Torrens Solar Panel Evaluation

Prepared for:

FOLD Housing Association

by the Research Unit, Northern Ireland Housing Executive

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Contents

Introduction

In September 2013 the Housing Executive's Research unit completed a piece of research on behalf of FOLD HA and the Housing Executive's Energy Unit in the newly built Torrens estate.

This was a Fold Housing Scheme with the NIHE architects employed to do the design work. It was a scheme that was designed to achieve an 'Excellent' rating for the Breeam eco homes rating.

The overall aim of the research project was to gauge satisfaction among users of the new solar thermal water heating system, with a view to providing an evidence base for both FOLD Housing Association and the Housing Executive to develop and further refine policies and procedures relating to installation and maintenance.

The site occupied approximately 2.37 hectares of land which comprised of land previously under the ownership of the NIHE & Belfast Education and Library Board. FOLD had previously completed the successful redevelopment of Phases 1&2, both within close proximity of the proposed new build site for Phase 3a.

The aim of the scheme was to build on the regeneration works already undertaken in the area by FOLD and the NIHE North Belfast Strategy, redeveloping a blighted area and creating improved living conditions to encourage physical and community regeneration.

The new housing reflected the needs of the varying family sizes and included five dwellings specifically designed by families with special needs. More than half (55%; 46) of the properties are 3 bedroom properties.

All properties are designed to Lifetime Homes, Secure By Design and Eco Homes Excellent achieving a score of 74.89% and also include Solar Water Heating Panels in each house. This was one of the first schemes undertaken by FOLD to include Solar Water Heating Panels.

In addition to the solar panels, 'photovoltaic' and whole heat recovery / ventilation systems were installed within thirteen dwellings, which helps to reduce energy costs both in terms of water and electricity for the tenants.

Methodology

All 112 households who had this water heating system were selected to take part in the survey. However, when voids and those tenants who said they had no solar water heating panels were removed from the sample, the total number of households was reduced to 103.

The Housing Executive's Research Unit sent a letter to all 112 households detailing the nature of the survey. Fieldwork consisted of face-to-face interviews conducted by the Research Unit. A total of 83 households completed the survey, giving a response rate of 81% (Table 1.1)

Table 1.1: Response Rate

	Number	%
Completed	83	81
No contact	16	16
Refusal	4	4
Total	**103**	**100**

Presentation of Findings

In quantitative research the number of respondents participating in the survey has an important bearing on the way in which information can be presented in the analysis. It is the Research Unit's policy, in accordance with standard practice, to present analysis from surveys of between 50 and 100 respondents in both numbers and percentages. Where the number of respondents is less than 50, numbers only are reported. Where findings are based on less than five respondents and may be of a sensitive nature, exact numbers are not reported to protect the anonymity of respondents.

Respondents provided information about their household based largely on the Household Reference Person (HRP). Otherwise known as the "highest income householder", the HRP must be a householder (i.e. a person in whose name the accommodation is owned or rented). Where there are joint householders, the person with the ***highest income*** is selected. If two or more householders have exactly the same income the ***oldest*** is selected.

The remainder of the report consists of a profile of Household Reference Persons (HRPs) and key findings, followed by conclusions. The appendix tables provide a more detailed breakdown of the survey responses.

Profile of Household Reference Persons

A total of 83 interviews were carried out with tenants living in Torrens. The main findings on the socio-demographic profile of the respondents were as follows:

Age:

The age profile of the tenants was relatively young compared to social housing tenants generally:

- Almost half (47%; 39) of HRPs were aged between 25 and 34. Twenty seven per cent (22) of HRPs were aged between 35 and 44 and 11% (9) were aged between 45 and 54. Eight per cent (7) of HRPs were aged 55 and older (Table 6.1).

Gender:

- The majority (87%; 72) of HRPs were female and 13% (11) were male (Table 6.2).

Employment Status:

As is generally the case in social housing, the proportion of HRPs in employment was relatively low.

- Thirty seven per cent (31) of HRPs were looking after the family/home. Thirty one per cent (26) of HRPs were working at the time of the survey. Twelve per cent (10) of HRPs were unemployed, either long-term or short-term and equal proportions (both 5%; 4) were either retired or students (Table 6.3)

Income:

- Almost half (46%; 38) of HRPs had an approximate annual income of between £7,281 and £15,600. Nineteen per cent (16) had an approximate annual income of £15,601 or more and 16% (13) had an approximate annual income of between £3,121 and £7,280 (Table 6.4).

