



**FLORIDA SOLAR ENERGY CENTER**

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A Research Institute of the University of Central Florida

*EnergyGauge® Software  
and Energy Star Homes*

**North Carolina Energy Star Conference  
December 8, 2005**

Philip Fairey



# *Change is Upon Us*

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- ❖ “There is nothing permanent except change”  
– Heraclitus
- ❖ IECC 2006 – major changes in presentation – minor change in performance-based efficiency
- ❖ NAECA – 23% increase in air conditioner efficiency and 12% increase in heat pump efficiency effective January 2006
- ❖ HERS – major changes in HERS Reference home specification
  - Aligned with DOE Residential IECC Code Change (RICC) proposal
  - Adopted by IECC 2006 and RESNET Standards (effective January 2006 and July 2006, respectively).



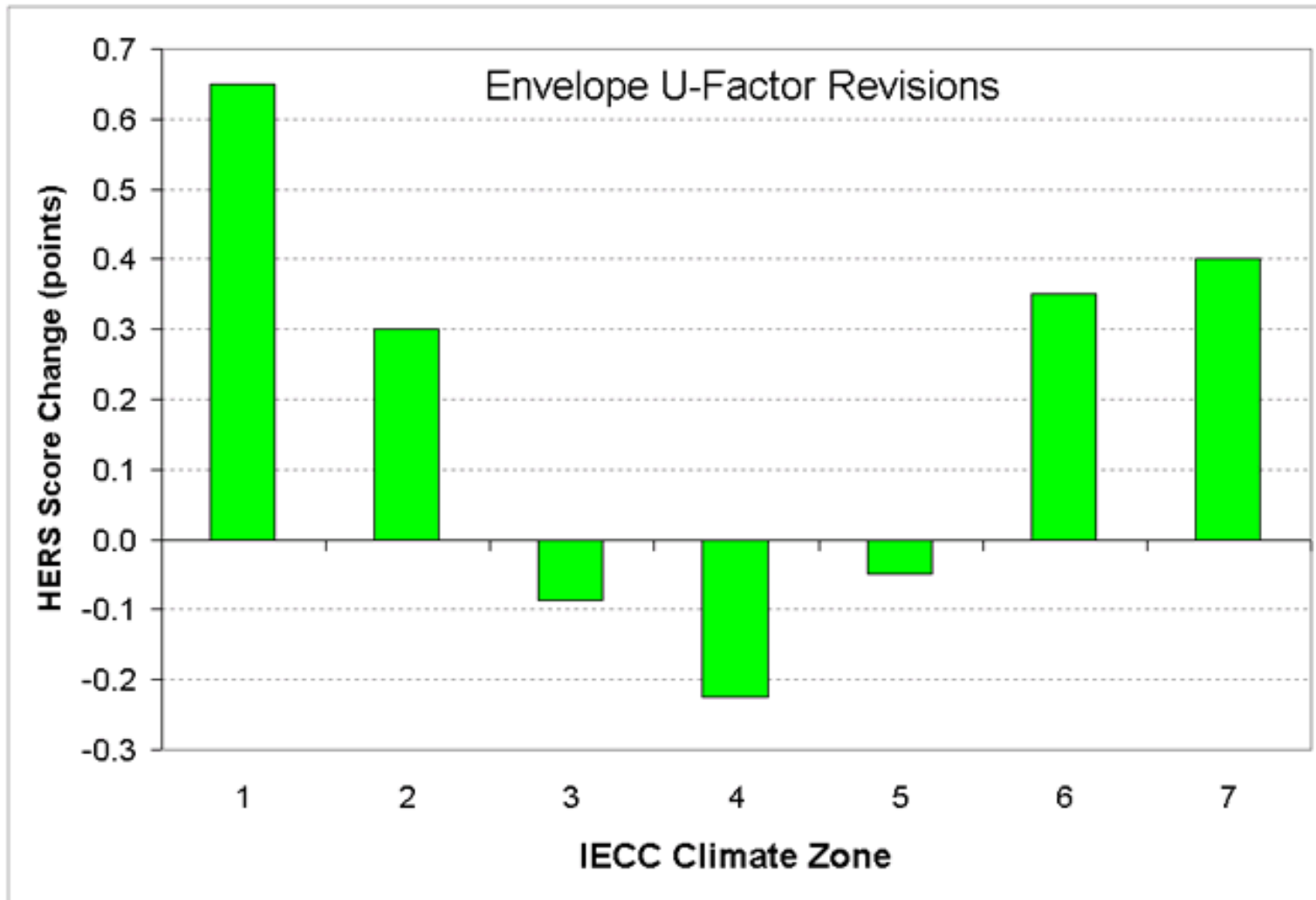
# *Impact Analysis*

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- ❖ RICC Standard Reference Design compared with current (1999) HERS Reference home
- ❖ EnergyGauge<sup>®</sup> and Rem/Rate software
- ❖ Individual impacts are averages of all results by climate zone
- ❖ Analysis does not include impacts of NAECA air conditioner and heat pump revision (SEER=13; HSPF=7.7)

