

*EnergyPlus*SPARK*DOE-2* EnergyPlus*VisualSPARK*DOE-2*GenOpt*EnergyPlus*DOE-2*GenOpt*EnergyPlus*
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Building Energy Simulation ♦ User News

*EnergyPlus*SPARK*DOE-2* EnergyPlus*VisualSPARK*DOE-2*GenOpt*EnergyPlus*DOE-2*GenOpt*EnergyPlus*
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Joe Huang Retires!

See page 14 for embarrassing photos!

The Buzz

EnergyPlus User Questionnaire

We invite all EnergyPlus users to participate in our survey. The questionnaire is on the Simulation Research Group's [website](#). Here's the direct link: <http://SimulationResearch.lbl.gov/surv07.html>

We will be gathering data from June through September 2007. In October we will draw the names/emails of five program users who completed the questionnaire; each one will receive a suitably "techie" prize!! (We promise that the prizes will NOT be copies of the giant 6-ft long poster of 20th Century Buildings. Although . . . there are still a few copies available. Send email to (klellington@lbl.gov) to get a free poster!

Disclaimer: The Building Energy Simulation User News was prepared as an account of work sponsored by the United States Government (USG). While this document is believed to contain correct information, neither the USG nor any agency thereof, nor the Regents of the University of California (RUC), nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process or service by its trade name, trademark, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the USG or any agency thereof, or the RUC. The views and opinions of authors expressed herein do not necessarily state or reflect those of the USG or any agency thereof or of the Regents of the University of California

Release of EnergyPlus 2.0

NEW FEATURES

DATA SETS

- New materials data set based on ASHRAE 2005 HOF (replaces legacy DOE-2 and BLAST data).
- Updated solar collector data set from the SRCC adds 55 more collectors for a total of 173.
- Added air change rate to ventilation loads report in StandardReports data set.

INPUT

- Objects and name lengths can now be 100 characters (previous limit was 60).
- New weather data for 86 locations added: 69 in Australia, 16 in Canada, and 1 in Iran.
- Three new unit ventilator input files created:
 - UnitVent5Zone.idf,
 - UnitVent5ZoneAuto.idf,
 - UnitVent5ZoneFixedOANoCoilOpt.idf.
- Three new thermal storage example input files created:
 - IceStorage-Parallel.idf,
 - IceStorage-Series-ChillerDownstream.idf,
 - IceStorage-Series-ChillerUpstream.idf.
- Example input files created for all new features (More than 225 example files now available)

GEOMETRY • WINDOW • WALLS • SHADING

- Shadowing Calculations object now allows user to specify maximum figures in shadowing overlaps.
- Phase change materials (PCM) with variable thermal conductivity and a temperature-enthalpy function incorporated in conduction finite difference solution algorithm.
- Basement program now outputs EnergyPlus IDF for wall and floor surface temperatures.
- Users can now enter interzone surfaces once and EnergyPlus will automatically create the mirror interzone surface.

DESIGN CALCULATIONS

- Zone Sizing modified to allow standards-type calculation of design outside air flow rates; allows minimum cooling and maximum heating limits on design supply air flow rates.

ON-SITE ENERGY SUPPLY

- Fuel cell model updated.
- Combustion micro cogeneration model added.

OUTPUT

- Report Variables and Meter Variables (rdd and mdd) separately reported and output as IDF.
- Meters can now report cumulative value in addition to resetting at reporting time interval.

Continued on the next page

Release of EnergyPlus 2.0

NATURAL AND MECHANICAL VENTILATION

- Zone forced air units added to reporting of mechanical ventilation rate and loads.
- Simple Ventilation object now reports air changes per hour.
- New options in UnitVentilator include no coil option and fixed amount for outside air control strategy.
- AirflowNetwork model can now use Zone Exhaust Fan, OnOff supply fan and the DX heating coil objects.

