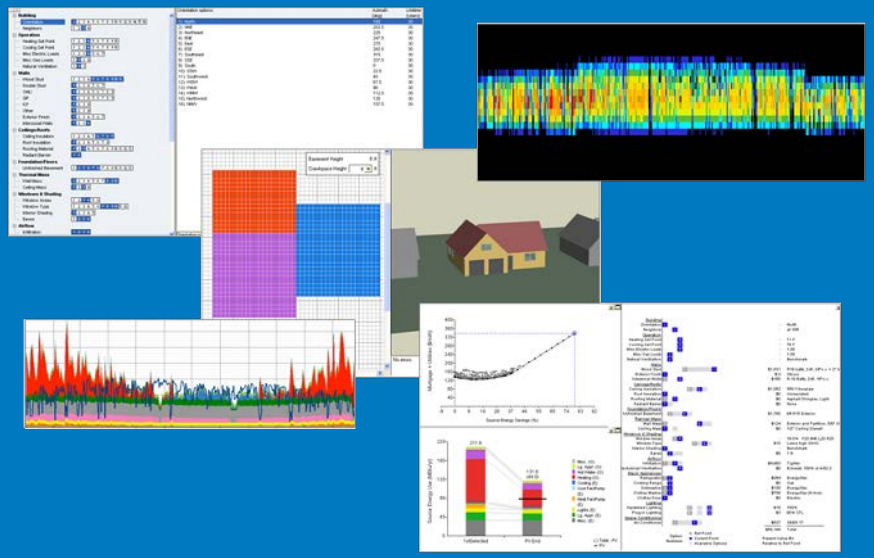
NREL
NATIONAL RENEWABLE ENERGY LABORATORY

BEopt Optimization Tool
National Residential Efficiency Measures Database



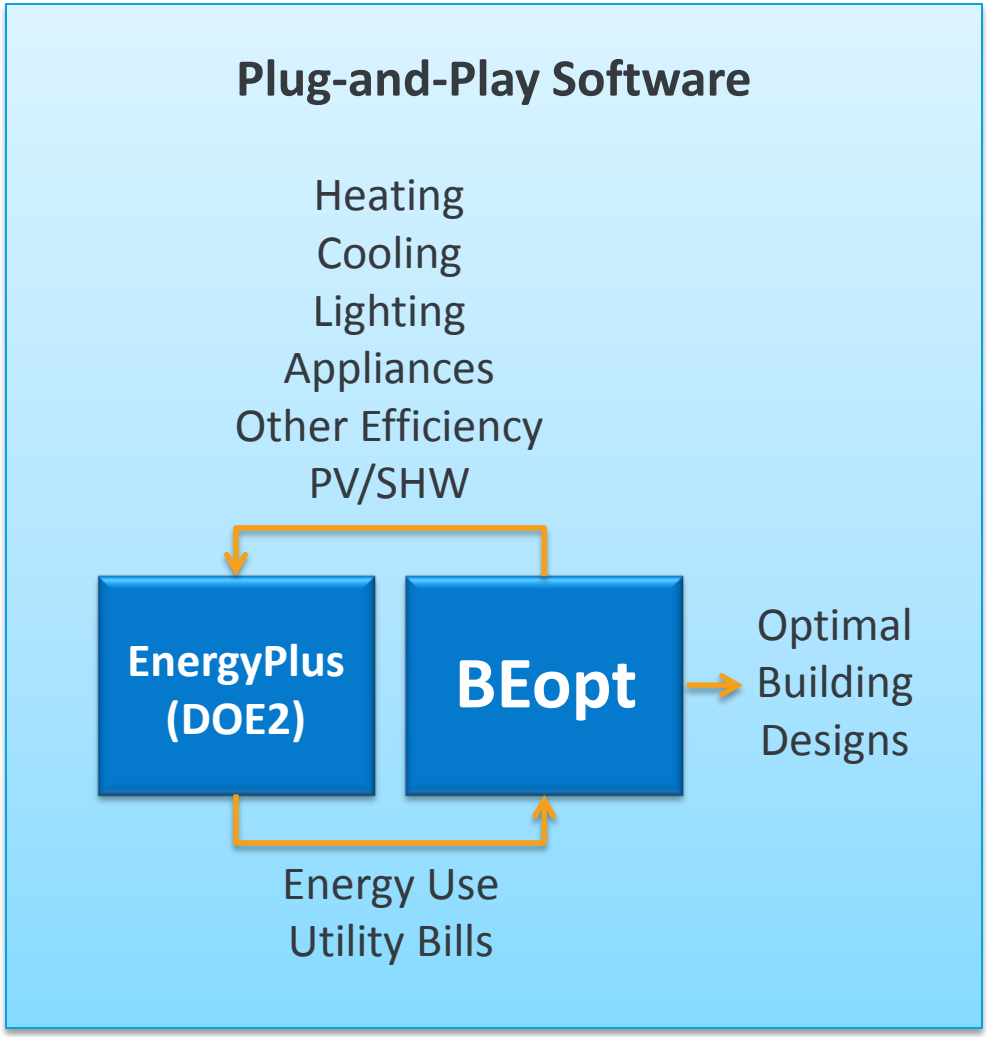



Scott Horowitz
Noel Merket

3/18/2015

beopt.nrel.gov

What is BEopt? (beopt.nrel.gov)



Features:

- New construction and retrofit
- Single-family and (soon) multifamily
- Design, parametric, optimization
- Detailed cost database
- Rapid building drawing tool
- Detailed utility rates
- PV compensation
- PV/efficiency incentives
- Demand response
- HPXML export
- Schedule wizard
- Output visualization
- Batch simulations
- Library manager
- …

BEopt Timeline

Partners

CEC (FY08-FY09)
BEopt w/Micropas

CPUC (FY11-14)
Retrofit analysis, utility cost effectiveness tests, incentives, etc.

