

# Building Energy Simulation

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*The Buzz - P. 11*

*Coming in 2008,  
Journal of Building  
Performance Simulation*

♥ ♥ ♥

Indian interface to  
EnergyPlus: Hourly Load  
Calculation Program

♥ ♥ ♥

*Wikipedia for Building  
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♥ ♥ ♥

*Additions to the  
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♥ ♥ ♥

*RETScreen Training in  
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♥ ♥ ♥

*Ask an EnergyPlus  
Expert: All 2007  
Questions and Answers in  
a single pdf file*

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*The "Lighting Portal"  
from the California  
Lighting Technology  
Center - an online  
resource.*

♥ ♥ ♥

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## **New Features of EnergyPlus 2.1**

### **NATURAL AND MECHANICAL VENTILATION**

- A new system availability manager was added to allow system-level control of hybrid ventilation systems.

### **HVAC**

- Added water-cooled condenser capability to refrigeration compressor racks for useful heat recovery.
- Chilled and hot-water coils can now be used in the outside air system to preheat or precool outside air.
- New desiccant dehumidifier with additional capabilities and flexibility compared to the existing solid desiccant dehumidifier model.
- Water side economizer (including simulation of integrated and non-integrated water side economizers).
- Packaged terminal air conditioner (PTAC) added to model a fan, DX cooling coil, and a gas, electric, hydronic or steam heating coil serving a single zone.
- Multispeed heat pump with up to four discrete speeds for both cooling and heating.
- Heat losses (and gains) from plant piping.
- New and updated Compact HVAC objects:
  - Compact HVAC chilled water coils now use the COIL:WATER:COOLING model by default, COIL:Water:DetailedFlatCooling can be selected as an option.
  - Compact HVAC unitary system now supports the draw-thru fan placement option, and allows a schedule for the supply fan operating mode (continuous or cycling).
  - New Compact HVAC options for dehumidification and humidification controls for unitary and VAV system types.
  - New primary-secondary loop options for Compact HVAC chilled water loops.
  - Compact HVAC expanded to support specification of outside air as a combination of flow/person, flow/area and flow/zone.
  - Compact HVAC baseboard heat option added for unitary and VAV zones.
  - New Compact HVAC objects for unitary heat pump, unitary VAV, packaged terminal air conditioner, and packaged terminal heat pump.

### **INPUT**

- Example input files created for all new features (More than 225 example input files now available).

### **OUTPUT**

- New tabular reports for surface shadowing, shading, lighting, HVAC sizing, system and component sizing, and outside air.
- New Report:SurfaceColorScheme allow users to select their own colors for building elements in the DXF output.

*Continued on the next page*

## **Release of EnergyPlus 2.1**

### **DATASETS**

- Color schemes for DXF. (original and default)

### **DESIGN DAY**

- User now can choose between ASHRAE Clear Sky and Zhang-Huang solar radiation models for use in design day calculations.

### **Geometry/Windows/Walls/Shading**

- Surface Surround Subsurface error detection more robust (less false errors)
- Autocalculate now allowed for shading surfaces (number of vertices)

### **ZONE MODEL**

- Zone sizing calculations now include heat gains from domestic/service hot water uses and water heaters.

### **UTILITIES**

- WeatherConverter now produces KML output (for Google Earth) of latitude, longitude, elevation, and a few climate statistics for locations in a list processing run.
- Add comma delimited form of CLM (ESP-r Ascii files) conversion to WeatherConverter.
- WinEPDraw produces in new default colors.

### **DOCUMENTATION AND GUIDES**

- The Getting Started Manual has been completely rewritten to provide more hands-on example exercises and other information for getting up to speed on EnergyPlus.
- The Input/Output Reference and Engineering Reference Manuals have been updated and extended for all new features and updates. Total documentation now exceeds 3500 pages.

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### **The BLDG-SIM Mailing List has a New Home**

The popular BLDG-SIM mailing list has moved from Gard Analytics to OneBuilding.org. If you subscribe to BLDG-SIM (or any of the other lists formerly maintained by GARD) you will be automatically switched over to OneBuilding.org. An archive of all BLDG-SIM posts is located at the following URLs.

