Your Retrofit Alone is Not Enough

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Note: All views in this article are those of the author and not Merthyr Valley Homes.

Retrofit alone is not enough.

This is the conclusion I've come to, despite two decades of exhorting Welsh Government and others to forget about electricity supply and focus instead on demand management and energy efficiency.

Why? Well...

Retrofit alone is *mostly* pointless for poor quality, old, social housing (although frankly, I think what you're about to read is probably applicable to poor quality old *private* housing like mine). And I would argue, it's almost pointless for domestic properties in the absence of widespread electrified space-heating drawing on a green grid.

So in Wales for at least the next decade.

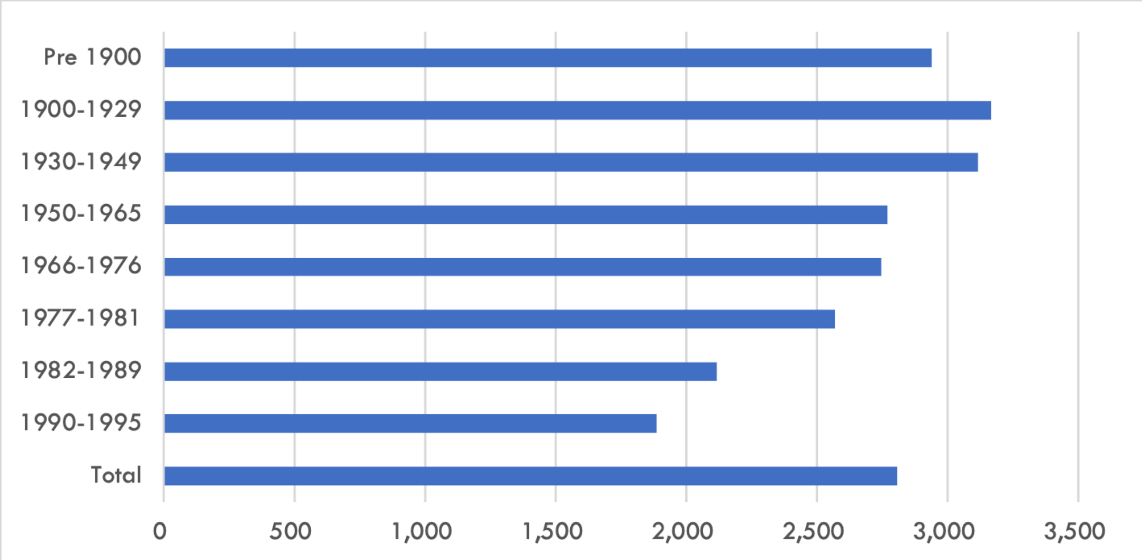
This revelation came from a deeply interesting project I did in collaboration with Merthyr Valley Homes (MVH), a mutually-constituted housing association with around 4,000 homes concentrated largely in Merthyr Tydfil town, and consisting largely of former council houses and flats. MVH is, of course, desperate to plot a course to Net Zero that is fast, fair and inclusive. And with around 75% of its carbon footprint associated with powering tenants' homes, MVH has (like other RSLs) embarked upon a programme of 'fabric first' retrofit to make its homes more energy efficient, comfortable and lower-emitting.

Our project estimated the MVH carbon baseline for both operational spending (all Scopes) and homes. For the latter, we were able to match each MVH home with UK Government data on the mean and median energy use (electricity and gas) for calendar year 2021 for houses in the relevant 7-digit postcode. With the majority of MVH housing clustered in large contiguous 'chunks' on Merthyr housing estates (such as Gurnos, Gellideg and Galen Uchaf), the full postcode data on energy use (and by extension carbon emissions) is a good proxy for MVH homes' emissions.

The key benefit of this approach is that MVH holds extensive data about each of its homes, covering archetype, construction method, age, and number of bedrooms. Critically (for this missive at least) MVH also holds good and recent data on SAP rating and EPC for each property. Accepting, then, a margin of error inherent in 'averaging' property energy use for each 7-digit postcode, we know a lot about what kind of houses have what kind of energy - and hence climate - footprint.

The results are largely intuitive. For example, the older the home, the worse the higher energy footprint (generally, and ignoring inter-relationships between age, size etc.). homes built in the 1990s have an energy/climate footprint 35% lower than those built before 1930.

