 0 | 9.3 | 61 | D | 3.51 | £913.21 | 83% | 83% | 83% | £1,831.04 |

The calculated heating costs for the current building are those required to maintain all of the building at an acceptable temperature using standard domestic tariff mains electricity. These are much higher than the amount being paid currently, probably because:

i. The building is not adequately warm.
ii. The current heating with halogen radiant heaters heats the users directly but only heats the air indirectly from heat radiated from people and the fabric, it is effectively still a cold building
iii. Parts of the building are effectively unheated

The aim is to produce a building which is comfortably warm, damp and condensation free and with the control necessary to regulate the temperature and direct the heat to where it is required.

**Insulation**

As a first step insulation is always the most cost effective step to take. Where heating is adequate insulation will result in a significant reduction in heating costs. In this instance it will go some way towards producing a warmer and more manageable environment. With the current heating in place, achieving a warmer environment would be prohibitively expensive if insulation work were to be carried out. The proposed heating improvement (below) will only be effective if the building is properly insulated.

The greatest improvement will be as a result of insulating the walls, most probably by relining the walls with a foam insulation backed plasterboard which is then finished with a gypsum plaster skim coat. This will result in an excellent finish and may be done in combination with any electrical wiring work. This alone will reduce heat losses by 32%. The store the rear would probably be suitable for cavity wall insulation at a relatively small cost and should be done if the other walls are insulated, though at the moment would probably not make a perceivable change.

Improving the insulation in the roof space will probably have a bigger benefit than the figures suggest as currently what heat is being provided is rising to the top of the hall and being lost from there.

**Heating improvement**

As mains gas is not available there are the following options:

Oil fired heating: Oil is expensive and likely to become much more so. No space for a storage tank

LGP (tanked gas): even more expensive than oil and no space for storage.

Mains Electricity: very expensive to heat properly. Radiant heaters warm up people but the rooms remain cold, resulting in dampness through condensation.

Storage heaters: only work well in well insulated buildings. No proper control and most suited to places where most of the use is in the day.

Heat pumps: Cheaper to run than anything else but buildings need to be well insulated. Usual need to be run for extended periods. Can be controlled in the same way as conventional central heating.

Large halls present particular problems due to the large volume and high ceilings, where a lot of the heat ends up in the unoccupied space above the users.

Once the building is adequately insulated, air sourced heat pumps become an option. One possibility to overcome the difficulty of heating up times and the heat rising to the top of the room is to use air circulation fans to bring the heat down and distribute the heat more evenly.

An improvement over this is to close up the current passive air vents (which are currently adding cold air to the main area without ventilating the areas where damp is most prevalent) and install forced air ventilation with heat recovery. This will introduce fresh air but keep the heat in the building. Heat would be recovered from the top of the hall and be put back in throughout the building and at the level of the users. Using this system, heating from a heat pump can be added to the recovered heat.

An additional benefit is that, as with the current heating, it will be felt quickly by the occupiers with heat only passing t the building fabric once the air has warmed up. From next April the use of a heat pump should attract an income from the Renewable Heat Incentive (RHI) – see renewables section for details and caveats.
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**Other savings**
Lighting: The current arrangement of lighting tubes switched in banks means that if some lighting is needed it is necessary to switch on all the lights. If the switching was arranged so that each turned on several tubes throughout the room, then users could select to switch on some of the lights only when there is nearly enough natural light coming through the windows.

A refinement of this is a system which automatically controls the lighting, switching the lights on and off to maintain a predetermined level of illumination using a minimum number of lighting units.

**Opportunities for renewable energy generation**
From this April a **Feed in Tariff** (FIT) was introduced which pays a considerable about of money for all renewable electricity generated, irrespective of whether used on the premises or exported to the grid. From next April a **Renewable Heat Incentive** (RHI) is due which will pay in a similar way for renewable heat, generated for instance from solar panel or heat pumps. The levels for these are set by government but paid by the utility companies and, once started, provide a guaranteed income for a fixed period of up to 25 years depending on the technology.

One problem that has arisen for community projects is that, although not paid from government funds, they are considered to be a government scheme and therefore are not payable if they are installed using funds also originated from government or Europe. For community projects improvements can use such funds, but renewables would need to be funded in other ways, such as the EON source fund or from charitable trusts.

The other main renewable opportunities would be solar panels, either for producing electricity (solar PV) or producing hot water (solar thermal). Given that the hot water requirement appears to be quite low, solar thermal panels would not be recommended, although technically they could provide an income once the Renewable Heat Incentive (RHI) is introduced next year.

Solar PV would be able to provide some useful electricity during the daytime, to subsidise some of the electricity use. Although the orientation is ideal (45$^{o}$ either side of south, this has a roof facing due south) to produce a useful output. Electricity produced alone does not provide enough benefit to justify the cost but there is a large income to be had from the Feed In Tariff introduced last April which would make them a useful investment.

## Summary of which areas are responsible for heat losses and reductions resulting from improvements

| | **Heat loss by area** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Current | CWI store | | upgrade loft | | internal wall | | all changes | | all changes and vent | | All change |
| | % | % | % of original | % | % of original | % | % of original | % | % of original | % | % of original | % difference from original |
| doors | 4% | 4% | 4% | 4% | 4% | 5% | 4% | 6% | 4% | 6% | 4% | 0% |
| windows | 10% | 10% | 10% | 10% | 10% | 14% | 10% | 15% | 10% | 16% | 10% | 0% |
| floor | 9% | 10% | 9% | 10% | 9% | 14% | 9% | 15% | 9% | 15% | 9% | 0% |
| walls | 46% | 45% | 44% | 49% | 46% | 22% | 15% | 21% | 13% | 22% | 13% | 33% |
| roof | 9% | 9% | 9% | 4% | 4% | 13% | 9% | 6% | 4% | 6% | 4% | 5% |
| ventilation | 23% | 23% | 23% | 24% | 23% | 33% | 23% | 37% | 23% | 36% | 22% | 1% |
| | 100% | 100% | 98% | 100% | 95% | 100% | 69% | 100% | 62% | 100% | 61% | 39% |