FLATLINE - PHASE 1 FEASIBILITY REPORT

EXECUTIVE SUMMARY

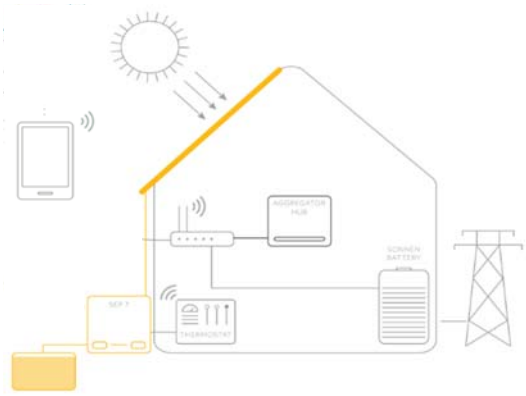

FIGURE 1 - FLATLINE HOME CONCEPT DIAGRAM

This Phase 1 feasibility FLATLINE project report is a response to the Department for Business, Energy and Industrial Strategy's competition for "Domestic Demand Side Response" (dDSR), and is written by project leaders Sero Homes with BRE, Minus 7, Samsung and sonnen, with further input from Smarter Lives, Cornwall Insight and Capital Law.

The objective of this feasibility study was to demonstrate in detail that the project concept can be delivered. FLATLINE's concept is that typical domestic energy consumers can benefit from very low, fixed price heat and power fuel bills; that this can be done whilst providing domestic Demand Side Response services to lessen the impact of those homes on the National Grid; and that this can be an economically viable business model without subsidy. This has been envisaged through using a low energy demand homes installed with renewable, low carbon and energy storage technologies, and by managing these homes through an advanced control network to intelligently draw, discharge and anticipate energy demands, whilst using this control to provide dDSR services to the Grid.

Put simply, the FLATLINE concept proposes a win:win:win scenario – significantly lower bills to home occupants practically eliminating the risk of fuel poverty, electrical demands on the National Grid being shifted entirely 'off peak', and a new UK business model that can lead to growth at home and abroad (the model is internationally replicable).

FIGURE 2 PILOT SITE IN SOUTH WALES

The work undertaken by the partners for this feasibility report has investigated this concept in considerable detail across a significant range of important topics. Briefly, this has comprised:

- Piloting a 'typical' housing site (South Wales), to individually model 58 homes to forecast their fabric and occupant energy demands, and to predict their renewable energy generation potential,
- Analysis of the communications network and system architecture that will be required to build and operate these homes, including reviewing cyber security and resilience,
- Prototyping of the advanced control network required to manage FLATLINE system across the pilot homes in order to simulate the performance of this platform in operation,
- Investigating the legal and regulatory barriers (or absence) for both current and reasonably anticipated future marketplaces,
- Developing the detailed commercial understanding of the energy markets, their DSR opportunities and the likely prices/tariff scenarios currently and into the future.

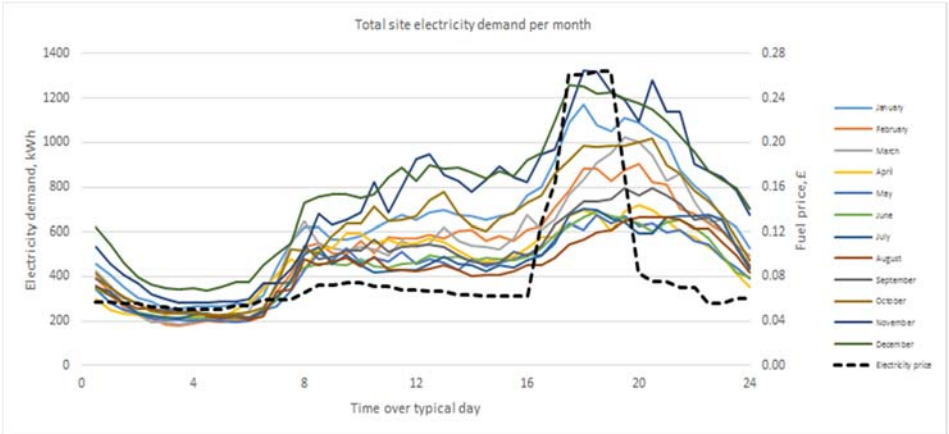

FIGURE 3 - ELECTRICAL DEMAND OF "BASELINE" HOUSING SITE

This report demonstrates that there is a viable business model that can deliver the FLATLINE goals of very low, fixed bills to occupants whilst providing domestic Demand Side Response services to the Grid. The investigations into the practicalities of legally and technically operating the

FLATLINE model have found no insurmountable barriers, whilst the study of the system architecture has suggested a number of viable solutions for delivery. In parallel, work to understand the energy markets has illustrated pricing structures which are viable and underpin the pilot.