Archived by thread: <http://www.gard.com/ml/bldg-sim-archive/threads.html>

Archived by date <http://www.gard.com/ml/bldg-sim-archive/maillist.html>

General information about the mailing list is at:

<http://lists.onebuilding.org/listinfo.cgi/bldg-sim-onebuilding.org>.

See also <http://lists.onebuilding.org/pipermail/bldg-sim-onebuilding.org/>

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## EnergyPlus Available for Apple's Intel-based Macintosh Platform



The newest version of EnergyPlus (2.1), released 10/31/07, is available for Apple's Intel-based Macintosh platform (in addition to Windows and Linux versions). Download at no cost from the EnergyPlus web site: <http://www.energyplus.gov>.

Our thanks to Greg Stark of Building Synergies, LLC for his help in porting EnergyPlus to the Apple Macintosh platform.

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## Status of EnergyPlus Plug-In for SketchUp



DOE plans to release an EnergyPlus plug-in for Google's SketchUp at the end of 2007. This free EnergyPlus plug-in will integrate building simulation functionality into the SketchUp drawing environment. The plug-in stores EnergyPlus input data on SketchUp surfaces as they are drawn by the user. An EnergyPlus toolbar provides a way to create zones and surfaces with only a few mouse clicks. Construction assignments are 'painted' onto surfaces using a palette of EnergyPlus wall, roof, and window constructions. Users will be able to execute an annual simulation from within SketchUp. Watch the EnergyPlus web site <http://www.energyplus.gov> and email for more information.

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## EnergyPlus\_Support Group at YahooGroups



Are you a commercial or academic user of EnergyPlus? Join over 1200 EnergyPlus users in an email group on YahooGroups. It's a place to ask your questions and share information with other users. The YahooGroup provides a searchable archive of all 7 years of discussion. You can also upload files to share with other users. This group supplements but does not replace the primary program support.  
[EnergyPlus-Support@gard.com](mailto:EnergyPlus-Support@gard.com).

The main web page for the group is: [http://groups.yahoo.com/group/EnergyPlus\\_Support](http://groups.yahoo.com/group/EnergyPlus_Support)

To subscribe, send an email message to:  
[EnergyPlus\\_Support-subscribe@yahoogleroups.com](mailto:EnergyPlus_Support-subscribe@yahoogleroups.com)

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### *A Getting Started Tutorial for EnergyPlus*

by Vishal Garg  
[Center for IT in Building Science](#)  
[IIT Hyderabad India](#)

Dr. Vishal Garg of the International Institute of Information Technology in Hyderabad, India, has created an EnergyPlus tutorial aimed at architects and engineers who are familiar with the basic concepts of energy simulation and HVAC systems. The tutorial out-lines the procedures for modeling a small room using EnergyPlus, including instruction on how to run the simulation, and how to interpret the output files. The output presents both heating and cooling energy consumption, so the user may experiment with size, orientation, material properties, location, etc., and compare heating/cooling energy usage.

<http://energyplustutorial.googlepages.com/>

## ENERGYPLUS EXAMPLE FILE GENERATOR – **UPDATED!!!**

[http://www.eere.energy.gov/buildings/energyplus/interfaces\\_tools.html](http://www.eere.energy.gov/buildings/energyplus/interfaces_tools.html)

DOE and NREL are pleased to announce the update of the EnergyPlus Example File Generator. The goal of the Example File Generator is to provide input files for building models that serve as a starting point for using and learning EnergyPlus. This service is free and available at the EnergyPlus web site ([www.energyplus.gov](http://www.energyplus.gov)) under Interfaces & Other Tools.

Web-based forms allow you to input some general information about the building you want to model. The service then automatically creates a complete EnergyPlus input file, runs an annual simulation on NREL's computers, and then sends you an email with the EnergyPlus input file along with a summary of the annual energy results (and a dxf image file). The attached DXF of an EnergyPlus example file was generated in just a few minutes.