HVAC

- Water-to-air heat pumps now use RegulaFalsi solution technique to improve robustness and to speed up simulation.
- Applicability schedule added to System Availability Manager:Low Temperature Turn Off (to support thermal storage).
- Evaporative condenser option added to existing refrigerated case compressor racks including availability schedule and basin heater with controls.
- Draw-through fan configuration added for furnaces, unitary system and air-to-air heat pumps.
- Different supply air flow rates now allowed for cooling, heating and when no cooling or heating is required in unitary, furnace and air-to-air heat pumps.
- Common Pipe for Primary-Secondary systems provides an alternative to the Connection component object to model Primary-Secondary systems
- Balanced flow desiccant heat exchanger option added for the existing heat exchanger-assisted DX cooling coil object.
- Stratified water heater model added.
- Uniform load distribution option added to plant load range based operation scheme.
- Height-dependent air temperature and wind speed now available for most HVAC systems.

UTILITIES

- New EP-Launch utility tab added where users can launch Basement, CalcSoilSurfTemp, CoeffCheck, CoeffConv, Slab and Weather utilities.
- CSVproc now supported in EP-Launch.
- IDF Editor now preserves the order of user IDFs and includes a large number of other new features.

WATER MANAGER

- Green roof simulation added.

DOCUMENTATION AND GUIDES

- Input/Output Reference and Engineering Reference updated and extended for all new features and updates. Total documentation now exceeds 3300 pages.

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



The newest version of EnergyPlus (2.0), released on April 12, 2007, is also available today for Apple's Intel-based Macintosh platform (in addition to Windows and Linux versions). Key new features in V 2.0 include green roofs, phase-change materials, and enhanced building controls. 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.

Status of EnergyPlus Plug-In for SketchUp



DOE plans to release an EnergyPlus plug-in for Google's SketchUp later this summer. 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.

EnergyPlus_Support Group at YahooGroups



Are you a commercial or academic user of EnergyPlus? Join more than 1200 EnergyPlus users in an email group on YahooGroups. A place to ask your questions and share information with other EnergyPlus users. The YahooGroup also provides a searchable archive of all 6 years of discussion. You can also upload files to share with other users. This group supplements but does not replace the primary support email address of EnergyPlus-Support@gard.com.

The main web page for the group is: http://groups.yahoo.com/group/EnergyPlus_Support

To subscribe, send an email message to: EnergyPlus_Support-Subscribe@yahoogroups.com

*** ENERGYPLUS SURVEY/USER QUESTIONNAIRE ***

The EnergyPlus Development Team would like your input. We need to know who you are and how you use EnergyPlus. This is your chance to help guide the future development of EnergyPlus.
[User Questionnaire.](#)

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

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) 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.

The new version has many new capabilities:

- Generates input file for EnergyPlus version 2.0.
- The input files are now completely annotated with the descriptions of the fields for each object.
- Added input boxes on the web page for New footprints 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



Give the service a try! If you have questions or feedback, email ewi_support@nrel.gov.

Ask an EnergyPlus Expert . . .

LOADS NOT MET / HOURS NOT MET

Is it possible to report hours in the "load not met report" for the whole building, instead of each individual room?

Answer

No, but that would be a useful new report variable.

You might find the ASHRAE 55 comfort warnings to be useful for this purpose. In the PEOPLE objects, set "Enable ASHRAE 55 comfort warnings" to Yes. This enables new report variables and also generates a warning in the error file whenever the number of hours uncomfortable exceeds 4% of the simulation hours. For more details, search for "ASHRAE 55" in the Input Output/Reference.

Ask an EnergyPlus Expert . . .

SHADING DEVICES

I want to simulate a cross-ventilated zone having different types of shading devices (19 types derived from two main devices on the exterior wall). Some are perpendicular to the wall, and some are parallel to the wall. I want to see the effects of these devices on the cooling loads. I modeled all these devices using CAD. When I import my drawings, will the program be able to recognize the information?

Answer

There is no current auto import of CAD data. One or more of the private-market user interface tools can display the CAD drawing and allow you to trace over it. Shading devices are modeled three ways in EnergyPlus:

- as a shade on the window surface,
- as a blind (movable slats) on the window surface, or
- as a collection of exterior shading surfaces (see SURFACE:SHADING:*)).

Question

When the window is open, how do I define a shading device? In the examples, there were glazed surfaces.

Answer

In EnergyPlus, a window (SURFACE:HEATTRANSFER:SUB, type=WINDOW) is required to transmit solar gains into the building. Windows are also used as controllable openings for natural ventilation (see AIRFLOWNETWORK). The solar transmittance of the window area does not change depending on the open or closed state of the window. If the window is never glazed, but is simply an opening in the exterior wall, then define the glazing properties to be nearly perfect (e.g., transmittance = 0.99999, reflectances = 0.00001).

