

BUILDING ENERGY SIMULATION

For Users of EnergyPlus, VisualSPARK, DOE-2, BLAST, GenOpt, BDA, ENERGY-10 and their Derivatives

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**Position Available in
Building Science Research**

**Lawrence Berkeley National
Laboratory seeks an
experienced professional to
lead the Simulation Research
Group (EnergyPlus,
DOE-2, VisualSPARK, and
GenOpt). [Click here for the
position description or email
klelligenton@lbl.gov for
details.](#)**

Release of EnergyPlus 1.2.2 - New Features

EnergyPlus Version 1.2.2

To download a free copy of the program go to

<http://www.energyplus.gov/>



• • Features of the New Release • •

HVAC

- Simplified definition of HVAC - compact HVAC allows user to specify a generic system type which is then automatically expanded into the traditional branches and nodes
- Refrigerated cases and associated compressor racks
- Variable speed cooling tower model with either user-selectable or user-defined performance based on either the CoolTools or YorkCalc correlation
- Three new setpoint managers for single zone heating, single zone cooling, and outside air pretreatment
- Evaporative coolers can now be included in outside air path
- Desuperheater heating coil with heat source from fixed percentage of DX cooling coil waste heat or refrigerated case compressor rack
- DXSystem:AirLoop can now be used as outside air equipment
- DX heating coil can be defined with a biquadratic curve
- Added electric consumption of forced draft fan (or other parasitic load) to Boiler:Simple
- Link to SPARK for simulating complex equipment and systems not currently supported by EnergyPlus

Geometry/Windows/Walls/Shading

- New special case of heat transfer surfaces - Exterior Vented Cavity - allows modeling of ventilated photovoltaic roof paver systems and other cladding systems

On-Site Energy Supply

- Transpired solar air collectors

HVAC (continued)

- Multimode DX coil added to model 2-stage, subcool reheat and partial bypass
- Compressor selection, latent degradation and antifreeze mixture models added to water-to-air heat pump
- Water mains temperature based on correlation or schedule as input for domestic hot water and water heater
- Water Heater:Mixed object can interact with zone heat balance, has off- and on-cycle parasitic load inputs, PLR curve, and can model tankless/instantaneous water heater
- Domestic hot water can be run stand-alone
- Domestic hot water and plant load profile now accept fractional schedules and supply temperatures can default to water mains temperatures
- Dehumidification controls added to DXSystem:AirLoop
- New Component Setpoint-based Operation control scheme added for Plant Loop for Chiller and Boiler control. This control scheme allows control of constant flow equipment to an outlet setpoint that is set by a Scheduled Setpoint Manager. The design flow rate for the components specified in the control scheme can be autosized along with the component.
- Automatic intelligent setting of controller convergence tolerance
- Improved night ventilation capability

Zone Model

- User can specify sensible fraction of load due to people
- New room air model for natural cross ventilation (coupled to COMIS)
- Outside face temperature of zone surfaces can now be specified with a schedule

• • continued on the next page • •

Release of EnergyPlus 1.2.2 - New Features -- continued

Input

- Schedule data can now be read from an outside file
- New dataset for commercial customer utility tariffs
- System convergence limits now allow the user to set minimum system time step and maximum HVAC iterations (can significantly reduce execution time)
- New control option for Exterior Lights that turns them off when the sun is up
- Updated dataset of measured input parameters from the Solar Rating and Certification Corporation for 115 different solar thermal (hot water) collectors
- Example input files for all new features (more than 200 example files available)
- More than 200 new international weather locations including Bangladesh, Brazil, China, Ethiopia, Ghana, Kenya, Italy, and Nepal in the EnergyPlus/ESP-r weather format (more than 900 locations in 100 countries available worldwide)

Output

- Heating and cooling loads and energy due to ventilation now can be reported
- Standard water heater ratings reported including energy factor and recovery efficiency
- Improved reporting of error context throughout
- Many other new variables now can be reported

Utilities

- IDF Editor
 - All file size limits have been removed
 - Allow multiple objects to be copied and pasted
 - Supports autosize as default
- Weather converter
 - TMY3 (SWERA) format can be processed
 - "Custom" format processing
 - Better "missing data" controls for user (can specify to an extent)
- WinEPDraw – Windows version
 - Allows some more control over >4-sided figure drawing
 - Will execute "Drawer" from inside program

Environmental Impacts

- Source energy factors can vary using a schedule
- Title 24 Time Dependent Valuation (TDV) factor schedules in Datasets

Documentation and Guides

- Input/Output Reference and Engineering Reference have been updated and extended for all new features and updates
- Revised Guide for Module Developers
- Revised Programming Guide
- More than 2200 pages of documentation

• • And speed improvements throughout • •

EP-Quick

EP-Quick is a simple program that creates an EnergyPlus input file for a building, without HVAC. Simple templates are used for the shape and zone layout.

Get EP-Quick from <http://www.glazersoftware.com>

EP-Quick creates input files for many any sized buildings using built in templates for the shape and zone layout. By using templates for commonly shaped buildings and zone layouts, the time needed to create an EnergyPlus input file is greatly reduced.

You may download EP-Quick and give it a try. The version you download is a demo and only generates EnergyPlus input files for triangular buildings.

Once purchased and registered, EP-Quick will generate EnergyPlus input files based on 26 different templates. Please see the web site for additional information including screen shots and images of each template. EP-Quick costs \$89 for a single user license and \$39 for an academic license.

EnergyPlus may be freely downloaded from:
<http://www.energyplus.gov/>

Questions and comments may be directed to Jason Glazer, Glazer Software, at jglazer@gard.com



Ask An EnergyPlus Expert



COMIS SITE WIND CONDITIONS

From the descriptions in the COMIS User Guide, I don't understand how to calculate the "Plan Area Density" in COMIS Site Wind Condition.

Answer

Plan Area Density = Built Area / Total Reference Area

where:

Built Area = looking from above (plan view), the area that contains buildings or other significant structures within the reference area

Total Reference Area = area surrounding the building; it extends from a radius of 10 times the building height to a radius of 25 times the building height

ASSISTED VENTILATION

I'm using the Direct Air Object given to a dummy zone and then mixed with the zone I need to simulate, adding a separate air supply for ventilation. I also use a completely different air loop for supply the direct air. Within the dummy zone I need to define walls. Is there a way to make the walls into non-heat-transfer surfaces or does the direct air object not care about satisfying zone conditions?

