**Development of a validated TRNSYS model of solar photovoltaic thermal systems for combined heat and power production in northern maritime climates**

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Abstract:

Experimentally validated numerical models of a flat plate non-concentrating and a concentrating heat-pipe solar photovoltaic thermal systems were developed using TRNSYS software and experimental data collected from indoor testing using the solar simulator facility at the University of Ulster. A concentrating system was designed to see if the required absorber area of solar photovoltaic thermal systems could be reduced which would make solar energy systems more cost effective. The thermal performance of the two systems was tested side by side according to the procedure outlined in British Standard BS12975-2:2006. The allowed the derivement of efficiency curves for both solar collectors and the measurement of the heat removal factor and heat loss coefficient of both systems. The simulations revealed that the heat-pipe system has potentially the best performance for northern maritime climates such as the UK. A life cycle costing for both systems using the results from an annual simulation to determine the likely fuel savings is presented and discussed.