Question

When the window is open, I want to consider the impact of both shaded and unshaded areas on the floor. Will this information import into EnergyPlus?

Answer

EnergyPlus will determine the net direct and diffuse solar radiation, which passes through the window, accounting for all shading devices. If you specify, Solar Distribution=FullInteriorAndExterior or FullInteriorAndExteriorWithReflections in the BUILDING object, EnergyPlus will determine on which surfaces the incoming direct solar falls and account for this in the heat balance for each surface. The sunlit area and sunlit fraction can be reported for exterior surfaces, but not for interior surfaces.

Question

Can Energyplus calculate the surface temperatures?

Answer

Yes, both inside and outside surface temperatures can be reported.

*** ENERGYPLUS SURVEY/USER QUESTIONNAIRE ***

The EnergyPlus Development Team would like your input. We need to know who you are and how you use EnergyPlus. This is your chance to help guide the future development of EnergyPlus.

[User Questionnaire.](#)

Ask an EnergyPlus Expert . . .

WINDOW REVEALS

I've read through all the documentation on window reveals, and I'm still confused. According to the documentation, the window reveals are specified from the inside reveal edge → glass, and EnergyPlus figures out the Glass → outside reveal. In other words, the input specifies the glass distance from the inner wall surface, and EnergyPlus calculates the glass distance from the outer wall surface.

However, as far as I know, EnergyPlus knows nothing about wall thickness (1-D calculations), so on what basis does it calculate the window-to-outer-wall surface. And will the default setting of "0" place the window on the inside wall surface (full depth reveal) instead of the U.S. architectural norm of the outside wall surface?

Finally, why does EnergyPlus take the inner reveal as the augment? The inner reveal has no impact on shading (and thus solar gain, although it does impact daylight diffusion), whereas the exterior reveal does.

Answer

Yes, this can be confusing.

Surfaces and SubSurfaces in EnergyPlus have no thickness in and of themselves. It is only when the vertex coordinates for a Window SubSurface place it in a different plane from its host Wall Surface, presumably some distance from the "inside" face of the Wall Surface plane, that an outside reveal is detected by EnergyPlus. Inside reveal depths and absorptances (for sill and other edges) are input through the WindowFrameAndDivider input object.

As to the impact of these reveals on solar gains, read the details in the Input/Output Reference under WindowFrameAndDivider/Reveal Surface Fields, in particular the following:

*"The net effect of beam solar reflected from **outside** reveal surfaces is to increase the heat gain to the zone, whereas the effect of beam solar reflected from **inside** reveal surfaces is to decrease the heat gain to the zone since part of this reflected solar is transmitted back out the window."*

OUTSIDE REVEAL SHADOWING

I want to see the solar gain effect of placing a window in either the outer or inner surface of a wall with 0.45 m thickness. The documentation states that this is related to the outside reveal depth (ORD), which is calculated from the inside reveal depth (IRD) that we input and from the wall thickness (WT) and glazing thickness (GT). My understanding is that $ORD = WT - IRD - GT$, since ORD and IRD are measured from the outside and inside glazing surfaces until the respective wall surfaces.

So, in order to change the glazing position between the inner and outer wall surfaces we should change the IRD value. The problem is that changing this value from its default (0) caused EnergyPlus to crash. By default, doesn't EnergyPlus consider the glazing in the outer surface?

Answer

The outside reveal depth is defined by the coordinates of the window vertices relative to the plane of the base wall surface. For example, if the corners of a south-facing wall are at $y=10$, then window with a reveal of 0.2m would have coordinates with $y=10.2$. This is discussed on p. 179 (pdf p.217) of the Input/Output Reference. The inside reveal must be defined using the window frame and divider inputs. Note that the material thicknesses are not known by the solar shading algorithms.

Ask an EnergyPlus Expert . . .

ZONE WITH NO WALLS

How do you model zones that do not have a wall between them? Should I leave the imaginary surface out, or should I define it using a wall with a full size window and miniscule heat transfer properties? If there is significant daylighting, then defining the imaginary surface a wall would block this out.

Answer

Unfortunately, there is no good solution to modeling this case. Here is a (rather) long answer in which some of the issues are examined.

