DOE Zero Energy Ready Home
Tech Training Webinar Series

Building Energy Optimization Tool (BEopt)
Website

• [www.buildings.energy.gov/zero/](http://www.buildings.energy.gov/zero/)

• **Events:**
  • Upcoming in-person ZERH Trainings
  • Technical Training webinars
  • Conference Presentations

• Partner Locator
• Program Specifications
• Webinar Recordings

Building America Solution Center

Thank You

For More Information:

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DOE Zero Energy Ready Home

BEOpt Training

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beopt.nrel.gov
Outline

• **Background**
• **Design Analysis**
  o Geometry Screen
  o Options Screen
  o Site Screen
  o Run
  o Output Screen
• **Optimization Analysis**
  o Path to ZNE
  o Validation
  o Options Screen
  o Run
  o Output Screen
• **Library Manager**
• **DView – Hourly Visualization**
Schedule

Partner Contributions

CEC (FY08-FY09) BEopt w/Micropas
ARRA (FY10-11) Updated platform, batch simulations
CEC (FY08-FY09) BEopt w/Micropas
CPUC (FY11-14) Retrofit analysis, utility cost effectiveness tests, incentives, etc.
CPS Energy (FY12) San Antonio analysis
CPUC (FY14-15) Multifamily
BPA (FY14) BEopt follow-on
BPA (FY13-14) EnergyPlus vs. SEEM validation
CPS Energy (FY12) San Antonio analysis
BPA (FY13-14) EnergyPlus vs. SEEM validation
ARRA (FY10-11) Updated platform, batch simulations
CEC (FY15) CSE tool
BPA (FY14) BEopt follow-on
BPA (FY14) BEopt follow-on
CPUC (FY14-15) Multifamily
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What is BEopt? (beopt.nrel.gov)

**Features:**
- Design, parametric, optimization
- New construction and retrofit
- Detailed cost database
- Rapid building drawing tool
- Detailed utility rates (tiered, time-of-use, real-time pricing)
- PV compensation (net-metering, feed-in tariffs)
- Utility cost effectiveness tests
- PV/efficiency incentives
- Demand response
- HPXML export
- Schedule wizard
- Output visualization
- Metrics: LCC, NPV, SPP, LCOE, CO2
- Batch simulations
- Library manager
- ...
Case Study

Denver Habitat for Humanity Zero Energy Home
BEopt GUI

Input

Geometry

Site

Options

Output

Run
Live Demo
Minimum-cashflow designs at various energy-savings levels
The Path to Zero Net Energy

- Energy-related cash flow

- 100% utility bills

- Energy savings relative to base

Source Energy Savings (%) vs. Mortgage Incr. + Utility Bills ($/year)
The Path to Zero Net Energy

Mortgage Incr. + Utility Bills ($/year)

Source Energy Savings (%)

- cash flow
- mortgage
- utility bills

Mortgage increment to pay for efficiency
Reduced energy costs
The Path to Zero Net Energy

- Source Energy Savings (%)
- Mortgage Incr. + Utility Bills ($/year)

- cash flow
- mortgage
- utility bills

$\text{efficiency} > \$\text{PV}$
The Path to Zero Net Energy

Source Energy Savings (%)

Mortgage Incr. + Utility Bills ($/year)

- cash flow
- mortgage
- utility bills

0% energy costs
The Path to Zero Net Energy

Source Energy Savings (%) vs. Mortgage Incr. + Utility Bills ($/year)
Validation

The graph illustrates the relationship between Total Annual Cost ($/yr) and Source Energy Savings (%). The data points represent different building designs, with the reference building and more efficient building designs marked. The graph shows a trend where as the source energy savings increase, the total annual cost also increases. The graph also highlights the concept of zero net energy, where the energy output equals the energy consumption over a year.
Validation

- Exhaustive Enumeration: (~750,000 simulations)
- Parametrics: (~750 simulations)
- Sequential Search:
- Optimization: (~750 simulations)