Benefits:

The high benefit dependency of the households reflects both their lower incomes and the fact that many are young families.

- The main benefits received by HRPs were: Child Benefit (76%; 63); Housing Benefit (75%; 62) and Child Tax Credit (51%; 42) (Table 6.5)

Key Findings

Gas Heating System

- Respondents were asked if they used any other type of heating in addition to gas heating in their home; 98% (81) respondents said they did not (Table 6.6).

Cost

- Respondents were asked if in the last 12 months they had been unable to adequately heat their home; 13% (11) respondents said they had (Table 6.7).

- Of those respondents, five said it was because of problems with their tank/boiler or that their system had broken down (Table 6.8). The other six respondents cited reasons relating to the cost of fuel and difficulties balancing the household budget.

Usage Pattern

Respondents were asked questions in relation to their heating patterns in the winter and summer.

- In the winter: 18% (15) of respondents said they kept their heating on all day, 84% (56) of respondents heated their home on weekday evenings and 84% (56) on weekend evenings. More than three-quarters (78%; 52) of respondents heated their home on weekday mornings (Table 6.9).

- In the summer, as would be expected, a very different pattern emerged: 47% (39) of respondents said they never put their heating on in the summer. Six per cent (5) of all respondents said they put their heating on during weekday evenings and five per cent (4) put their heating on during weekend evenings (Table 6.10)

Satisfaction

- Respondents were asked about their satisfaction with different aspects of their heating system: Table 1.2 below details their responses. There were particularly high levels of satisfaction with the type (99%; 82), control (95%; 79) and ease of use of the system (95%, 79) (Table 6.11).

- Overall satisfaction levels were very high. Even in terms of the cost of running - which had the lowest satisfaction - 87% were very satisfied/satisfied (Table 6.11).

Table 1.2: Satisfaction with Gas Heating

	Very satisfied/Satisfied	Neither Satisfied nor Dissatisfied	Very dissatisfied/Dissatisfied
The type of heating	**99**	**0**	**1**
The cost of running your system	**87**	**4**	**10**
The amount of heat you can get	**94**	**1**	**5**
The control over the level of heat	**95**	**2**	**2**
The ease of use of the system	**95**	**2**	**2**
Ease of use of heating programmer	**94**	**2**	**4**

Solar Panel Water Heating System

Supply of Hot Water

- Respondents were asked if their solar panel water heating system generally provided hot water in both the summer and the winter: 74% (61) of respondents said that it generally provided hot water in the summer, but fewer respondents (25%; 21) said that it generally provided hot water in the winter (Table 6.12).

- Of those respondents (26%; 22) who said the system did not provide adequate hot water in the summer, 69% (43) said they never had to boost their supply of hot water (Table 6.13).

- Of those respondents (75%, 62) who said it didn't provide adequate hot water in the winter, 48% (30) said they had to boost their supply of hot water regularly (Table 6.13).

Advice/Guidance

Respondents were asked whether they had been given guidance on how to operate the solar panel water heating system when they signed up for their new home.

- 45% (37) of respondents said they did receive guidance of which 81% (30) said a member of staff from FOLD HA explained the operation to them (Tables 6.14 & 6.15).

- Respondents were asked if they were given any information/advice on how to change their pattern of hot water use to make the most of their solar panel water

heating system; 82% (68) of respondents said they had not been given any information/advice (or could not recollect any such advice) (Table 6.16).

- Since sign-up, 94% (78) of respondents stated they had not received any further advice/guidance on how to operate the solar water panel heating system (Table 6.17).

Repairs

Respondents were asked if they or any member of their household had reported a repair relating to the solar panel water heating system in the last 12 months; 80% (66) of respondents had not reported a repair in the last 12 months (Table 6.18). Of those respondents (21%; 17) who had reported a repair:

- 53% (9) said they had reported only one repair (Table 6.19);
- 47% (8) said that the last repair they reported to FOLD related to the system being faulty or not working at all (Table 6.20); and
- 29% (5) of respondents were very satisfied/satisfied with the way FOLD had handled their repair request, but 71% (12) were very dissatisfied/dissatisfied (Table 6.21).