Assumptions should be carefully reviewed. There is no guarantee that the models are fully compliant with the energy performance Standards used to generate model details. Give the service a try! If you have questions or feedback, email [ewi\\_support@nrel.gov](mailto:ewi_support@nrel.gov)

The new version has many new capabilities:

- Generates input file for EnergyPlus version 2.1.
- The input files are now completely annotated with the descriptions of the fields for each object.
- Added input boxes for geometry including -- Rectangle, Courtyard, L-Shape, H-Shape, T-Shape, U-Shape
- Gas appliances
- Fins
- Continuous daylighting
- Addition of over 50 HVAC systems
- Ventilation rates by people and/or area
- Service Water Heating inputs



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### WEATHER DATA AND CUSTOM WEATHER FILES

The EnergyPlus web site contains more than 1300 weather files from a large number of international sources. But we know that leaves a large part of the world with very few or no weather files. If you're looking for a weather file, first look at the EnergyPlus web site:

[http://www.eere.energy.gov/buildings/energyplus/cfm/weather\\_data.cfm](http://www.eere.energy.gov/buildings/energyplus/cfm/weather_data.cfm)

Then, check the [EnergyPlus YahooGroup](#) to see whether a weather file has already been created and posted (you will need to join the EnergyPlus group)

[http://tech.groups.yahoo.com/group/EnergyPlus\\_Support/](http://tech.groups.yahoo.com/group/EnergyPlus_Support/)

As a last resort, upon request, the EnergyPlus Team can create a few weather files for a country using the Meteororm weather generator (<http://www.meteotest.ch>). Version 6 of Meteororm, which was released mid-2007, includes EnergyPlus EPW format as an output option. **Caution:** Meteororm uses interpolation, extrapolation and other statistics to derive the weather file. You use these weather files entirely at your risk; you need to review them carefully to ensure that they meet your needs. Send your request to the EnergyPlus\_Support YahooGroup with the location you need -- one or two locations at most please! Usually we can create the files within a few days.

Also, if you know of weather data sets that we haven't included on the EnergyPlus web site, please send email to [Drury.Crawley@ee.doe.gov](mailto:Drury.Crawley@ee.doe.gov)

# Recent Reports

Proc. BS 2007, Sept. 3-6, 2007, Tsinghua U, Beijing.

## **ADVANCED ZONE SIMULATION IN ENERGYPLUS: INCORPORATION OF VARIABLE PROPERTIES AND PHASE CHANGE MATERIAL (PCM) CAPABILITY**

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### **ABSTRACT**

EnergyPlus models follow fundamental heat balance principles very closely in almost all aspects of the program. However, the simulation of building surface constructions has relied on a transfer function transformation carried over from BLAST. This has all the usual restrictions of a transformation-based solution: constant properties, and fixed values of some parameters. As the energy analysis field moves toward simulating more advanced constructions, such as phase change materials (PCM), it becomes necessary to step back from transformations to more fundamental forms. This paper describes the development of an implicit finite difference thermal model of building surfaces that has been incorporated into EnergyPlus. The model simulates the performance of PCM's using an enthalpy or heat content formulation so energy accounting is accurate, and the phase change enthalpy is included fully. The model also permits modeling temperature dependent thermal conductivity. The complete multilayer construction capability of EnergyPlus is retained, so simulations can be done with the PCM in any location within the surface structure. Because of the short time steps used in the finite difference solution algorithm, the zone time step can be reduced to correspond with the one minute minimum time step used by the integrated system in EnergyPlus. Examples showing the effect of using PCM's in various locations within a wall construction, and examples of the annual energy performance changes caused by such materials are presented. [http://gundog.lbl.gov/dirpubs2/BS07/eplus\\_506.pdf](http://gundog.lbl.gov/dirpubs2/BS07/eplus_506.pdf)

Proc. BS 2007, Sept. 3-6, 2007, Tsinghua U, Beijing.

