

SUNY-ESF, March 20, 2009



Session Title: Design, Installation and Monitoring of Small Solar Thermal Systems

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ABSTRACT: Solar thermal heating is the most important renewable energy technology for buildings in cold climates. As building efficiency becomes paramount, building codes will not allow structures to be built without passive and active solar thermal systems serving as the primary heat source. Regardless of the overall heat load of a building, current technology makes it relatively easy to provide 100% of the domestic hot water (DHW) for a building's occupants - several examples of such systems will be shown. In contrast, the feasibility of solar space heating depends critically on the thermal performance of the structure. We have found that existing buildings with average levels of insulation, even those meeting current code requirements, are not good candidates for such systems. Heat load and economic analyses will be presented that clearly demonstrate why this is so. For new construction, it is now the ethical responsibility of building architects and engineers to design structures with net zero energy use and minimal adverse effect on our environment. With rare exception, new buildings should incorporate both passive and active solar thermal systems to meet the anticipated heat load — combustible fossil fuels will still have a role, but only for backup. This is the reality of well-designed solar DHW systems now. Further, once designed and built, monitoring systems must be in place to demonstrate that a building's systems and energy flows are working according to designers' claims. Finally, building designers must consider the full life cycle costs and environmental impact of solar thermal and other building systems — how will the system be maintained, how long will it last, and how will it be recycled and replaced at the end of its service life?