FAREHAM
BOROUGH COUNCIL

Report to
Housing Tenancy Board

Date **28 October 2013**

Report of: **Director of Finance and Resources**

Subject: **FINDINGS FROM ENERGY AND WATER SURVEY**

SUMMARY

This report sets out presents the options for the retained housing stock to reduce energy and water demand and the subsequent impact on carbon emissions and energy bills.

RECOMMENDATION

That the Board notes and scrutinises the information contained within the report and endorse the implementation of energy and water reduction strategy.

INTRODUCTION

1. Fareham Borough Council has a moral obligation to reduce carbon emissions produced by its built assets, reducing energy bills for building users and reduce the water usage.

2. Fareham Borough Council engaged a consultancy to assist the development of a strategy for to reduce energy and water consumption across the Council housing stock.

EXECUTIVE SUMMARY

3. This energy and water strategy has been prepared for Fareham Borough Council and shows the options for the retained housing stock to reduce energy and water demand and the subsequent impact on carbon emissions and energy bills.

4. Fourteen different property types have been identified and these have been modelled in NHER SAP 2009 software to assist in the identification of cost and carbon effective measure for each property type.

5. Baseline data on energy demand, carbon emission and water use has been calculated and this is presented in Section 1. A fabric first approach has been taken to reduce the energy demand of the dwellings by improving insulation and subsequent heat loss, then improving controls to the heating system and reducing water use. Then appropriate low and zero carbon technologies have been applied where suitable.

6. The impact of user behaviour is also considered as it is expected that within the timescales of this strategy, smart metering will be rolled out and this would be an opportunity to undertake a campaign to reduce energy and water use within the home. Details of this approach are shown in section 2.

7. Section 3 considers the low and zero carbon technologies which are appropriate for the sites and house types and gives reasons why some technologies are not included in this strategy

8. The dwelling types are considered by typology and each type has been modelled and impact on energy use, carbon emission and bills are shown in section 4. For each dwelling type the cost and payback of each action is given which leads to the recommendations made in section 7

9. The approach to water reduction is taken in section 5 and section 6 looks at the financial support mechanism available at the present time.

SUMMARY OF THE PROPERTY TYPES

10. The dwellings have been split into houses, flats and bungalows and for each property category there are a number of types based on construction details and design. A summary of the property types is shown below.

Ref Number	Category	Description	Example	Qty
1	Flat	2 bed maisonette blocks: Cavity wall, additional roof added. Gas heating		164
2	Flat	1 bed flats: Cavity wall, additional roof added. Electric heating		156
3	House	2/3/4 bed houses: Non-traditional Wimpey no-fines, Cornish, Reema. Gas central heating		113
4	Flat	1 and 2 bed flats: Non-traditional build Wimpey no fines, Unity, Cornish, Reema. Gas and electric central heating		134
5	Bungalow	1 and 2 bed: cavity construction/gas central heating		165
6	Flat	1 bed flats Sheltered housing: Cavity wall, electric heating		104

Ref Number	Category	Description	Example	Qty
7	Flat	Duplex Flats, 1 bed: Cavity construction with gas central heating		290
8	Flat	1 and 2 bed flats Traditional build: Cavity construction with gas central heating		282
9	Flat	1/2 bed flat/maisonette : Cavity construction, gas central heating		89
10	Flat	1/2 bed flat/maisonette: Cavity construction, Communal gas central Heating		40
11	Flat	1 bed flat Selleck Nicholls: Concrete/PVCu curtain walling. Gas central heating		19
11	House	2/3 bed house Selleck Nicholls: Concrete/PVCu curtain walling. Gas central heating		14

Ref Number	Category	Description	Example	Qty
12	House	3 and 4 bed houses: Cross wall/timber frame. Gas central heating		194
13	House	2/3/4 Traditional build: Cavity constriction with gas central heating		467
14	Flat	0/1/2/3 bed flats H Block: Butterfly roof. Cavity construction Electric NSH		112

SAP RATINGS

11. The average SAP rating of the stock is 73 which equates to a C rating. How this compares to national averages is shown below. National Data is taken from the Office for National Statistics 2011.