Answer

1. You cannot serve the same zone with two air loops. You can have more than one system serving a zone, but only one can be an AIR PRIMARY LOOP. The other equipment must be zone equipment (window AC, fan coil, etc.).
2. Direct air has no capability to control, so it will deliver the specified flow (unless the air loop supplying it cannot do so) all the times it is available.
3. The presence of ZONE CONTROL:THERMOSTATIC for a given zone determines whether there is a "zone load" that the HVAC equipment will try to meet if it can (but Direct Air cannot do so in any case).
4. The dummy zone does not need a full set of surfaces, it just needs one. You can use Surface:HeatTransfer:InternalMass if you wish. Or use Surface:HeatTransfer and make it adiabatic by setting the OutsideFaceEnvironment to be itself.

CHILLER:ELECTRIC, TEMPERATURE RISE COEFFICIENT

How do I identify the "Temp Rise Coefficient" in the module Chiller:Electric ? Also, how do I get "Required entering condenser air or water temperature to maintain rated capacity" and "Required leaving evaporator water outlet temperature to maintain rated capacity".

Answer

These values can be calculated by looking at a set of performance data for the chiller for a range of evaporator and condenser water temperatures. For example, say an electric chiller has a nominal capacity of 1000W at 6.7C Design Evaporator Outlet and 29.4C Design Condenser Inlet. Find another set of water temperatures at which the same chiller delivers 1000W of capacity (you may have to interpolate to find such a point in the performance data). For example, say the chiller also has a capacity of 1000W at 8C Evaporator Outlet and 32C Condenser Inlet. Then the Temp Rise Coefficient would be $(32-29.4)/(8-6.7)=2.6/1.3=2.0$.



Ask An EnergyPlus Expert



DETERMINING TOTAL BUILDING ENERGY CONSUMPTION

I am simulating five Zone DX VAV (with gas reheat) building. I want to calculate the energy consumed by the building for the run period. From the variable report, I selected all key values for these variables:

- 1- Lights-Electric Consumption
- 2- Heating Coil Gas Consumption
- 3- DX Cooling coil electric consumption
- 4- Fan Electric consumption

I added them to calculate the total energy consumption by the building. However, for the same file I requested reporting by ReportMeter for the following variables (all key values were selected):

- 1- Electricity
- 2- Heating gas

I added the result to find the total energy consumption and compared it with the previous results. The total energy consumption value from the second run was higher than the first run. I need help to determine the proper way of calculating the total energy consumption in a building.

Answer

The meter details (*.mtd) output file lists the connections of report variables and meters. The first section lists each metered report variable and the meters to which it is attached. The second section lists each meter and which report variables are listed. Electricity:Facility and Gas:Facility are the total use for the building and HVAC systems.

Question

Does this mean that if I ask for Electricity:Facility and Gas:Facility, I will get the total electricity and gas consumed by the building without having to add the electric and gas consumed by the individual variables?

Answer

Well, the short answer is "yes." However, another method to get these values for a full year is to use

```
Report:Table:Style,  
HTML;           !- ColumnSeparator (can be csv or other options)  
  
Report:Table:Predefined,  
Annual Building Utility Performance Summary; !- ReportName1
```

TEMPERATURE SETPOINTS

I am simulating an insulated single space building with double pane windows using the Purchased Air option. The orientation of the building will change in order to show the effect of daylight in reducing or increasing the heating and cooling loads throughout the year. I would like to run it so that the Purchased Air is turned on according to certain temperature (temperature setpoints). Do the setpoints in EnergyPlus reflect the temperature of the specified space node or from the outdoor environment?

Answer

Purchased air is controlled to meet the setpoints specified in ZONE CONTROL:THERMOSTATIC and related objects. These setpoints specify the desired zone air dry bulb temperature.



Ask An EnergyPlus Expert



SCHEDULE ERRORS

In my model, one of the schedules is set as follows,

```
SCHEDULE,  
  COOL-SCHED,          !- Name  
  Temperature,        !- ScheduleType  
  COOL-SCHED-Week,    !- Name of WEEKSCHEDULE 1  
  4,                  !- Start Month 1  
  1,                  !- Start Day 1  
  11,                 !- End Month 1  
  30;                 !- End Day 1
```

When I ran the model, the ERR file gave this message:

```
** Severe ** Schedule "COOL-SCHED" has missing days in its schedule pointers
```

Should the schedule be specified all year round?

Answer

From p. 51 in the Input/Output Reference:

"Each schedule must cover the entire year or a fatal error will result."

This does not mean that you must have your equipment on the entire year, just that the SCHEDULE must address each day of the year. A replacement for the schedule shown above would be:

```
SCHEDULE,  
  COOL-SCHED,          !- Name  
  Temperature,        !- ScheduleType  
  OFF-Week,  
  1,  
  1,  
  3,  
  31,  
  COOL-SCHED-Week,    !- Name of WEEKSCHEDULE 1  
  4,                  !- Start Month 1  
  1,                  !- Start Day 1  
  11,                 !- End Month 1  
  30,                 !- End Day 1  
  OFF-Week,  
  12,  
  1,  
  12,  
  31;
```

Where, of course, OFF-Week must be defined per usual conventions.



Ask An EnergyPlus Expert



DIFFERENT FAN MODELS

I built a model with an air-cooled chiller; the fan model is the Fan:Simple:Variable Volume, and the fan coefficient values were set as the values of Inlet Vane Dampers in table 20 on page 748 in the Input/Output Reference. The model was run and I obtained the electricity consumption of the fan and the chiller. Then I substituted Fan:Simple:Constant Volume instead of Fan:Simple:Variable Volume and ran the model again. And again I obtained the electricity consumption of the fan and the chiller. However, the results of these two cases were almost identical, and the result of the model with the constant air volume fan was even a bit smaller than that of the other model. Shouldn't the model with variable air volume fan consume less energy than the model with constant air volume fan?

Answer

Changing the fan object alone is not sufficient to change a VAV system to a constant volume system. The air terminal units establish the upper limit on airflow through a system and even a constant volume fan can deliver less than full flow (with linear power consumption) in order to maintain mass balance. To do your comparison, you could use either the VAV or CV fan object and simply change the minimum flow fractions on the VAV terminal units to 1.0. This will force the system to function as a constant volume system.

PV AND WYEC FILES

Where can I get detailed explanation of the data fields in the WYEC files? I need the data to do some hand calculations for PV energy.

