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**Thesis: Modeling and Evaluation of the NIST Net Zero Energy
Residential Test Facility**

Motivation

- The residential sector consumes over 20% of the total energy use in the U.S.
- Net zero energy buildings reduce energy consumption and reduce dependence on non-renewable energy sources.
- As interest in building net zero energy houses grows, there is an increased interest in research into optimal residential alternative energy systems.

Overview

- NIST has built a net zero energy residential test facility (NZERTF) in Gaithersburg, MD.
 - Over the course of its first year of operation, it produced more energy than it consumed.
- A model of the NZERTF has been developed by Brian Leyde (2014).



Objectives

- Validate the NZERTF model
- Use model to evaluate various alternative energy system configurations
 - Heating domestic water with solar thermal collectors vs. photovoltaic panels and a heat pump hot water heater
 - Enthalpy exchanger vs. heat recovery ventilation system
 - Ground-source heat pump vs. air-source heat pump
 - Ground-source heat pumps with slinky or horizontal vs. vertical tube ground heat exchangers
- Predict NZERTF behavior in other climates