Network Innovation Competition Full Submission

Supplementary Answer Form

Tick if this answer is Confidential: ☐

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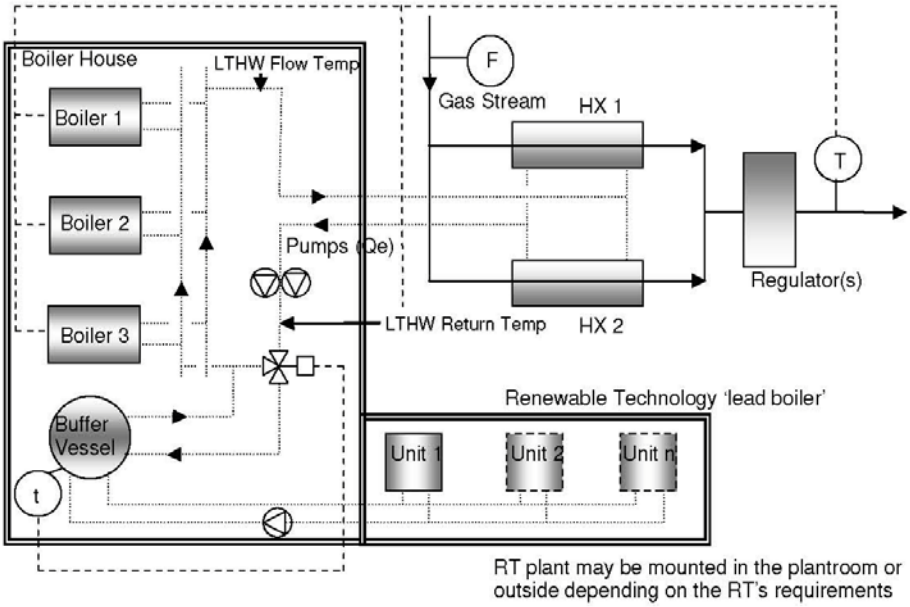
Project code:	NGN GN 01	Question Number	2
Question date	15.08.2013	Answer date	19.08.2013
Submission section question relates to	Section 2 & 6		
Topic	Alternative Technologies		
Question	A preliminary study resulted in the exclusion of a number of alternative technologies that did not meet specified criteria. Details of the criteria and the technologies excluded, with reasons, are requested.		
Notes on question			
Answer	The scope of the preheating feasibility study was to investigate possibilities for renewable and alternative methods of preheating as well as exploring the benefits of the current designs. Feasibility was assessed in terms of capital expenditure, life cycle costs, current available incentives and alternative methods of procurement such as the possibility of using an Energy Services Company (ESCo). Rather than assessing each of the technologies in isolation, we first had to understand how each of the renewable technologies could be incorporated into a preheating design. This then made the assessments specific to the gas industry and made comments of value to the application of the technology, not just to the technology itself. The diagram below shows the assumptions used to understand how the technology would be built into a preheating system before we made comment on its applicability.		



Units 1, 2, n were assumed to be the following technologies, for each, the pros and cons were assessed and are briefly explained below:

- Solar Thermal. 1. Only feasible where sites are exposed to direct sunlight and have a suitably sized footprint for the installation of the panels. 2. Seasonally these provide energy at the wrong time of year. So when the maximum heat is required in winter, these panels would be producing the least amount of energy. 3. Capacity, the potential to provide enough energy to the gas stream is low. On anything other than a site with a very small heating load these panels would make a minimal difference.
- Gas Absorption Air Source Heat Pumps (GAASHP). 1. The refrigerant used in these units is Ammonia. Ammonia is toxic and flammable and hence is not recommendable for an AGI. 2. Seasonally these provide the most energy in summer when the ambient air temperature is at its highest. This is not at the same time as when the gas stream needs the most energy. 3. Capacity, to obtain a useful amount of heat from this technology would require a number of these units to be mounted together in parallel. More equipment adds to the risk of fault so other than on sites with relatively small heating loads, this technology is not scalable.
- Ground Source Heat Pumps (GSHP). 1. Space is required on site for the installation of the loops underground, installing things underground on an AGI is not ideal as gas pipework is usually present. 2. Fuel. The primary energy required to run these is electricity. 1kW hour of electricity gives off around 3 times the amount of carbon as 1kW hour of gas so even if efficiency is increased, the carbon emissions may actually increase simultaneously. 3. Noise. The use of compressors creates noise. This may have an impact on planning conditions. 4. Capacity, to obtain a useful amount of heat from this technology would require a number of these units to be mounted together in parallel. More equipment adds to the risk of fault so other than on sites with relatively small heating loads, this technology is not scalable.
- Air Source Heat Pumps (ASHP). 1. Seasonally these provide the most energy in summer when the ambient air temperature is at its highest. This is not at the same time as when the gas stream needs

	the most energy. 2. Fuel. The primary energy required to run these is electricity. 1kW hour of electricity gives off around 3 times the amount of carbon as 1kW hour of gas so even if efficiency is increased, the carbon emissions may actually increase simultaneously. 3. Noise. The use of compressors creates noise. This may have an impact on planning conditions. 4. Capacity, to obtain a useful amount of heat from this technology would require a number of these units to be mounted together in parallel. More equipment adds to the risk of fault so other than on sites with relatively small heating loads, this technology is not scalable. • Biomass. 1. Biomass does not collect 'free heat' from the surrounding atmosphere as sunlight or heat pumps do. 2. Fuel storage. Although the emissions from burning biomass fuel are considerably less than those from gas or electricity, storing large amounts of biomass fuel on an AGI pose an unacceptable fire hazard. 3. Air quality. Some local authorities restrict emissions from biomass plants (Air Quality Management Areas) so this technology could not be applied throughout the country. 4. Regular visits to site would be required to re-fuel and for ash removal. 5. Fuel deliveries. In severe weather conditions remote sites may be inaccessible by delivery vehicles. • Combined Heat and Power (CHP). 1. Suitability. A site suitable for a CHP plant would have a constant electricity demand and heat demand as the units are most productive when they can run for as long a period as possible. This does not suit the majority of AGI's as the load profile of the heating is not usually constant. 2. Feed-In Tariff (FIT). When the study was carried out, the FIT was only applicable to units with a total installed capacity of 2kW, this is tiny relative to capacity of a preheating installation. For all of the above technologies it was considered that similarities were as follow. These ultimately all lead to higher whole life cost: • Each adds more moving parts therefore increases the risk of fault occurring i.e. more equipment on site results in more potential faults. • Each adds capital cost without offsetting 'usual' costs for a boilerhouse. This is because the renewables would need to be backed up by a traditional boiler in case of a fault. For example, in the case of no sunshine for the solar thermal equipment. • Each adds additional specialist maintenance costs. • By incorporating the technologies into the preheating equipment as shown in the diagram, the amount of water within the system must increase (note the buffer vessel). This results in an increased thermal inertia of the systems which can be expected to give slower response times and hence increased thermal losses.
Attachments	None
Verbal Clarifications (Consultants)	