## **POTENTIAL OF BURIED PIPES SYSTEMS AND DERIVED TECHNIQUES FOR PASSIVE COOLING OF BUILDINGS IN BRAZILIAN CLIMATES**

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Universidade Federal de Santa Catarina – Brazil

### **ABSTRACT**

Objective of this study is to evaluate the cooling potential of buried pipes and a derivative thereof, for buildings situated in Brazilian climate. In a first step, the cooling potential of these techniques is characterized independently of any building dynamic, in terms of the available temperature differential relatively to a specified comfort set point, with simulation performed by way of a specific model. In a second step, the effective response of a residential as well as of a commercial building is evaluated by way of EnergyPlus, in free-floating as well as in air conditioning mode. [http://gundog.lbl.gov/dirpubs2/BS07/eplus\\_624.pdf](http://gundog.lbl.gov/dirpubs2/BS07/eplus_624.pdf)

### **Message from Dru Crawley -- Updated Meteorom Weather Files**

We've replaced all the Meteorom Version 5 files that were on the EnergyPlus\_Support YahooGroup with updated files from Meteorom Version 6. The good news is that many more of the files have better and more complete data (less interpolation). However, the caveats about the synthetic weather remain. Join the Yahoo group here: [http://tech.groups.yahoo.com/group/EnergyPlus\\_Support/](http://tech.groups.yahoo.com/group/EnergyPlus_Support/)

### **Ask an EnergyPlus Expert . . .**

#### **LONGWAVE RADIATION FROM THE ENVIRONMENT**

I'm trying to determine the different heat fluxes through a wall. Everything is fine for the interior surface heat balance; however, I encountered problems with the outside surface heat balance, especially with the longwave radiation from the environment.

If I try to calculate qLWR with the formulas on p. 36 of the Engineering Reference document and with the output from a simulation (surface temperatures, sky temperature, outside air temperature), there is a big difference between the "calculated qLWR" and the flux out of the simulation (= [Surface Inside Face Conduction] - [qSOL] - [qconv,exterior]). There is no thermal storage (density = specific heat = 0).

And if I ask for the report variables Surface Ext Rad to Air Coeff, Surface Ext Rad to Sky Coeff, Surface Ext Rad to Ground Coeff, they are always zero. How do I get those variables?

In the Engineering Reference document (p. 60 basic heat balance): "TARP includes four possible representations for the basic outside surface heat balance. The first two depend on which of the optimal surface conductance algorithms the user selects. The simple outside surface conductance that includes both the convective and thermal interchange between the surface and the environment in a single coefficient, " ... " The detailed outside surface conductance model considers convection and radiation interchange with the sky and with the ground as separate factors."

- How do you choose the optimal surface conductance algorithm?
- What is the value of the single coefficient? Does it take surface emissivity into account?
- The detailed outside surface conductance seems to be almost the same as mentioned on p. 35, except that I don't see the radiative heat transfer coefficient to the air in figure 28 on p. 62. (HA = outside convection coefficient -- or is HA a single value for radiation and convection?)

#### **Answer**

The exterior radiant coefficients will be zero when OUTSIDE CONVECTION is set to "simple." The "simple" convection algorithms use a combined convection-radiation coefficient and additional radiant transfer is not modeled.

To see values in these variables, use the "Detailed" OUTSIDE CONVECTION option. These are the "simple" and "detailed" methods referred to in the TARP manual; however, the coefficients may be slightly different than what is found in the TARP manual. The detailed convection model is based on ASHRAE equations.

#### **Question**

So the report variable "Surface Ext \*Convection\* Coeff[W/m<sup>2</sup>-K](TimeStep)" for simple convection algorithm means the \*total\* exterior heat transfer coefficient (radiant and convective) and is independent from the surface emissivity?

#### **Answer**

Yes. See Engineering Reference discussion of convection algorithms, p. 42, pdf p. 78)

#### **Question**

I tried all the other convection algorithms (detailed, TARP, DOE-2), but I still get zero for the radiant heat coefficients. Does the convective heat transfer coefficient stay the same as calculated with the simple convection algorithm. And do I need to set other settings besides the outside convection algorithm?

#### **Answer**

Make sure you have set the wind exposure to "NoWind" on the surface:heattransfer object. See the discussion of this in the Input/Output Reference, p. 139, pdf p. 178. NoWind overrides the OUTSIDE CONVECTION option and forces it back to Simple. Change this to WindExposed and the radiant coefficients should show non-zero values.

### **Ask an EnergyPlus Expert . . .**

#### **GROUND TEMPERATURES**

What, exactly, is a ground view factor (GVF)? I ask because the online tutorial says the floor has a GVF of 0, but an example in the program says it should be 1. Both were examples of a box-shaped room.