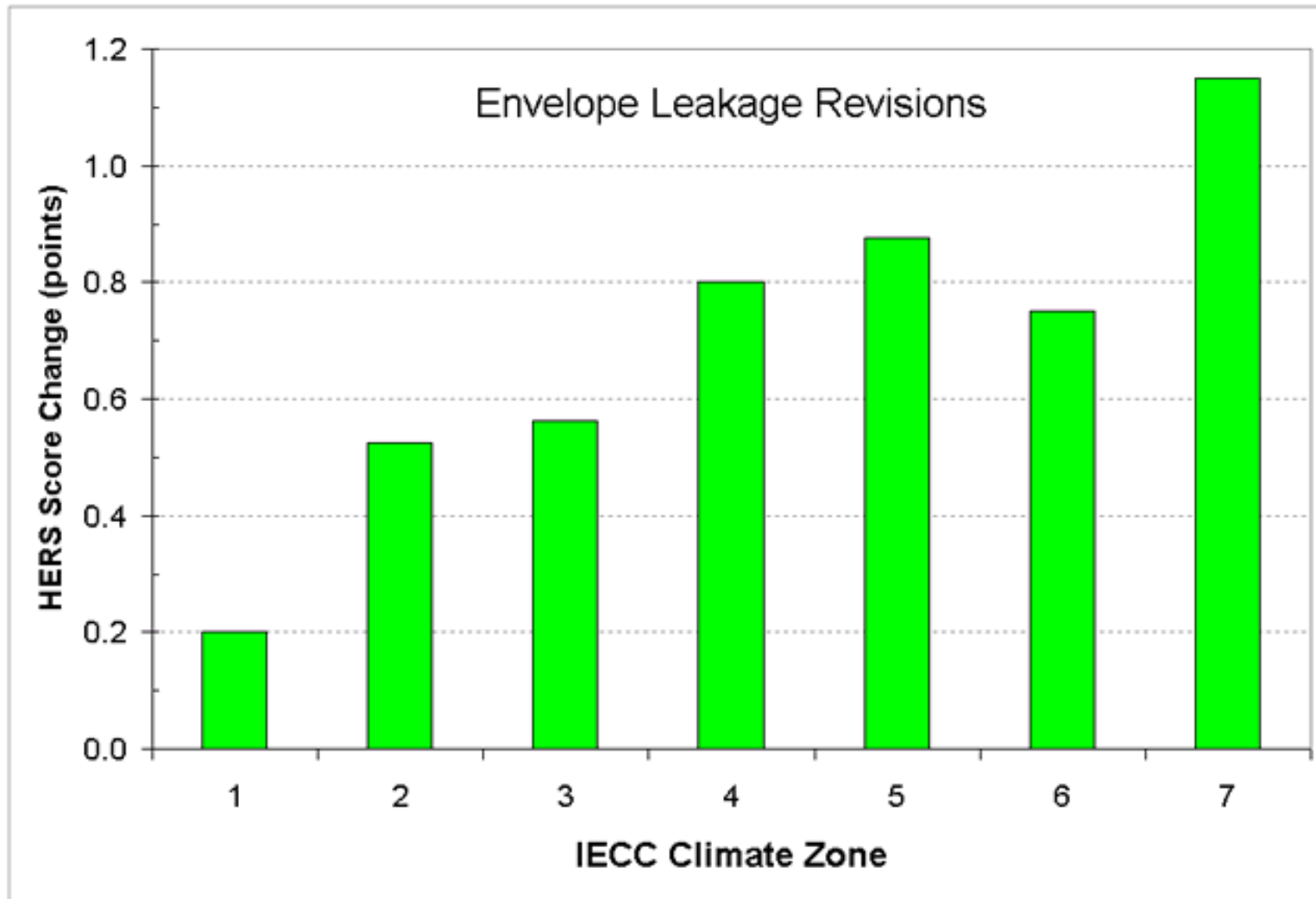


# *Envelope U-Factor Impacts*



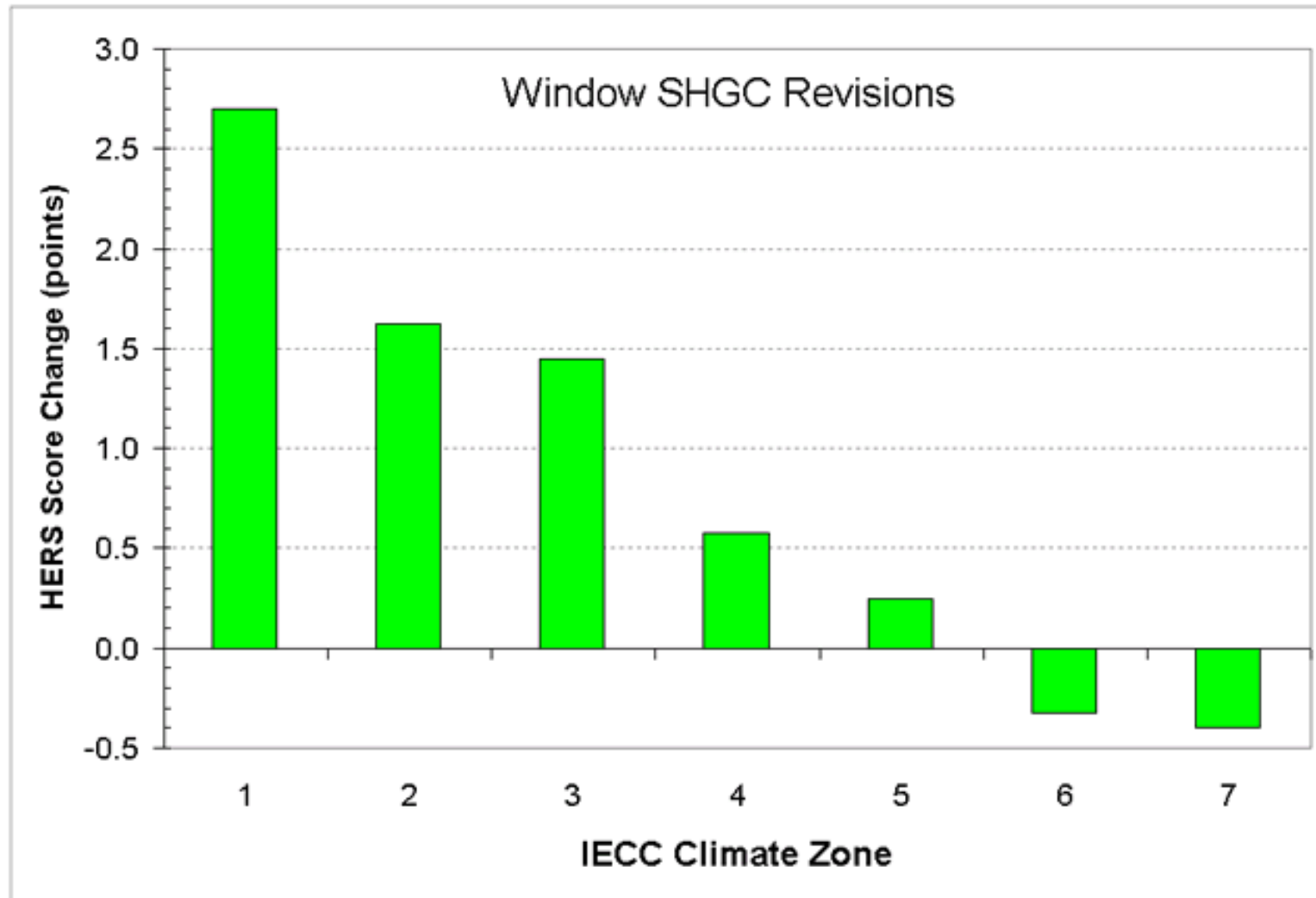


# *Envelope Leakage Impacts*



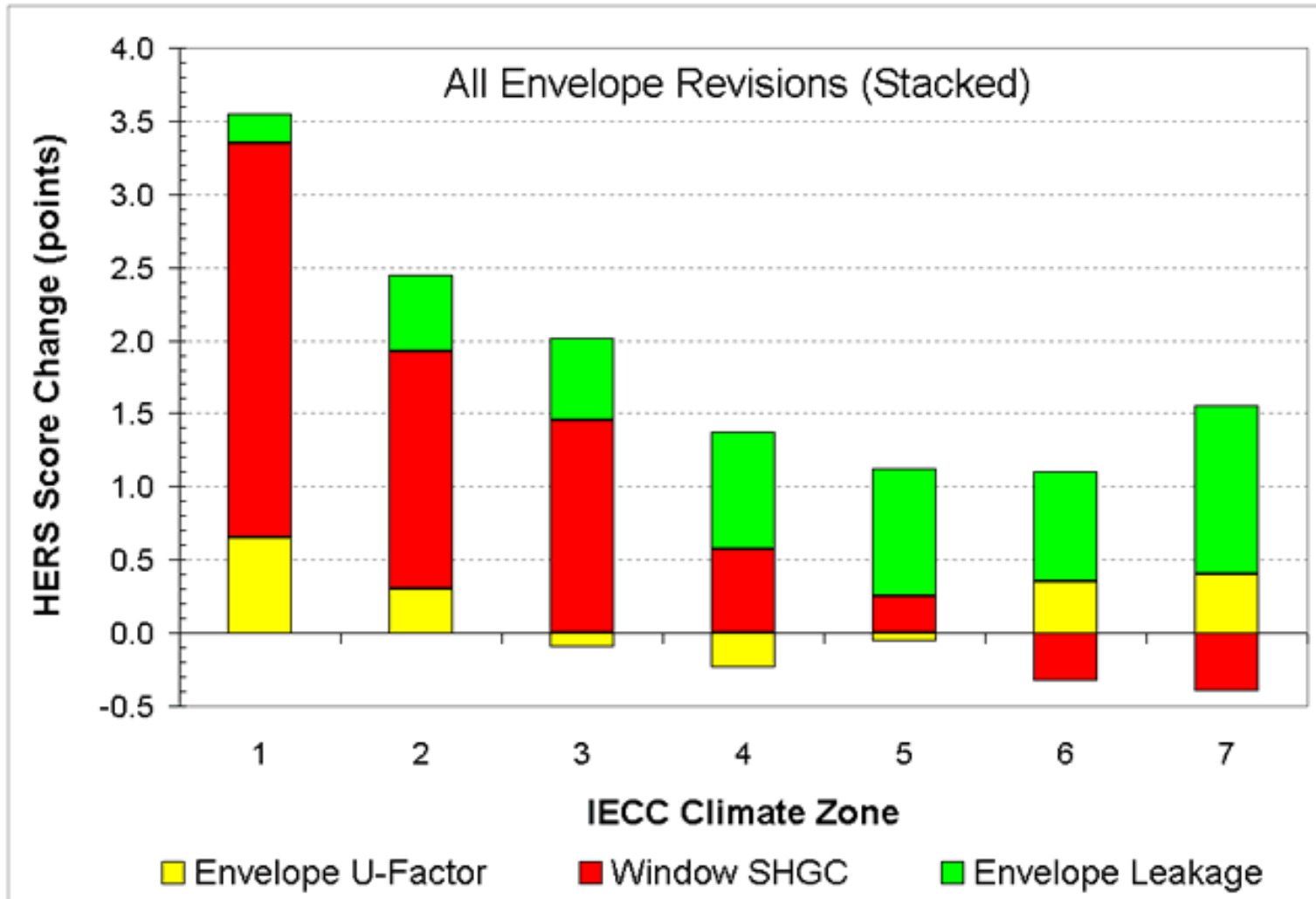


# *Window SHGC Impacts*





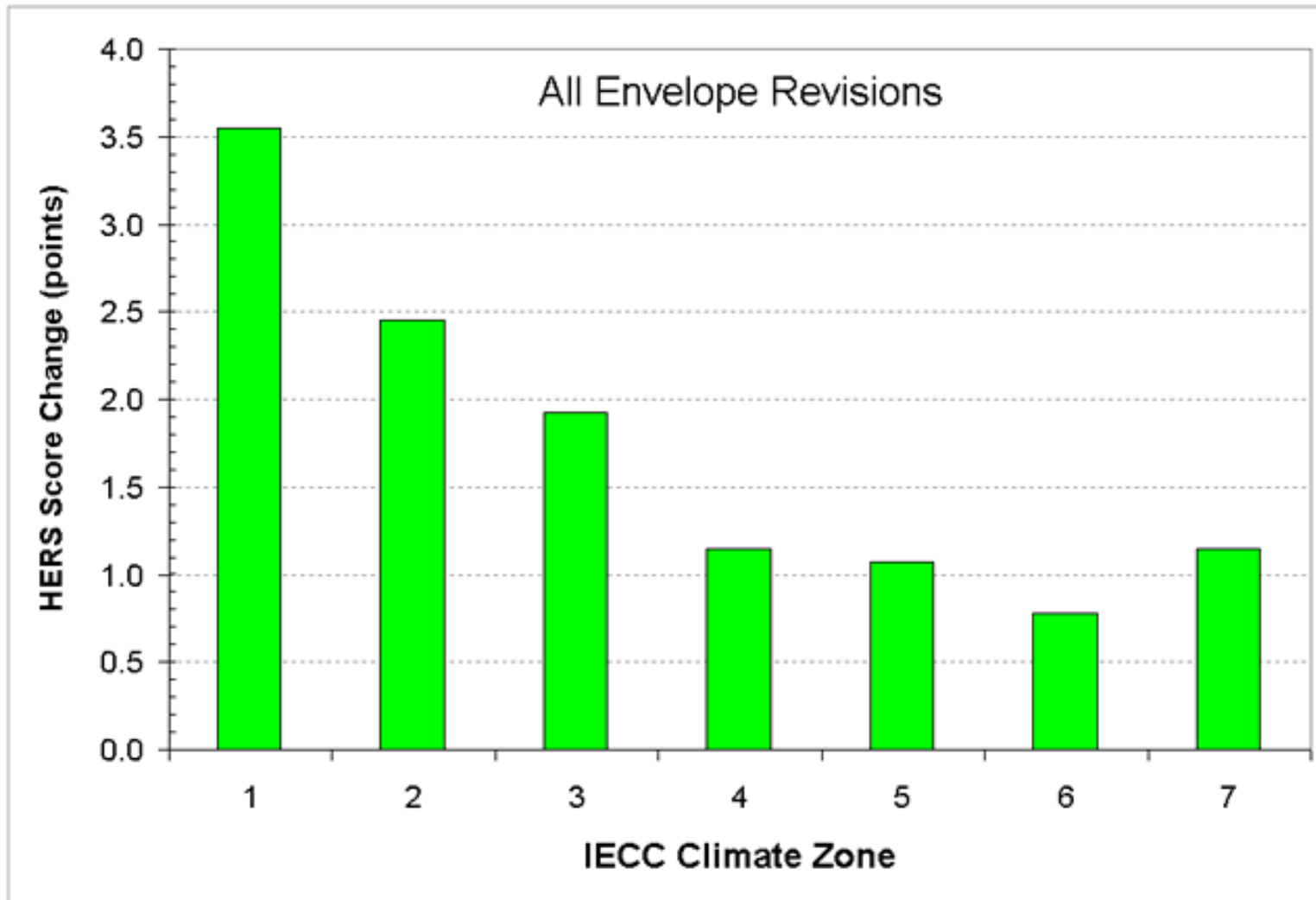
# Combined RICC Impacts





# *Net RICC Impacts*

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## *Other Revisions*

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- ❖ Interior Shading Factor (IECC & HERS)
  - Heating ISF = 0.90 >> ISF = 0.85
  - Cooling ISF – no change = 0.70
  - Anticipated Impact: slight increase in heating energy use, impacting northern climates more than southern climates.
  
- ❖ Internal Gains (HERS)
  - 72,000 Btu/day >> function of floor area and Nbr
  - Anticipated Impact: Internal gains increase for homes >~1600 ft<sup>2</sup>, reducing heating energy use and increasing cooling energy use. Internal gains decrease for small homes.