Answer

EnergyPlus has a various ways of calculating photovoltaic power production using EnergyPlus weather data. It isn't necessary to model an entire building, so developing input files isn't terribly difficult for PV-only modeling. The example file demonstrating PV systems is "GeneratorswithPV.idf." There are three types of models available including a simple user-defined/constant efficiency, the equivalent one-diode model (originating from TRNSYS), and the newer, David King model from Sandia National Labs. Over 100 input data sets are provided for the Sandia model. The incident solar can be modeled to include the effects of other surfaces that might shade, or reflect onto, the panels.

PURCHASED COOLING AS BACKUP COOLING

I am simulating a building that can use cooling directly from condenser loop (cooling tower and so on). But in the summer season there are days the cooling load cannot be matched. So there is need to provide chilled water as backup cooling source. How do I set up purchased cooling as the backup cooling source in EnergyPlus? To clarify,, the cooled water from cooling tower is still the main cooling source. When the cooled water temperature from cooling tower is not low enough, then the purchased cooling is to be mixed with water from the cooling tower to lower the cooled water temperature.

Answer

The current free cooling components assume that the chilled water loop will operate either a chiller or the free cooling heat exchanger but not both. To model your situation, put two cooling coils in series in the main air branch. Connect the first cooling coil to a chilled water loop served by the free cooling heat exchanger. Connect the second cooling coil to a chilled water loop served by a chiller. If the first coil meets the desired supply air setpoint, then the second coil should remain off.



Ask An EnergyPlus Expert



FLUID LOOPS

Does EnergyPlus have a virtual loop for refrigerants? If so, how does the component obtain the fluid properties for simulation? And is there a routine included in every HVAC component specially for the processing of the fluid properties?

Answer

PLANT LOOPS and CONDENSER LOOPS are currently only liquid loops and do not model refrigerants. Specific fluid properties are used by key components, but not by all. REFRIGERANT properties are currently used only by the COIL:WaterToAirHP:Cooling and COIL:WaterToAirHP:Heating.

OUTSIDE MINIMUM FLOW

I have a question about using the object "Controller:outside air." I am not sure how to input the field *minimum outside flow rate* combined with minimum limit field (FIXED or PROPORTIONAL). Assuming the system design maximum airflow rate is 6 m³/s; with 80 occupants; each zone minimum airflow ratio 0.3 (VAV system); the sum of total maximum airflow rate for all zones is 7 m³/s (it is bigger than system airflow rate). Set minimum airflow rate for each occupant 8L/s. If I use "fixed minimum," then the minimum outside air flow rate should be: 80*0.008=0.64 m³/s. The maximum outside flow is 6m³/s. Is this correct?

If I choose PROPORTIONAL MINIMUM and set the ratio of outside air flow rate to system air flow rate of 0.3, what should be the minimum outside air flow in this field? To my understanding, it should be 7 (sum of total air flow)* 0.3 (zone minimum air flow)* 0.3 (outside airflow to system airflow ratio)=0.63 m³/s. So should the input be 0.63 into the minimum outside air flow rate field? And is this method correct?

Answer

The minimum outside air flow rate input should reflect the desired minimum OA flow when the system is at its full flow rate. With FIXED MINIMUM, the OA flow rate will equal the "minimum outside air flow rate" multiplied by the current "Minimum Outside Air Schedule Value" (if specified). However, if the total system supply flow rate falls below this value, the OA flow will be reduced to match the supply flow rate. It is up to the user to set the VAV minimum flow rates to deliver enough total flow to meet the desired OA minimum flow.

With PROPORTIONAL MINIMUM, the OA flow rate will equal the "minimum outside air flow rate" multiplied by the current "Minimum Outside Air Schedule Value" (if specified) multiplied by the ratio of the current system supply flow rate divided by the design full system supply flow rate.

Eventually, a clearer explanation of this will be added to the Input/Output Reference.

DIMMER

How do I specify the efficiency of a dimmer in daylighting:detailed. For example, if the efficiency is 70%, how would it be entered in the minimum power output and minimum lighting output?

Answer

If by 70% efficiency, you mean that the minimum power the dimmer will go to is 30%, look at the example file: DElight-Detailed-Comparison.idf. You enter the minimum power and minimum light output in DAYLIGHT:DETAILED in these fields: Minimum input power fraction for continuous dimming control, Minimum light output fraction for continuous dimming control. See the discussion of DAYLIGHT:DETAILED beginning on page 223 of the Input/Output Reference (page 253 of the PDF). These fields are discussed beginning on page 227 (page 257 of the PDF).



Ask An EnergyPlus Expert



COIL MODEL QUESTIONS

I have two questions about the DX Coil Model. For the DX Coil Model -- DX Cooling Coil Model, I'm confused by a sentence in the Engineering Document:°

The total cooling capacity modifier curve (function of flow fraction) is a quadratic curve with the independent variable being the ratio of the actual air flow rate across the cooling coil to the rated air flow rate (i.e., fraction of full load flow).

The "actual air flow rate across the cooling coil" seems to be a mean value in a time step. What does that mean exactly?

Answer

Yes, the air flow rate reported by EnergyPlus is an "average" value for the simulation time step when the DX system's fan cycles on and off to meet the sensible cooling load. This average value is determined by the air flow rate across the cooling coil when the fan is on multiplied by the fraction of the time step the fan operated. So the "actual air flow rate across the cooling coil" referred to above means the air flow rate when the fan was on, NOT the average reported each time step.

Question

How can I define the "the actual air flow rate" from the manufacture's catalogue data in order to get the modifier coefficient?

Answer

Manufacturers provide a rating for air conditioning systems at some nominal air flow rate and some "rated" inlet air condition. At this nominal air flow rate and "rated" inlet air condition, the manufacturer states a gross and/or net cooling capacity. Be careful to use the gross cooling capacity as stated by the manufacturer. If the manufacturer only provides a net cooling capacity, the fan heat must be subtracted to yield a gross cooling capacity (gross cooling capacity is higher than net cooling capacity).

For this example, let us assume 1000 W gross cooling capacity at 2 m³/s nominal air flow rate and at a "rated" inlet air condition of 26.7 C dry-bulb and 19.4 C wet-bulb when the outdoor temperature is 35 C.

The manufacturer also provides performance data tables at air flow rates different from the nominal air flow rate. Find the "rated" cooling capacity in the chart and note the "rated" inlet air conditions.