##### **Answer**

If the OutsideFaceEnvironment = Ground, then the surface is in direct contact with the soil, and "View Factor to Ground" does not apply, so the value entered does not matter. I suspect this is why the two examples do not agree, yet are both "correct" simply because the value is not relevant.

If the OutsideFaceEnvironment = ExteriorEnvironment, then "View Factor to Ground" would be 1.0 for a horizontal exposed floor which is facing downward.

#### **CHANGE THE WEATHER FILE**

I received a fatal error when attempting to run a weather file simulation. The only modification I made to the EPW weather data file was to change the drybulb temperatures for two calendar days. The simulation converges when using unmodified weather files. Are EPW files meant to be modified?

```
** Fatal ** Unexpected End-of-File on EPW Weather file, while reading header information, looking for header=LOCATION
```

##### **Answer**

Follow the approach suggested in the Auxiliary programs document:

1. Take the EPW file and save it (using the weather converter) as a CSV format file. While this format is readable by spreadsheet programs, it is an EPW CSV file.
2. Make your modifications in the CSV file (using a spreadsheet program is the easiest way). Save that file back as CSV format.
3. Run the weather converter again, reading in the CSV format and saving it as an EPW file.

#### **U-VALUE INPUT**

Is there a simple way to define U value for a wall, which is made up of several layers? I need to set the wall to a standard U-value.

##### **Answer**

Not directly. EnergyPlus uses layer-by-layer descriptions; targeting a specific U-value often requires iteration. Tune the material properties of an insulation layer inside the construction. But be careful about the surface film coefficients when setting targets. EnergyPlus can report them with or without, but Standards aren't always so clear. If the Standard is 90.1, you could try constructions out of an input file from the EnergyPlus Example File Generator. – OR – You can enter a material with an R-Value and use that for your entire wall construction. U-Value is 1/R. However, you will not see effects of thermal mass using this construction.

#### **OUTPUT FILE LOCATION**

I used the GrndTempCalc and EP-Launch to get the ground temperatures from the weather file. It runs, it ends, and I have no idea where the output files are. I tried to find them using Search, but failed.

##### **Answer**

The generated results for slab and basement programs will be in the same folder as your original. EP-Launch should stay up and you will see the buttons to open those files.

Warning: A space in your path will cause a new EP-Launch to "launch."



### **Ask an EnergyPlus Expert . . .**

#### **FLOATING TEMPERATURE SCHEDULE**

In EnergyPlus, can I set the room (zone) temperature to a profile that depends on the ambient temperature? For example: The room temperature should be 22°C with an external temperature of up to 26°C, and then float up to 26°C with an external temperature of 32°C. Above 32°C, the temperature should be held constant at 26°C.

#### **Answer**

Use the Schedule:File:Comma object. Convert your weather file to csv format. Open the weather file and "create" an hourly temperature set point schedule from the outdoor temperature using your description. Then save the temperature set point schedule in csv format. Enter the file name and temperature set point column number in the Schedule:File:Comma object. When you run the simulation, use the Zone/Sys Thermostat Cooling Setpoint and Schedule Value report variables to check your work. See the Input/Output Reference document for further details.

#### **SCHEDULE INTERVALS**

In the DAYSCHEDULE is there a way to have the input in less-than-hourly intervals (e.g. to have 10-minute or 15-minute input data)?

#### **Answer**

Yes. Look at the documentation on Dayschedule:Interval and Dayschedule:List objects. This documentation starts on p. 57 (PDF p. 96). Also, the usage is illustrated in the example file: 1ZoneUncontrolled\_DDChanges. The Schedule:Compact object can also handle sub-hourly schedules using the scheme presented in the Dayschedule:interval object.

#### **EARTH BERM MODEL**

I'm modeling a school that has a small earth berm around most of its perimeter. The berm is 1-m high at the outside wall, and slopes down at about 15° until it reaches grade about 3.75-m from the wall. I have two ideas as to how to best model this:

1. Create a "soil" material and that has a thickness of 1.875-m ( $3.5\text{-m}^2$ ) so that when applied onto a surface that is 1-m high, it will have the same volume per unit wall-length as the berm. Use this as the outermost material in the construction for a surface that covers the bottom 1m of the exterior wall.
2. Use the basement pre-processor and model the building as basically sitting in a 1-m deep basement.