CPS Energy (FY12)
San Antonio analysis

ARRA (FY10-11)
Updated platform, batch simulations

BPA (FY13-14)
EnergyPlus vs. SEEM validation

BPA (FY14)
BEopt follow-on

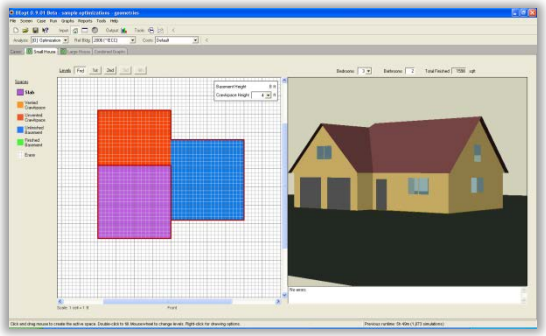
CPUC (FY14-15)
Multifamily

BPA (FY15-16)
BEopt/EnergyPlus model enhancements

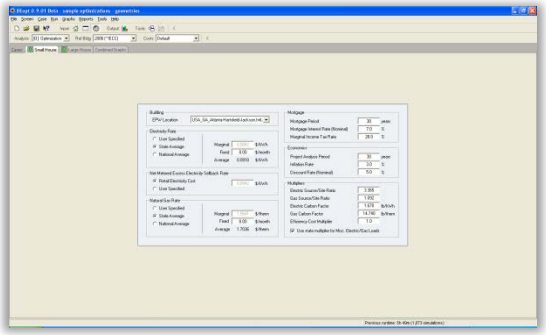
BEopt GUI

Input

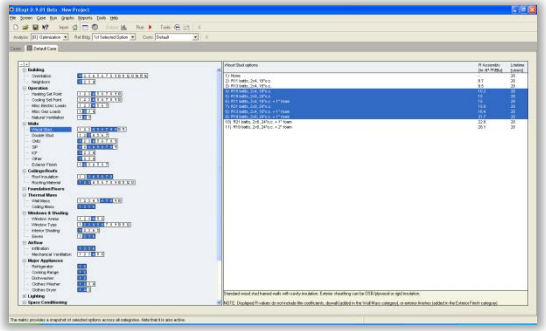