So, at indoor conditions of 26.7 C dry-bulb / 19.4 C wet-bulb and 35 C outdoor temperature we have from the performance data table:

Air flow (m ³ /s)	Capacity (W)
2.0	1000 *** rating point ***
1.5	850
1.0	657

Next this data has to be normalized to 1 at the rating point as follows:

Continued on the next page



Ask An EnergyPlus Expert



COIL MODEL QUESTIONS (CONTINUED)

Divide the air flow column by the rated air flow (2.0 in this example) and the capacity column by the rated capacity (1000 W in this example). Since capacity is a quadratic function of air flow I will also show the air flow rate squared in the example below. You get:

Normalized Capacity	Normalized Air Flow	Normalized Air Flow squared
1.0	1.0	1.0
0.85	0.75	0.5625
0.675	0.5	0.25

This normalized data set must then be curve fit according to the equation:

Normalized Capacity = $A1 + B1 \cdot \text{Normalized Air Flow} + C1 \cdot \text{Normalized Air Flow} \cdot \text{Normalized Air Flow}$

-- or --

Normalized Capacity = $A1 + B1 \cdot \text{Normalized Air Flow} + C1 \cdot \text{Normalized Air Flow squared}$

When this is completed you will have calculated the regression correlation coefficients (we used a common spreadsheet) for Normalized Cooling Capacity as a function of air flow ratio (ratio of actual air flow to rated air flow) as:

$A1 = 0.25$ $B1 = 0.95$ $C1 = -0.20$

The EnergyPlus curve object would then look like this:

```
CURVE:QUADRATIC,  
CapacityAsAFunctionOfFlow,      !- Name  
0.25,                            !- Coeff1 Constant  
0.95,                            !- Coeff x  
-0.20,                          !- Coeff3 x**2  
0.0,                             !- minimum value of x  
1.0;                             !- maximum value of x
```

Question

From the formula of PLR, what do "sensible cooling load" and "steady state sensible cooling capacity" mean respectively? How does the program calculate them (is latent cooling load neglected)? Any suggestion and guide will be appreciated.

Answer

The sensible cooling load is the load to be delivered by the AC system to meet the thermostat set point temperature. The sensible cooling capacity is the capacity of the AC unit when it runs continuously. So if the cooling load is 100 W and the sensible cooling capacity is 200 W, then the PLR is 0.5 and the AC unit only runs 50% of the time. To clarify -- Latent loads are not neglected, but the PLR is calculated based on the sensible portion of the load delivered divided by full-load sensible capacity.



How to Create Meteonorm Weather Files for EnergyPlus



Over the last few years, a number of users have needed weather data to use with EnergyPlus but cannot find measured data on the EnergyPlus web site. When possible, we have created weather data using the Meteonorm software. Meteonorm extrapolates hourly data from statistical data for a location.

Where statistical data aren't available, Meteonorm interpolates from other nearby sites. Generally a statistical approach is a last resort--weather files generated from statistics will not demonstrate the normal hour-to-hour and day-to-day variability seen in measured data.

To help users create a Meteonorm weather file for EnergyPlus, we developed these guidelines:

Step	Directions
1	Start Meteonorm.
2	Click the Site button.
3	Next click the WMO/OMM button and select the continent. (WMO usually means there's a weather station recording hourly data.)
4	In the search site box, enter the first one or two characters of the desired location name and a '*' and click on the >> button.
5	Select the site (if available) from the list and click OK. If there isn't a WMO site available, go to step A.
6	If the location is there, click on the name and Meteonorm will give any warnings about the data. Write down the warnings (in a text file) and note that you used WMO, Station or City data, and the version of Meteonorm used.
7	Click the Format button, select TMY2, and click OK.
8	Click the Hourly Values button, then click the Save button and gave the TMY2 a name when prompted. (Use the ISO 3-letter country abbreviation followed by the city and the format. For example, for Kathmandu, Nepal, this would be: NPL_Kathmandu_MN5.tm2)
9	Convert to EPW using the EnergyPlus WeatherConverter.
10	Post a .ZIP on the EnergyPlus_Support YahooGroup under Files/Meteonorm_Weather_files. The .ZIP should include the .EPW, .DDY, .STAT, and the warnings text file you created (give it a .INFO extension). Save the TMY2 source and the .AUDIT in a separate .ZIP but do not post it to the YahooGroup.

Each .ZIP includes these

- .STAT (EnergyPlus weather data statistics)
- .EPW (EnergyPlus weather file), and
- .INFO (Information about the source data and limitations from Meteonorm).

In all cases, you should review the .stat file for the location before using any of these files to ensure that it represents the climate of the location as you understand it. In many cases, a nearby location with measured data will be more appropriate than one derived from statistics. Use these files at your own risk.

Meteonorm ... continued

If no WMO data are available, try this:

- A. Click the Station button and select the continent again.
- B. In the search site box, enter the first one or two characters of the desired location name and a '*' and click on the >> button.
- C. Select the site (if available) from the list and click OK. If there isn't a site available, go to step Z. If there is a site, go back to step 6.

Finally as a last resort, try this:

- Z. Click the Cities button and select the continent again.
- Y. In the search site box, enter the first one or two characters of the desired location name and a '*' and click on the >> button.
- X. Select the site (if available) from the list and click OK. If there isn't a site available, you are out of luck. If there is a site, go back to step 6.

NOTE: Quality of data declines exponentially if no WMO or Station data is available. Steps Z-X should be used if when no other data are available.

Please note that Meteotest significantly updated the wind and other calculations [hourly wind direction in TMY2, which we use, was constant ... the update makes them variable]. If you received a file from the EnergyPlus team before early December 2004, we strongly recommend that you download the new file. We are working on getting data for another 200 locations over the next few months; targets include Italy (60+ files), Brazil, Ghana, Kenya, Ethiopia, Nepal, Bangladesh, and China. All except Italy are from the UNEP SWERA project (so we're waiting on the data to become available on the SWERA web site swera.unep.net/swera/). As always, if you know of sources of weather data that we might be able to share with the EnergyPlus community, please contact [Dru Crawley](#).



QuickLinks to EnergyPlus Documents



- [Input/Output Reference \(PDF 4.2 MB\)](#)
- [Output Details and Examples \(PDF 493 KB\)](#)
- [Engineering Document \(PDF 4.5 MB\)](#)
- [Module Developer's Guide \(PDF 539 KB\)](#)
- [Interface Developer's Guide \(PDF 200 KB\)](#)
- [Programming Standard \(PDF 168 KB\)](#)

EnergyPlus Version 1.2.2

To download a free copy of the program go to

<http://www.energyplus.gov/>



EnergyPlus is an R&D 100 Award Winner, named one of the 100 most technologically significant new products of the year.