#### **Answer**

This is a challenging feature to model. I would agree that approach number 1 is probably the best. Or perhaps break it into two parts, one half with a thinner average soil thickness, and another for the lower thicker half of the berm. You may run into problems modeling such a thick, massive construction. Watch for loads initialization did-not-converge warnings and increase the number of warm-up days (BUILDING object) if necessary. And check results carefully to see that they seem reasonable. I would also suggest creating a copy of the model without the berm and comparing results to see if trends seem reasonable.

#### **NEW!!! ENERGYPLUS WEATHER FILE FOR PORTUGAL**

A new EPW for Tabua, Portugal has been posted on the YahooGroup web site in the weather\_files section. The .zip file includes the EPW, STAT, INFO (from Meteororm), and DDY (design day conditions).

As with all Meteororm files, you need to check the file to make sure it is consistent with your understanding of the location and its weather patterns.

Be sure to read the 'AAA\_ReadMeFirst.txt' file before using this EPW.

## EnergyPlus Version 2.1

### Support Tools

Support software is listed on the main EnergyPlus website.

### Weather Data

Main weather data site is at  
[http://www.eere.energy.gov/buildings/energyplus/cfm/weather\\_data.cfm](http://www.eere.energy.gov/buildings/energyplus/cfm/weather_data.cfm)  
Weather data for more than 800 locations are now available in EnergyPlus weather format.  
See the write-up on how to create [Meteonorm Files](#)

### Ask an EnergyPlus Expert

Questions from program users are answered promptly via the EnergyPlus User Group at Yahoo. To join, go to [http://groups.yahoo.com/group/EnergyPlus\\_Support/](http://groups.yahoo.com/group/EnergyPlus_Support/)  
Selected questions and answers have been compiled into PDF documents:  
for [2002](#), for [2003](#), for [2004](#), for [2005](#), for [2006](#), for [2007](#).

### Are you an EnergyPlus consultant?

If you are an EnergyPlus consultant and would like to be listed in this newsletter and on our website, please send details to [klellington@lbl.gov](mailto:klellington@lbl.gov)

### Testing and Validation

Go to <http://www.eere.energy.gov/buildings/energyplus/testing.html> for info.

*EnergyPlus is being developed by University of Illinois and Lawrence Berkeley National Laboratory, 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).*

## Five New EnergyPlus Consultants

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### **New!! *Journal of Building Performance Simulation***

The International Building Performance Simulation Association (IBPSA) has reached an agreement with a publisher to launch a new academic journal for 2008: the *Journal of Building Performance Simulation*. This exciting new publication is aimed at advancing and promoting the science of building performance simulation as a vibrant and important academic area. An official announcement of the journal and a call for papers will be made in 2008. For more information, contact Ian Beausoleil-Morrison at [ibeausol@mae.carleton.ca](mailto:ibeausol@mae.carleton.ca)



### **Indian Interface to EnergyPlus: HLCP Hourly Load Calculation Program**

HLCP (Hourly Load Calculation Programme) is a graphical user interface for design-day and hourly load calculations for Indian cities, to be used with EnergyPlus. Note that HLCP is a for-purchase program. For details, please go to <http://www.hvacindia.com/hlcp/>



### **WikiPedia for Building Simulation**

What do you get when you combine *Building Simulation* with a *WikiPedia*?? You get **Simupedia** -- a user-driven encyclopedia aimed at building simulation practitioners. The idea originated with IBPSA-Germany and it is hoped that Simupedia will become a world-wide effort. Add to it at <http://129.187.44.165/index.php/Simupedia/en> .

And here's the IBPSA-Germany website: <http://www.ibpsa-germany.org/>



### **"Big List of FREE"**

Recent additions to the "Big List of FREE" at <http://gundog.lbl.gov/dirsoft/free.html>

- Ray Tracing News Guide (for all you *Radiance* fans)
- Title 24 (State of California) Residential Lighting Design Guide
- *A Getting Started Tutorial for EnergyPlus*
- Free DVD "HVAC Changeouts and Cool Roofs" (State of California)



### **Energy Efficiency and RETScreen v.4**

Engineers, architects, technologists, planners, facility managers and educators are invited to a [free RETScreen Version 4 introductory training seminar](#).