Stock	SAP Rating	SAP Rating
Fareham BC	73	C
Social Housing average – England	59	D
Whole Stock – England	51	E
Private rented sector - England	50	E

12. The average SAP rating for the housing stock at Fareham compares well to the national average for social housing and is well above the average rating of E for the UK as a whole.

13. There is some variation in SAP rating between the different property types and this is show in the table below.

Dwelling Type	Ref No	SAP rating	SAP rating
Flats Seleck Nicholls	11	64	D
Non-traditional Flats- Electric Heating	4	65	D
House- Seleck Nicholls	11	65	D
Flats - Block of 24	2	70	C
Flats H Blocks butterfly roofs	14	70	C
House - Crosswall linked to timber frame	12	72	C
Bungalows	5	72	C
Flats - Garden Court	10	73	C
House- non traditional	3	74	C
House- traditional build	13	74	C
Flats - maisonette block	1	75	C
Flats – Duplex	7	76	C
Flats - Frosthole Close	9	76	C
Flats - traditional build	8	77	C
Flats - Electric Heating	6	78	C
Non-traditional Flats- Gas heating	4	78	C

ENERGY USE

14. There is a wide variation in the energy needed to heat each type of dwelling. The highest average energy demand and therefore the least energy efficient are the Selleck Nichols houses (type 11). The dwelling with the least average energy demand and the most energy efficient are the electrically heated flats (type 6). This may not be reflected in fuel bills however as, electricity is on average three times as costly as natural gas. The ranges are shown in the table below.

Dwelling Type	Ref No	Energy for heating kWh/year	SAP rating
House- Seleck Nicholls	11	14003	65
House - Crosswall linked to timber frame	12	9402	72
House- traditional build	13	8759	74
Flats Seleck Nicholls	11	8758	64
House- non traditional	3	7255	74
Flats - maisonette block	1	6923	75
Bungalows	5	6623	72
Flats - Garden Court	10	6241	73
Non-traditional Flats- Electric Heating	4	5076	65
Non-traditional Flats- Gas heating	4	4541	78
Flats - traditional build	8	4598	77
Flats - Frosthole Close	9	4144	76
Flats - Duplex	7	4024	76
Flats H Blocks butterfly roofs	14	3617	70
Flats - Block of 24	2	2945	70
Flats - Electric Heating	6	2275	78

CARBON EMISSIONS

15. The amount of carbon dioxide gas emitted from a dwelling is a combination of the energy needed to provide heating, hot water and electricity and the fuel used, as each fuel type will have different emission per kWh. The main fuel types and their current emission factors are shown below. Emission factors can change for example as less nuclear fuel and more coal is used at power stations, the carbon content of electricity may rise in the short term. The carbon content of gas has increased as less North Sea gas is used and more is imported in liquid form.

16. The table below shows the average carbon dioxide emissions from the energy use for heating, hot water and electricity from each home.

Dwelling Type	Ref No	Carbon Emissions kg CO2/year	Main heating fuel
Non-traditional Flats- Electric Heating	4	3591	Electricity
House- Seleck Nicholls	11	3580	Gas
Flats H Blocks butterfly roofs	14	2838	Electricity
House - Crosswall linked to timber frame	12	2771	Gas
House- traditional build	13	2654	Gas
Flats - Block of 24	2	2379	Gas
Flats Seleck Nicholls	11	2299	Gas
House- non traditional	3	2263	Gas
Flats - maisonette block	1	2176	Gas
Flats - Electric Heating	6	1951	Electricity
Flats - Garden Court	10	1928	Gas
Bungalows	5	1680	Gas
Non-traditional Flats- Gas heating	4	1645	Gas
Flats - traditional build	8	1621	Gas
Flats - Frosthole Close	9	1530	Gas
Flats - Duplex	7	1456	Gas

WATER USE

17. Water use was estimated using The Water Efficiency Calculator for New Dwellings 2009 published by the BRE. This is used as the standard assessment methodology by the Department of Communities and Local Government for showing compliance with Building Regulations and the Code for Sustainable Homes. The specification and water use in litres per person per day is show below.

