Prototype House Provides Test Case for Energy-Efficient Systems

Mitchell Homes — Pensacola, Florida

Building America is sponsored by the U.S. Department of Energy. The program aims to:

- Build 2,000 efficient, affordable homes by the end of 2000
- Reduce energy use and construction time and waste by 50%
- Improve indoor air quality and comfort
- Encourage a systems-engineering approach for design and construction in 70% of new homes by 2010.

The Carbelle prototype house is a new design produced under the U.S. Department of Energy's (DOE's) Building America program. Design features include:

- **Windows**—Double-pane windows, with low-emissivity coating and thermal break in aluminum frames. Less heat from the sun and the outside environment enters the house through the windows.
- **Heating and Cooling**—Efficient air source heat pump instead of gas furnace and electric air conditioner.
- **Distribution System**—Ductwork partially moved inside. The air distribution system for a typical home is exposed to a hot vented attic, where conditioned air is warmed and air leaks to the outside. The Carbelle design loses less cooling energy because more of the ductwork is within conditioned space.
- **Lighting and Appliances**—Compact fluorescent lighting and Energy Star-certified appliances. Standard homes primarily use less efficient incandescent lighting and appliances that do not meet efficiency standards set by the federal Energy Star program.
- **Architectural Design**—More open floor plan with additional daylighting and ceiling volume and a simpler roof shape. These features result in a small energy penalty, but lead to better lighting quality and lower construction cost.
- **Energy Star Rating**—The Carbelle uses at least 30% less energy than standard new construction as defined by the DOE/U.S. Environmental Protection Agency Energy Star Homes program.

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The first Carbelle prototype house in Pensacola, Florida, built by Mitchell Homes under DOE's Building America program.

Working with other members of the Consortium for Advanced Residential Buildings, Mitchell Homes developed the Carbelle as an energy-efficient upgrade to one of their standard models. By treating all design aspects of the house as a system and involving all stakeholders in the process, Mitchell expects to decrease on-site energy use for space heating and cooling by as much as 40% compared to their typical construction. The improvements will be accomplished with limited impact on initial cost.

The Carbelle's intended design features are the result of systems engineering, marketing, and architectural studies conducted to identify the optimal combination of building envelope materials, mechanical systems, appliances, and lighting. Not all features have been implemented for the first prototype house.

BUILDINGS FOR THE 21ST CENTURY

Buildings that are more energy efficient, comfortable, and affordable ... that's the goal of DOE's Office of Building Technology, State and Community Programs (BTS). To accelerate the development and wide application of energy efficiency measures, BTS:

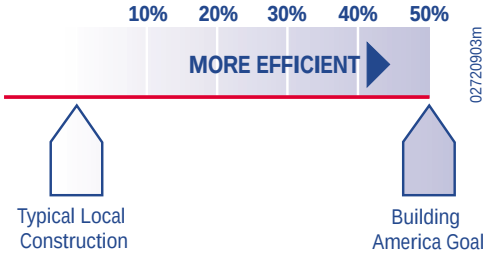
- Conducts R&D on technologies and concepts for energy efficiency, working closely with the building industry and with manufacturers of materials, equipment, and appliances
- Promotes energy- and money-saving opportunities to both builders and buyers of homes and commercial buildings
- Works with state and local regulatory groups to improve building codes, appliance standards, and guidelines for efficient energy use
- Provides support and grants to states and communities for deployment of energy-efficient technologies and practices.

The Approach

Building America's systems-engineering approach unites segments of the building industry that have traditionally worked independently of one another. It forms teams of architects, engineers, builders, equipment manufacturers, material suppliers, community planners, mortgage lenders, and contractor trades. More than 150 different companies make up the five Building America teams:

- Integrated Building and Construction Solutions (IBACOS)
- Consortium for Advanced Residential Buildings (CARB)
- Building Science Consortium (BSC)
- Hickory Consortium
- Industrialized Housing Partnership.

Building America Performance Goal



The teams design houses from the ground up, considering the interaction between the site, building envelope, mechanical systems, and other factors. With this approach, the teams can incorporate energy-saving strategies at little or no extra cost.

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Printed with a renewable-source ink on paper containing at least 50% wastepaper, including 20% postconsumer waste

January 2000 NREL/FS-550-27209