It is extremely difficult to model the interactions between thermal zones that are connected by a large opening. If the zones are controlled to the same conditions, then there is little to be gained by making them interact, so you could neglect any connections between the zones. In fact, if this is the case, you might consider combining the spaces into a single thermal zone. If you expect the zones to have significantly different temperatures and/or humidities, then use one of the following options. If they are modeled as separate zones, EnergyPlus models only what is explicitly described in the input file, so simply leaving a void (no surfaces) between two zones will accomplish nothing -- the two zones will not be connected. The main interactions which occur across the dividing line between two zones that are fully open to each other are these:

1. Convection or airflow, which will transfer both sensible heat and moisture. Some modelers use MIXING (one-way flow) or CROSS MIXING (two-way flow) to move air between the zones, but the user must specify airflow rates and schedules for this flow, and it cannot be automatically linked to HVAC system operation. Other modelers use AirFlowNetwork with large vertical openings between the zones as well as other openings and cracks in the exterior envelope to provide the driving forces. It can also be connected with the HVAC system (for limited system types). This requires a much higher level of detailed input and should be used only if the detailed specification data is available. If the two zones are controlled to similar conditions, this effect could be safely neglected.
2. Solar gains and daylighting. The only way to pass solar and daylight from one zone to the next is through a window or glass door described as a subsurface (Surface:HeatTransfer:Sub) on an interzone wall surface. Note that all solar is diffuse after passing through an interior window.
3. Radiant (long-wave thermal) transfer. There is currently no direct radiant exchange between surfaces in different thermal zones. Windows in EnergyPlus are opaque, in order to direct radiant exchange, so an interzone window will not behave any differently than an opaque interzone surface for this aspect. However, a large interzone surface (opaque or window) would result in some indirect radiant exchange since the interzone surface will exchange directly with surfaces in zone A and in zone B. The surface thermal resistance should be low in order to most closely approximate this effect.
4. Conduction. If an interzone surface is placed between the two zones, it will conduct sensible heat between the two zones. Using a low thermal resistance helps to move radiant exchange between the zones.
5. Visible and thermal radiant output from internal gains. These gains will not cross zone boundaries. But again, they will impact any interzone surfaces, so some of the energy may move across to the next zone.

Reply

Great answer. This information should be saved and linked to the EnergyPlus help files.

Ask an EnergyPlus Expert . . .

UNENTERED OTHER ZONE SURFACE

If "UnenteredOtherZoneSurface" is selected as the Outside Face Environment for a particular surface, does EnergyPlus determine the proper area from the corresponding surface of the specified ZONE, or should I make sure that the specified ZONE has a surface with area equal to the subject surface?

Answer

When using OtherZoneSurface, you must describe the surface twice, once in each zone. For an example of UnenteredOtherZoneSurface, see example file 5ZoneAirCooledConvCoef.idf.

CORRIDOR MODELING

I am doing a simulation that includes a corridor (a zone). The corridor is the outside surface zone for several offices (each one a different zone). Do I need to fragment my corridor wall so it coincides with the offices walls (so surfaces on the offices correspond to surfaces on the corridor)? Or should I define the surfaces in the offices using the wall on the corridor as their outside zone and then only define one wall on the corridor with "unenteredOtherZoneSurface"?

Answer

A new feature in EnergyPlus 2.0 will automatically define one wall, which is in contact with the corridor, for each office. Here's how:

1. In each office describe the wall next to the corridor using "unenteredOtherZoneSurface" and specify the Corridor as the outside face environment object.
2. Do not describe any of these walls in the corridor zone; the "unenteredOtherZoneSurface" option will create them internally. You can see them in output reports, but you do not need to describe them in the idf file.

EPW FILES -- CLIMATE DATES

In the .epw files, which columns are the ones for the temperature of the site and which are for direct radiation?

Answer

Note that the data in the EPW files is comma-delimited, not "columns."
The format of the EPW file is described in AuxiliaryPrograms.pdf , beginning on page 37 (pdf page number 49), *"For those interested in creating their own weather data in CSV or EPW formats or reading the .csv or .epw files that are produced by the Weather Converter program....."*

EnergyPlus Technical Note – Opaque Ventilated Façades

On May 28, 2007, Emanuele Naboni (PhD Candidate), a visiting researcher from the Politecnico di Milano (Italy) gave a lecture at Lawrence Berkeley National Laboratory on how he used EnergyPlus to model Ventilated Opaque Façades. A .pdf of his presentation is available at

<http://SimulationResearch.lbl.gov/reports.html> under the heading "All EnergyPlus Reports."