Usage

Respondents were asked a series of questions relating to bath/shower usage.

- Almost all respondents (99%; 82) had a bath. Of those:
    - 82% (67) reported that their bath was a standard/normal size bath (Table 6.22).
    - 30% (23) said that their household took, on average, 1-5 baths per week and 21% (16) said they took, on average, 11-15 baths per week (Table 6.23).
    - Forty-three per cent (35) of respondents normally used hot water for having a bath in the evening and 38% (31) at night time (Table 6.24).
- Almost half of respondents (49%; 41) had a shower, of those:
    - 88% (36) of respondents had a standard shower (Table 6.25).
    - 27% (11) of respondents said their households took, on average, 6-10 showers per week and 22% (9) said they took, on average, 11-15 showers per week (Table 6.26).
    - Sixty-eight per cent (28) of respondents normally used hot water for showering in the morning (table 6.27).
    - Fifty-nine per cent (24) of those respondents spent on average 6-10 minutes taking a shower (Table 6.28).

Savings

Respondents were asked a series of questions in relation to the cost of running the water heating system.

- 71% (59) of respondents said they thought they saved money by having Solar Thermal Panels (Table 6.29).
- Of those respondents (71%; 59) who thought they had saved money:
    - 64% (38) said they had saved as much on their energy bill as they expected (Table 6.30).
    - 61% (23) of respondents said that the money they had saved exceeded their expectations (Table 6.31).

Satisfaction

- 74% (61) of respondents were very satisfied/satisfied with the quantity of hot water over the summer months (Table 6.32).
- 72% (60) of respondents were very satisfied/satisfied with the temperature of hot water over the summer months (Table 6.32).
- 72% (60) of respondents were very satisfied/satisfied with the reliability of their solar panel water heating system over the summer months (Table 6.32).
- The survey asked a number of questions regarding levels of satisfaction with the hot water system; Table 1.3 below details the responses. There are clear similarities with respondents' levels of satisfaction with type (77%; 64), cost (75%; 62) and amount of hot water they were able to get (75%, 62) (Table 6.33).

Table 1.3: Satisfaction with Solar Panel Water Heating System (%)

	Very satisfied/Satisfied	Neither Satisfied nor Dissatisfied	Very dissatisfied/Dissatisfied
The type of hot water system	**77**	**4**	**19**
The cost of running your system	**76**	**8**	**16**
The amount of hot water you can get	**75**	**4**	**22**
The control over the temperature	**71**	**7**	**22**
The ease of use of the system	**74**	**6**	**20**

Respondents who were dissatisfied with any aspect of their hot water system were asked to explain their reasons for dissatisfaction and twenty five respondents gave a comment. Around half (52%; 13) said the system didn't work, 24% (6) said they were dissatisfied because they had never been shown how to use it properly and 12% (3) said they didn't get enough hot water from the system (Table 6.34).

Respondents were asked if they would recommend a solar panel hot water heating system to a friend; 82% (68) of respondents said they would, 17% (14) said they would not and 1% said they didn't know whether they would or not (Table 6.35).

- Of those respondents (17%; 14) who said they would not recommend the solar panel hot water heating system to a friend, 50% (7) said it was because they couldn't recommend something that wasn't working and 50% (7) said it was because they couldn't recommend a system they didn't know how to use (Table 6.36).

General Comments

- Respondents were asked if there were any other comments they would like to make in regards to their heating system. Forty two respondents gave a response of which 41% (17) said they would be happier if they were shown how to use it. Thirty three per cent (14) said they were generally happy with the system and 19% (8) said the system does not work. Detailed figures can be found in Table 6.37.

Conclusions

The results of the survey generally show satisfaction with the Solar Panel Water Heating System with clear similarities with respondent's level of satisfaction with type (77%,64), cost (75%,62) and amount of hot water (75%,62). However respondents indicated a general lack of knowledge in using the system and maintaining it. Of those respondents who were dissatisfied with any aspect of the system (25), 52% (13) said it was because the system didn't work and 24% (6) said it was because they had never been shown how to use it. This was reiterated in the general comments when 41% (17) of those respondents who gave a comment (42) said they would be happier if they were shown how to use the system and 19% (8) said the system did not work.

