Institution: The Glasgow School of Art
Unit of Assessment: 34 Art and Design: History, Practice and Theory
Title of case study: Wyndford options appraisal for Cube Housing Association

1. Summary of the impact (indicative maximum 100 words)

A 2008 'options appraisal' by the Mackintosh Environmental Architecture Research Unit (MEARU) for Cube Housing Association (CHA) impacted directly on practice apropos eliminating 'fuel poverty' (energy cost >10% disposable income) and complying with the Scottish Housing Quality Standard (SHQS) – this achieved by a major combined heat and power (CHP) installation linked to thermal upgrading (complete 2012). This tangible impact for CHA in turn helps Scotland to achieve its CO_2 reduction targets alongside improved public health. The initial research work by MEARU for CHA followed many years of work with energy efficiency and environmental quality in housing (2 below).

2. Underpinning research (indicative maximum 500 words)

Porteous initiated a European solar demonstration project (SE-167/88-UK) 'Passive Solar Retrofit of Thermally Substandard Housing at Easthall, Glasgow' – final report to Directorate General for Energy (Porteous 1994). The inclusion of glazed enclosure of former recessed balconies as part of a comprehensive energy retrofit had relevance for the Wyndord CHA Case Study 2. The tactic not only reduced heat loss, but also enhanced indoor air quality (IAQ), resulting in The monitoring of the landmark Easthall project, where such tactics could be measured for efficacy along with more routine energy measures, provided the evidence of increased comfort with elimination of 'fuel poverty' – hence an appropriate level of expertise required for the Wyndford options appraisal, underpinned in turn by evidenced health improvements (Lloyd et al, 2008; cited in 'Health Impact Assessment of Glasgow's Housing Strategy', disseminated June 2010). Similar to Easthall, at Wyndford the poor control of ventilation was perceived by CHA to be a related problem to that of sub-standard energy efficiency and poor heating control, with reliance on a combination of electric storage units and direct electric appliances. The glazing-in of balconies has so far been restricted to 9 storey Bison towers, where other constructional solutions to 'cold-bridging' heat loss were not viable.

This key role of IAQ relative to energy-efficiency is underpinned in another publication, which set the Easthall demonstration in a wider Scottish context (Porteous, 1996) and in a book, which widened the context internationally and included related investigations by MEARU (Porteous and Macgregor, 2005). Porteous and Rosalie Menon then explored issues around achieving carbon-neutral new-build housing, partly reliant on mechanical ventilation with heat recovery (MVHR) powered by building-integrated photovoltaic (BIPV) panels. (Porteous and Menon, 2008). The relevance of this theoretical new-build study in terms of the key retrofit impact at Wyndford, the installation of CHP together with related energy-efficiency measures, requires explanation. The nub is that such retrofitting in terms of practical achievability, although still well below current new-build insulation targets, provides a better heat-electricity balance for CHP than would a zero-energy or nearly zero-energy new-build. In the latter case, building-integrated renewable technologies can feasibly play a significant role; whereas, for Wyndford, such techniques were shown to have minor potential. A peer-reviewed paper (Porteous and Menon, 2008) summarised the key aspects of the full technical report and hence underpinned the primary impact – the large infrastructural investment of CHP (mooted as biomass at options appraisal stage) evidenced as the most practical approach. The wider physical impacts of upgrading, such as the enhanced appearance in the Easthall demonstration, underpins the already achieved, and further anticipated, improvement to quality of life due to mitigation of fuel poverty. Similarly, the 'pride-in-home' aspect, psychologically afforded by it being the largest EU project of its kind at that time, and the only one where the residents' association was the lead proposer, parallels the close involvement between Cube HA and the residents in this case. Moreover, the significance of the CHP in the context of Glasgow and Scotland should involve similar added-value impacts.

3. References to the research (indicative maximum of six references)

Colin D A Porteous, Passive Solar Retrofit of Thermally Sub-standard Housing at Easthall, Glasgow: Final Report – Results of the Monitoring Programme 1992-94, May 1994, Evaluation