Here is the direct link: http://simulationresearch.lbl.gov/dirpubs/vent_facade.pdf

Ask an EnergyPlus Expert . . .

WINDOW WITH SWITCHABLE GLAZING

Can EnergyPlus simulate Window construction tinted automatically with solar incident?

Answer

Look under WindowShadingControl. You can choose SwitchableGlazing as the Shading Type and then select from several triggers for darkening the glazing.

Question

Do the triggers mean adding shade behind the window glass?

Answer

By trigger, I mean a control variable that sets a threshold for darkening the tint of electrochromic glazing. This is explained under WindowShadingControl Shading Control Type.

You did not ask about shades in your original message. Note that you can also use the Shading Control Types in WindowShadingControl to deploy (add) a shade that has been defined as inside, outside, or between glass layers of a window. You will have to read the Input/Output Reference documentation on Material:WindowShade.

INTERIOR BLINDS

In a model I made to simulate heat transfer from the envelope, I made runs with and without interior blinds for windows. I thought that the cooling loads through the envelope due to solar heat gain should be higher without blinds than with blinds, but the results showed that sometimes the results were higher with the blinds (early morning on the east facade and late afternoon on the west façade). I also tried interior shade, but the results are similar.

Answer

Placing blinds and/or shades on the interior of a window will not stop solar gains from entering the zone. Solar will still be transmitted through the window and will warm up the blind/shade surface, which is inside the zone. Some solar will be reflected back out the window, but this will not reliably lower the overall solar gains relative to a window without an interior blind or shade.

Try placing the blind/shade on the exterior of the window for comparison.

CONVERT DOE-2 FMT TO ENERGYPLUS EPW

How do I convert the DOE-2 FMT to EnergyPlus epw?

Answer

The WeatherConverter will do that for you. DOE-2 FMT (text format) is one of the supported formats. From the Start button → Programs → EnergyPlus V2-0 Programs → click on Weather Statistics and Conversions. More information is also provided in the Auxiliary Programs PDF.

EnergyPlus Version 2.0

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
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/
Selected questions and answers have been compiled into PDF documents:
for [2002](#), for [2003](#), for [2004](#), for [2005](#), for [2006](#)

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

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).

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 monthly *User News* Newsletter, please contact klellington@lbl.gov

Get 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 text document.

Recent Reports

*Proceedings ACEEE Summer Study on Energy Efficiency in Buildings,
August 13-18, 2006 • Pacific Grove, CA*

Establishing Benchmarks for DOE Commercial Building R&D and Program Evaluation

Michael Deru, Brent Griffith, and Paul Torcellini, National Renewable Energy Laboratory

ABSTRACT

The U.S. Department of Energy (DOE) Building Technologies Program and the DOE research laboratories conduct a great deal of research on building technologies. However, differences in models and simulation tools used by various research groups make it difficult to compare results among studies. The authors have developed a set of 22 hypothetical benchmark buildings and weighting factors for nine locations across the country, for a total of 198 buildings. The benchmark buildings are representative of new commercial building stock and meet the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1-2004. The benchmark building definitions are complete descriptions suitable for whole building energy simulations and are implemented in EnergyPlus input files. The complete benchmark definitions with documentation of all inputs will be available in a technical document published near the end of 2006. The EnergyPlus input files are automatically created by preprocessor routines, which minimize errors and ensure that everyone has consistent implementation in the most recent version of EnergyPlus and the most recent version of the benchmarks. The benchmark buildings will form the basis for research on specific building technologies, energy code development, appliance standards, and measurement of progress toward the DOE energy goals. Having a common starting point allows us to better share and to compare research results and move forward in making more energy-efficient buildings. In addition, the benchmark buildings can be used with minor modifications to evaluate other energy efficiency programs and individual buildings.