Sanitary Specification	Water Use/Flow rate	Consumption /person/day in litres
Bath Armitage Shanks Sandringham	200 litres to capacity	100 litres
WC Armitage Shanks Sandringham dual flush	6/4 litres per flush	20.60 litres
Basin Taps Bristan 0.3 bar	17 litres/minute	28.44 litres
Kitchen Tap Bristan 0.3 bar	16.6 litres/minute	17.66 litres
Assumption for dishwater		4.50 litres
Assumption for washing machine		17.16 litres
TOTAL per person per day		**188.36 litres**
Adjusted with normalisation factor litres per person per day		**171.4**

18. The estimated water use of 171.4 litres per person per day has been applied to the whole stock based on the following occupancy rates (taken from Live Tables on Household Characteristics ONS). Based on these assumptions the total water use for the current stock is estimated to be 74,281 litres per day or 271,126,882 litres per year.

19. The current performance targets for internal potable water use are shown below and compare to the current sanitary specification.

Performance Target	Maximum consumption of potable Water (Litres/person/day
Fareham sanitary specification	171
Average UK water use	150
Building Regulations 17K compliance	125
Code for Sustainable Homes level 3/4	105
Code for Sustainable Homes Level 5/6	80

20. The table shows that the current sanitary specification could lead to more than average water use per year.

IMPROVING ENERGY EFFICIENCY

Approach

21. Each property type has been modelled in NHER SAP software to create the baseline data. Various energy efficiency improvements have been considered and the impacts on energy use and carbon emissions have been modelled. Some measures have been applied to all dwellings and others are more site specific.

22. The energy efficiency measures have been divided into two sections. The first section covers simpler measures which could be combined with existing programs (for example window or boiler replacement) or have a lower cost. It is assumed that where appropriate all of the simpler measures are applied before the more complex ones.

23. The second section covers more complex measures and rather than being applied sequentially each measure is applied alone and therefore one or all could be considered.

Energy Efficiency Measures - Simpler

24. Below are the simpler energy efficiency measures considered for the dwellings. Some are applied to all house types and some are more site specific. It is assumed that where appropriate all of these measures are applied before the more complex measures are considered.

ITEM	IMPROVEMENT	DETAIL
1	Insulation to roofs	Increase to 300mm
2	Replacement windows	Replacement windows and doors to achieve 1.4W/m²K
3	Boilers and controls	Ensure each dwelling id fitted with Thermostatic Radiator Valves, a programmer and a room stat Consider installing weather compensators
4	Reduce water consumption	Installing over-bath showers and water efficient appliances (ie dual flush cisterns, low flow taps) when undertaking modernisation works.
5	User behaviour	Energy companies installing smart meters – education programme for residents

Energy Efficiency Measures - Complex

25. Below are the more complex energy efficiency measures considered for the dwellings. As with the simpler measures, some are applied to all house types and some are more site specific.

ITEM	IMPROVEMENT	DETAIL
1	Improve air permeability	Implement a complete building package of air permeability measures including draft proofing, gap sealant to doors, windows and service pipework and blocking up redundant fireplaces.
2	External insulation	Installation of external wall insulation to majority of homes.
3	Insulation to party walls	Investigate party walls with cavities and insulate to prevent thermal loss.
4	Renewables – Photovoltaic panels Biomass Systems	 Install PV panels to flats and houses with south facing roofs of 30^{o} – 45^{o} Investigate installation of biomass heating and hot water system for some sheltered schemes.

STRATEGY

Energy

26. The survey has identified that the current energy efficiency rating for the whole housing stock positively exceeds the national performance rating for all groups, a reflection of good investment programmes over the past couple of decades. Generally, scope for improvement is small however a number of simple improvement measures remain available (see paragraph 24, items 1, 2, 3 and 5) to further improve the level of thermal comfort within the housing stock.

27. In addition, the survey identifies a small pocket of properties as requiring significant investment to achieve similar ratings as the vast majority of the stock. Therefore the viability of improvement measures or redevelopment of Selleck Nicholls type properties will be considered.

Water

28. The survey has identified that the average water consumption for the housing stock is 14% greater than the average UK water use of 150 litres per person per day.

Therefore, the specification for kitchen and bathroom modernisations will be updated to include the recommendation of this survey (see paragraph 24, item 4) to reduce water consumption to below the current average for the UK.

