**Head of Economics and Efficiencies (Finance and Network Assets)  
Utility Regulator  Queen’s House  14 Queen Street  BELFAST  BT1 6ED**

Dear Mr Swales

The Northern Ireland Housing Executive is the regional housing authority for Northern Ireland and is also the Home Energy Conservation Authority promoting home energy efficiency for all local homes.  We provide social rented housing to ca 86,000 households, and have a role in supporting the Social Housing newbuild programme.  The majority of our tenants are likely to be ‘fuel poor’, spending over 10% of household income on heat and electricity.

We have a number of observations on your investment plans:

NIHE strategies

NIHE is currently developing two major strategies/ policies that can have an impact on these plans:

A ten year energy efficiency strategy for NIHE housing stock, that will examine insulation and energy savings.

A periodic review of the heating systems that NIHE installs. NIHE follows government policy in installing gas systems where feasible, which provide a low carbon ‘Pay As You Go’ heating service, but 34,000 NIHE homes still depend on heating oil, often in areas with good wind energy resources.

NIHE would like to move away from using oil systems when tenants must pay for large deliveries of oil.  Oil is a high carbon fuel with risks from fire and large costs for remediating spillages and for maintenance.  One alternative we must evaluate is the use of electric heat pumps to provide a ‘Pay As You Go’ heating service. Depending on how we install these, with or without extra insulation, larger radiators, or large water-based thermal stores, or auxiliary boilers, the demands for additional grid investment will vary a lot.  Another option is to heat homes directly with electricity at times when it is not in demand for other uses, but the way that costs for electricity distribution and control are recovered, and taxes and levies, makes this too costly for our tenants, unless there are changes to make retail electricity more competitive with gas and heating oil at particular times that can be varied depending on electricity prices and grid congestion.

Presenting us with a wider diversity of retail electricity retail prices now can incentivise us to install heating and energy storage systems that will decarbonise home heating at least cost in the long run.

Better Controls for Electric Systems

Controls to interrupt, delay, or bring forward the recharging of electric storage heaters and hot water cylinders can safely be made available for NIHE homes before other homes.   The NIHE have ca 3400 wholly electric heating systems and over 40,000 homes with hot water cylinders. Starting the recharging of all the electric storage heaters at the same time each evening increases losses, as the heaters remain hot at night when heat is not needed, and wind energy that might otherwise heat these heaters may be curtailed & wasted in low demand periods after recharging as ceased.  NIHE’s policy is to install any new electric storage heaters in tall flat blocks with provision for interrupting recharging on demand, so will welcome developments by NIE Networks that support remote control of heating loads and the development of new tariffs for tenants, or new revenue streams for social landlords.

Availability of additional meters for electricity and other energy sources.

NIE networks provide, read, and service more secure energy meters than anyone else throughout Northern Ireland.  Adding further energy meters to their installed base should be possible at a competitive cost, and the Utility Regulator should establish a regime or rules to allow them to do this.

E.g. For electric vehicle charging, for variable or interruptable electricity supplies to make more use of available wind energy, for other fossil fuels, and if feasible, for heat itself.  Heat metering supports a variety of lower carbon heating options and at different scales in both urban and rural areas, from one simple boiler shared between 4 flats, to large community biomass, heat pumps, or combined heat and power systems serving many homes.

A second meter for auxiliary electric heating can provide a basis for a valued ‘Pay As You Go’ system for heating oil, by charging extra for remotely controlled electric heating, and recycling additional revenues to pay for future tanks of heating oil.  Providing such additional metering services will reduce NIE networks’ investment costs and carbon emissions, by cutting the use of electric heating in peak winter demand periods, and by using a bigger fraction of wind energy, some of which might otherwise be ‘curtailed’ and wasted.  Having new ‘optional’ markets for electricity can also provide additional revenues to support the most efficient or lowest cost generators. Using efficient Closed Cycle Gas Turbine plant with gas at low ‘spot’ prices to release more wind energy and keep the grid stable, then using this extra electricity to displace heating oil, can result in much lower carbon emissions than a new Compressed Air Energy Storage system, especially for summer hot water when oil boilers are less efficient.

Alternatively, the Utility Regulator should establish rules to establish when extra electricity has been used when controlled by remote switching, to make a different pricing regime appropriate.

Environmental Protection

Spillages cost the NIHE tens of thousands of pounds to remediate.  Providing ‘Pay As You Go’ systems for heating oil makes spillages less likely. E.g. Spillage from small oil drums.  Tanker traffic in residential areas is also cut with fewer and larger deliveries serving a ‘Pay As You Go’ system or buying club.

Ways to increase the capacity of the network without installing more wires.

The EA Technology report mentions Dynamic Rating/ wire cooling with wind and cold, and Active network management.  These both treat electricity demands as an independent variable.