The seminar is intended for these and other professionals who would like to learn how to use the RETScreen Clean Energy Project Analysis Software to assess the viability of energy efficiency measures for commercial, institutional and residential buildings, and for industrial facilities. Registration will be on a first-come-first-serve basis. Click on the events below for details and to register online:

- [New Delhi, India – February 7, 2008](#)
- [Washington, DC, USA – March 3, 2008](#)

Each seminar will provide a basic overview of RETScreen Version 4, including its applicability for various clean power, heating and cooling technologies. The participants will then see a demonstration of the new energy efficiency model and learn how to use the software to evaluate existing or expected energy use, assess potential savings opportunities and then prepare proper financial analysis for stand alone measures and entire facilities as a system.

The RETScreen Software is available free-of-charge.



### **Ask an EnergyPlus Expert 2007 Questions and Answers**

All the "Ask an EnergyPlus Expert" questions and answers from 2007 that appeared in the *Building Energy Simulation User News* have been combined into one .pdf file. Download from [http://SimulationResearch.lbl.gov/dirpubs/un\\_articleEP07.pdf](http://SimulationResearch.lbl.gov/dirpubs/un_articleEP07.pdf)

If you'd like to review past years' "Expert" files, they are all on our [Technical Reports page](#) at <http://SimulationResearch.lbl.gov/report.html>.



### **The Lighting Portal**

The Lighting Portal is a new online resource for the lighting efficiency community that provides a forum for lighting energy efficiency enthusiasts, researchers, manufacturers, lighting designers, architects, policy makers, etc., to exchange ideas and information.

Try out the beta version at <http://www.thelightingportal.ucdavis.edu>



# Recent Reports

NREL/TP-550-41957

## **Assessment of the Technical Potential for Achieving Net Zero-Energy Buildings in the Commercial Sector**

B. Griffith, N. Long, P. Torcellini, and R. Judkoff  
National Renewable Energy Laboratory  
D. Crawley and J. Ryan  
U.S. Department of Energy

### **EXECUTIVE SUMMARY: Are Zero-Energy Commercial Buildings Achievable?**

This report summarizes the findings from research conducted at NREL to assess the technical potential for zero-energy building (ZEB) technologies and practices to reduce the impact of commercial buildings on the U.S. energy system. Commercial buildings currently account for 18% of annual U.S. energy consumption, and energy use is growing along with overall floor area. Reducing the energy use of this sector will require aggressive research goals and rapid implementation of the research results. The U.S. Department of Energy (DOE) Building Technologies Program (BT) has adopted a goal of developing market-viable ZEBs by 2025. In this study, NREL researchers developed quantitative predictions to answer the questions: How low can you practically go in terms of energy use? To what extent can rooftop photovoltaics (PV) supply the remaining energy needs of commercial buildings? NREL used DOE's energy modeling tool EnergyPlus to quantify the energy performance opportunities for a large set of building models derived from the 2003 Commercial Buildings Energy Consumption Survey (CBECS; EIA 2006). Each building was modeled first as a baseline with energy features and performance consistent with new 2005 buildings complying with ANSI/ASHRAE/IESNA 90.1-2004 (cited hereafter as 90.1-2004). Next, we modified these baseline building models with a set of technologies and practices that represent projections for improvements out to 2025. These annual simulations provide estimates for the energy performance levels that might be achievable in 2025. These estimates included projections of the number of buildings and floor area that could achieve the ZEB goal. The analysis is limited to the technical potential and does not assess market penetration or make detailed projections for how the various commercial building subsectors might evolve by 2025. Technical potential is determined from the energy performance with known technologies and practices projected out to 2025.