GRANTS AND FINANCIAL SUPPORT

29. Feed-in Tariffs (FITs) are payments made by energy companies to individuals or organisations who generate their own low carbon electricity. The FITs scheme, which has been operating in the UK since April 1st 2010, rewards owners of renewable energy technology by paying them for the green electricity that they generate even if they use it themselves.

30. The current rate for Feed in tariffs Feb 2013 – June 2013 from the OfGem website are shown in the table below. These rates are applicable for existing buildings and new build.

Size of system	Lower rate p/kWh	Middle rate p/kWh	Higher rate p/kWh	Lifetime
4kWp or less	7.10	13.90	15.44	20 years
4kWp – 10kWp	7.10	12.59	13.99	20 years
10kWp to 50 kWp	7.10	11.73	13.03	20 years

31. The medium rate is payable if the system owner (in this case Fareham BC) has more than 25 FIT registered PV installations (90% of the higher rate) For the purposes of any calculations it will be assumed that this middle rate is payable.

32. The table below shows the potential income per year and over 20 years for the PV array suggested for communal supply and for individual dwelling

Communal PV on blocks						
Dwelling Type	No	kWp per array	Estimated Annual kWh generated per array	Income from feed in Tariff at current rates (£ per year)	total energy per dwelling type	Income from feed in Tariff at current rates over 20 years*
2	8	2.88	2475	£344	19,800	£55,044.00
4b	2	7.2	6180	£778	12,360	£31,122.48
4b	1	16.8	14,420	£1,691	14,420	£33,829.32
6	1	16.8	14,420	£1,691	14,420	£33,829.32
TOTAL					75,420	£153,825.12

Renewable Heat Incentive

33. The renewable heat incentive is a similar subsidy to the Feed In Tariffs and it applied to heat rather than electrical generation. At present the following technologies are eligible however the first is the single option considered appropriate for further investigation.

- Biomass boilers

- Biogas combustion (but only up to 200kWth)
- Deep Geothermal
- Ground Source Heat Pumps (heating water)
- Energy from biomass proportion of Municipal Solid Waste
- Solar Thermal (but only up to 200kWth)
- Water Source Heat Pumps (heating water)

Biomass

34. The heat generated from a wood pellet boiler is also eligible for the RHI. The type 6 dwellings would need approximately 150kW or 105kW boilers for each development and this would be designated as small scale biomass (under 200kW).

35. The tariff system for biomass is more complex as there is a two tier system of payment. The current tariff (April 2013- March 2014) for small biomass are set out below and are fixed for 20 years.

Tariff name	Details	Tier 1 p/kWh	Tier 2 p/kWh
Small biomass	Less than 200 kW	8.6	2.2

36. The potential under the RHI is summarised in the table below.

Dwelling	Boiler Details	Hours of operation	Estimated RHI per year	Total RHI over 20 years (no adjustment for inflation)
Crofton Court	150kW	2,372	£20,441	£408,820
Downing Court	150kW	2,372	£20,441	£408,820
Western Court	105kW	2,372	£14,309	£286,180
Garden Court	150W	2,372	£20,441	£408,820

RISK ASSESSMENT

37. There are no significant risk considerations in relation to this report

SUMMARY AND CONCLUSION

38. There are three key strands to this energy and water reduction strategy, to improve the energy efficiency of the dwellings, to reduce internal potable water use, which also impacts on hot water demand, and to install appropriate low and zero carbon technologies.

39. The houses and flats have been modelled on NHER SAP 2009 software to estimate the baseline energy, carbon and fuels costs of the housing stock today. Then a series of energy and water efficiency measures have been applied and a cost benefit analysis undertaken to enable work to be prioritised.

40. Internal potable water use was estimated using the BRE water use calculator and water saving measures suggested. The impact on energy by reducing hot water use was then calculated back into the energy, carbon and cost savings.

41. For energy efficiency, whilst there remains scope for improvement, the housing stock performs very well when benchmarked with national performance for social-rented and private rented accommodation. However, the stock performs below national average for water consumption where further scope for improvement has been identified.

42. Based on costs and payback timescales a phased approach is recommended and this has the potential to deliver the following fuel and carbon savings across the whole stock, including the energy supply to communal areas.

Background Papers: None

Reference Papers: None

Enquiries:

For further information on this report please contact Chris Newman. (Ext 4849)