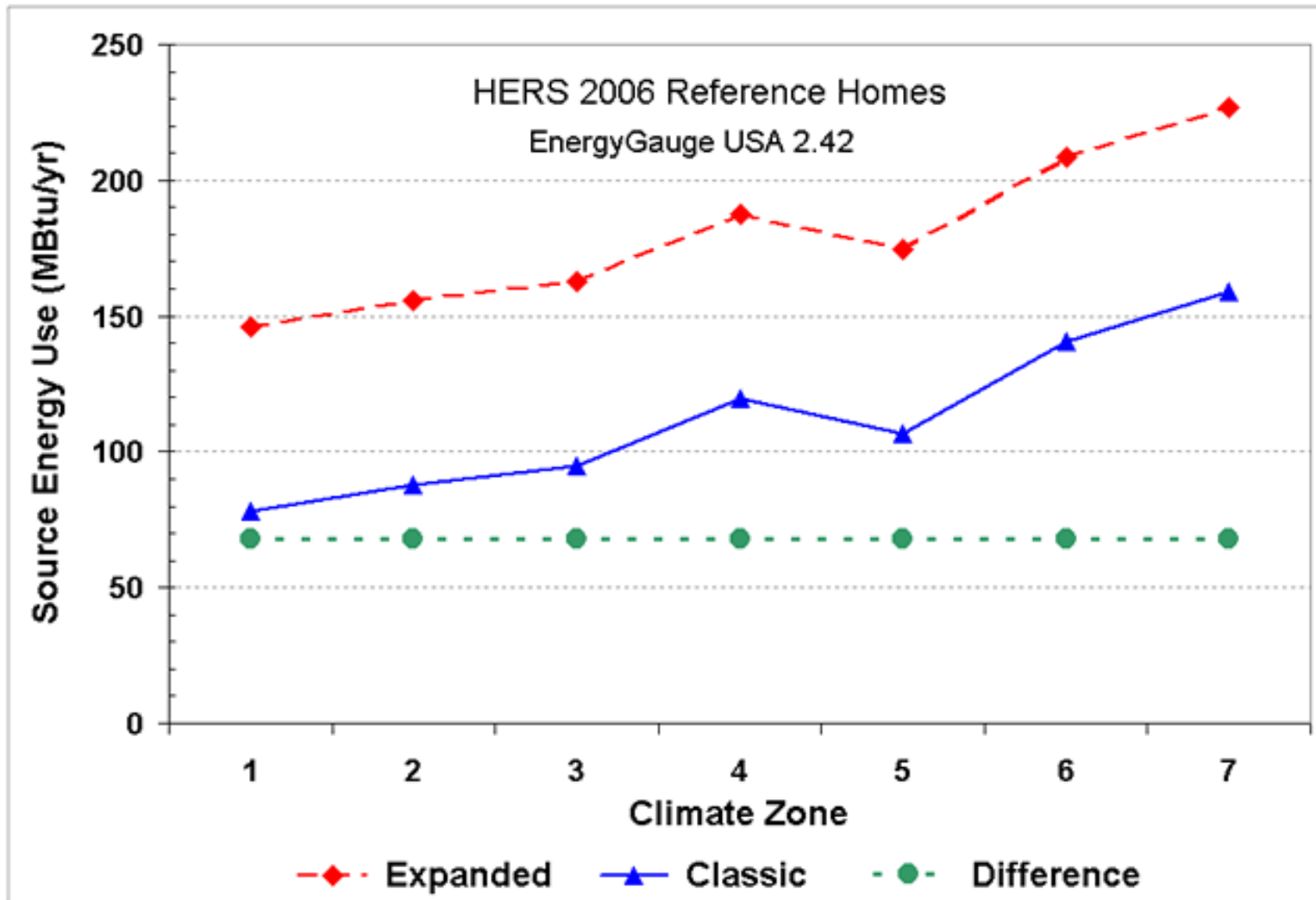
# *HERS Changes*

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- ❖ Expanded scoring method
  - Expands energy uses to include all lighting and appliances
  - Credits for improved lighting, refrigerators, dishwashers, and ceiling fans
- ❖ HERS Index instead of HERS Score
  - 100 = new HERS Reference home
  - 0 = zero net energy use
- ❖ Simple conversion back and forth:
  - Index =  $(100 - \text{Score}) * 5$
  - Score =  $100 - \text{Index}/5$



# Expanded Reference Impacts






# EnergyGauge® USA

EnergyGauge U.S.A./Internal - Project Search

File Help



**Project Options**

- Create New Project
- Show All Existing Projects
- Project Query
- Load \*.enb/\*.rgs File
- Import \*.blg File

**Project Search Results:**

Project ID	Building Number	Project Title	Building Type	Number of IA's
1	1	Example - Baltimore Code	Rated	
70	1	P_Class base-1	Detailed	
71	1	P_Class base-1_HRV	Detailed	
72	1	P_Class base-1_EW	Detailed	
65	1	P_Class WE	Detailed	
67	1	P_Class WE_N-Dlight	Detailed	

Open Project



# *What is EnergyGauge*

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- ❖ An easy-to-use, powerful hourly simulation design tool specifically for:
  - The design of energy-efficient homes and
  - The evaluation of utility peak demand impacts
- ❖ Featuring:
  - FSEC-enhanced DOE-2.1E hourly simulations, analysis and reports
  - IECC Code compliance (1998, 2000, 2003 & 2006)
  - Accredited HERS Ratings (1999 & 2006)
  - Tax Credit qualification
  - Integrated energy and economic analysis



## *FSEC Enhancements*

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- ❖ More accurate computation of heating and cooling system part load performance
- ❖ More accurate prediction of indoor air relative humidity
- ❖ More accurate attic modeling (including attic ventilation, reflective roofing and radiant barriers)
- ❖ Detailed hourly modeling of duct heat transfer and duct air leakage



# User-Friendly Interface

EnergyGauge U.S.A./Internal - Example - Baltimore Code

File View Calculate Reports Registration Help

Project ID: 1 Bldg ID: 1 Code-Rating Entry Mode # of IA's: 10

**Current Window, Number 4 of 4**

Orient: W Tint: SHGC[window]=.68 # of windows like this one: 1

**U-Factor Modifiers**

Type: Low-E Double

Frame: Single Double Triple

Storm

Int Shade: Low-E Single Low-E Double Low-E Triple

**U-Factor**

0.47

Calculate

Auto Calculate

**Overhang Data**

Width: 2 ft 2 in

Separation: 1 ft 4 in

Comment:

**Window Area Data**

Area: 45 ft<sup>2</sup>

OR

Width:

Height:

**Overview of windows**

BLDG_NUM	Window ID	Glass Type	Tinting	Orientation	Total Area (ft <sup>2</sup> )	Units	Height (ft)	In
1	2	Low-E Double	SHGC[window]=.68	E	60	1		
1	3	Low-E Double	SHGC[window]=.68	S	150	1		
1	4	Low-E Double	SHGC[window]=.68	W	45	1		

Right-click for page help, or place cursor in any field and press F1 for context-sensitive help.