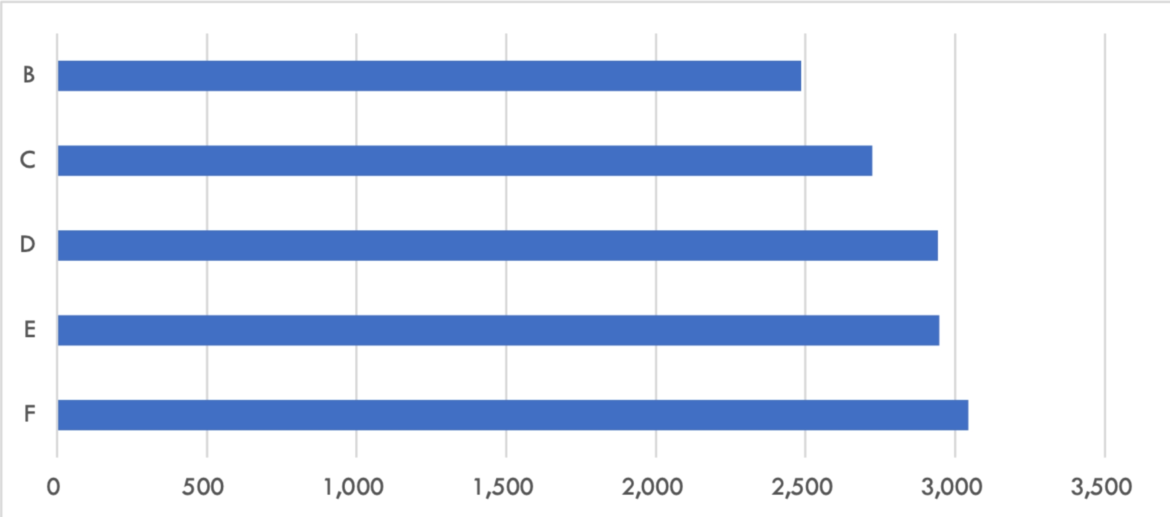
(kg CO2e)	TOTAL_GHG_UK_BASIS	GHG_Gas	GHG_Electricity_UK	Count
Pre 1900	2,939	2,353	586	22
1900-1929	3,167	2,475	692	220
1930-1949	3,115	2,420	696	630
1950-1965	2,769	2,168	601	1,697
1966-1976	2,747	2,153	594	1,050
1977-1981	2,568	2,019	549	344
1982-1989	2,117	1,764	353	29
1990-1995	1,886	1,408	478	26
Total	2,808	2,196	612	3,996



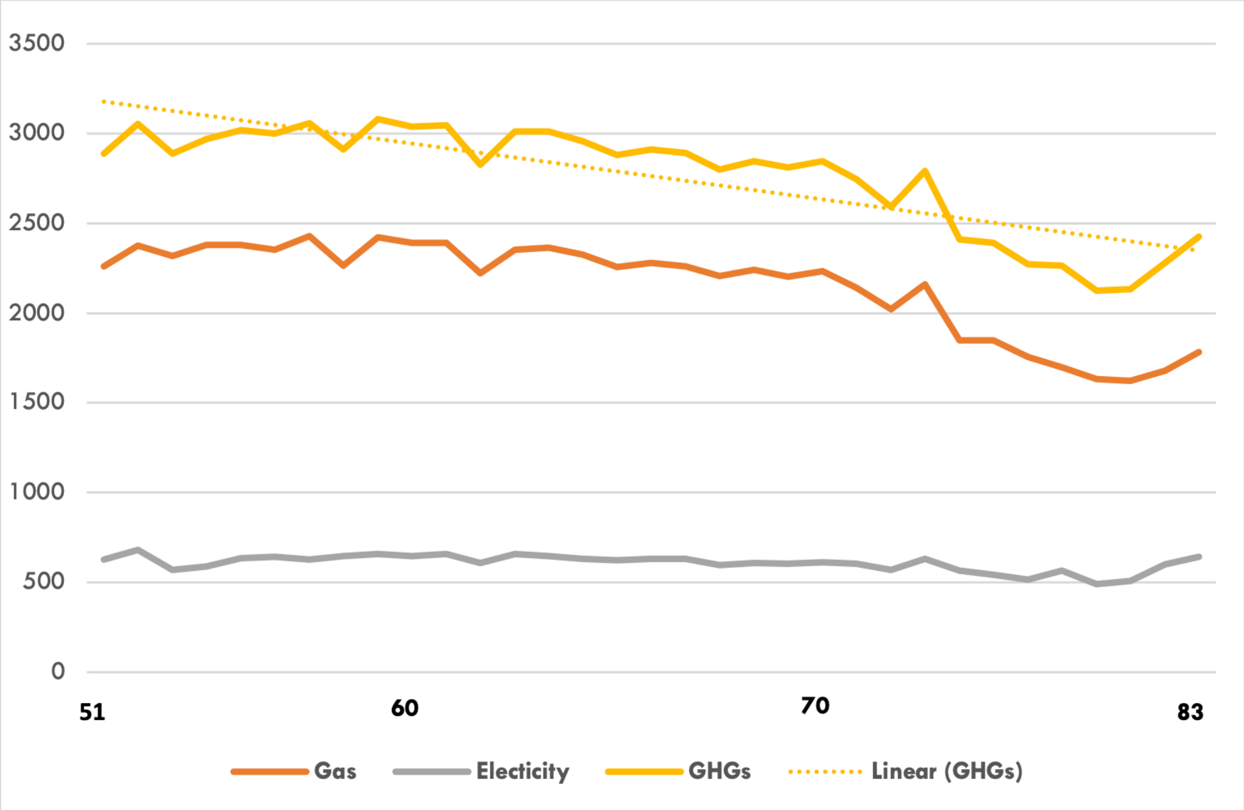
It is of course the old, difficult houses, prevalent in Wales that are at the front of mind regarding the retrofit of energy efficiency measures. As Figure 1 shows, for social housing at least, pre-1981 houses are pretty much - well, a bin fire - emitting over 2.5 tonnes of CO2 each per annum and with pre-war housing (clearly very different in construction) over 3 tonnes. Unfortunately, further investigation of our data suggests remedial measures - at least those assessed by improved SAP ratings and EPC performance - may be less than transformative. For example, MVH houses are clustered largely in EPC ratings D (1571 homes) and C (2,325 homes). The former emit 2.9 tonnes of CO2 per annum (as do those in EPC E), the latter 2.7 tonnes - an improvement of some 7.5%. Dragging homes into EPC B would appear to generate a further improvement, with a 2.5 tonne energy footprint comprising a 15% improvement over EPC D (Figure 2).