EnergyPlus Support Tools

Support software is listed on our website (http://SimulationResearch.lbl.gov/EP/ep_tools.html) and in Section 2 of this newsletter.

EnergyPlus Weather Data from <http://www.eere.energy.gov/buildings/energyplus/weatherdata.html>

Weather data for more than 800 locations are now available in EnergyPlus weather format — 295 locations in the USA, 55 locations in Canada, and more than 450 locations in 93 other countries throughout the world. See also the write-up on how to [create Meteororm files for EnergyPlus](#).

Ask an EnergyPlus Expert

Questions from EnergyPlus users are answered promptly via email by program developers. To submit questions, join the EnergyPlus User Group at http://groups.yahoo.com/group/EnergyPlus_Support/. A selection of questions/answers are compiled (yearly) into a downloadable PDF document: Q and A for [2002](#), Q and A for [2003](#), Q and A for [2004](#).

EnergyPlus Testing and Validation <http://www.eere.energy.gov/buildings/energyplus/testing.html>

Are you an EnergyPlus Consultant ?

If you are engaged in EnergyPlus consulting, and would like to be listed in the *Building Energy Simulation User News* and on our website (<http://SimulationResearch.lbl.gov>), please send details to klellington@lbl.gov.

Join the EnergyPlus User Group

The developers of EnergyPlus have formed a support group to foster discussion and maintain an archive of information for program Users. We invite questions about program usage and suggestions for improvement to the code. Go to http://groups.yahoo.com/group/EnergyPlus_Support/

Translate EnergyPlus Web Pages

A new link on the main EnergyPlus web page (www.energyplus.gov/) allows you to view the pages in any of eight languages. Unfortunately, the translator doesn't work with PDF files. Look for the fish at the bottom of the web page. Pages may be translated into Chinese, French, German, Italian, Japanese, Korean, Portuguese and Spanish.

EnergyPlus is being developed by University of Illinois and Lawrence Berkeley National Laboratory, with the assistance of DHL Consulting, C. O. Pedersen Associates, Florida Solar Energy Center, GARD Analytics, the National Renewable Energy Laboratory, Oklahoma State University and others. Development of EnergyPlus is supported by the U. S. Department of Energy, Assistant Secretary for Energy Efficiency and Renewable Energy, Office of Building Technologies Program (Program Manager, Dru Crawley).



EnergyPlus Consultants in the United States



California

- [Steven Konopacki](#), 2315 Ward Street, **Berkeley**, CA 94705, (510) 207-9649
- [Wayne Seward, CEA](#), [Bear Technologys](#), 7774 Calle Mejour, **Carlsbad**, CA 92009, (760) 635-2327
- [Cliff Gustafson](#) or Smita Gupta, [Taylor Systems Engrg., Inc.](#), 9801 Fair Oaks Boulevard, #100, **Fair Oaks**, CA 95628, Tel: (916) 961-3400, fax: 961-3410
- [John F. Kennedy, Jr.](#), [GeoPraxis, Inc.](#), 205 Keller Street, #202, **Petaluma**, CA 94952-3874, (707) 766-7010, fax: 766-7014
- [Paul Linden](#), [Natural Works – Consultants](#), **San Diego**, CA
- [Dr. Tianzhen Hong, P.E.](#), [Architectural Energy Corporation](#), 142 Minna Street, **San Francisco**, CA 94105, Tel: (415) 957-1977, fax: 957-1381

Georgia

[Mate Thitisawat](#), Dept of Architecture, Georgia Institute of Technology, **Atlanta**, GA 30309, Tel: (404) 385-4677 (office), Mobile (404) 933-9864

Illinois

- [Erik Olsen](#), [OWP/P Engineers](#), 111 West Washington St., #2100, **Chicago**, IL 60602-2714, Tel: (312) 960-8313, fax: 837-8313
- [Jason Glazer](#), [GARD Analytics](#), 1028 Busse Highway, **Park Ridge**, IL 60068, Tel: (847) 698-5686, fax: 847-698-5600
- [Michael J. Witte, Ph.D.](#), [GARD Analytics](#), 1028 Busse Highway, **Park Ridge**, IL 60068-1802, Tel: (847) 698-5685, fax: 847-698-5600

Massachusetts

[Paul Lyons, P.E., M.E.](#), [Zapotec Energy](#), 26 Glenwood Ave., **Cambridge**, MA 02139-4708, Tel: 617-868-1964, fax: 617-547-9140

Minnesota

- [Richard Hermans, PE](#), [The Center for Energy and Environment](#), 212 Third Ave North, Suite 560, **Minneapolis**, MN 55401, Tel: (612) 335-5840, fax: 335-5888
- [Tom McDougall](#), [The Weidt Group](#), 5800 Baker Road, **Minnetonka**, MN 55345, Tel: (952) 938-1588, fax: 938-1480

New York

[Christopher Balbach](#), [Thomas Associates, Architects and Engineers](#), 215 The Commons, **Ithaca**, NY 14850 Tel: (607) 277-7100, fax: 277-1410

North Carolina

[Derrick Giles](#), Energy Manager, [ENPULSE Energy Conservation, Inc.](#), 100 N. Elm Street, #138, **Greensboro**, NC 27401-2803, Phone: 336-370-1088 Fax: 336-230-0554

Virginia

[John R. Ross III, P.E.](#), Westwind Corporation, 1609 Sereno Court, **Vienna**, VA 22182-1958, Tel: (703) 255-4712, fax: 255-4712

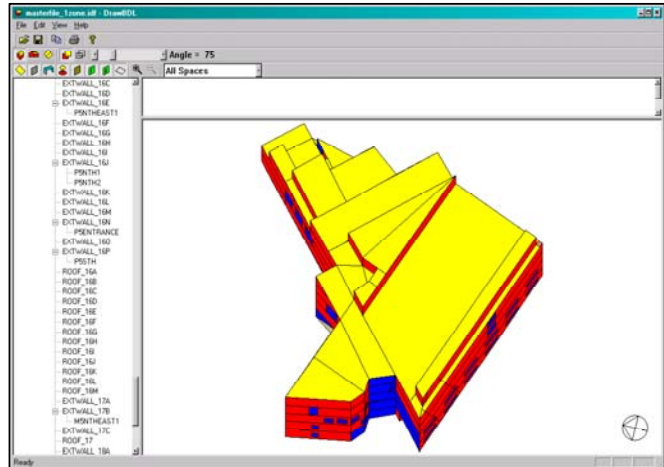
If you would like to be listed as an EnergyPlus consultant in the newsletter and on our website, please send email to klellington@lbl.gov

The "Plus" in DrawBDL+ 3.1 refers to EnergyPlus . . .