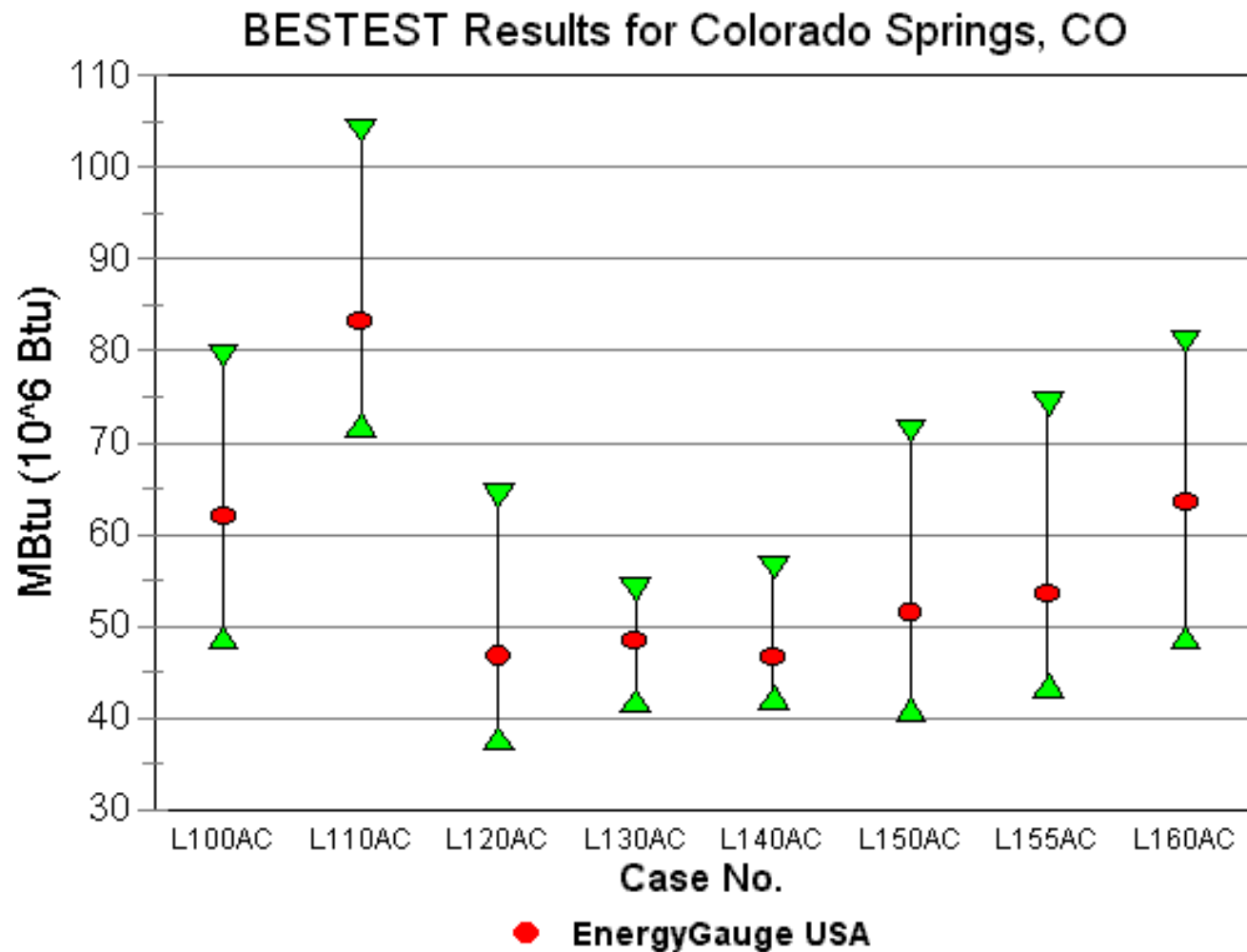
Floors(1) Roof Ceilings(1) Doors(2) Windows(4) Walls(1) Infiltration Garage Sunspace

Site Envelope Equipment

- Component-based organization with notebook-type navigation tabs
- Extensive pull-down menus for most data input
- Any order data input
- Extensive input error checking
- Full, context-sensitive help



# HERS BESTEST Results





# *Field Verification*

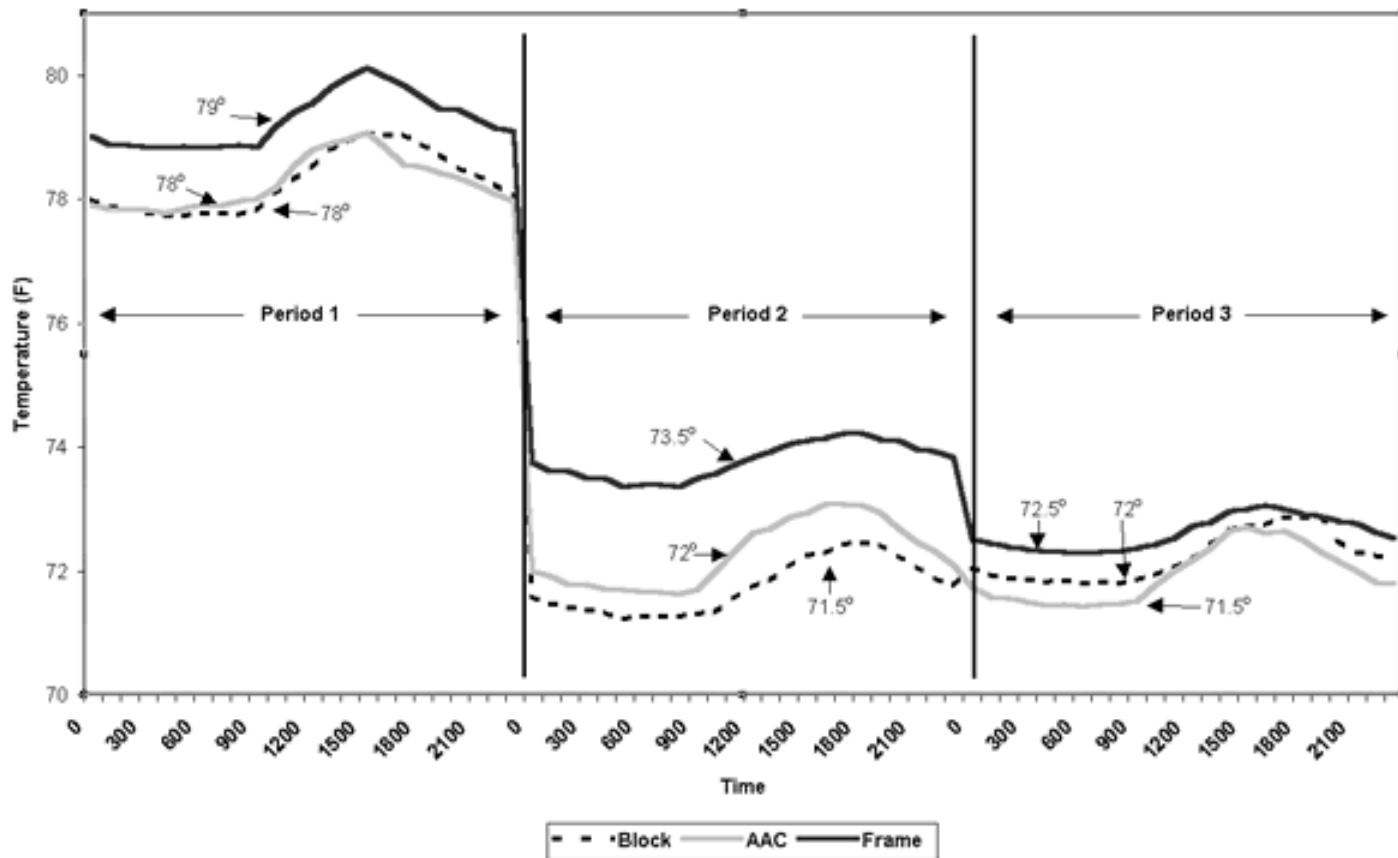
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# Indoor Temperatures