As a result of the survey the following good practice guide has been developed in partnership with FOLD:

Good Practice Guide for Social Landlords

Overall the indications were that the system worked well and levels of satisfaction were high, particularly with the supply and cost of hot water. However, the research also identified areas for improvement and for good practice which should assist social landlords to refine their policies and procedures relating to the installation and ongoing maintenance of solar thermal water heating panels.

Knowledge of how the system works

Knowledge of how the system actually works among tenants was limited and technical knowledge of the system was also limited among the landlord staff. There was a lack of clear understanding of what could be expected from the system, what might go wrong and what to do if something does go wrong. These issues should be addressed by improved communication and guidance.

Communication and Guidance

Information should be provided to tenants at the following stages:

Pre Tenancy Commencement;

Post Tenancy starting; and

At regular intervals throughout the Tenancy and at least annually.

Pre Tenancy

Guidance and training for tenants should be provided at handover or tenancy commencement stage. Staff should practically demonstrate the system and social landlords should develop leaflets on the solar panel system as part of the 'sign up pack' which should include:

- What can be expected from the system in terms of hot water provided;

- How to get optimum efficiency from the system;
- What the settings are and how to use them;
- A 'troubleshooting' checklist for the tenant if they feel there is a problem;
- Guide to reporting repairs and what response can be expected

Post Tenancy

Tenants should be visited after a period of settling in by the landlord staff. At this visit they should discuss the solar panel system and go through the leaflet and operational instructions again. This will help to ensure that the tenants have understood all the information they were provided with at the sign up stage and will also establish if there are any difficulties or problems with the system that need to be addressed.

Annual Review

Social landlords as good practice should annually review all their properties where solar water heating panels have been installed. This should include an inspection of the system to ensure it is operating efficiently and also to obtain feedback from the tenants and any concerns they may have.

Ongoing maintenance and repair of the system

The research indicated that social landlords need to understand more about the ongoing maintenance, repair and potential lifecycle costing of the systems. There is a need for investment in training and awareness for in house staff on all aspects of the system. Further future research will be required to determine if the benefits of the system and provision of low cost hot water outweigh the lifecycle costs of repair, maintenance and replacement.

In conclusion, the research has indicated that the tenants on the whole are satisfied with the solar thermal water heating panels. It also indicates however that there is limited knowledge of the operational and maintenance aspects of the system and these could be addressed by introducing the measures outlined as good practice above. The research has also highlighted the need to continue to monitor the systems and capture relevant information to inform the long term costs and benefits analysis.

Appendix Tables

PROFILE OF HOUSEHOLD REFERENCE PERSON

Table 6.1: Age of Household Reference Person

	Number	%
16-24	6	7
25-34	39	47
35-44	22	27
45-54	9	11
55-64	4	5
65+	3	4
Total	83	100

Table 6.2: Gender of Household Reference Person

	Number	%
male	11	13
female	72	87
Total	83	100

Table 6.3: Employment status of Household Reference Person

	Number	%
Self-employed	1	1
Working full time	7	8
Working part time	18	22
Not working short time (<1 year)	1	1
Not working long term (>1 year)	9	11
Retired	4	5
Student	4	5
Permanent sick/disabled	6	7
Looking after family/home	31	37
Other, including school child	2	2
Total	83	100

Table 6.4 Household Income

	Number	%
£3,121-£4,160	2	2
£4,161-£5,200	4	5
£5,201-£6,240	5	6
£6,241-£7,280	2	2
£7,281-£10,400	17	21
£10,401-£15,600	21	25
£15,601+	16	19
Refused	3	4
Don't know	13	16
Total	83	100

Table 6.5 Benefits received by Household Reference Person

	Number	%
Child Benefit	63	76
A disability benefit	20	24
Incapacity Benefit	3	4
Housing Benefit	61	74
Income Support	37	45
Jobseeker's Allowance	6	7
Retirement Pension	3	4
Working Tax Credit	20	24
Child Tax Credit	42	51
Pension Credit	2	2
Other	7	8

KEY FINDINGS

Table 6.6 In addition to gas do you use any other type of heating in your home?

	Number	%
Yes	2	2
No	81	98
Total	83	100

Table 6.7 In the last 12 months, have you been unable to adequately heat your home?