Report to CEC Energy Directorate, E-1049, Brussels. Mackintosh School of Architecture, The Glasgow School of Art, Glasgow G3 6RQ, UK.
E L Lloyd, C McCormack, M McKeever and M Syme, The effect of improving the thermal quality of cold housing on blood pressure and general building health: a research note, 2008, Journal of Epidemiology and Community Health, Vol. 62, pp. 793-797.
Colin Porteous, Airing energy efficiency: home truths, 1996, alt'ing the Scottish Journal of Architectural Research, Vol. 1, No. 1, The Rutland Press, Edinburgh, pp. 17-28.
Colin Porteous with Kerr MacGregor, Ch 6 Machine Control, Harvesting hot air – integrated collectors, Solar Architecture in Cool Climates, 2005, Earthscan, London, UK, and Sterling, Virginia, USA, pp 190-192, ISBN 1-902916-62-X (266 pages).
C D A Porteous and R Menon, Towards Carbon-Neutral Housing in Scotland – New-build and Retrofit, 2008, Open House International, The Quest for Zero Carbon Housing Solutions, Vol. 33, No. 3, pp 70-87, ISSN 0168-2601.
C D A Porteous and R. Menon, Opportunities and Constraints for Upgrading 1960s Housing to Low-Carbon Status, 2008, Proceedings World Renewable Energy Congress 19-25 July, 2008, Glasgow, Scotland, UK. ISBN: 978 008 056 8973.

4. Details of the impact (indicative maximum 750 words)

Research in the years preceding the Wyndford study (cited above), together with that involved in the options appraisal itself, has underpinned the key impacts partly through national and international dissemination and incremental accretion of peer esteem, and partly because the research recommendations were practical and achievable. For CHA, the latter aspect meant that the retrofit measures, both constructional and servicing, were compatible with a viable business plan via their analytical model – Strengths, Weaknesses, Opportunities, and Threats (SWOT), an impact replicable by other housing associations with similar stock.

The citations (2-3 above) have their own trajectories in terms of readership, and have a role in underpinning the credibility of the key socio-economic impacts. Notably, the empowerment embedded in 'community technical aid' was the factor that demonstrated to the residents of Easthall the viability of retrofit as opposed to demolition. Upgrading was the route to the eradication of fuel poverty that was desired, and today, for the residents of Wyndford, the principle has been extended in an important way. The 1960s Wyndford mix of four different systems of high-rise (lift access) with low-rise (walk-up access) had all-electric heating based primarily on storage units. The occupants found these difficult to control and therefore augmented them with direct-electric heaters on a much more expensive tariff. The retrofit to CHP has meant that heat is now delivered to all spaces by responsive 'wet' radiators, all with valves enabling fine-tuning in each room. Although we are now used to seeing high-rise towers blown up (three in Greenock 11/03/13), this is an intrinsically expensive route to achieving the required number of affordable, energy-efficient housing units. Retrofit is essential, and the transition from unwieldy electric heating to the responsive systems provided by CHP is a paradigmatic impact. The other key impact of the CHP from the landlord's perspective is the electricity generated offsets the considerable power demand for lifts and communal lighting.

The reach and significance of such impacts first and foremost improves the lives of the residents of this large-scale 1960s urban housing. The upgrade also impacts tangibly on Cube HA, not simply in its compliance with the 2015 SHQS, but also in its standing as a leading and innovative housing landlord and developer. This is the largest CHP retrofit project in West Scotland to date, and the visibility of its central plant room, not to mention the visibility of the associated over-cladding, will help to extend the reach and significance of the impacts well beyond Glasgow, with the internet a powerful lay vehicle. An invisible aspect, such as the daunting economic challenges for the business model required to bring about fruition from the underpinning research, is also likely to have significant impact on elected councillors, Members of the Scottish Parliament (MSPs) and their respective local and devolved governmental instruments in Scotland. Further, once interest is raised to that level, it tends to spread. The Wyndford CHP upgrade will certainly impact on other parts of the UK, and is also likely to interest our European neighbours who still have thermally sub-standard housing stock.

The CHP system at Wyndford has been operational for only a year (First Minister Alex Salmond carried out the official switch-on in November 2012) and the over-cladding work is ongoing. Therefore, measured impact in terms of improved comfort and control of comfort in these dwellings remains downstream at this point. The same applies to health improvements, and the health study led by Lloyd as a 21st C spin-off from the 1990s Easthall demonstration provides extrapolative evidence for Wyndford. Financial benefit to CHA and its residents will also partly depend on the precise details of CHA's business model, apropos tariffs, flat-rate or metered charging and so forth. What can be said at this stage is that although SHQS compliance was the initial driver, and Cube HA has to balance its books in a relatively demanding financial climate subject to an interactive set of constraints and stressors, it also had from the outset a wider altruistic agenda with the residents at its heart. More than 1500 Cube Housing Association tenants and around 200 owners are benefiting from cheaper fuel bills (http://cubehousing.co.uk/home/home.asp).
Wider impacts will in their turn be partly dependent on the published performance after a period of time, as well as the publicity machines of CHA, associated bodies such as Glasgow Housing Association (GHA), umbrella organisations such as the Scottish Federation of Housing Associations (SFHA, the utility company involved, local government and governmental instruments and voluntary sector NGOs such as Energy Action Scotland.