DrawBDL+ 3.1

Joe Huang and Associates has both added a "Plus" (+) to the program name, as well as increased the version number to 3.1 to emphasize the ability of *DrawBDL+* to read and display *EnergyPlus* IDF files, as well as to convert the building surface descriptions from *DOE-2* BDL to *EnergyPlus* IDF. For Version 3.0, completed in March 2003, we completely rewrote *DrawBDL* using C++ to run in a native 32-bit environment such as Windows 95/2000/NT. In addition to a different "look and feel" from earlier versions, 3.1 has the following improvements:

1. New user interface with a hierarchical tree showing all building surfaces.
2. No limit on the number of building surfaces.
3. For building surfaces, the expanded data window shows not only the input values, but also their locations in the global coordinate system; for spaces, the data window shows the gross and net areas of walls, windows, doors, roofs, and skylights.
4. Displays surfaces as 2-D or 3-D polygons.
5. Ability to change the sort order of building surfaces used in the display; this allows users to "touch up" the shaded drawings for use in presentations.
6. Interprets both *EnergyPlus* IDF files as well as *DOE-2.1* BDL files.
7. Surface data is output as an *EnergyPlus* IDF file. This allows *DrawBDL+* users to convert their *DOE-2* building descriptions to *EnergyPlus* with a single mouseclick. However, since *DrawBDL+* processes only building geometry data, the converted IDF file is a partial file containing only the inputs for building surfaces.



Example of the *EnergyPlus* input file for the Te Papa Tongarewa Museum (New Zealand)*

The price for *DrawBDL+3.1* remains \$125 plus shipping (shipping charge only applies to mailed diskettes). Updates from previous *DrawBDL* Versions 1.X or 2.X cost \$62.50 plus shipping. Shipping costs are \$5 US, \$10 international.

For more information about *DrawBDL+* or to order, please contact



Joe Huang and Associates
31 Sarah Lane
Moraga CA 94556-2563
Phone 925-247-9180
mail to: joeh@drawbdl.com



Night view of the completed building

**DrawBDL+* example was kindly provided by Sam Roose of Energy Solutions, Ltd., New Zealand (<http://www.energy-solutions.co.nz/>)

◆ www.drawbdl.com ◆ www.drawbdl.com ◆ www.drawbdl.com ◆

PG&E Educational Programs May-June 2005

For a complete listing of classes or to register call 415.973.7268 or go to www.pge.com/pec

ARCHITECTURE

Wed, May 4	Exceeding Title 24 for Retail Buildings
Thu, May 12	Assessing the Future of Green Building
Wed, May 18	Green Building Materials Selection
Tue, Jun 7	New Collaborative for High Performance Schools (CHPS) Design Workshop

H V A C

Thu, May 5	Moisture Intrusion
Tue, May 24	2005 Title 24 Nonresidential Mechanical and Acceptance Test Requirements
Tue, June 14	Exploring the New and Improved Functional Test Guide

LIGHTING

Tue, May 3	Daylighting Controls Practicum
Wed, Jun 8	Measuring the True Value of Light

TITLE 24 (CALIFORNIA ENERGY CODE)

Wed, May 11	2005 Title 24 Prescriptive Lighting Requirements
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Southern California Gas Company

Educational Programs >< May and June, 2005

To register go to http://www.socalgas.com/business/resource_center/erc_seminar_info.shtml

May	Event	I.D. Number
Tue 3	EnergyPro Training: Envelope/Lighting/Windows	12980
Wed 4	EnergyPro Training: Advanced	12982
Wed 4	IHACI Residential & Light Commercial Zoning (1 night class)	13547
Wed 4	EnergyPro Training: Mechanical	12981
Thu 5	2005 Non-Residential Title 24 Standards: Compliance & Beyond	12987
June	Event	I.D. Number
Tue 14	IHACI - Preventing Compressor Failures/Refrigeration Cycles	13550
Wed 22	New Source Review	13548
Thu 23	High Performance Schools: The CHPS Program	13589
Tue 28	High Performance Schools: The CHPS Program	13590
Thu 30	High Performance Schools: The CHPS Program	13591

The Gas Company's Energy Resource Center, 9240 Firestone Blvd., Downey, CA

The Forecast Looks Favorable for ...

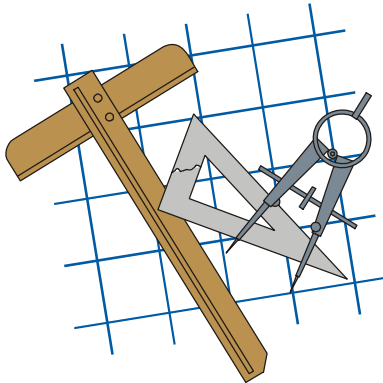
(Free!) Weather Data on Demand

You can access archived weather data from around the world through this U.S. DOE web interface:



www.eere.energy.gov/buildings/energyplus/cfm/weatherdata/weather_request.cfm

Hourly weather data is continuously collected and stored into a local database, available through this web interface. Most stations have information for dry bulb temperature, wet bulb temperature, wind speed/direction, atmospheric pressure, visibility, cloud conditions, and precipitation type.

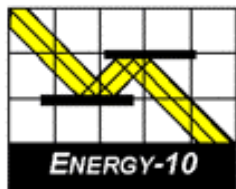


Building Energy Tools Directory

The web-based Building Energy Tools Directory contains information on more than 270 building-related software tools from around the world.

For each tool in the directory, a short description is provided, along with information about technical expertise required, users, audience, input, output, validation, computer platforms, programming language, strengths, weaknesses, technical contact, availability and cost. A link is also provided for directly translating the web pages into more than eight languages.

Know of a tool (yours?) that isn't in the directory? Visit http://www.eere.energy.gov/buildings/tools_directory/your_software_here.html or contact Dru Crawley at Drury.Crawley@ee.doe.gov.



ENERGY-10, VERSION 1.6

ENERGY-10 is a design tool for smaller residential or commercial buildings that are less than 10,000 ft² or buildings that can be treated as 1- or 2-zone increments. It performs whole-building energy analysis for 8760 hours/year, including dynamic thermal and daylighting calculations. ENERGY-10 was specifically designed to facilitate the evaluation of energy-efficient building features in the very early stages of the design process.