<http://www.nrel.gov/docs/fy08osti/41957.pdf>

## **WEATHER DATA AND CUSTOM WEATHER FILES**

Weather data for more than 1300 locations are now available in EnergyPlus weather format — 295 locations in the USA, 71 locations in Canada, and more than 800 locations in 100 other countries throughout the world. The weather data are arranged by World Meteorological Organization region and Country. If you're looking for a weather file, first look at the EnergyPlus web site:

[http://www.eere.energy.gov/buildings/energyplus/cfm/weather\\_data.cfm](http://www.eere.energy.gov/buildings/energyplus/cfm/weather_data.cfm)

Then, check the [EnergyPlus YahooGroup](#) to see whether a weather file has already been created and posted [http://tech.groups.yahoo.com/group/EnergyPlus\\_Support/](http://tech.groups.yahoo.com/group/EnergyPlus_Support/)

As a last resort, upon request, the EnergyPlus Team can create a few weather files for a country using the Meteororm weather generator (<http://www.meteotest.ch>). Version 6 of Meteororm, which was released mid-2007, includes EnergyPlus EPW format as an output option. **Caution:** Meteororm uses interpolation, extrapolation and other statistics to derive the weather file. You use these weather files entirely at your risk; you need to review them carefully to ensure that they meet your needs. Send your request to the EnergyPlus\_Support YahooGroup with the location you need -- one or two locations at most please! Usually we can create the files within a few days.

Also, if you know of weather data sets that we haven't included on the EnergyPlus web site, please send email to [Drury.Crawley@ee.doe.gov](mailto:Drury.Crawley@ee.doe.gov)

## [DOE-2.1E, Version 124](#)

### Are you a DOE-2 Consultant?

If you would like to be listed as a DOE-2 consultant on our website and in the *User News* please contact [klellington@lbl.gov](mailto:klellington@lbl.gov)

### DOE-2 Documentation OCR'd by the Energy Systems Lab, TAMU

PDF files at this link: <http://esl.tamu.edu/pub/DOE%2D2%5FOCR%5FManuals/>

### More Free DOE-2 Documentation. Download from <http://SimulationResearch.lbl.gov/>

[DOE-2 Basics Manual \(2.1E\)](http://gundog.lbl.gov/dirpubs/BASIC/basiclist.html) <http://gundog.lbl.gov/dirpubs/BASIC/basiclist.html>

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 [2006](#) [2005](#) [2004](#) [2003](#) [2002](#)

A compilation of all the "how to" and "DOE-2 Puzzler" articles from the newsletter.

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

<http://simulationresearch.lbl.gov/dirpubs/VERSIONS.txt>

All changes and bug fixes in a plain-text document.

Those energetic folks at the Building Simulation Laboratory at Texas A&M University have scanned all the DOE-2 manuals into pdf files. Jeff Haberl and Company have generously made the files available to DOE-2 users. Follow the link to the searchable pdf files [including the rare "Engineers Manual"].

<http://esl.tamu.edu/pub/DOE%2D2%5FOCR%5FManuals/>



### 2008 Energy Efficient Business Seminars

San Diego Gas and Electric Company -- <http://www.sdge.com/training/>

Feb 07	<a href="#">Advanced Lighting Technologies</a>	Mar 18	<a href="#">System Duct Design (Part 1 &amp; 2 of a 4-night class)</a>
Feb 19	<a href="#">Heat Pump Part 1</a>	Mar 20	<a href="#">System Duct Design (Part 2 of a 4-night class)</a>
Feb 21	<a href="#">Heat Pump Part 2</a>	Apr 15	<a href="#">System Design (Part 3 of a 4-night class)</a>
Mar 06	<a href="#">Adjustable Speed Drives</a>	Apr 17	<a href="#">System Design (Part 4 of a 4-night class)</a>

### Meetings - Conferences - Symposia

#### 2008

May 03-08	Solar 2008	<a href="http://www.ases.org/solar2008/">http://www.ases.org/solar2008/</a>
June 16-18	8th Nordic Symposium on Building Physics	<a href="http://www.nsb2008.org/">http://www.nsb2008.org/</a>
June 21-25	ASHRAE Annual Meeting in Salt Lake City, UT	<a href="http://www.ashrae.org">http://www.ashrae.org</a>
July 30 -Aug 01	SimBuild 2008 (Univ.Calif at Berkeley)	<a href="http://gaia.lbl.gov/ocs.index.php/simbuild/2008">http://gaia.lbl.gov/ocs.index.php/simbuild/2008</a>
August 17-22	Indoor Air 2008	<a href="http://www.indoorair2008.org">http://www.indoorair2008.org</a>