Geometry



Site

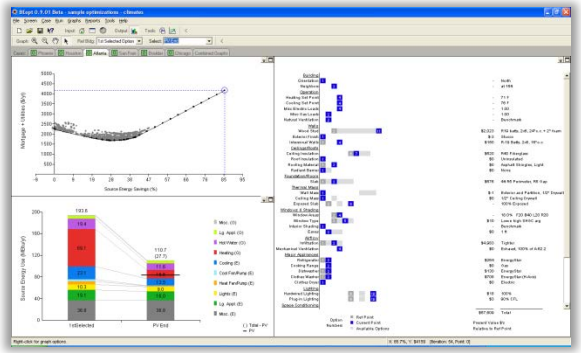


Options



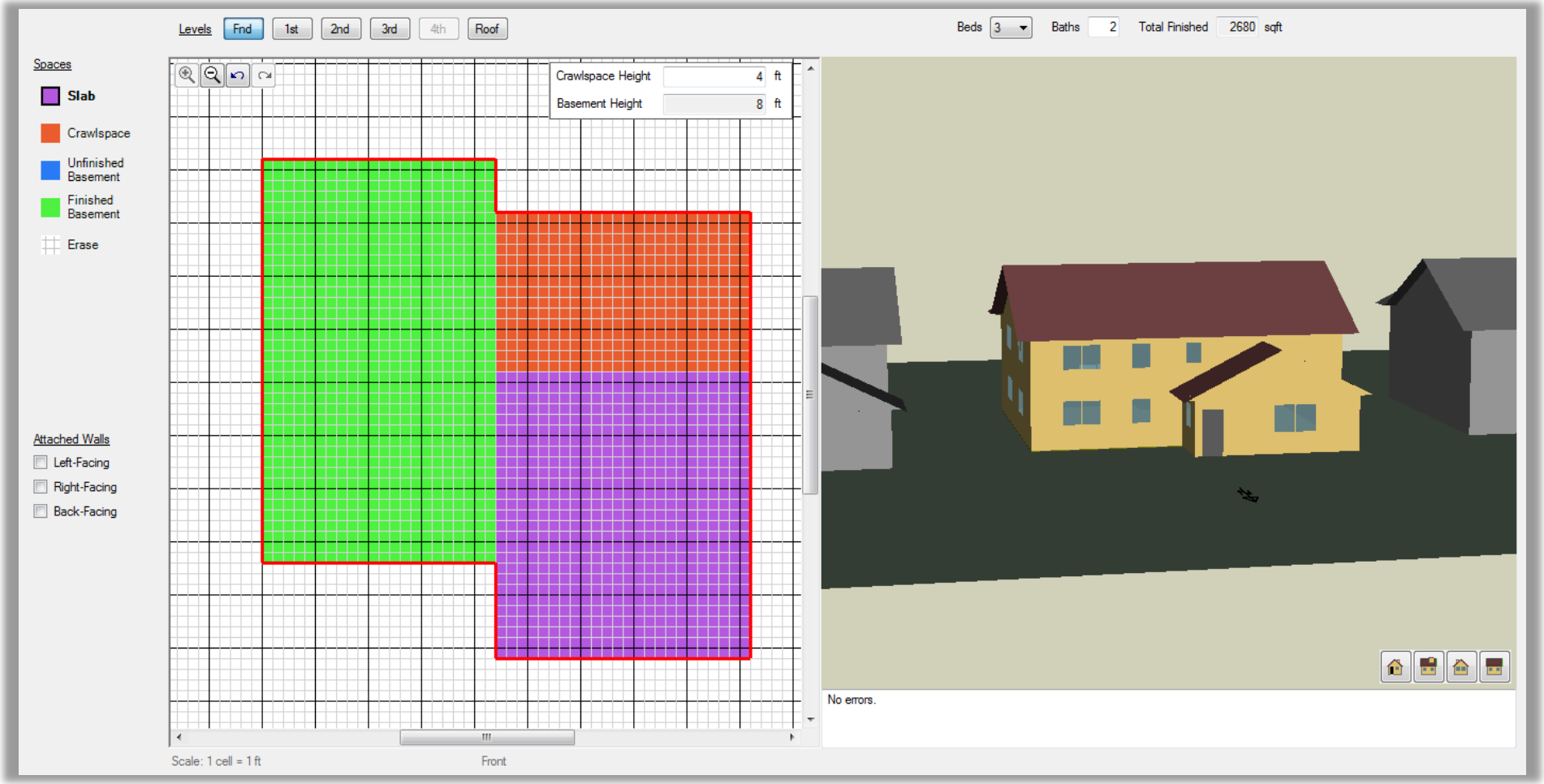
Run

Output



BEopt Input - Geometry

drawing tool for quick/accurate detailed building geometry



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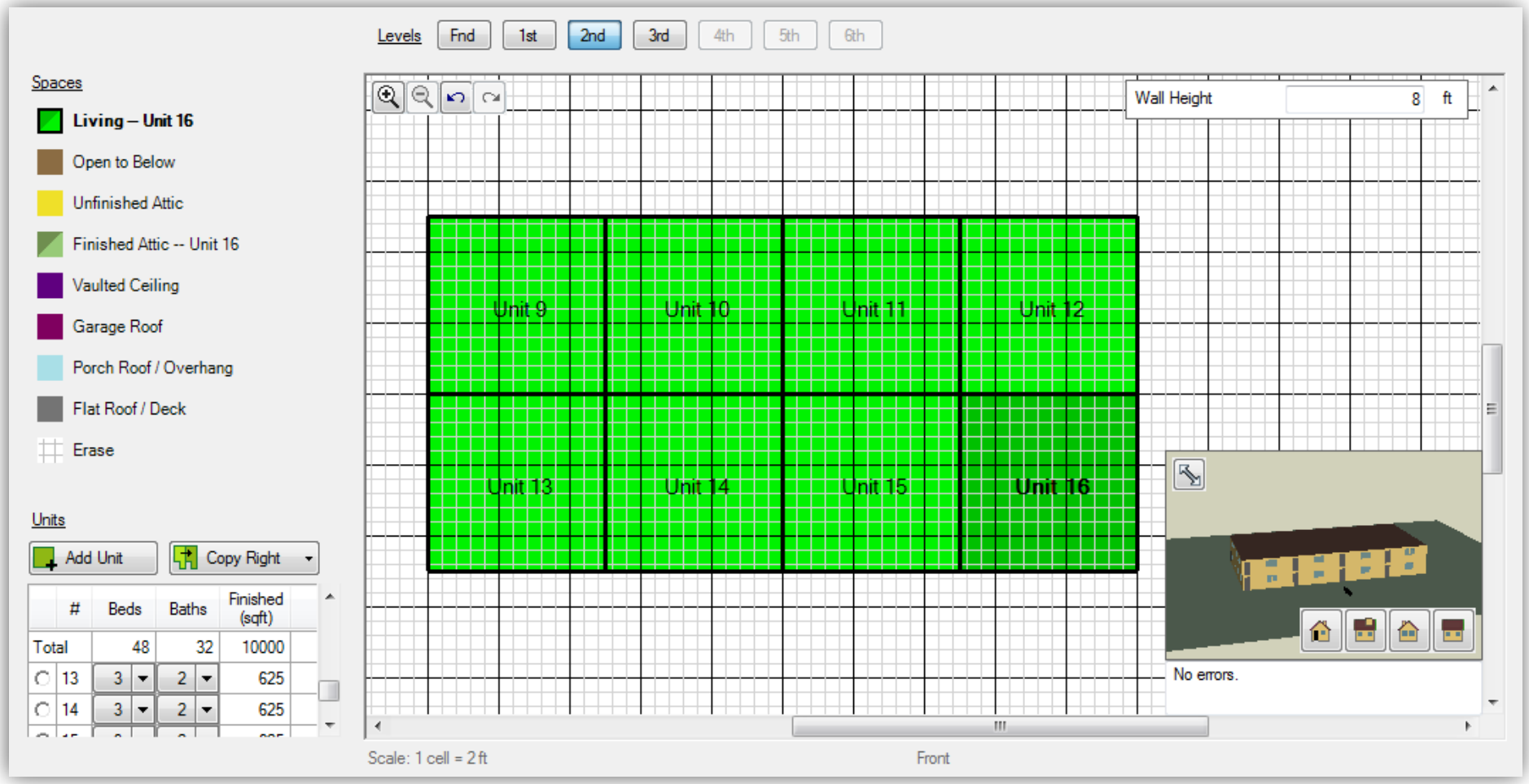
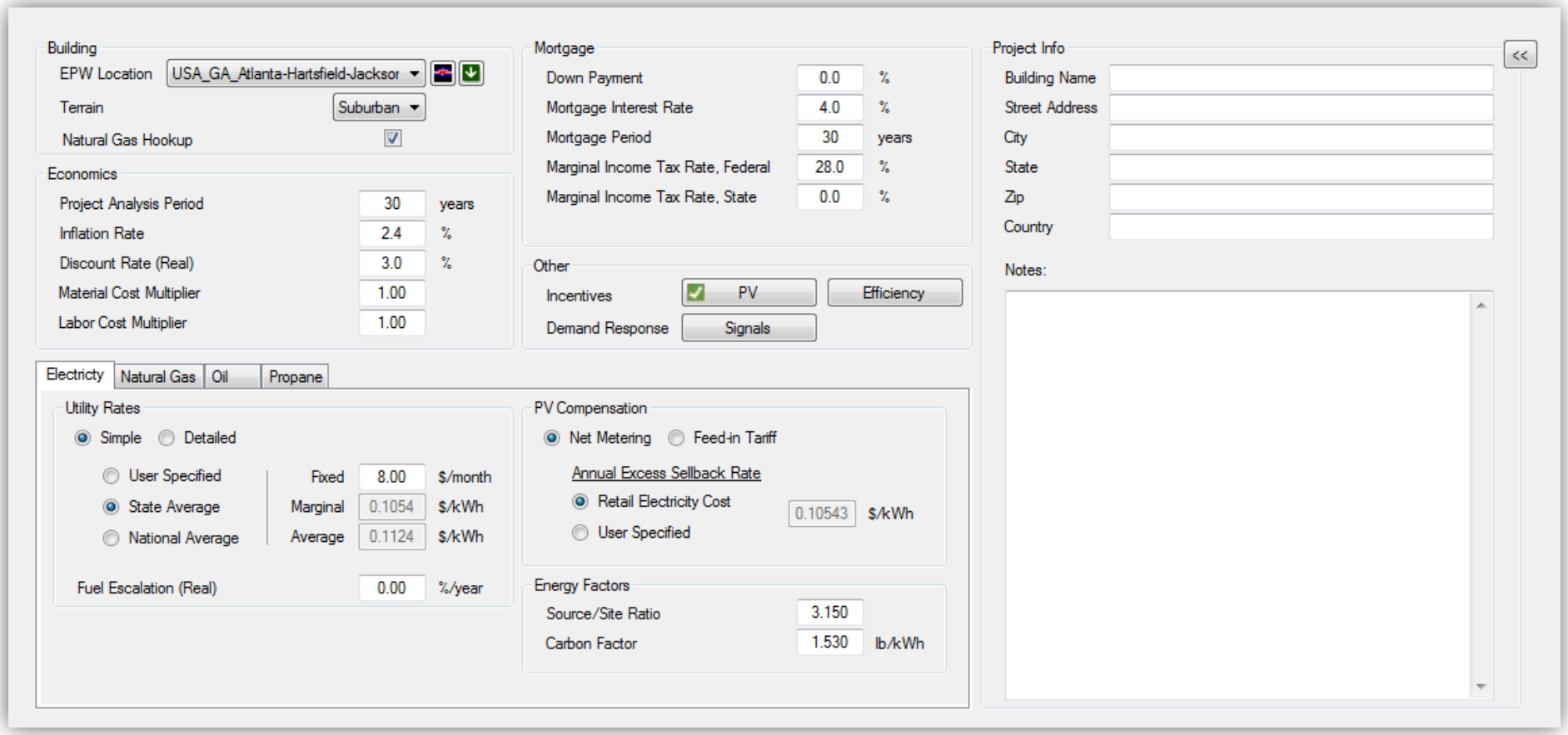


