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Sent: 14 April 2022 19:26

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Subject: Consultation responses ISNI Gas and Electricity networks price controls & Seasonal multipliers for Gas transmission.

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Dear SIB. UREGNI

Hope you don't mind these responses regarding investment in a Smart Local Energy System including new heat networks being brought together.

When installing new gas mains it may now be appropriate to also install ducts ready for the extra electricity cables needed, for new EV and heat pump loads, perhaps also for hydrogen electrolyzers and fuel cells linked to new heat networks. Plastic ducting is low cost.

Electricity system operators must quickly install automatic load limiting and load 'turn up' control equipment, to achieve rapid decarbonisation of heat supply and to avoid supply interruptions and overloads due to new loads from fast electric vehicle charging and heat pumps. Also to accommodate dispersed renewable generation such as solar panels. Heat loads should be mapped to inform heat and power network plans, as electric heat pumps will meet most heat loads in future, and there are decisions to be made about installing heat networks and their linkages to large scale, long duration heat storage above or below ground.

Consideration could be given to negative pricing of gas network capacity at times in consideration of gas's role in releasing a higher renewables output on the system, and to prevent fossil gas setting inappropriately high power prices when the majority of output is coming from renewable generators. A different rate might be applied to gas for generation, perhaps at night or in the afternoon, for this reason.

Levies and transit fees do not only have a role in cost recovery, but also set up a system of investment and usage incentives when more investment is needed in heat and power storage on the demand side, by individuals and firms with a higher cost of capital than utilities. i.e. Incentives and cost differentials need to be larger to stimulate investment in say long term heat or power battery storage. The current system of large environmental levies and energy security costs onto power prices is no longer fit for purpose when electricity can now be very low carbon. Funding arrangements in different parts of the energy system should not intensify this misfit.

It seems unlikely that burning hydrogen will be viable as the sole source of heat for homes. A number of recent publications point to the use of efficient electric heat pumps being key to decarbonising heat. Producing heat with the more variable parts of wind energy output, and storing it in bulk for use later, may side-step difficulties with supplies of chemicals for electric batteries and limit the size of investments required in the power system, while utilising surpluses from corporate demands for 100% renewable power 24/7/365. e.g. Maximising the use of existing power connections along a new heat network at times of low non-heating power demands to produce heat, using banks of air source heat pumps, for transfer to longer term storage.

Ambient and near ambient lower temperature heat loops can also reduce peak power demands from heat pumps at individual homes in more dispersed settlements.

Best Wishes

Andrew Frew Architect

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A few interesting publications released in the last weeks, which point towards more consideration of big electric heat pumps and heat networks to largely decarbonise the heat supply needed to replace all the heat losses; through building fabric, via hot water heating, and via the heated air that is removed for ventilation. Large scale heat storage under the ground or in big tanks could have a big role in energy security/ meeting heat demands from heat that was produced weeks earlier using wind energy and big heat pumps. E.g. Pre-heating the source water for heat pumps could enable existing radiators to be used, or can reduce running costs or peak electrical demands on the grid that everyone pays for. Decarbonising heat supply is likely to cut emissions faster for homes than disruptive retrofitting interventions, and may also be achieved for suburban homes. (see second link)

References:

<http://www.sdewes.org/jsdewes/pid8.0340>

"decarbonisation of the example district's power and heating energy can be reached even without the availability of biomass, if sufficient Power to Heat (XXL Hpumps) and Power to Gas capacity is integrated to the District Heating grid, and sufficiently more wind- and solar power is installed"

<https://www.leeds.ac.uk/policy-leeds/doc/shared-ground-heat-exchange-decarbonisation-heat>

Ambient temperature heat loops

Cambridge Econometrics study:

<https://europeanclimate.org/resources/renovating-and-and-electrifying-buildings-strengthens-europes-economy-and-energy-security/>

University of Ulster Article

<https://www.sciencedirect.com/science/article/pii/S0960148122004153>

Value of demand flexibility/ turn up for managing wind energy constraint and curtailment. Currently wasted wind energy could save fuel poor households up to £220 per year.

Has data on accommodating heat pumps on the existing grid.

(It may be easier to accommodate ground source heat pump units when they have a lower peak load or elevated source temperatures, Smart controls.)

<https://www.imperial.ac.uk/people/c.markides>

Thermo-mechanical energy storage systems can be very durable.

Can use salt cavern storage, the sea as a heat sink, underground strata.