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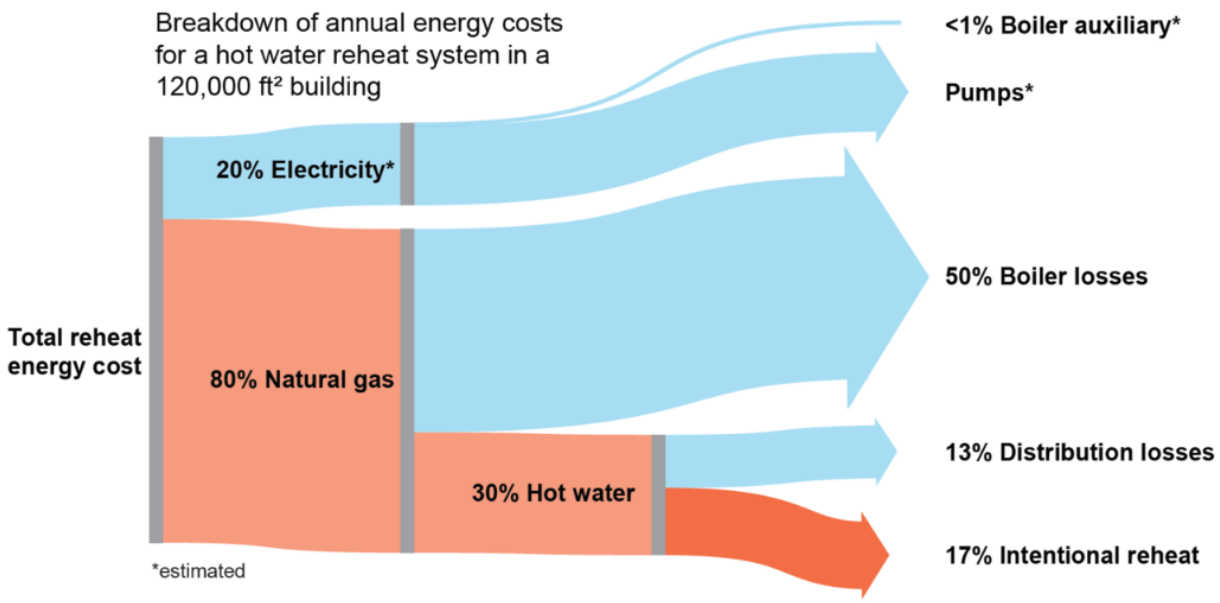
Hot water distribution system efficiency

Additional submitted attachment is included below.

Center for the Built Environment
An Industry/University Research Collaboration
University of California, Berkeley

Hot water reheat distribution system efficiency

Hot water reheat systems supplied by a gas boiler are very common – they are in most medium and large commercial buildings in California. For the first time, we analyzed data in depth from such a system in a large commercial office building. The losses from the distribution system were quite high, particularly as a fraction of the actual reheat requirement in the building (which was quite low). Similarly, the efficiency of the gas boiler was very poor because it operated at very low part loads. Overall, the energy cost efficiency was just 17%! (see figure below). We compared this to other buildings using utility bill level data, and the results suggest that this may be a common problem that hasn't been brought to light before. For more detail, please see a one page overview **here** or the full paper (available open access **here**).



This poses several interesting areas for further research, for example to:

- Determine cost effective ways to reduce these losses and improve the energy efficiency of these systems in both new and existing buildings (hot water supply temperature reset, boiler replacement, etc.)
- Develop design guidance for new buildings and/or major retrofits. For example, in this building, the losses were so high that an all-electric reheat system with photovoltaic panels would likely have been *cheaper to install and cheaper to operate*.

This seems like a valuable topic for further research under the Natural Gas Research Initiative, particularly given California's goals of energy efficiency and decarbonization.