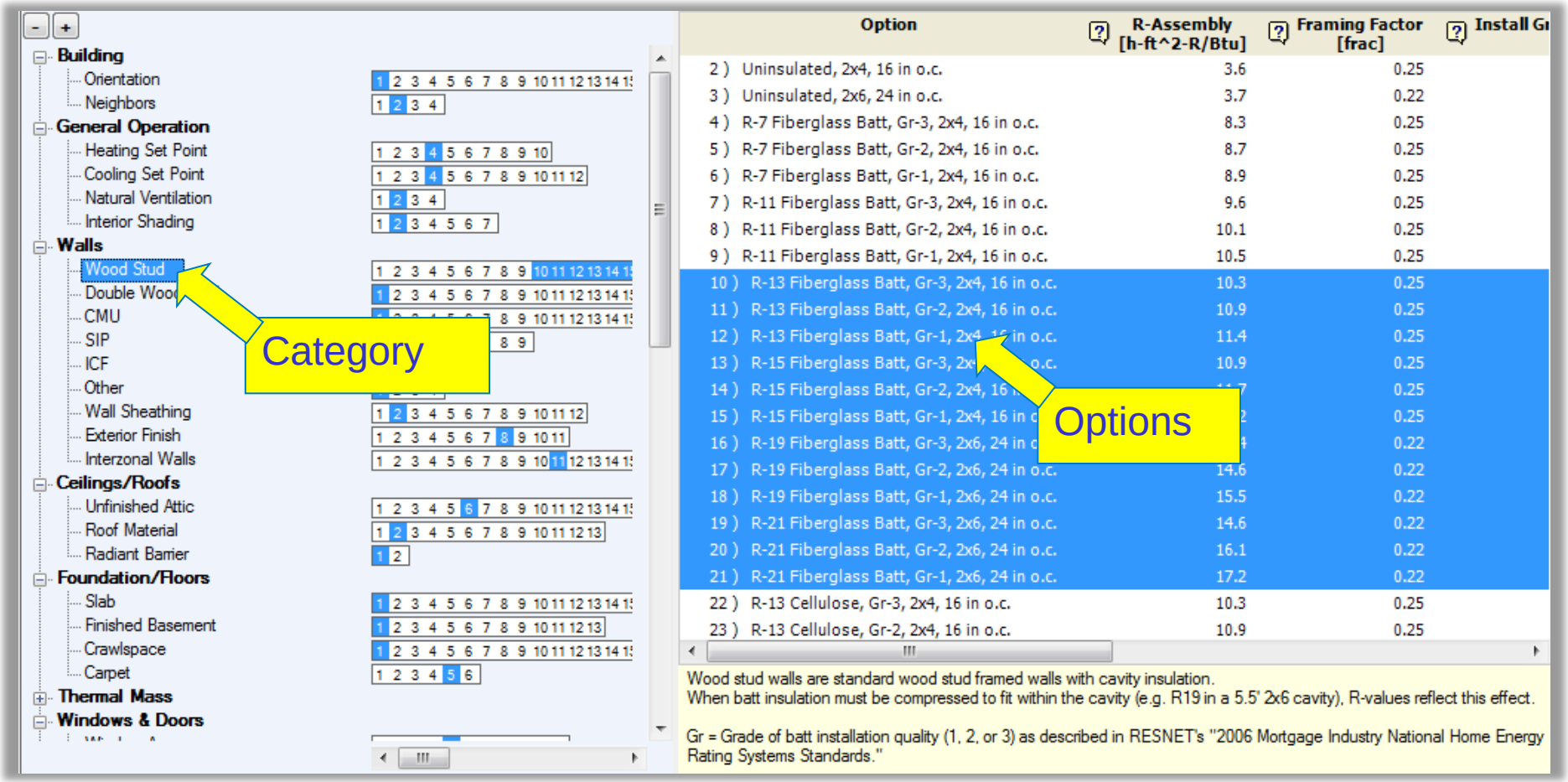
BEopt Input - Site

weather, financing, utility rates, incentives, etc.



BEopt Input - Options

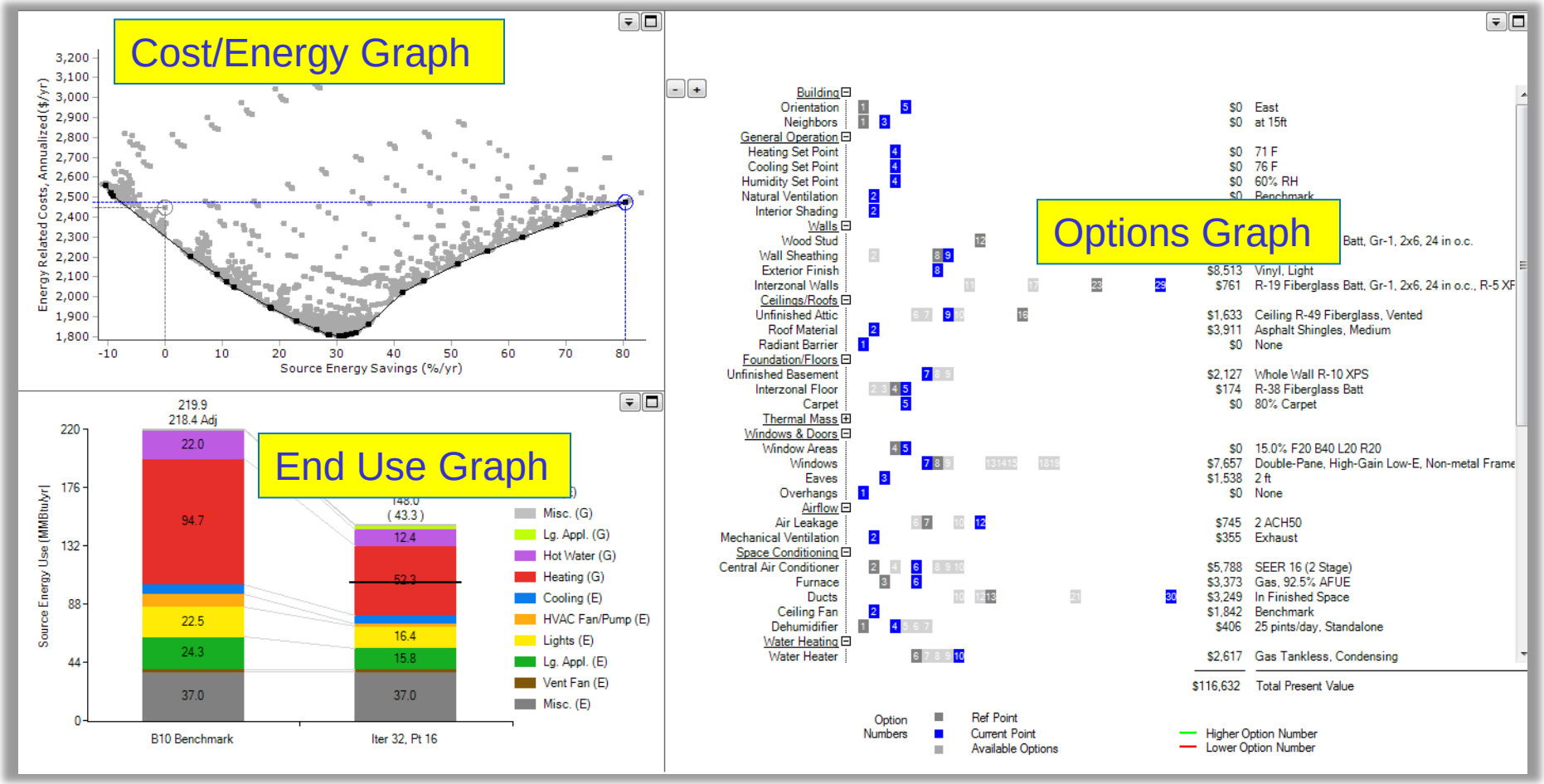
operation, envelope, equipment options from Measures Database



~1000 options (in ~100 categories)