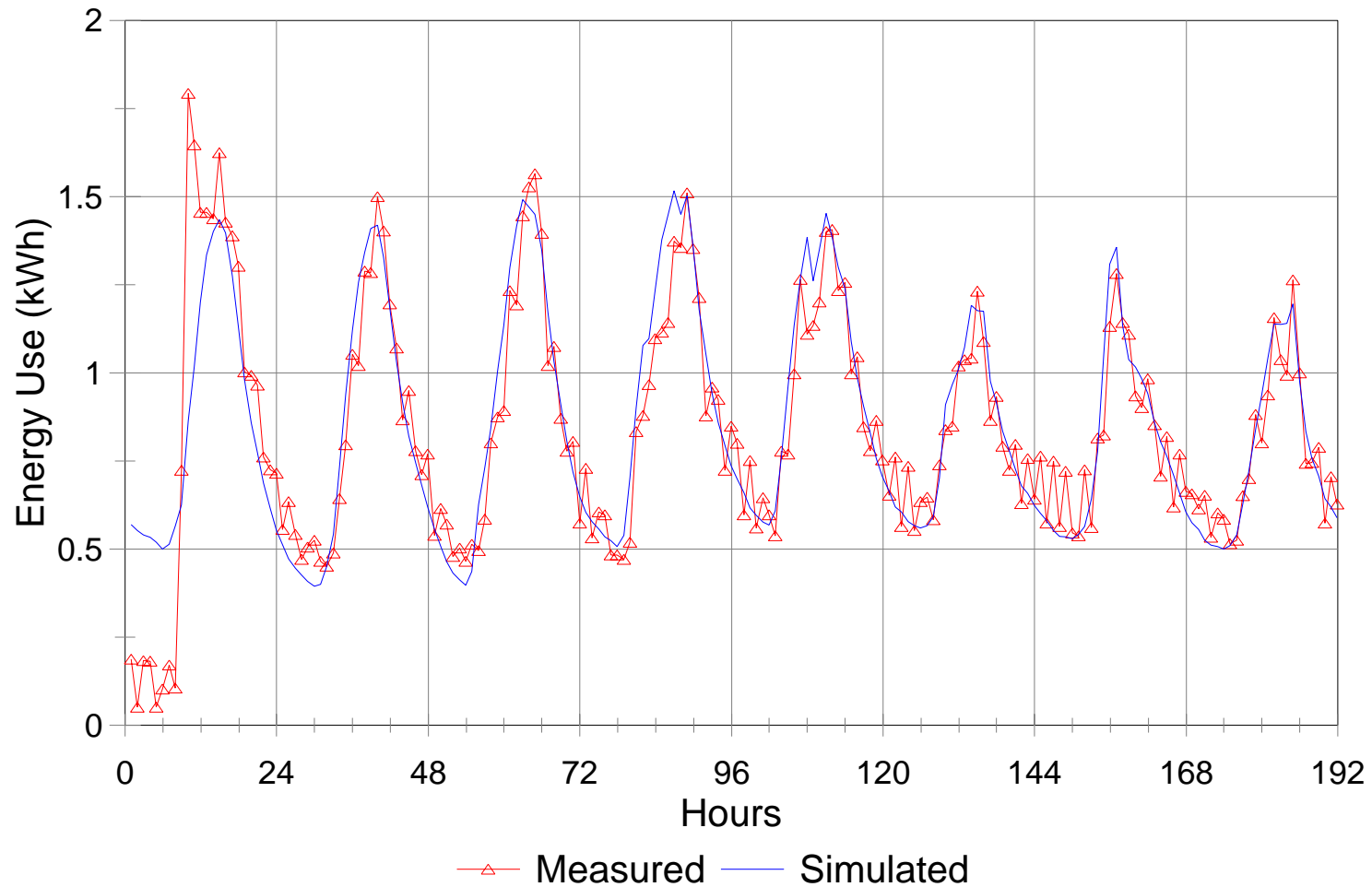
Indoor Temperatures by Hour





# Autoclaved Concrete

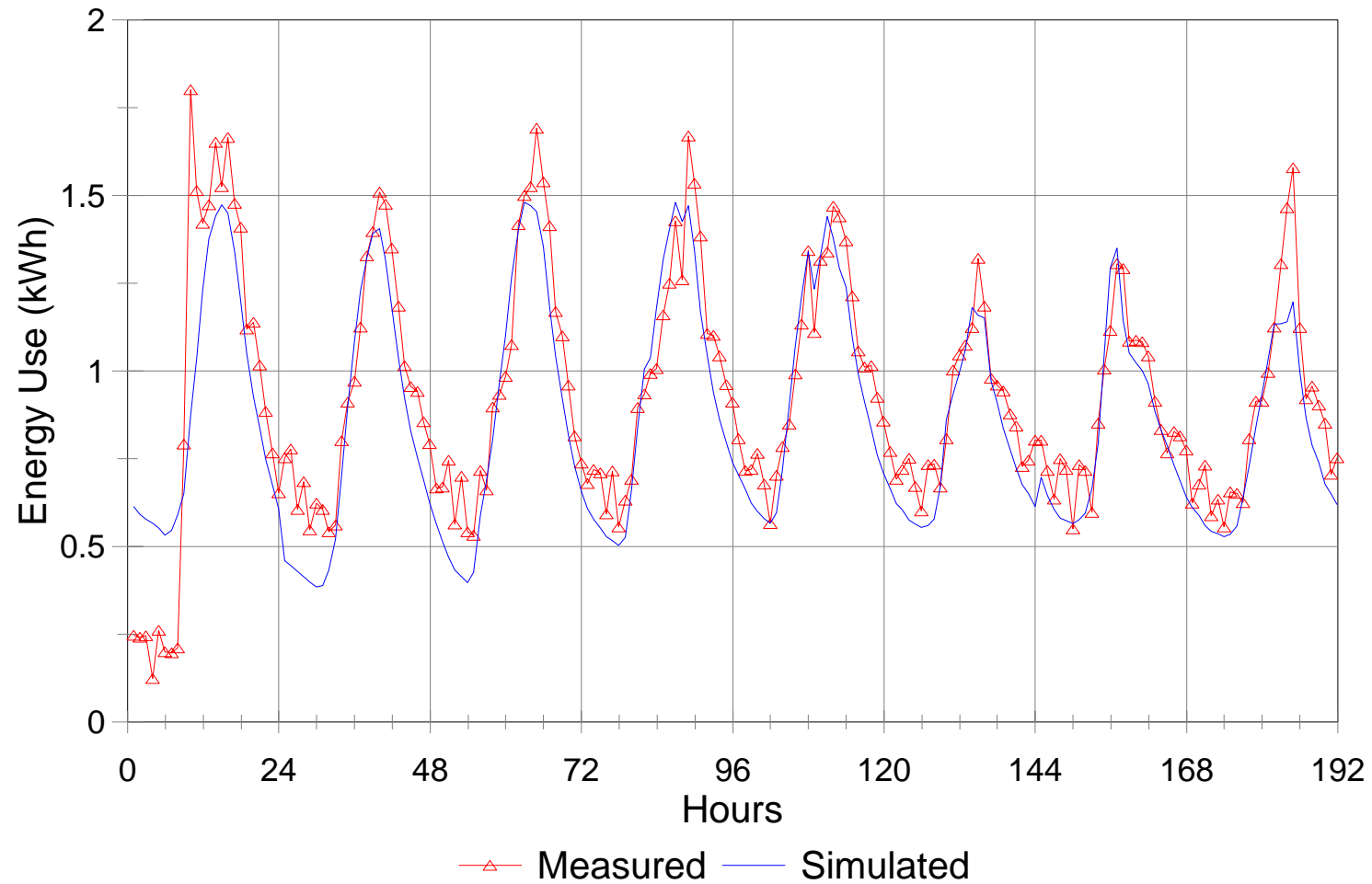
AAC Home: Period 2





# Concrete Block

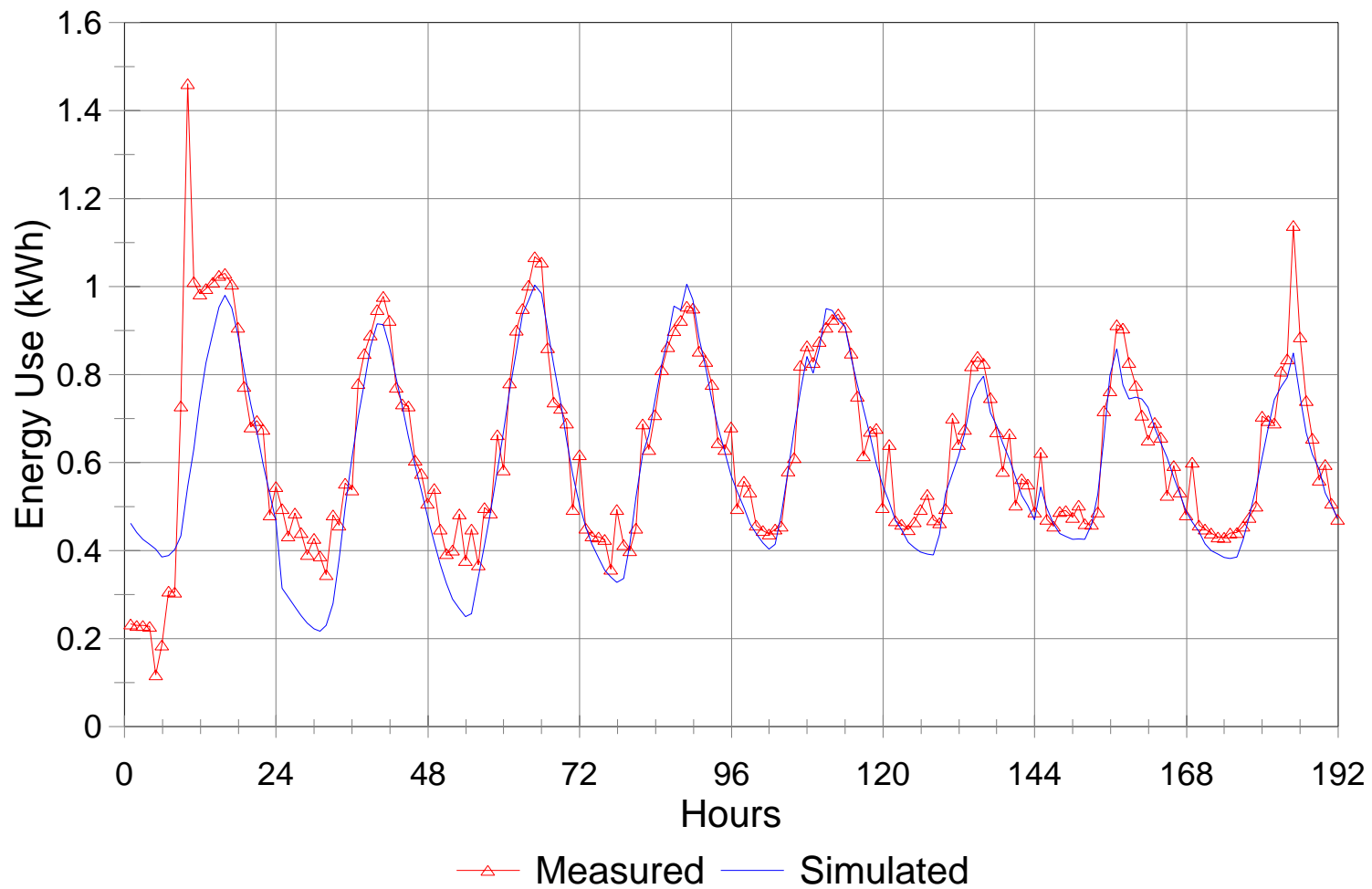
Block Home: Period 2





# Wood Frame

Frame Home: Period 2





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**EnergyGauge<sup>®</sup>**



Energy and Economic Analysis Software

Fla Residential

Fla Commercial

USA Residential