5. Sources to corroborate the impact (indicative maximum of 10 references)

External sources to corroborate underpinning work relative to case study:

Directorate General for Energy, DG (Ener) [formerly DG 12], Rue J-A Dermot, B-1040 Brussels: relative to Final Report of Demonstration Project SE-167/88-UK, 1994, cited as underpinning work relative to impacts of case study.

Glasgow City Council and Glasgow Centre for Population Health, 'Health Impact Assessment of Glasgow's Housing Strategy 2011-2016, June 2010; reporting findings of half-day workshop 5th May 2010, which identified potential health and wellbeing impacts of Glasgow's Local Housing Strategy (LHS); citing the article by Lloyd et al (section 3) relating to the Easthall solar demonstration project and its significance, including for upgrades such as that achieved at Wyndford:

"Findings from the Easthall study find support in the evidence from an extensive body of research studies from across the UK and abroad and this strongly suggests that the greatest potential for investment in housing as a health improvement strategy appears to be in targeting improvements in affordable warmth at vulnerable households who have poor health and live in poor housing."

This statement takes its lead from conclusion in the Abstract of Lloyd et al's article in the Journal of Epidemiological and Community Health, 2008:

"Improving the thermal quality of housing to eliminate damp and mould and produce a comfortable temperature throughout the house has a major impact on the health of the residents. There are also financial benefits for the residents and indirectly for the NHS."

Cube Housing Association, McCafferty House, 71 Firhill Road, Glasgow G20 7BE,
tel: 0845 250 7966: copy of Final Report 'WYNDFORD ENERGY EFFICIENCY OPTIONS APPRAISAL for CUBE HOUSING ASSOCIATION', Mackintosh Environmental Architecture Research Unit (MEARU), Mackintosh School of Architecture, The Glasgow School of Art, August 2008

Prof. Joe Clarke, ESRU, University of Strathclyde, Montrose St, Glasgow, e-mail: joe@esru.strath.ac.uk as organiser/chair of World Renewable Energy Conference 2008, Glasgow, with underpinning research paper 'Opportunities and Constraints for Upgrading 1960s Housing to Low-Carbon Status' in Proceedings ISBN: 978 008 056 8973.

Sources to corroborate impact relative to case study

Cube Chief Executive Lynn McCulloch said:

"We wanted our high-rise tenants to have warmth they could control and afford, but we didn't have the funding for the established approach of cladding and new electric heating. The district heating system allowed us to reduce heating bills, cut carbon emissions and meet the Scottish Housing Quality Standard."

(http://www.cubehousing.co.uk/home/home.asp)

Cube Housing Association website "What's New' Nov. 2012 and March 2013:

First Minister Alex Salmond said:

"I am delighted to officially launch Cube Housing Association's new, state-of-the-art heating and hot water system in Glasgow. This new plant is one of the largest in the UK and it will provide low cost hot water and heat to more than 1,500 homes at the Wyndford Estate in Maryhill.
"This project is a fantastic example of what district heating can bring to a community, helping to lift people out of fuel poverty by lowering their fuel bills, while at the same time reducing the total carbon emissions from the estate.
"The Scottish Government is committed to supporting the development of district heating networks, just like this one, right across Scotland. They help homes and businesses stay warm, create jobs and help the whole country meet its obligations to reduce our carbon footprint."

Liz Ruine, Chair of Cube Housing Association, said:

"Cube wants its tenants to have modern homes that are affordable to run. This is a fantastic collaboration between the public and private sectors to improve the lives of hundreds of tenants and homeowners.
"We are delighted to welcome the First Minister to Cube and show him how we are helping our tenants find new innovative ways to cut their heating bills."

Work on the site began in January this year (2012) and all of Cube's tenants should be connected to the new heating system in time for Christmas.

SSE, working with its partner Vital Energi, designed and built the district heating system and will operate it on behalf of Cube. Scottish Gas has supplied £2million of funding for the power station and is also managing and funding the overcladding work.

Jon Kimber, Managing Director of British Gas New Energy, said:

"This has been an ambitious project which will transform the homes and lives of Cube tenants. Scottish Gas is proud of the part we have played in it, as part of our commitment to improving the energy efficiency of Scottish communities."

Jim McPhillimy, Managing Director, SSE Group Services, said:

"SSE is delighted to have delivered this state-of-the-art scheme and we look forward to providing affordable heating and hot water to our customers on the Wyndford estate for many years to come.
"We've already had some great feedback from residents who are enjoying noticeably warmer homes and this makes all the hard work worthwhile.
"SSE is committed to helping communities realise their green ambitions and this project is a shining example of what can be achieved through effective collaboration, targeted financial support and a shared focus on a sustainable future."

(http://www.cubehousing.co.uk/WhatsNew/November_2012.asp)