RESEARCH in Progress

Forest Products Laboratory

Integrating Renewable Energy and Water Systems for Cold Climates

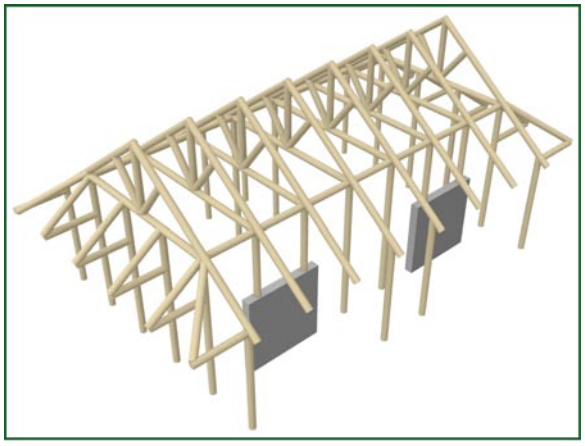
Energy and water are critical and strategic resources. The residential sector accounts for 22% of annual energy consumption in the United States and average per capita water consumption exceeding 100 gallons per day. While conservation may provide modest gains in efficiency, sources of energy and water are likely to change as we find better ways to use natural resources.

Background

Small-diameter trees, harvest rainwater, and energy (thermal and electrical) from wood waste and the sun are plentiful and renewable resources. Effective use of these resources can provide a sustainable support system for cold-climate housing by reducing reliance on fossil energy and groundwater. The technologies needed to effectively use these resources are being developed and require validation and testing in real-world settings to determine how far we can go toward achieving a zero energy and water house in cold climates.

Objectives

This applied research project has two principal objectives: (1) To test how sustainable resources—renewable energy, harvest rainwater, and small-diameter trees—can be strategically combined in a system that meets the energy and water needs of a typical cold-climate residential household and (2) to effectively interpret the system and results to the public.



Small-diameter roundwood frame.

Approach

This project was conceived as an extension of the potable rainwater harvesting project being conducted by the University of Arizona's Environmental Research Laboratory. For efficiency, it was combined with the BioMax wood waste energy research project being conducted by the Forest Products Laboratory (FPL) at its research demonstration house in Madison, Wisconsin. Energy from the sun (via photovoltaics) and forest thinning waste will be used to produce electricity and heat. Rainwater will be harvested, stored, and disinfected to produce potable water.

A building to house the infrastructure for both projects will be constructed near the FPL research demonstration house from small-diameter trees from forest thinning. Universal design will afford access to all visitors so that the systems being evaluated can be effectively interpreted to the public.

The building, appropriately scaled to fit the site and complement the existing research demonstration house, will be the size of a contemporary two-car garage and workshop. This new building is of a scale and utility

to demonstrate the technical feasibility of using small-diameter roundwood in a utility building and its potential for acceptance in the conventional housing market.

Expected Outcomes

This project will show that (1) the BioMax wood pellet energy system and solar energy can together meet most of the power needs for a residential unit in cold climate, (2) rainwater can be reliably treated for potable use, (3) systems to save energy and water are safe and reliable and provide sustainable security, and (4) these technologies are available and work well in cold climates.

Timeline

- Project schematic design through 2005
- Systems and design development, February 2006
- Construction documents, May 2006
- Bidding and construction, summer 2006
- Systems installation, fall 2006
- Operations and testing, spring 2007

Cooperators

University of Arizona
USDA Forest Service, Forest Products Laboratory

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