	Number	%
Yes	11	13
No	72	87
Total	83	100

Table 6.8 Thinking about the last time you were unable to adequately heat your home, was it because of…?

	Number	%
The cost of domestic fuel	3	27
Low household income	2	18
Money needed for other priorities	4	36
Heating had broken down/problems with tank/boiler	5	6.0

Table 6.9 Approximately, when do you put your heating on in the winter?

	Number	%
As and when needed	1	1
All day/all the time	15	18
Weekday morning	52	78
Weekday lunchtime	8	12
Weekday afternoon	22	33
Weekday evening	56	84
Weekend daytimes	38	57
Weekend evenings	56	84

Table 6.10 Approximately, when do you put your heating on in the summer?

	Number	%
Never	**39**	**47**
As and when needed	**5**	**6**
Weekday morning	**4**	**5**
Weekday afternoon	**1**	**1**
Weekday evening	**5**	**6**
Weekend daytimes	**1**	**1**
Weekend evenings	**4**	**5**

Table 6.11 How satisfied/dissatisfied are you with each of the following aspects of your heating system?

	Very satisfied/satisfied		Neither satisfied nor dissatisfied		Very dissatisfied/dissatisfied	
	Number	**%**	**Number**	**%**	**Number**	**%**
The type of heating	**82**	**99**	**0**	**0**	**1**	**1**
The cost of running your system	**72**	**87**	**3**	**4**	**8**	**10**
The amount of heat you can get	**78**	**94**	**1**	**1**	**4**	**5**
The control over the level of heat	**79**	**95**	**2**	**2**	**2**	**2**
The ease of use of the system	**79**	**95**	**2**	**2**	**2**	**2**
Ease of use of Heating Programmer	**78**	**94**	**2**	**2**	**3**	**4**

Table 6.12 Generally does your Solar Panel hot water system provide adequate hot water in both the summer and the winter?

	Number	%
Summer	61	74
Winter	21	25

Table 6.13 How often do you boost your supply of hot water using the immersion heater in the summer and/or winter?

	Summer		Winter	
	Number	%	Number	%
Never	43	69	18	29
Sometimes	6	10	14	23
Regularly	13	21	30	48

Table 6.14 Thinking about when you signed up for your new home were you given guidance on how to operate the solar panel water heating system?

	Number	%
Yes	37	45
No	41	49
Don't know	5	6
Total	83	100

Table 6.15 Who explained the operation of the solar panel water heating system to you at the time of sign up?

	Number	%
A member of staff from FOLD HA	30	81
A member of staff from the company who installed the system	6	16
can't remember	1	3
Total	37	100
Not Applicable	46	
Total	83	

Table 6.16 Were you given any information/advice on how to change your pattern of hot water use to make the most of your solar panel water heating system?

	Number	%
Yes	7	8
No	68	82
Don't know	8	10
Total	83	100

Table 6.17 Since sign-up, have you received any further advice/guidance on how to operate the solar panel water heating system?

	Number	%
Yes	2	2
No	78	94
Don't know	3	4
Total	83	100

Table 6.18 Have you or any member of your household reported any repair relating to the solar panel water heating system to FOLD in the last 12 months?

	Number	%
Yes	17	21
No	66	80
Total	83	100

Table 6.19 Approximately how many times have you had repairs to the solar panel water heating system carried out in the last 12 months?

	Number	%
once	9	53
twice	5	29
three times	2	12
none	1	6
Total	17	100
Not Applicable	66	
Total	83	

Table 6.20 What was the last repair you reported to FOLD?

	Number	%
System faulty, not working	8	47
Boiler problems	2	12
Pressure keeps dropping	2	12
Leak at the tank	2	12
Other	3	18
Total	17	100
Not applicable	66	
Total	83	

Table 6.21 Generally, how satisfied or dissatisfied are you with the way FOLD handled your last repair request?

	Number	%
Very satisfied	3	18
Satisfied	2	12
Dissatisfied	4	24
Very dissatisfied	8	47
Total	17	100
Not applicable	66	
Total	83	

Table 6.22 What size is your bath?

	Number	%
Smaller than normal	12	15
Standard/Normal	67	82
Larger than normal	2	2
Other	1	1
Total	82	100
No bath	1	
Total	83	

Table 6.23 Altogether, how many baths would you say your household take per week?

