**Lytchett Matravers Parish Council**

**Detailed Design of Climate Emergency Improvements to the Sports Pavilion**

# Introduction

This paper forms one of the next steps in implementation of the Climate Emergency Action Plan, which was approved by the Parish Council at the Full Council meeting on 26th February 2020.

The Action Plan included a Conceptual Design of improvements to be made to the Sports Pavilion to reduce its carbon footprint. The proposed improvements to the Sports Pavilion are designed to:

* Improve the insulation of the building to reduce the energy required for heating
* Switch from a gas fired heating system to a renewable energy heating system
* Make the heating system more efficient by extending the use of thermostatic controls
* Install solar panels on the roof to provide a 100% renewable source of electricity
* Reduce electricity demand by switching to LED lighting

Taken together, these improvements represent a “whole building” solution to reducing the carbon footprint.

The Conceptual Design has been developed through discussions with local suppliers of renewable energy equipment suppliers, and through factoring in additional information on the pattern of usage of the Sports Pavilion set out in section 2. The resulting Detailed Design is presented in section 4.

# Building Usage

The current pattern of usage is made up of the following four basic elements:

* The Football Club leads to two types of use during the football season, namely:
  + Youth Football involves a large number of children together with coaches, engaged mostly in training sessions every weekend on Saturday and/or Sunday mornings.
  + Adult Football normally involves two teams plus match officials, typically on alternate weekends (home and away matches).
* Club activities such as the Bridge Club and the Table Tennis Club, which take place one evening a week throughout the year.
* Exercise and dance sessions, which take place one evening a week throughout the year.
* Occasional meetings, including the Sports Club Committee Meetings and Parish Council Meetings, which are booked in advance, but do not follow a set schedule.

These different types of usage lead to the following requirements for the heating, hot water, and lighting systems for the building:

* The main demand for hot water is for showers for football, which is primarily a weekend activity.
* The heating demand has three different patterns:
  + The demand associated with football which can be readily programmed for the weekends
  + The demand associated with Club activities and Exercise and dance sessions which can be programmed on a day by day basis
  + The demand associated with meetings, which are intermittent, and cannot be readily programmed

These different requirements mean that the hot water and heating system for the building will probably need to have different components and controls to provide for programmable demands which can be satisfied with relatively slow response times, and an intermittent demand which needs more rapid response times.

# Areas/Rooms within the Building

The areas/rooms within the Sports Pavilion which need to be covered by the Heating System are as follows:

* The Kitchen
* The Central Area
* The two Changing Rooms

Radiators are currently fitted in the Central Area and the Changing Rooms, but not in the kitchen. The radiators are of a relatively low efficiency design, and most have thermostatic control valves.

The occupancy of the Kitchen is lower than the other areas, and it is therefore not essential for it to be covered by the rapid response time heating system designed for intermittent demand, options for providing heating to the kitchen should be investigated.

The Central Area and the Changing Rooms will need to be served both by the programmable heating system, and the rapid response time system designed for intermittent demand.

# The Detailed Design

## Insulation

The windows are already double glazed and will be retained.

The Sports Pavilion has not been fitted with cavity wall insulation, which will be included in the Climate Emergency improvements. In addition, the roof is only partly insulated with fibreglass/mineral wall, and only to a depth of ~100mm. To bring it up to modern standards, 400mm of insulation will be fitted throughout.

The current external doors provide little insulation, and should be upgraded.

## Heating System Overview

A first estimate for the heat loss from the building is 7.5kW.

It is proposed that to reduce the GHG emissions from the Sports Pavilion, the existing gas boiler should be replaced by an Air to Water Heat Pump (8kW initial estimate), linked to the existing hot water cylinder (a Renewable Heat Incentive scheme is in place to support the installation of Air Source Heat Pumps, which would provide quarterly payments over a period of 20 years to offset the costs – see section 5). The existing gas boiler system has separate circuits supplying (a) hot water to the sinks and showers, and (b) heating via the radiators, which can be separately valved off. This facility should be maintained in the new system design.

The Air to Water Heat Pump supplies water at a lower temperature than the existing gas boiler, and as a result the existing radiators will need to be replaced with modern high efficiency models to deliver the heat needed. The size of radiators needed will be assessed as part of the heat loss calculations which will need to be carried out as part of the design of the new heating system.

Because of the different response time of an Air to Water Heat Pump compared to a gas boiler, it is also proposed that an Air to Air Heat Pump is installed to provide hot air heating to the Central Area and the Changing Rooms (and possibly the Kitchen). The Air to Air Heat Pump will provide the rapid response system for intermittent demands.

Separate controls systems will be needed for the Air Source Heat Pump and the Air to Air Heat Pump. The former will consist of a programmable timer (potentially only capable of being set by officers of the Sports Club), plus a thermostat on the hot water cylinder, plus thermostatic controls valves on all radiators. The controls for the Air to Air Heat Pump will consist of a simple on/off control plus thermostats in the Central Area and the Changing Rooms. The system will need to be capable of delivering heat to any of the 3 areas which is below the set temperature.

