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A 'whole-system' approach to hot water

An RMIT University investigation into the environmental impacts of hot water systems has revealed the need for greater flexibility in Australian building policies, writes Paula Wallace.

Researchers from RMIT's Centre for Design have for the first time compared the impact across the life cycle of a gas centralised hot water system with a point-of-use instant electric system in medium and high-density apartments.

Alan Pears, senior lecturer in environment and planning at RMIT, said the results of the comprehensive life cycle assessment showed current policies favouring gas and gas-solar hot water systems were short sighted, reflecting the lack of a whole-system approach to measuring environmental impact.

"Our findings show there are significant opportunities today, and in coming years, for point-of-use electric systems to perform better than gas and solar-boosted gas, in greenhouse gas emissions and energy demand," Pears said.

He said context is the key to choosing environmentally-friendlier hot water systems and that policymakers should consider a systems approach in regulation.

"Because of their strong energy efficiency, point-of-use electric hot water systems could also be the choice to ensure future-proofing of developments, as future grid emission reductions combine with efficiency for strong environmental outcomes."

It's important to note that the study does not suggest the optimal solution in all situations is a point-of-use electric system. However, the case studies demonstrate that where distribution losses are high and hot water use is low, an electrical system can be more efficient.

The independent research, which assessed greenhouse emissions, water use, solid waste and cumulative energy demand and included the use of dynamic thermal modelling software, was commissioned by Australian-owned MicroHeat Technologies.

While the study found gas currently scored better on greenhouse emissions in coal-reliant Victoria over the life cycle, the electric system could perform better with green power now and in coming decades when there is more grid renewable energy.

Translating the findings to warmer states that have more green power feeding into their grids showed the point-of-use system already performs better for average hot water use and on greenhouse emissions in the smaller building.

Commercial implications

In the first instance, MicroHeat patented technology is being applied to two categories of on-demand, continuous flow, electrical, water-heating appliances for installation at the point-of-use: hot water services (kitchen/bathroom/laundry) and boiling water dispenser services.

MicroHeat's unique rapid fluid heating technology does not rely on heat exchange technology as does every other water heating appliance.

Cedric Israelsohn, technical director at MicroHeat, told WME, "the elimination of heat exchange technology allows energy utilisation efficiencies of greater than 99% to be achieved".

In addition, the technology is being applied to electric vehicle air conditioning systems. The MicroHeat technology platform can be applied to many and varied fluid heating applications, where immediate and accurate temperature control is critical.

"The point-of-use electric philosophy drives right across residential or commercial high rise ... you only reticulate cold water," said Israelsohn, adding this can dramatically reduce infrastructure and maintenance costs and improve the energy rating of buildings.

However, the uptake of electric hot water system has been slow in Australia, a trend he attributes to lack of experience in these systems and "unfounded fear".

"There is a fear that everyone will turn on the hot water at the same time... and the instant energy required will be overwhelming," said Israelsohn. But he points to Europe to counter these claims, where there is almost universal use of instantaneous electric hot water systems.

"What we're proposing is that you only use energy when you need it ... there's no heating in anticipation of use, where eliminating the need to store hot water eliminates associated heat and energy losses," said Israelsohn.

He said a large commercial property developer has successfully trialled the MicroHeat system at an existing retail complex, where it independently evaluated their performance and found that they used significantly less energy than a conventional electric storage tank type hot water system.

Read the full RMIT report [here](#) (PDF File link)

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FACT FILE: Electric vs Gas

Testing by RMIT of the MicroHeat point-of-use electric product and comparing it with a gas system over the life cycle in an 8-apartment building and a 257-apartment building, found:

- In operation, point-of-use was up to 3.1 times more energy efficient than gas in the medium-density block (up to 1.6 times compared with solar-boosted gas); and
- In operation, point-of-use electric was up to 2.3 times more energy efficient than gas in the high-density building.

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