Detailed modelling of the pilot site has demonstrated that, if built to modern Building Regulations as a baseline, the 58 homes would have an annual fuel cost of £49,900 (electric and gas)[i]. This represents the best of what is currently built in the UK at any scale since these "baseline" homes would achieve an Energy Performance Certificate of "A" or "B", and would average monthly fuel cost per house of approximately £72. In terms of the energy networks, electricity demands for such a development coincide with the worst times for National Grid impact.

FIGURE 4 - SOLAR CAPACITY MODELLING OF PILOT SITE

When modelled as FLATLINE homes, the 58 properties are forecast to have an annual fuel cost of £18,000 (all electric), a cost reduction of 64%, which equates to average monthly fuel cost per house of less than £26, before taking into account further dDSR income or management charges. This is derived from initial prototype simulations demonstrating a reduction to £29,100, with identified anomalies quantified as a further saving of £11,100 of electricity. This near-threefold reduction in forecast energy costs is also achieved with a practically complete avoidance of impact on the National Grid at peak times (noting the current first prototype has some impact under the anomaly).

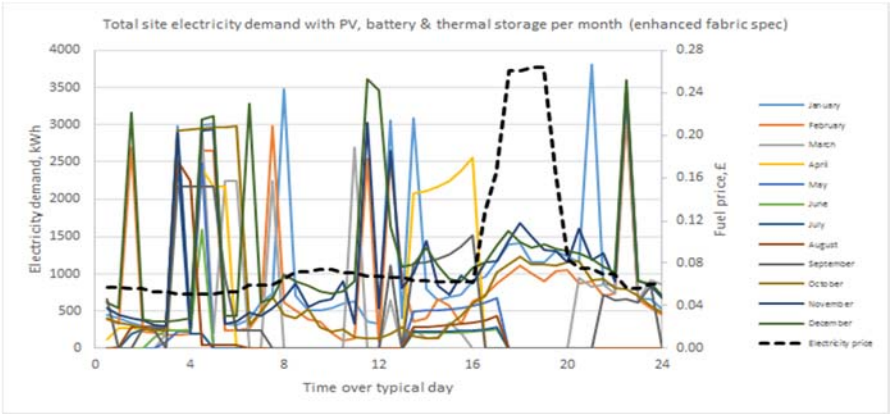

FIGURE 5 - ELECTRICAL DEMAND OF FLATLINE HOUSING SITE (INCLUDING HEATING)

The report shows that the project can offer significant 'Demand Turn Up' capacity (250-300kW) to the grid at the times it needs it most, whilst offering moderate 'Reserve' capacity due to the fact the homes are already turned down at peak times.

This Phase 1 feasibility report therefore concludes that there is a strong, viable and well-evidenced case to suggest that the FLATLINE project can deliver meaningful Domestic Demand Side Response services to the National Grid, whilst achieving very significant fuel bill reductions to residents, in an economically sustainable business model.

The full Phase 1 public feasibility report can be found at: **www.FLATLINEenergy.co.uk**

	Electricity		Gas		TOTAL	
	kWh	£	kWh	£	kWh	£
Baseline house	313.8	31,300	396.3	18,600	710.1	49,900
Enhanced fabric house	313.8	31,300	359.5	17,300	673.3	48,600
Enhanced LZC systems	295.7	31,000			295.7	31,000
Enhanced LZC storage	348.5	29,100			348.5	29,100*

* Likely to reduce to approx. £18,000 once control logic optimised over winter months

FIGURE 6 - COMPARATIVE TABLE OF FORECAST COSTS BASED ON A VARIABLE ENERGY TARIFF

[i] Costs based wholesale prices and network charges but excluding VAT, supplier margin and Environmental Obligations.