Due to the use of the Sports Pavilion by a number of different organisations, it is proposed that the controls available in publicly accessible areas are kept as user friendly and simple as possible.

## Electricity Supply

To ensure that the GHG emissions from the Sports Pavilion are as low as possible, it is proposed that solar panels are installed on the roof, providing a 100% renewable electrical supply, compared to the supply from the Grid, approximately 45% of which is currently generated by burning fossil fuels.

There is sufficient space on the roof to house solar panels with a capacity of ~10kW. However, the capacity that can be installed is likely to be limited by the capacity of the local SSE distribution network. This will be resolved by submitting a request to SSE for installation of a renewable energy source, which is underway. The electricity generated by the solar panels would generate income, and also reduce the amount of electricity that would need to be purchased from the grid (see section 5).

## Summary

A summary of the different components of the Detailed Design, including budgetary cost estimates, is given in Table 1.

Table 1 : Detailed Design Summary

|  |  |  |  |
| --- | --- | --- | --- |
| Stage | Description | Improvement Measure | Budgetary Cost Estimate (£) |
| 1 | Insulation | Insulate the Cavity Walls | 1000 |
| Insulate the loft with 400mm mineral/glass wool throughout  (currently 100mm over 75% of the roof) | 600 |
| Replace External Doors | 500 |
| 2 | Heating | Replace Gas Boiler with Air to Water Heat Pump | 10,000 |
| Install Air to Air Heat Pump | 3,000 |
| Install Controls for Air to Air Heat Pump | 500 |
| Replace current radiators with more efficient modern units | 1000 |
| Install Thermostatic Valves on all Radiators (currently on ~50% of radiators) | 200 |
| 3 | Electricity Supply | Install ~10kW PV Panels on Roof (capacity to be confirmed through request to SSE) | 12,000 |
| 4 | Lighting | All Lighting to LED | 200 |
|  |  | Total Cost | 29,000 |

# Financials

The Climate Emergency Action Plan indicated that the total costs of the actions proposed was beyond the resources readily available to the Parish Council. As a result external funding is to be sought where this might be available, in order for the Parish Council to achieve its target of reaching net zero GHG emissions by 2030.

The Climate Emergency Action Plan has been sent to Low Carbon Dorset, together with an Expression of Interest in securing grant funding. Having considered these documents, Low Carbon Dorset have confirmed that the works proposed for the Sports Pavilion are eligible for a grant as part of their programme of work. The next stage is to work with Low Carbon Dorset to prepare and submit an application for a grant, which, if successful, might be up to 40% of the costs.

Table 2 presents an analysis of the budgetary cost estimates shown in Table 1, together with estimates of the grants that might be secured (including RHI payments), income from the solar panels (assuming solar panel capacity of 10kW at a tariff of 5.2p per kWh), and savings due to cessation of purchase of gas and reduced purchase of electricity from the grid.

Table 2 : Budgetary Costs, Estimated Grants and Estimated Incomes

|  | **2020/21** | **2021/22** | **Total Next 10 Years** |
| --- | --- | --- | --- |
| Total Budgetary Cost Estimate | 29,000 |  |  |
| Low Carbon Dorset Grant (Estimated at 40% of Total Cost) | 11,600 |  |  |
| Income From Solar Panels |  | 520 | 5,200 |
| Savings From Reduced Purchase of Electricity from Grid |  | 422 | 4,220 |
| RHI Payments for Air Source Heat Pump |  | 120 | 1,200 |
| Savings From Cessation of Gas Purchases |  | 500 | 5,000 |
| Total Cash Inflow Outflow | 17,400 | 1,562 | 15,620 |
| Cumulative Total | 17,400 | 15,838 | 218 |

Notes

1. All values are 2020 £, ie values for future years are not adjusted for inflation.
2. Solar Panel Export Tariff taken to be 5.2p per kWh. Annual electricity generated estimated to be 10,000kWh.
3. Tariff used for RHI payments for Heat Pump is 2.79p per kWh. Annual heat generated estimated to be 4,680kWh(th).
4. Total Gas Bill for Period from September 2018 to September 2019 was £502.
5. Electricity used from September 2018 to September 2019 was 1457kWh, at a tariff of 30p per kWh, giving a total cost of £422. It is assumed that in future all electricity used in the Sports Pavilion will be supplied from the Solar Panels, since significantly more electricity is generated than is used (with sufficient excess to cover the additional load associated with the heat pumps).

# Recommendations and Next Steps

The Parish Council are invited to approve the following:

1. The Detailed Design set out in section 4 above.
2. The preparation and submission of an application for a grant from Low Carbon Dorset.
3. Interactions with SSE to confirm the capacity of solar panels that can be installed.
4. A tender process to obtain quotes against the Detailed Design from a minimum of 3 suppliers. This process will be structured to reflect the different areas of work (e.g. separate tenders for the insulation, the heating system, and the solar panels), with at least 3 suppliers selected for each.
5. The quotes obtained will be submitted to the Parish Council for approval prior to the start of works.

Councillor Rob Carswell

Councillor Ralph Watts

March 2020