Zero Energy Buildings: A Critical Look at the Definition

Paul Torcellini, Shanti Pless, and Michael Deru, National Renewable Energy Laboratory
Drury Crawley, U.S. Department of Energy

ABSTRACT

A net zero-energy building (ZEB) is a residential or commercial building with greatly reduced energy needs through efficiency gains such that the balance of energy needs can be supplied with renewable technologies. Despite the excitement over the phrase “zero energy,” we lack a common definition, or even a common understanding, of what it means. In this paper, we use a sample of current generation low-energy buildings to explore the concept of zero energy: what it means, why a clear and measurable definition is needed, and how we have progressed toward the ZEB goal. The way the zero energy goal is defined affects the choices designers make to achieve this goal and whether they can claim success. The ZEB definition can emphasize demand-side or supply strategies and whether fuel switching and conversion accounting are appropriate to meet a ZEB goal. Four well-documented definitions—net-zero site energy, net-zero source energy, net-zero energy costs, and net-zero energy emissions—are studied; pluses and minuses of each are discussed. These definitions are applied to a set of low-energy buildings for which extensive energy data are available. This study shows the design impacts of the definition used for ZEB and the large difference between definitions. It also looks at sample utility rate structures and their impact on the zero energy scenarios.

July Educational Programs	
Pacific Gas & Electric Company, San Francisco, California	
<i>For a complete listing of classes or to register go to www.pge.com/pec</i>	
BUILDING ENVELOPE	
Jul 18	PG&E's Residential New Construction Program
H V A C	
Jul 17	Critical Tools for the Design and Commissioning Process
TITLE 24	
Jul 11	Advanced MICROPAS Calculations for EnergyStar, Tax Credits, and California Solar Initiative
COMMISSIONING (Cx)	
Jul 17	Critical Tools for the Design and Commissioning Process
INCENTIVES	
Jul 11	Advanced MICROPAS Calculations for EnergyStar, Tax Credits, and California Solar Initiative
RENEWABLES	
Jul 14	Solar Power Basics for Residential Customers

Freebie!

Quick, what's six feet long, over two feet wide and jam-packed with buildings factoids?
If you guessed that it's a poster entitled

"Energy and Buildings in the 20th Century -- Changing How We Live and Work in America"

you would be correct! Published by the U.S. Department of Energy as part of their "Greening America" campaign, the poster is a timeline of 20th century achievements in building. There are photos of "milestone" buildings like the 1940 Solar House at M.I.T., Buckminster Fuller's 1927 Dymaxion House, the 1933 House of Tomorrow at the Chicago World's Fair, the Empire State Building, etc.

In addition to the buildings, there are time lines for electricity and technology along with a mini history of how human shelters developed through the centuries; it warps you from the Mesa Verde Cave Dwellings to the present White House! The poster is available **free of charge** from your friendly federal government and would look terrific in an office or classroom. Please send your request to klelligenton@lbl.gov.

Meetings - Conferences - Symposia

2007		
July 7-12	Solar 2007	http://www.ases.org/solar2007/participate.htm
Sept 03-06	Building Simulation 2007 Beijing, China	http://www.bs2007.org.cn
Oct 28-31	Int'l Conference on IAQ, Ventilation and Energy Conservation in Buildings	yoshino@sabine.pln.archi.tohoku.ac.jp
Nov 16	IBPSA-England Symposium	http://www.ibpsa-England.org/
2008		
Aug 17-22	Indoor Air 2008	http://www.indoorair2008.org

So long, Joe Huang !!

After devoting 26 long years to building energy research, Joe Huang has decided to retire from Lawrence Berkeley National Laboratory.



As you can see from the photo at left, he's leaving with only the barest of necessities: his camel ("Spunky") and his laptop (as yet, un-named).

Seriously, though, the Simulation Research Group will miss him greatly and we wish him good luck with his new venture,

[White Box Technologies](#), a consulting firm, located in Berkeley, California.

Joe's Most Wanted Playing Card → →

At an EnergyPlus Team Meeting held in Berkeley in 2004, Joe was featured as one of the face cards in our irreverent version of the then-popular deck of "Iraq Personality Identification Playing Cards." However, instead of members of Saddam Hussein's Revolutionary Command Council, our playing cards featured members of the EnergyPlus Development Team.

To see the whole EnergyPlus deck, click [here](#).

If you want to contact Joe, his new email is joe@drawbdl.com



Last seen sprinting through the Beijing Airport screaming "Hold the Plane!"