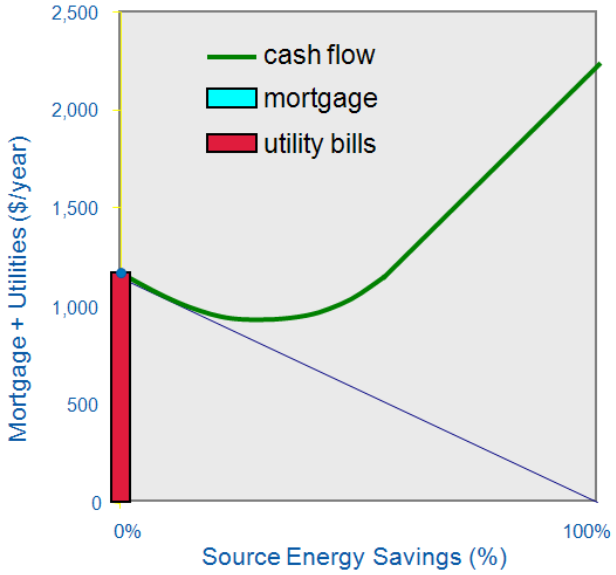
BEopt Output

results for multiple designs, selected individual designs

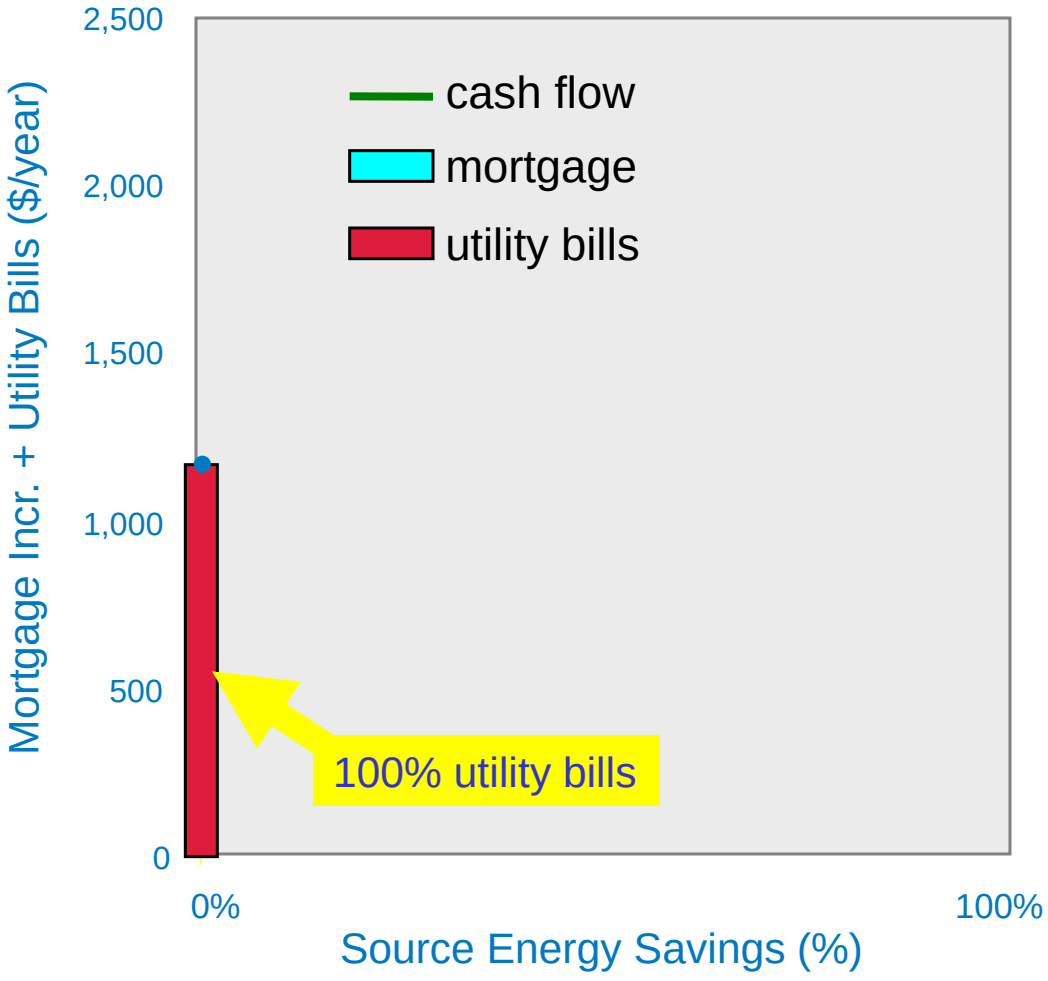


The Path to Zero Net Energy

Minimum-cashflow designs at various energy-savings levels



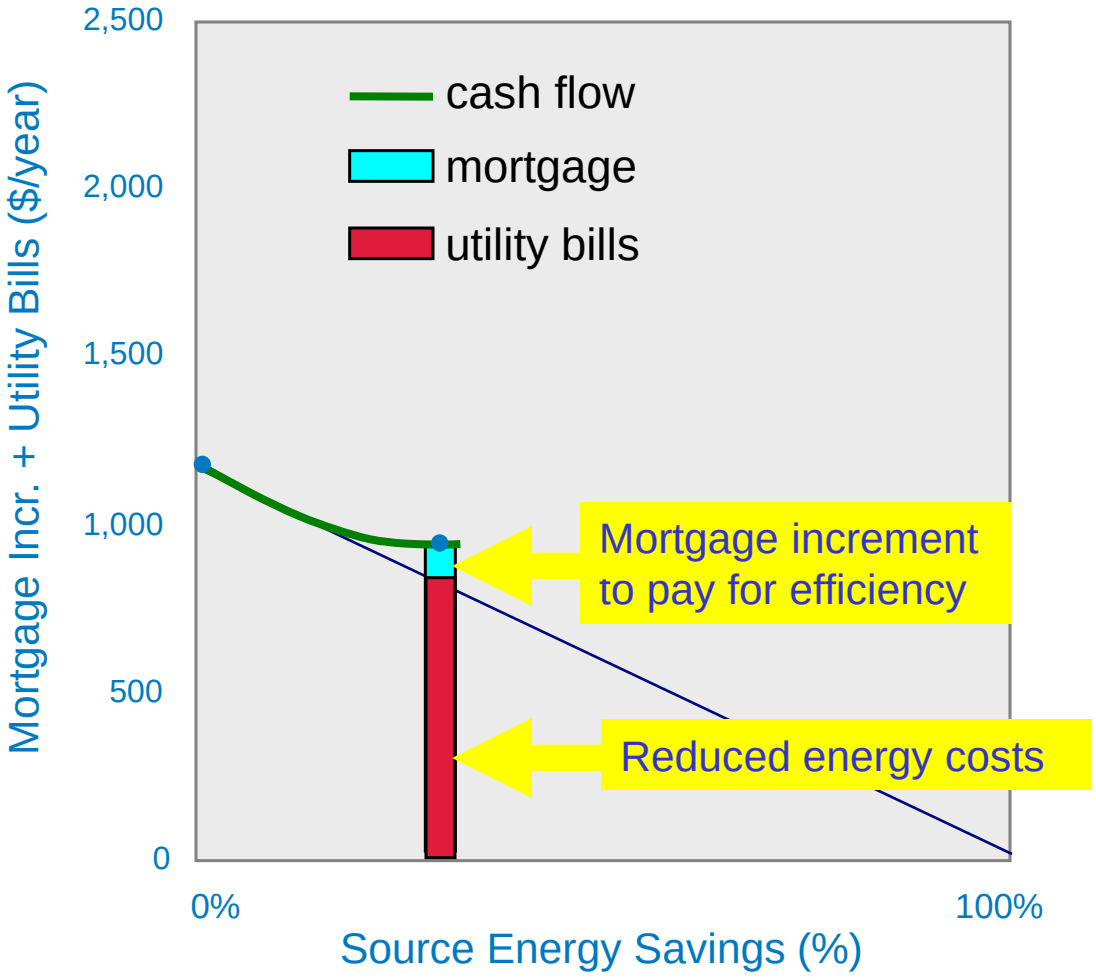
