

Roof Integrated Photo Voltaic with Air Collection on Glasgow School of Art Campus Building: A Feasibility Study

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Abstract : Building integrated photovoltaic systems with air collectors (hybrid PV-T) have proved successful however there are few examples of their application in the UK. The opportunity to pull heat from behind the PV system to contribute to a building's heating system is an efficient use of waste energy and its potential to improve the performance of the PV array is well documented. As part of Glasgow School of Art's estate expansion, the purchase and redevelopment of an existing 1950's college building was used as a testing vehicle for the hybrid PV-T system as an integrated element of the upper floor and roof. The primary objective of the feasibility study was to determine if hybrid PV-T was technically and financially suitable for the refurbished building. The key consideration was whether the heat recovered from the PV panels (to increase the electrical efficiency) can be usefully deployed as a heat source within the building. Dynamic thermal modelling (IES) and RetScreen Software were used to carry out the feasibility study not only to simulate overshadowing and optimise the PV-T locations but also to predict the atrium temperature profile; predict the air load for the proposed new 4 No. roof mounted air handling units and to predict the dynamic electrical efficiency of the PV element. The feasibility study demonstrates that there is an energy reduction and carbon saving to be achieved with each hybrid PV-T option however the systems are subject to lengthy payback periods and highlights the need for enhanced government subsidy schemes to reward innovation with this technology in the UK.

Keywords : building integrated, photovoltaic thermal, pre-heat air, ventilation

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