Douglas K. Schroeder
1331 H Street N.W., #1000
Washington, DC 20004



Tel: 202.628.7400 ext 210
Fax: 202.383.5043
www.sbicouncil.org

Sustainable Buildings Industry Council (SBIC)

Building Energy Software

from the Environmental Energy Technologies Division of Lawrence Berkeley Laboratory

Free Downloads	
BDA 3.0 (Building Design Advisor) (building decision-making from design through completion)	gaia.lbl.gov/BDA
COMIS (multi-zone air flow and contaminant transport model)	www-epb.lbl.gov/comis
EnergyPlus 1.2.1 (new-generation whole-building energy analysis program, based on BLAST and DOE-2)	www.energyplus.gov/
GenOpt[®] 2.0 (generic optimization program)	SimulationResearch.lbl.gov
Optics 5.1.02 (for analyzing optical properties of glazing systems)	windows.lbl.gov/materials/optics5/
RADIANCE 3.5 (analysis and visualization of lighting in design)	radsite.lbl.gov/radiance/
Desktop Radiance 2.0β (integrates the Radiance Synthetic Imaging System with AutoCAD Release 14)	radsite.lbl.gov/deskrad/
Radiance Control Panel (automates some Radiance tasks once the model has been created)	www.squ1.com/site.html
THERM 5.2 (models two-dimensional heat-transfer effects in building components where thermal bridges are of concern)	windows.lbl.gov/software/therm/therm.html
VisualSPARK 2.0 (Simulation Problem Analysis and Research Kernel) (connect component models to simulate innovative building envelope and HVAC systems)	SimulationResearch.lbl.gov
WINDOW 5.2 (thermal analysis of window products)	windows.lbl.gov/software/window/window.html
Free Software / Request by Fax from 510.486.4089	
RESFEN 3.1 (choose energy-efficient, cost-effective windows for a given residential application)	windows.lbl.gov/software/resfen/resfen.html
Web Based (free)	
Home Energy Saver (quickly computes home energy use) and Home Improvement Tool (simplified Home Energy Saver)	hes.lbl.gov and hit.lbl.gov



DOE-2



DOE-2.1E (v. 121) 1,000-Zone version for Windows from ESTSC; other vendors of DOE-2 based programs are listed on our website: <http://SimulationResearch.lbl.gov/>.

Cost is as follows:

- \$ 300 U.S. Government/Non-Profits/Education
- \$ 575 U.S. Public, Mexico, Canada
- \$1129 to \$1268 Other Foreign

DOE-2 Documentation on a CD from ESTSC - Cost US\$100

What is included on the CD?

- DOE-2 Reference Manual (Part 1)
- DOE-2 Reference Manual (Part 2)
- DOE-2 Supplement to the Reference Manual (2.1E)
- DOE-2 BDL Summary (2.1E)
- DOE-2 Engineers Manual (2.1A)

Order Software and ESTSC Documentation

Ed Kidd or Kim Buckner
NCI Information Systems, Inc.
Energy Science and Technology Software Center (ESTSC)
P.O. Box 1020
Oak Ridge, TN 37831

Phone: 865/576-1037
Fax: 865/576-6436
Email: estsc@adonis.osti.gov

Purchase DOE-2 Documentation

DOE-2 Sample Run Book (2.1E) -- The Sample Run book is the only remaining DOE-2 manual not available electronically. It must be purchased separately from NTIS; ordering information may be found at <http://SimulationResearch.lbl.gov> > DOE-2 > Documentation

Free DOE-2 Documentation (<http://simulationresearch.lbl.gov/>> DOE-2 > Documentation)

[DOE-2 Basics Manual \(2.1E\)](#)

Update Packages: Update Packages are **not** cumulative; each one contains different information. Download all four packages then print and insert the pages into your existing DOE-2 manuals.

- [Update Package #1:](#) DOE-2.1E Basics, the Supplement and BDL Summary
- [Update Package #2:](#) BDL Summary and Supplement.
- [Update Package #3:](#) Appendix A of the Supplement.
- [Update Package #4:](#) (1000-zone DOE-2.1E) BDL Summary.

[DOE-2 Modeling Tips \(pdf files\)](#) for 2003 for 2002

A compilation of all the "how to" and "DOE-2 Puzzler" articles from the *Building Energy Simulation User News*.

[Changes and Bug Fixes to DOE-2.1E \(txt file\)](#)

Description of all changes and bug fixes in a text document.

DOE-2 listings are continued on the next page



DOE-2 (continued)



DOE-2 Training

Private or group DOE-2 courses for beginning and advanced users.
Contact Marlin Addison at (602) 968-2040, marlin.addison@doe2.com

DOE-2 Help Desk

Email (klellington@lbl.gov) or fax the Simulation Research Group with your questions. Fax: (510) 486-4089

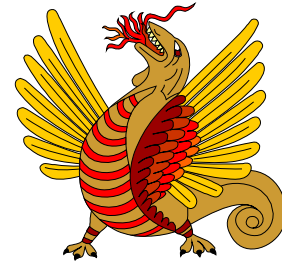


New DOE-2 Consultant



Dr. Magnus Herrlin, Ph.D.
ANCIS, Inc.
San Francisco, CA

<http://www.ancis.us/>



Run for safety, foolish pedestrians!

HVAC Engineer for DOE-2/EnergyPlus Modeling

Steven Winter Associates, Inc. has one opening in their Norwalk, CT office in the commercial/institutional division, for an HVAC engineer with design experience and knowledge of DOE-2. Salary commensurate with experience. Excellent opportunity to work on high visibility projects, gain experience, assume responsibility and advance.

- Steven Winter Associates, Inc. performs sustainability consulting on buildings ranging from 10,000 to 2.4 million square feet, with LEED ratings from Certified to Platinum.
- We work with design teams and developers, advising on energy efficiency, renewables, daylighting, IAQ, materials and resources, as well as commissioning. Our team includes engineers, architects and scientists.

