

CONVECTIVE HEAT TRANSFER COEFFICIENTS FOR PHOTOVOLTAIC-THERMAL ROOF SYSTEMS

Background

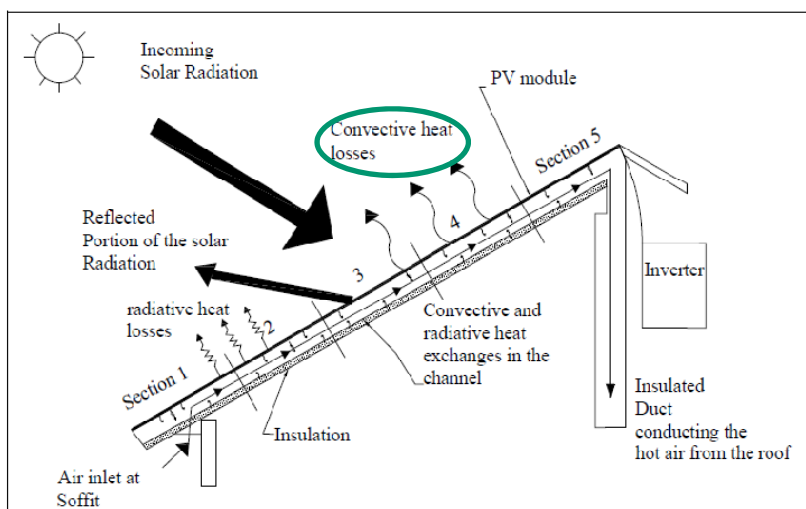
Commercial photovoltaic systems convert 6-18% of the solar energy into electricity. An additional 20-50% can be recovered as heat if innovative technologies are implemented.



Photovoltaic-Thermal (PV/T) roof system

Objective

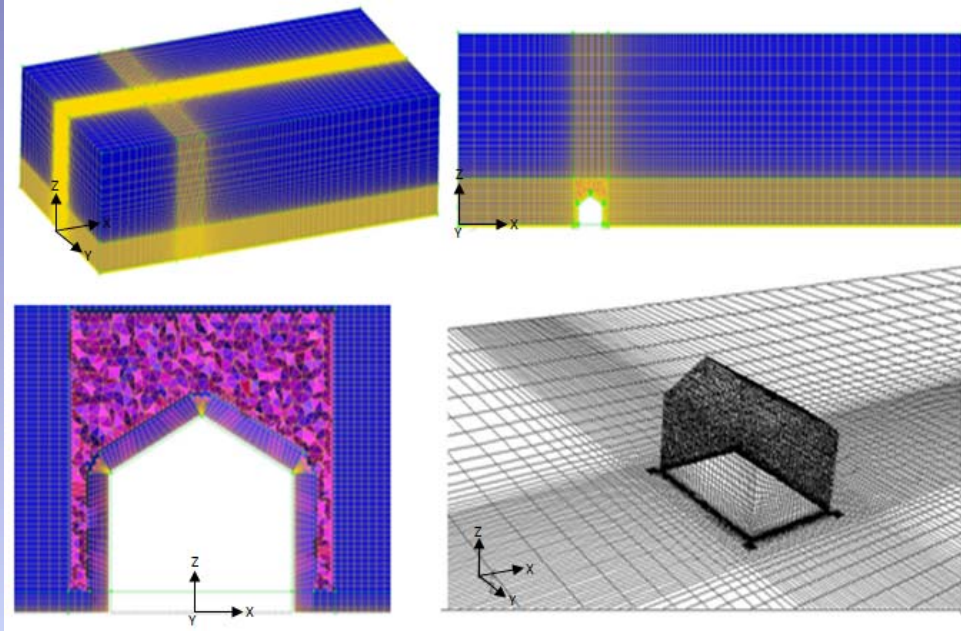
Evaluate exterior convective heat transfer coefficients (CHTC) for a PV/T system on a low-rise building and study the effects of reference wind speed and direction and roof slope.



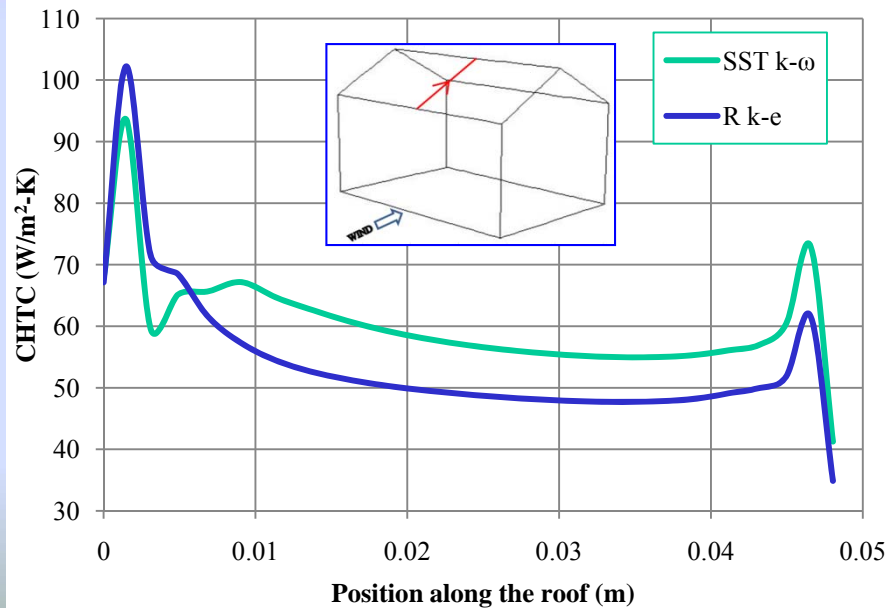
Open loop air based BIPV/T system

Research Carried Out

High-resolution 3-D steady RANS simulations with different turbulence models were performed and validated by a wind tunnel study undertaken using a 1:50 scale building model.



3D grid and mesh arrangement



CHTC along the roof of the house

Key Findings

Higher CHTC observed near the lower edge of the roof. SST k- ω turbulence model showed better match in the validation study. Realizable k- ϵ turbulence model under-predicts CHTC on the roof.