The Path to Zero Net Energy



energy-related cash flow

energy savings relative to base

The Path to Zero Net Energy



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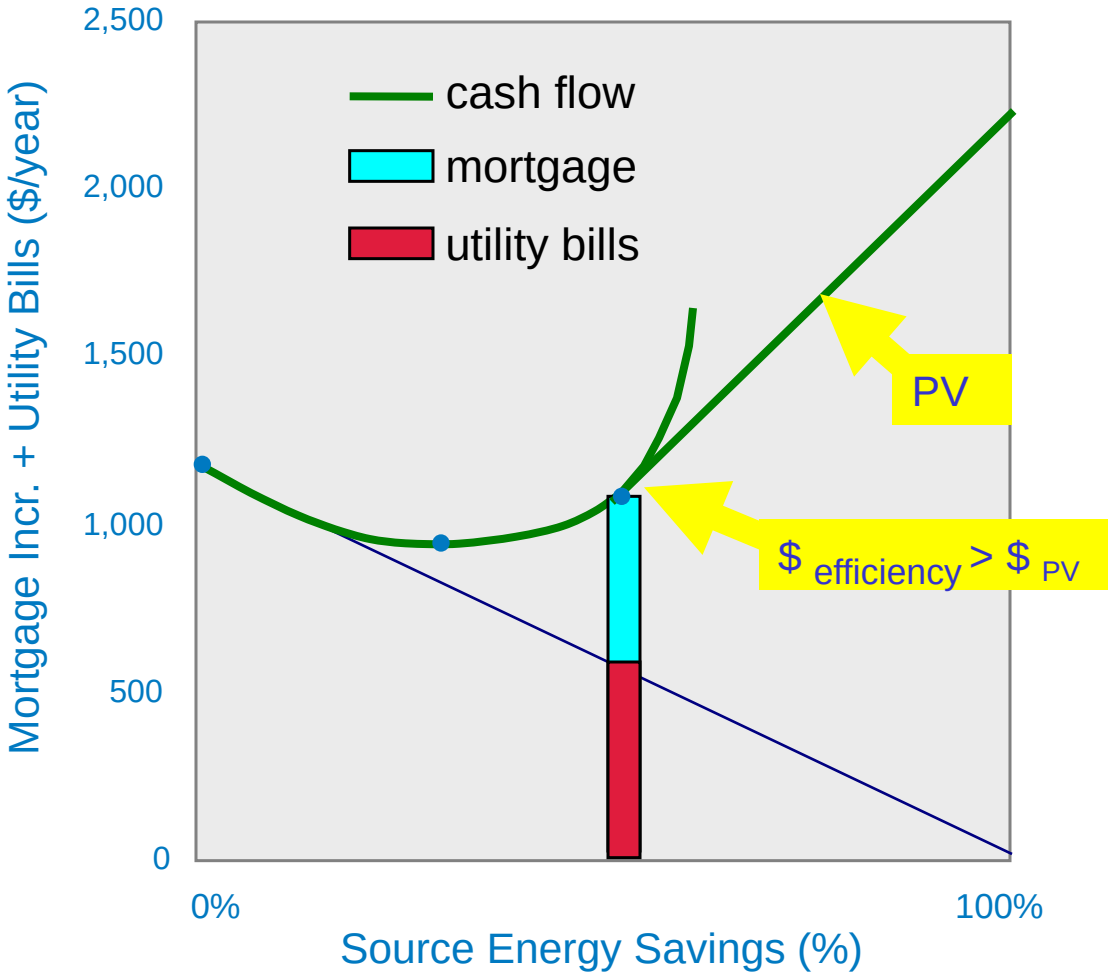

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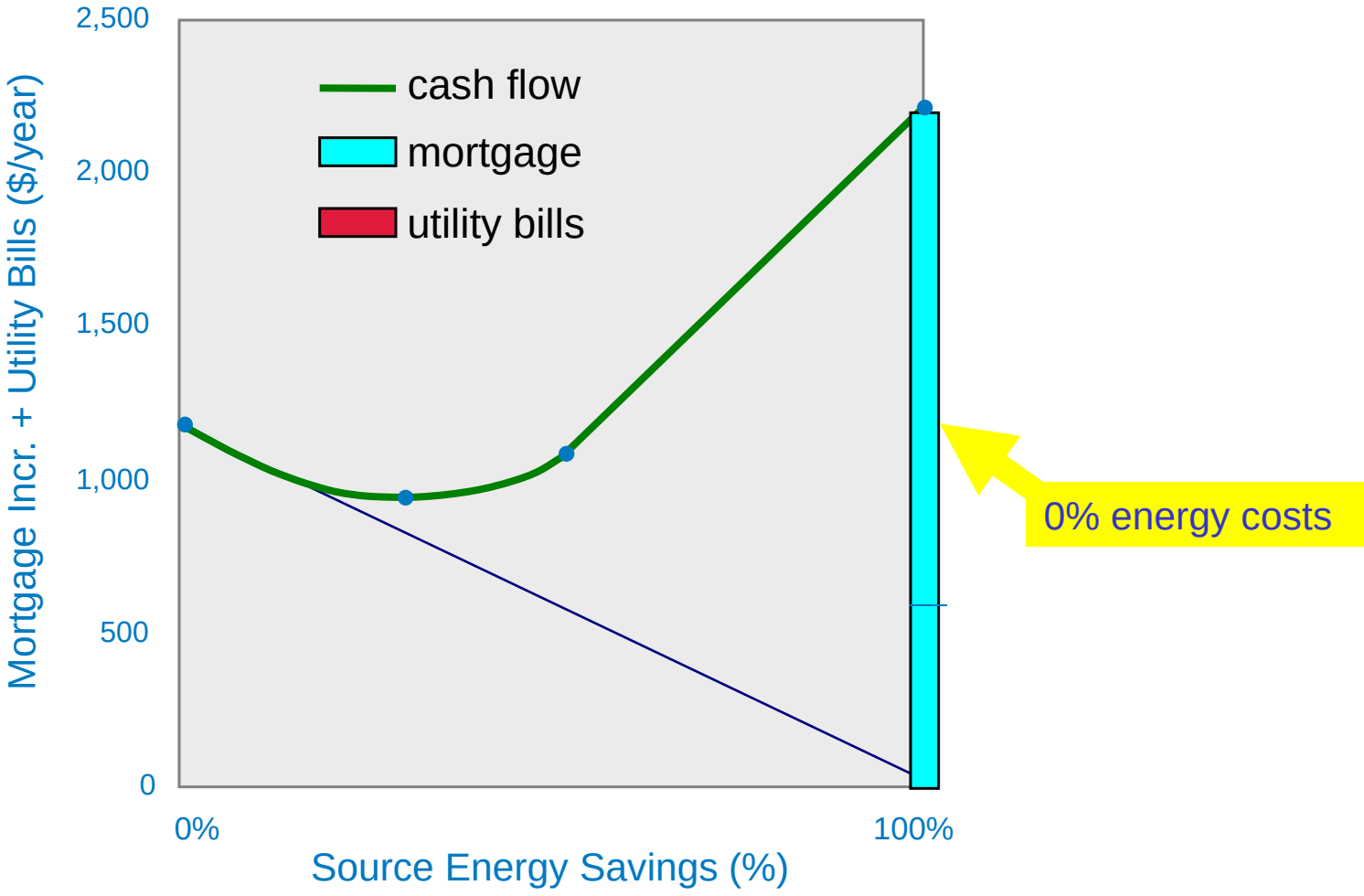