The role of Demand Side Management and heating load control needs to be developed to reduce network costs in the long term.  If extra electricity for new full or partial electric heating applications is distributed in a controlled way, and can be limited at short notice to conserve grid capacity for conventional demands, the average capacity of the grid to distribute electricity has also been increased, without installing or paying for more wires.  NIE Networks should investigate how large this load limiting ‘Demand Side Response’ can be, as electrification of heating is usually seen as part of decarbonising energy supply. E.g. How electricity can displace the use of heating oil, or how it can be used to heat large insulated water tanks to heat those homes with smaller energy demands.  The peak demand of new heat pumps can vary massively depending on the detail of the heating installation and any thermal storage.

Active Local Load Controls

The NIHE has a lot of choice in the energy systems it installs in homes, the controls on these systems, and where installations are done.  The NIHE would like to investigate with NIE networks how it may be possible to safely install additional solar PhotoVoltaic panels on more homes, and on roofs that are not facing due South. E.g. Diverting peak solar outputs to heat hot water to prevent unwelcome reverse flows at transformers.  If damaging back flows can be avoided with local controls that sense insolation, voltage, or frequency, or which simply operate according to a summer calendar, such systems cannot be disrupted by hacking.

Managed Connections and Remote Control of Local Loads

Increasing numbers of households have access to internet communications.  Even if this is not 100% reliable, it may be reliable enough to improve, say, the performance of electric storage heaters, if the controls return to a safe default mode with any break in data communications.

Security of energy supply and electric heating

It may be appropriate to reduce the rated loads on electricity connections, or to charge more for connections with heavier maximum currents.  Increasing comfort standards, larger underoccupied homes, removal of fireplaces, and higher incomes make it more likely that people may attempt to heat homes electrically in the event of a fossil fuel supply interruption, particularly for heating oil, making power cuts more likely.  Providing a proportion of the heating for oil-fired homes using electricity extends the life of the heating oil stored in garden tanks, or allows kerosene or wind energy to substitute for gas used for generation, improving security of supply.

Business Case for Smart Metering with Remote Communications and Control

The NIHE can forsee value in a secure Low Power Wide Area radio network or low bandwidth communications system, and would want to ensure that NIHE tenants obtain good value for any investment in new ‘Smart Metering’ systems and their communications, whether by reductions in electricity costs or in heating costs, which are both large and comparable amounts, or in obtaining other valued services (see table below). E.g. Pay As You Go services for heating oil, remote maintenance alerts, other services to maintain health and safety at home.  It is appropriate that NIE Networks investigates the additional benefits possible using remote communications and control with us, to maximise the side benefits for users for any large social investment in ‘Smart’ metering. E.g. Measuring heating oil tank levels or installing Pay As You Go systems can support the development of oil discount delivery clubs to benefit homeowners, private renters, and NIHE households.

Yours faithfully

Andy Frew

For NIHE

(Below: table with additional applications for any secure wide area communications and control system)

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| LPWA radio, or low bandwidth wired communications and control applications list: | LPWA: Low Power Wide Area (radio communications and control) |
| **Application** | **Benefit** |
| Confirmation of activity, presence, from electricity or heating monitoring etc | Increased safety for those with degenerative or mental conditions. |
| Controlling the operation of 'Economy 7' electric storage heaters or immersion heaters at night | Reduces generation costs, emissions, by avoiding a peak demand at midnight. Improves the performance of existing heaters, increasing their useful life. |
| Controlling the operation of immersion heaters heating hot water cylinders | Can support novel energy services contracts including a "Pay As You Go" element for oil, or rebates for electricity used after an automated request. |
| Frost protection | Avoids property damage and human distress. |
| Monitoring oil use, activating boilers | Can support an oil 'Pay As You Go' system for those on low incomes, reducing damp and avoiding oil spills and large cleanup costs. |
| Monitoring heating oil levels in tanks | Can also enable the 'able to pay' sector to participate in deliveries for oil clubs, to reduce costs |
| Boiler monitoring: Oil boiler false starts occur before final failure | Predicts failure, can reduce the frequency of regular maintenance visits |
| Heating system pressure monitored | Predicts stoppage in advance, allowing planned maintenance |
| Solar hot water panel pressure monitored | Predicts stoppage, can reduce the need for regular maintenance |
| Shared  boilers: Boilers shared between homes | Lower average maintenance and access costs.  Optimising investment in more efficient, lower emission systems over time. |
| Security | Notifications of equipment interference or theft, breaches of safety systems or of closed areas |
| Heating demands stored offsite, using 'Smart' thermostats | 'Spare' wind energy can heat homes at times, saving heating oil, lowering emissions |
| Controlling battery charging for electric bicycles or cars | Cheaper transportation, reduced grid rienforcement costs & carbon emissions |
| Boosting the summer electrical output of PhotoVoltaic (PV) Panels to match local electricity demands | More PV panels can be installed if they are installed to divert their output to hot water when sunny summer conditions coincide with low demands on the grid |
| Heat Metering data transfer, heating control | Supports 'Pay As You Go' arrangements for any fuel or for larger shared community heating systems with higher efficiencies and lower carbon emissions |
| Responding to offers of low electricity prices by doing laundry etc | Lowers average energy costs within dual fuel or novel energy services contracts for those at home all day, reduces carbon emissions. |

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