	Number	%
1-5 baths	23	30
6-10 baths	14	18
11-15 baths	16	21
16-20 baths	12	15
21-25 baths	8	10
26+ baths	5	6
Total	78	100
Not applicable	5	
Total	83	

Table 6.24 When do you normally use hot water for having a bath?

	Number	%
Morning	**16**	**20**
Midday	**2**	**3**
Evening	**35**	**43**
Night	**31**	**38**
Never	**4**	**5**

Table 6.25 What type of shower do you have?

	Number	%
Standard shower	**36**	**88**
Power shower	**5**	**12**
Total	**41**	**100**
No shower	**42**	
Total	**83**	

Table 6.26 Altogether, how many showers would you say your household take per week on average?

	Number	%
1-5 showers	5	12
6-10	11	27
11-15 showers	9	22
16-20 showers	4	10
21-25 showers	7	17
26+ showers	4	10
don't know	1	2
Total	41	100
not applicable	42	
Total	83	

Table 6.27 When do you normally use hot water for showering?

	Number	%
Morning	28	68
Midday	1	2
Evening	17	42
Night	13	32

Table 6.28 Approximately, how many minutes would you spend taking an average shower?

	Number	%
1-5 minutes	8	20
6-10 minutes	24	59
10-15 minutes	5	12
More than 15 minutes	3	7
don't know	1	2
Total	41	100
Not Applicable	42	
Total	83	

Table 6.29 Do you think you save money by having Solar Thermal Panels?

	Number	%
Yes	59	71
No	11	13
Don't know	13	16
Total	83	100.0

Table 6.30 If yes, have you saved as much on your energy bill as you expected?

	Number	%
Yes	38	64
No	10	17
Don't know	11	19
Total	59	100
Not Applicable	24	
Total	83	

Table 6.31 If yes, do you agree that the money you saved….?

	Number	%
Exceeded my expectations	23	61
Fully met my expectations	12	32
Partially met my expectations	2	5
I did not expect to save money	1	3
Total	38	100
Not Applicable	45	
Total	83	

Table 6.32 How satisfied/dissatisfied were you with your solar panel water heating system over the summer months in terms of….?

	Very satisfied/satisfied		Neither satisfied nor dissatisfied		Very dissatisfied/dissatisfied	
	Number	%	Number	%	Number	%
Quantity of hot water	61	74	8	10	14	17
Temperature of hot water	60	72	8	10	15	18.0
Reliability	60	72	10	12	13	16

Table 6.33 Overall, how satisfied/dissatisfied are you with each of the following aspects of your hot water system?

	Very satisfied/satisfied		Neither satisfied nor dissatisfied		Very dissatisfied/dissatisfied	
	Number	%	Number	%	Number	%
The type of hot water system	64	77	3	4	16	19
The cost of running your system	63	76	7	8	13	16
The amount of hot water you can get	62	75	3	4	18	22
The control over the temperature	59	71	6	7	18	22
The ease of use of the system	61	74	5	6	17	20

Table 6.34 If very dissatisfied/dissatisfied please state why

	Number	% of cases
Doesn't work	13	52
Never been shown how to use it properly	6	24
Don't get enough hot water	3	12
It is expensive	2	8
FOLD haven't fixed it	2	8
Other	5	20
Total	31	

NB: 25 respondents gave a total of 31 responses

Table 6.35 Would you recommend a solar panel hot water heating system to a friend?

	Number	%
Yes	68	82
No	14	17
don't know	1	1
Total	83	100

Table 6.36 If no, why not?

	Number	%
Don't know the benefit of it as it's not working	7	50
Don't know how to use the system, therefore can't recommend it	7	50
Total	14	100
Not applicable	69	
Total	83	

Table 6.37 Are there any other comments, regarding your solar panel hot water heating system, you would like to make?

	Number	% of cases
Happier if shown how to use it	**17**	**41**
Generally happy with the system	**14**	**33**
System doesn't work	**8**	**19**
Very noisy	**2**	**5**
Doesn't seem to be very beneficial	**2**	**5**
Other	**5**	**12**
Total	**48**	

NB: 42 respondents gave a total of 48 responses