



by Smart Home Plans, LLC

BUILDING AMERICA TOP INNOVATIONS HALL OF FAME PROFILE

INNOVATIONS CATEGORY:

2. House-as-a-System Solutions
- 2.1 New Homes with Whole-House Packages

High-Performance Home Cost Performance Trade-Offs Production Builders

Building America helped Tommy Williams Homes of Gainesville, FL, increase insulation and air sealing and cut air conditioner size by a ton, saving \$1,000 per home.

Building America's research teams have partnered with more than 300 production home builders to conduct field studies impacting over 40,000 homes since the program began in 1995. By documenting meaningful energy savings at minimal increased first cost, these field studies have encouraged the strong market response to voluntary label programs like ENERGY STAR for Homes and DOE Challenge Home. Today these programs represent nearly 30% of the new homes market, with more than 1.3 million homes labeled.

Building America field projects with production builders have demonstrated that high-performance homes experience significant cost trade-offs that offset other cost increases. This proved transformational, gaining builder traction with related market-based programs like ENERGY STAR for Homes and DOE Challenge Home.

“Break points” or cost trade-offs that are identified during the engineering analysis of the residential construction process can yield two types of business savings: 1) reductions in costs of warranty and call-back service; and 2) offsets or “credits” attributed to reductions in other construction costs. The tables below show examples of cost and savings trade-offs experienced by Building America projects in hot-dry and cold climates.

Energy-Efficiency Measures Yield Trade-Offs in Costs & Savings

How Energy Upgrades Change First Costs – Hot-Dry Climate Example

Unvented Roof	+ \$750
NOT Installing Roof Vents	- \$500
High-Performance Windows	+ \$300
Controlled Ventilation System	+ \$150
Downsize Air Conditioner 2 Tons	- \$1,000
Sealed Combustion Furnace	+ \$400
TOTAL ADDED COST	+ \$100

How Energy Upgrades Change First Costs – Severe Cold Climate Example

Advanced Framing	- \$250
High-Performance Windows	+ \$250
Controlled Ventilation System	+ \$150
Power Vented Gas Water Heater	+ \$300
Simplified Duct Distribution	- \$250
Downsize Air Conditioner 1 Ton	- \$350
TOTAL ADDED COST	- \$150



BUILDING AMERICA TOP INNOVATIONS

Recognizing Top Innovations in Building Science – The U.S. Department of Energy's Building America program was started in 1995 to provide research and development to the residential new construction and remodeling industry. As a national center for world-class research, Building America funds integrated research in market-ready technology solutions through collaborative partnerships between building and remodeling industry leaders, nationally recognized building scientists, and the national laboratories. Building America Top Innovation Awards recognize those projects that have had a profound or transforming impact on the new and retrofit housing industries on the road to high-performance homes.

Building America's research teams have worked directly with more than 300 production builders providing expert guidance that has directly improved the performance of more than 42,000 homes.

During the mid-1990s the housing industry was being introduced to building science and new labeling programs such as ENERGY STAR® for Homes. However, builders were extremely cost-adverse, even with energy-efficiency measures that result in greater monthly energy savings than the incremental monthly mortgage expense attributed to the measure. By documenting cost trade-offs, Building America addressed a key concern of the housing industry.

Production builders all across the country have embraced high-performance construction practices based on the empirical evidence provided by this research. Testimony from Building America builders who might have experienced slightly higher construction costs, but also sold at slightly higher prices with slightly higher profit margins have strengthened the argument for higher performance. Moreover, entire programs like ENERGY STAR for Homes and Masco's Environments for Living were able to bring these lessons to their builder partners and fuel exponential growth in their programs.

Builders who have participated in Building America research projects have experienced upfront cost savings in numerous ways:

- employing advanced framing techniques that cut lumber and labor costs
- designing on a 2-foot grid that reduces materials cost and waste
- downsizing HVAC equipment through better insulation and air sealing of the building envelope
- substituting rigid foam for structural panel sheathing for better performance at neutral cost
- using spray foam rather than individually cutting and caulking rigid foam to insulate and air seal rim joists for time and labor savings
- moving ducts out of crawlspaces and attics and into conditioned space, for installation labor cost savings
- using factory-built frame wall components or structural insulated panels (SIPs), which reduces construction time, labor costs, and callback expenses.

Key Lessons Learned

- Energy efficiency does not exist in a bubble. Builders care about the bottom line. Providing them with data about upfront costs and savings has substantially helped influence their willingness to change construction practices.
- Building America has collected cost and market data as well as energy savings data; continuing this data collection is vital to help make the business case for higher performance construction.



Urbane Homes of Louisville, KY, estimated that while some energy-efficiency measures like insulating sheathing and an upgraded heat pump added to the initial construction cost of their homes, the advanced framing and frost-protected shallow foundation techniques recommended by the National Association of Home Builders Research Center, a Building America partner, saved them \$300 to \$500 per unit.

REFERENCES

DOE. 2004-2012. *Building America Best Practices Series, Climate Guides*, Volumes 1-5, 9, 11, 12, 15, 16, U.S. Department of Energy Building America, www.eere.energy.gov/buildings/building_america/climate_specific_publications.html