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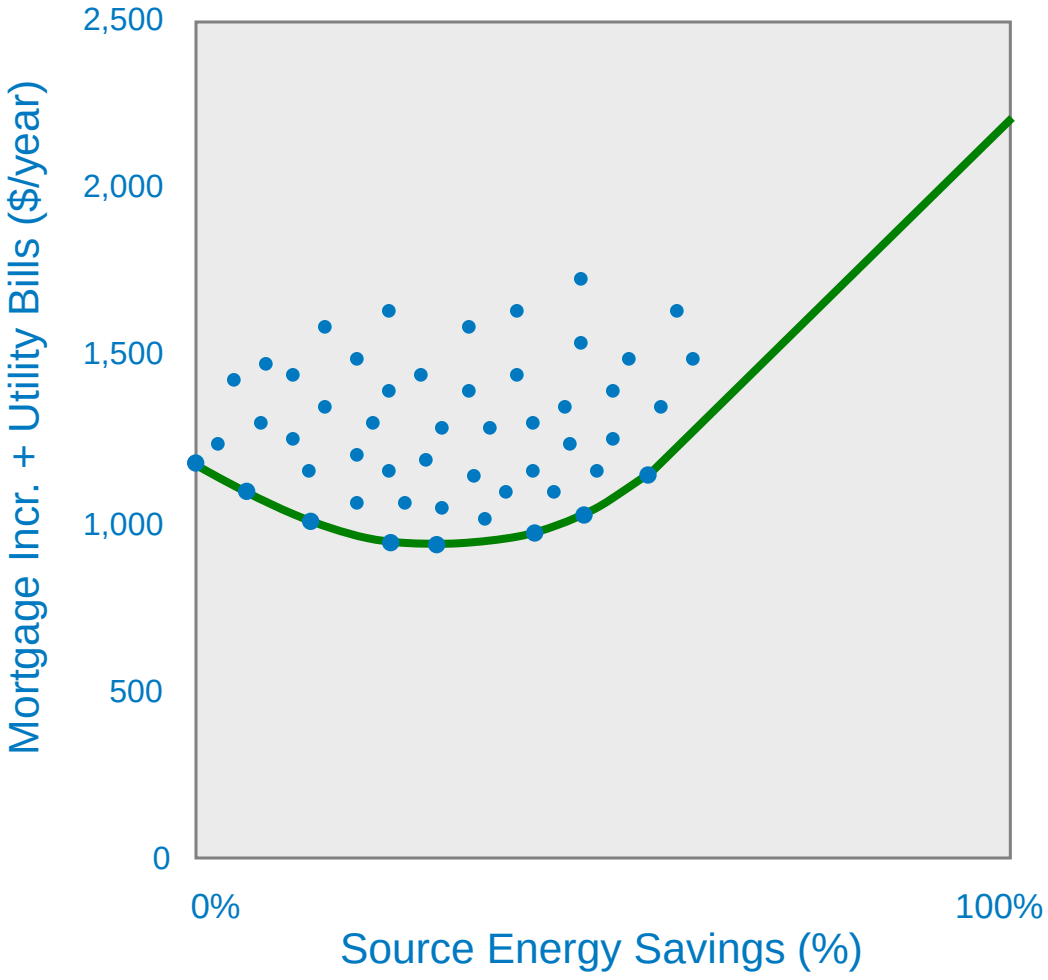
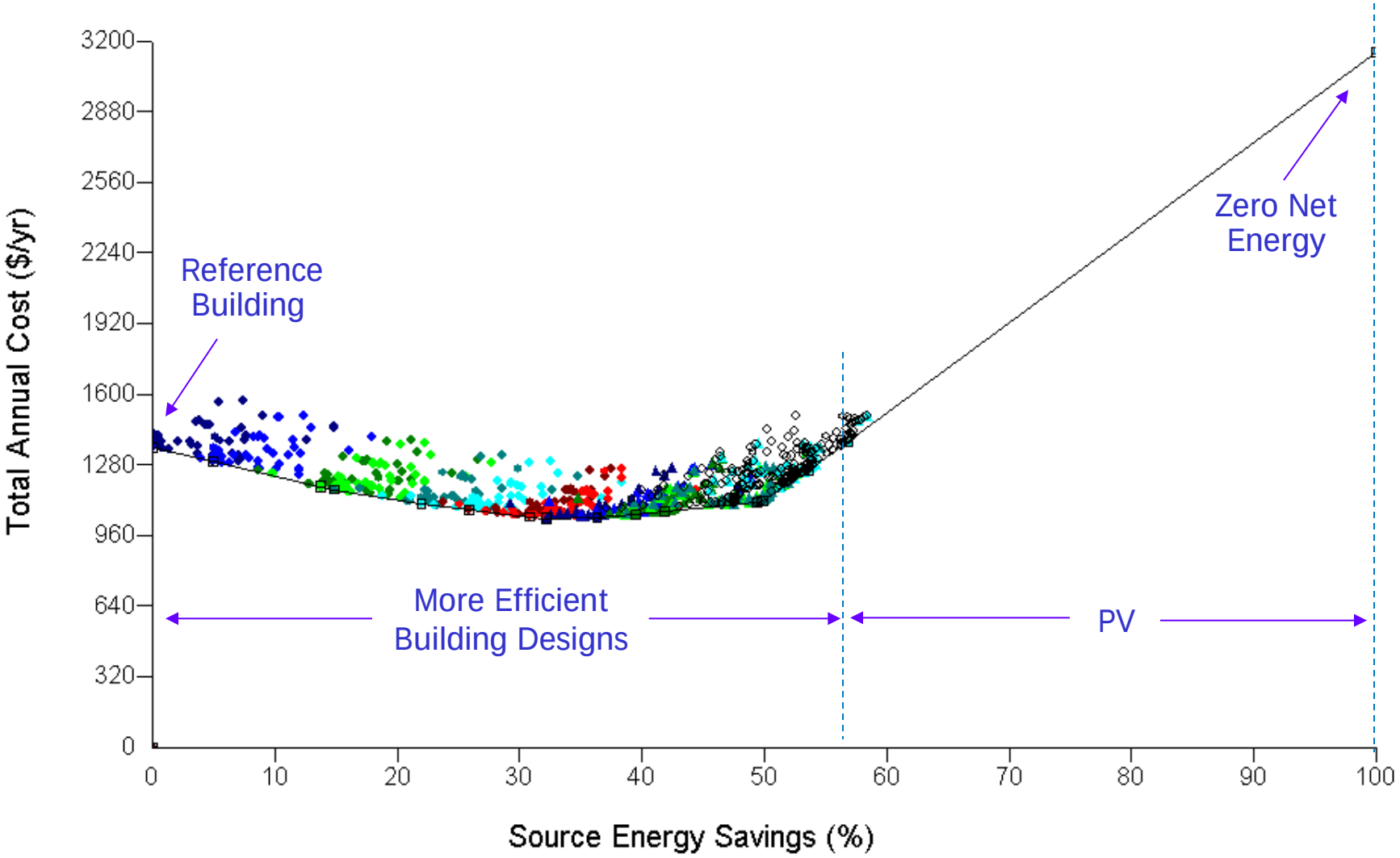
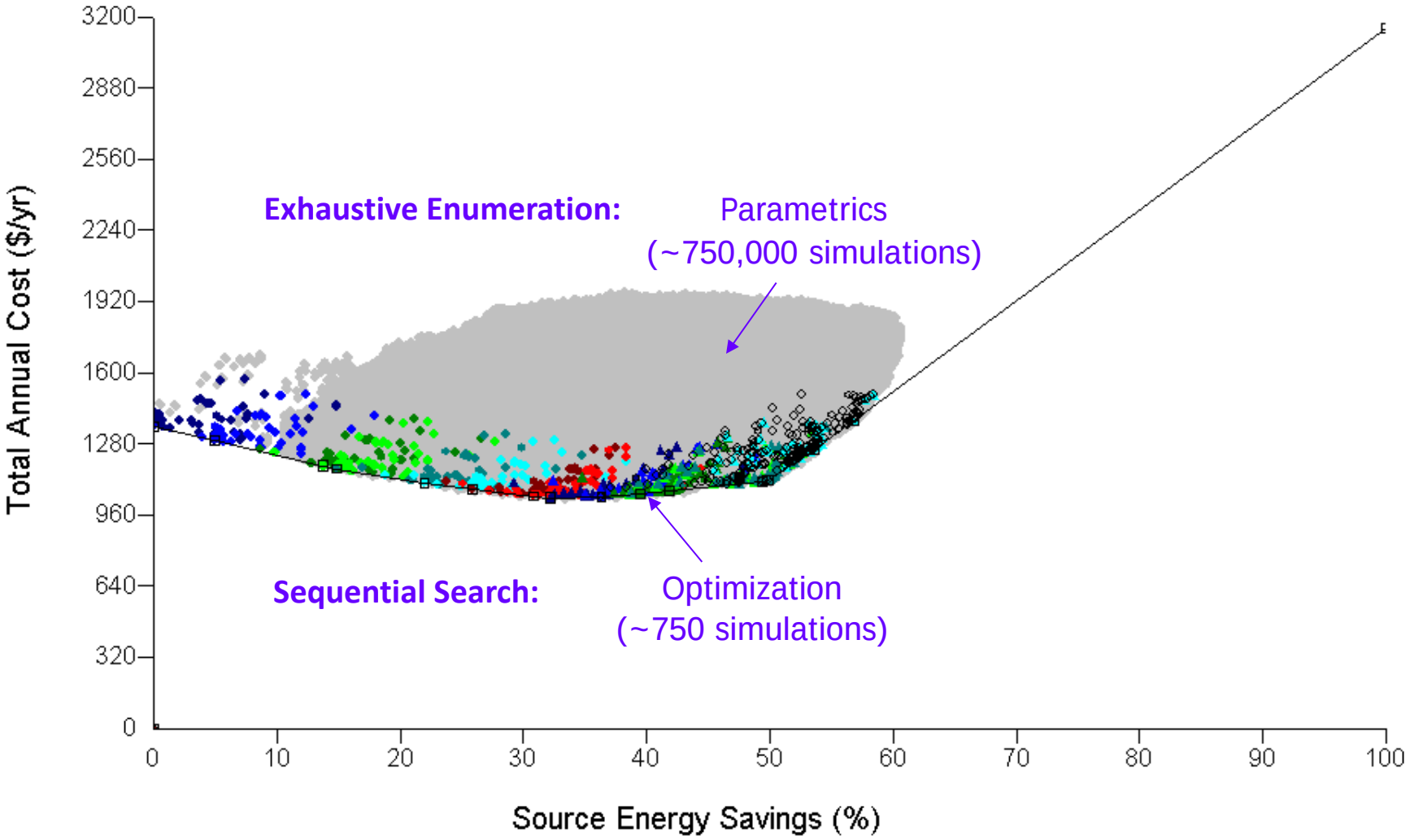