As for further improvement... MVH has no EPC A properties in its database.

(kg CO2e)	GHG_UK_BASIS	GHG_Gas	GHG_Electricity_UK	Count
B	2,486	1,847	639	47
C	2,723	2,126	597	2,325
D	2,941	2,306	635	1,571
E	2,947	2,335	612	89
F	3,043	2,412	632	6
Grand Total	2,808	2,196	612	4,038



Further illustration can be gained by turning to the Standard Assessment Protocol, SAP, a far more nuanced rating given to properties' energy efficiency. Figure 4 reinforces the argument that changes across the middle of the efficiency spectrum might have very limited impacts - different SAP ratings of between 50 and 70 seem to have an extremely limited relationship with the use of mains gas, with the latter only declining as SAP rises beyond 70, i.e. for the very best houses (of which MVH has relatively few). Electricity use meanwhile does not decline at all as SAP rises, being extremely rare as a heat source for these homes.



What does this mean in practice? Well, the 900 MVH worst SAP-rated homes generated on average an estimated 3 tonnes of GHG in 2021, compared to around 2.5 tonnes for the 900 best-rated. Thus, Moving a home from the *lowest* to *highest* performing quartile would, all other things remaining equal, save around 15% of GHG emissions from that property.

This level of SAP improvement is... definitely not pointless if only for the comfort and cost savings it brings, but for the climate, clearly not at all adequate. The idea that retrofit energy efficiency measures for poor quality housing will contribute anything very significant to the Net Zero challenge must be in question. A raft of measures might improve matters more than these somewhat superficial estimates suggest - a real push towards EPC B and A, together with strong behavioural and educational interventions with clients might lever a handful or two of further percentage savings. But the financial and human resource implications of such interventions are, in the current climate, stark.

These data suggest a far deeper transformation is required. The electrification of heating via heat pumps is the clear front-runner option, but financial, fabric and behavioural challenges, for both housing associations and tenants, remain. And even if we were to electrify heating in this way, we still sit, in south Wales at least, on the joint-dirtiest regional grid in Britain: almost wholly reliant for electrons on the burning of imported gas from Pembroke, and with almost imperceptible progress in decarbonisation in the last decade. The key learning from this work is then not really for housing - it is for a creaking, use-blind and slothful behemoth of a grid which has become perhaps *the* major obstruction to a more climate-responsible future.

For this sector - or at least this type of home - the cost per unit to *really* decarbonise gut-feels prohibitive. Maybe these sorts of houses - and maybe the sort of turn-of-the-century Valleys terrace I live in - can never be made Net Zero compliant in a way that makes sense; too leaky, too thrown-up, too crap to ever sip parsimoniously at energy in a more constrained post-carbon world. And if they *are* all obsolete... what should we do with them?