Reply in confidence to Adrian Tuluca, Principal, Steven Winter Associates, Inc, 50 Washington Street, Norwalk, CT 06854,

atuluca@swinter.com

JOIN THE BLDG-SIM MAILING LIST

BLDG-SIM is a mailing list for users of building energy simulation programs like EnergyPlus, DOE-2, Trace-600, HAP, BLAST, ESP, SERIRES, TRNSYS, TASE, ENERGY-10 and others. Because building simulation professionals are located worldwide, the BLDG-SIM list is an attempt to foster the development of a community of those users. Users of all levels of expertise are welcome and are encouraged to share their questions and insights about these programs. To subscribe, send a blank email message to BLDG-SIM-SUBSCRIBE@GARD.COM

The web page for BLDG-SIM is www.gard.com/bldg-sim.htm

Jason Glazer, P.E., of GARD Analytics, Inc., is the list administrator (jglazer@gard.com).



*Riches may
adorn a house
but virtue
adorns a person*



SPARK is an equation-based simulation environment that allows you to build customized models of complex physical processes by connecting calculation objects that represent system components like walls, fans, heat exchangers, chillers, ducts, mixing boxes, controls, etc. It is aimed at the simulation of innovative and/or complex building systems that are beyond the scope of whole-building programs like DOE-2 and EnergyPlus. **VisualSPARK** adds a graphical user interface to SPARK to simplify its use.

Download VisualSPARK Free of Charge From

<http://simulationresearch.lbl.gov/>

Please go to our website to download new VisualSPARK documentation:

- **New Features, Bug Fixes, And Changes**
- **Frequently Asked Questions**
- **How To Port Atomic Classes To Spark 2.X**
- **Theoretical Speed-Up Using Spark**

SPARK was developed by the Simulation Research Group at Lawrence Berkeley National Laboratory and by Ayres Sowell Associates, with Support from the Assistant Secretary for Energy Efficiency and Renewable Energy, Office of Building Technologies Program of the U.S. Department of Energy, Program Manager Dru Crawley.

We'll drink to that!! Free winery tool to reduce energy and water costs

California Wine-Country Workshops Will Introduce The BEST Winery Tool To Facilities Managers.

Berkeley, CA—California wineries now have an easy-to-use, computer-based tool and a handbook to help them reduce energy and water costs, thanks to researchers at Lawrence Berkeley National Laboratory who worked with Fetzer Vineyards on the project. **BEST (Benchmarking and Energy and Water Savings Tool) Winery** compares the performance of a target winery to a similar reference winery.



BEST's reference winery is based on a very efficient winery using state-of-the-art but commercially available energy- and water-efficient technologies. After evaluating how the target winery compares to the reference winery, the user can use the tool's inventory of available efficient practices and technologies to select those measures that will save money, energy and water. Development of **BEST Winery** was supported by the Public Interest Energy Research Program of the California Energy Commission. **BEST Winery** applies to small to medium scale wineries. It is available for free to all California wineries.

With the support of Pacific Gas & Electric, three free training sessions will take place on May 10, 12, and 13, 2005. To register please go to <http://www.pge.com/>.

(This information was extracted from LBNL's Energy Efficient Technologies Division blog located at <http://bleer.lbl.gov/> -- technical contact for the **BEST Winery Tool**: is Christina Galitsky of the Energy Analysis Department, LBNL; the blog was created by Allan Chen of the EETD Communications Office, LBNL)



New Website for ... International Building Performance Simulation Association

IBPSA, a non-profit international society of building performance simulation researchers, developers and practitioners, has a new website that's chock full of news, announcements, meetings, access to conference papers, etc.

Be sure to download the excellent *IBPSA News* when you visit.

www.ibpsa.org



BLAST news

www.bso.uiuc.edu

Building Systems Laboratory
 University of Illinois, 30 Mechanical Engineering
 Building,
 1206 West Green Street, Urbana, IL 61801
 Tel: (217) 333-3977 - Fax: (217) 244-6534
support@blast.bso.uiuc.edu

The **Building Loads Analysis and System Thermodynamics (BLAST)** program predicts energy consumption, energy system performance and cost for new or existing (pre-retrofit) buildings.

BLAST contains three major sub-programs:

- **Space Load Prediction** computes hourly space loads in a building based on weather data and user inputs detailing the building construction and operation.
- **Air Distribution System Simulation** uses the computed space loads, weather data, and user inputs.
- **Central Plant Simulation** computes monthly and annual fuel and electrical power consumption.

Heat Balance Loads Calculator (HBLC)

The BLAST graphical interface (HBLC) is a Windows-based interactive program for producing

BLAST input files. You can download a demo version of HBLC (for MS Windows) from the BLAST web site (User manual included).

HBLC/BLAST Training Courses

Experience with the HBLC and the BLAST family of programs has shown that new users can benefit from a session of structured training with the software. The Building Systems Laboratory offers such training courses on an as needed basis typically at our offices in Urbana, Illinois.

WINLCCID 98

LCCID (Life Cycle Cost in Design) was developed to perform Life Cycle Cost Analyses (LCCA) for the Department of Defense and their contractors.

To order BLAST-related products, contact the Building Systems Laboratory at the address above.

Program Name	Order Number	Price
PC BLAST Includes: BLAST, HBLC, BTEXT, WIFE, CHILLER, Report Writer, Report Writer File Generator, Comfort Report program, Weather File Reporting Program, Control Profile Macros for Lotus or Symphony, and the Design Week Program. The single CD-ROM includes soft copies of the BLAST Manual, technical articles and theses related to BLAST, nearly 400 processed weather files with a browsing engine, and complete source code for BLAST, HBLC, etc.	3B486E3-0898	\$1500
PC BLAST Package Upgrade from level 295+	4B486E3-0898	\$450
WINLCCID 98: executable version for 386/486/Pentium	3LCC3-0898	\$295
WINLCCID 98: update from WINLCCID 97	4LCC3-0898	\$195

The last four digits of the catalog number indicate the month and year the item was released or published. This will enable you to see if you have the most recent version. All software will be shipped on 3.5" high density floppy disks unless noted otherwise.

GenOpt 2.0

Generic Optimization Program

GenOpt is an optimization program for the minimization of a cost function, such as annual energy use, that is evaluated by an external simulation program. **GenOpt** can be used with any simulation program -- such as EnergyPlus, SPARK or DOE-2 -- that has text-based input and output. It also offers an interface for adding custom optimization algorithms to its library.

GenOpt processes discrete independent variables, such as different window constructions, either for optimization problems with mixed discrete and continuous independent variables or for doing parametric studies. Some simulation programs, such as EnergyPlus, cannot pre-process the independent variables or post-process values that are computed during the simulation. For such situations, *input function objects* and *output function objects* can now be used without having to modify *GenOpt's* source code.

GenOpt 2.0 (with documentation) may be downloaded free of charge from

<http://SimulationResearch.lbl.gov>