Validation


Total Annual Cost ($/yr)
3200
2880
2560
2240
1920
1600
1280
960
640
320
0
0
10
20
30
40
50
60
70
80
90
100
Source Energy Savings (%)
Reference Building
Zero Net Energy
More Efficient Building Designs
PV

Validation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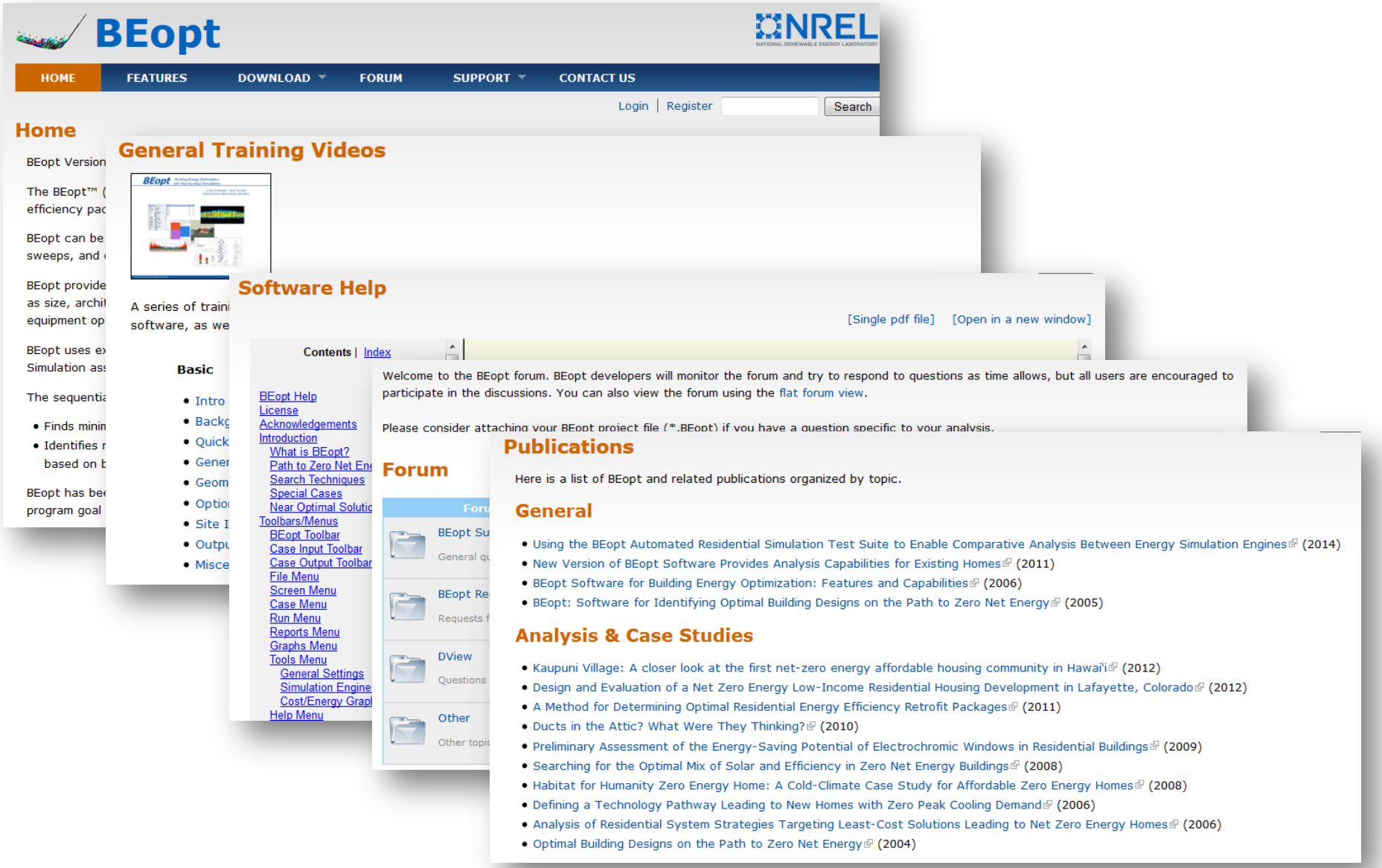
40
50
60
70
80
90
100
Source Energy Savings (%)
Exhaustive Enumeration:
Parametrics
(~750,000 simulations)
Sequential Search:
Optimization
(~750 simulations)

BEopt Website – http://beopt.nrel.gov



National Residential Efficiency Measures Database

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The National Residential Efficiency Measures Database is a publicly available, centralized resource of residential building retrofit measures and costs for the U.S. building industry.

With support from the U.S. Department of Energy, NREL developed this tool to help users determine the most cost-effective retrofit measures for improving energy efficiency of existing homes. Learn more about the database.

By accessing the database, the user agrees to the terms and conditions of use.

View Data Now

Supporting Resources
The following resources provide more information about the data and allow you to download the data.

- Data dictionary
- XML file download
- Simulation Protocols
- Glossary
- Guide for Application Developers
- Development Document

"The purpose is … to provide a nation unified database of residential building retrofit measures and associated costs."

Measures Database – What's Available

- Building component engineering properties
- Performance levels of building components (IECC code, ENERGY STAR, Federal appliance standards)
- Lifetimes of components
- Average and range of material and labor costs
- Combinations of reasonable efficiency measures (i.e. improves efficiency, meets code and Federal standards)

Measures Database – Example

Replace Furnace:

Before-Component	After-Component	Cost
Gas, 68% AFUE **Properties:** • AFUE: 0.68 Btu/Btu • Fuel Type: gas • Max Supply Temp: 120.0 degrees F **Lifetime:** • 20 Years	**Gas, 98% AFUE** **Properties:** • AFUE: 0.98 Btu/Btu • Fuel Type: gas • Max Supply Temp: 120.0 degrees F **Performance Standards:** • Exceeds Federal Standard 1992 • Exceeds Energy Star 2006 • Exceeds Federal Standard 2015 **Lifetime:** • 20 Years	**Measure Cost** Units: $/kBtuh; Range: 17 - 34; Average: 24 Units: $; Range: 680 - 1500; Average: 1100

Measures Database – Application

- Integrated in BEopt
- Data available as XML for software developers

- For more info visit http://www.nrel.gov/ap/retrofits

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