

EnergyPlus SPARK*DOE-2* EnergyPlus*VisualSPARK*EnergyPlus*DOE-2*GenOpt*EnergyPlus*
*EnergyPlus*VisualSPARK*DOE-2*GenOpt*SPARK*EnergyPlus*VisualSPARK*DOE-2 *GenOpt*

BUILDING ENERGY SIMULATION USER NEWS

EnergyPlus SPARK*DOE-2* EnergyPlus*VisualSPARK*EnergyPlus*DOE-2*GenOpt*EnergyPlus*
*EnergyPlus*VisualSPARK*DOE-2*GenOpt*SPARK*EnergyPlus*VisualSPARK*DOE-2 *GenOpt*

Highlights

- 2 ... New Weather Files for **EnergyPlus**
- 2 ... Ask an **EnergyPlus** Expert
 - 2 Constant Deck and Supply Temperatures
 - 3 Water-Side Economizer
 - 3 Purchased Air and Ventilation,
 - 4 Gains from People and Lights
 - 4 End-Use Category for DX Coils,
 - 5 Light Shelf Surface Temperature,
 - 5 Meters,
 - 6 Reports – Electrical Energy Demand

Recent Reports

- 7 ... "Using EnergyPlus for California Title-24 Compliance Calculations "
"Methodology for Analyzing the Technical Potential for Energy Performance in the U.S. Commercial Buildings Sector with Detailed Energy Modeling "

Regular Features

- 7 ... Meetings Sponsored by ACEEE
- 8 ... 2007 Technical Seminars from Southern California Gas Co.
- 9 ... 2007 Energy Efficiency Seminars from San Diego Gas & Electric
- 9 ... Meetings, Conferences, Symposia
- 9 ... April 2007 Educational Classes from Pacific Gas & Electric

Big List of FREE! has moved to [section 2 of the User News](#)

The  Buzz

Two New EnergyPlus Consultants
Turn to p. 2 for details.

Developer of FORTRAN Dies
John W. Backus, who assembled and led the IBM team that created Fortran, the first widely used programming language died at his home in Ashland, Ore. He was 82 years old.

For more information, please see <http://tinyurl.com/yyn7a4>

From the March 19, 2007 New York Times

New DOE-2 Consultants
See p. 8 for details.

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

Ask an EnergyPlus Expert

CONSTANT DECK AND SUPPLY TEMPERATURES

I am trying to simulate a 100% outside air, constant-volume, constant-temperature ventilation system.

I want to dehumidify the ventilation air by using a DX coil (I used a DXSystem:AirLoop object) and then a gas reheat coil (FURNACE:BLOWTHRU:HEATONLY). I want the air to come off the DX coil at a maximum and constant 55F (except during the winter when the OA to the system will be lower than that temperature). I want the air to come off the gas coil in the furnace at a constant 68F, year round, no matter what. I tried using setpoint controllers at the outlet nodes to both coils, but the furnace mandates that the thermostat location be in a zone; this causes my setpoint managers to be over-ridden by the zone needs.

Answer

While the DX coil cannot control itself directly, a gas heating coil can. For this application, delete the FURNACE object and put the gas heating coil directly on the branch and then specify the coil outlet node to be the Coil Temp Setpoint Node. Use SET POINT MANAGER:SCHEDULED to place the heating and cooling setpoints at the respective outlet nodes.

I have made a note to make sure that the Input/Output Reference Manual explains which coils can go directly on a branch, which need a controller, and which need to be contained inside a parent object.

New EnergyPlus Consultant

Pongsak Chaisuparamikul Ph.D
College of Architecture, Illinois Institute of Technology
3140 South Michigan Avenue, #604, Chicago, IL 60616-3807
Phone: 312 225 4610, Fax: 775 368 3267
pongsak_archenergy@sbcglobal.net
<http://www.pongsak-chaisuparamikul.com>

Benjamin DUGUET
ECOFYS <http://www.ecofys.nl>
P.O. Box 8408; 3503 RK
Utrecht, The Netherlands
Phone: 0031(0)303002479
<mailto:B.Duguet@ecofys.nl>

New EnergyPlus Weather Data

Sixteen new weather files for Quebec, Canada, and for one location in Iran (Tehran) are now available on the EnergyPlus web site:

http://www.eere.energy.gov/buildings/energyplus/cfm/weather_data3.cfm/region=4_north_and_central_america_wmo_region_4/country=3_canada/cname=CANADA#PQ

http://www.eere.energy.gov/buildings/energyplus/cfm/weather_data3.cfm/region=2_asia_wmo_region_2/country=IRN/cname=Iran%20-%20Islamic%20Republic%20of

Thanks to Environment Canada and White Box Technologies for sharing these files with the EnergyPlus community.

Ask an EnergyPlus Expert

WATER-SIDE ECONOMIZER

I am trying to use the water-side economizer in EnergyPlus by adding a Free Cooler Branch: HEAT EXCHANGER:HYDRONIC:FREE COOLING. I referred to the example file (Free cooling chiller.idf) but there are some things I don't fully understand. Here are my questions (and thank you in advance);

1. What is the difference between Chiller: Electric and Chiller: Const COP? In real applications, which one is more practical?
2. When I use the CHILLER:Electric object, I am not quite sure about some of the parameters. For example, say the chiller supply water is 6C and the COP is 3.2. If I increase chiller water temperature to 15C (used for radiant cooling), should I change the COP to about 4.3 in the model input? Also, should I change the coefficients inputs? And if I have to change the coefficient inputs, where do I get some reference data?

Answer

1. Const COP chiller is an ideal chiller. Use CHILLER:ELECTRIC or CHILLER:ELECTRIC:EIR
2. The CHILLER:ELECTRIC and CHILLER:ELECTRIC:EIR models automatically adjust for differing chilled water and condenser water temperatures. The design (or nominal) COP entered for the chiller must be consistent with the design chilled water and design entering condenser temperatures. You can report the chiller COP using REPORT VARIABLE "Chiller COP."

PURCHASED AIR AND VENTILATION

I'm modeling a restaurant that has three air handling units and some exhaust fans in the kitchen. I want to use the PURCHASED AIR object, and I have information on the building's Outdoor air, supply air, return air and the Kitchen's exhaust air. Where should I specify each one of those and which flow rate should I specify for the Ventilation object?

Answer

If you want the EnergyPlus simulation to always meet the load, then allow the PURCHASED AIR object to have unlimited capacity.

If you want to limit the PURCHASED AIR flow rate, then specify the supply air flow rate.

Assuming the systems are balanced such that the outdoor air flow is equal to or greater than the exhaust fan flow, then specify the outdoor air flow rate in the VENTILATION object(s).

If you are modeling three thermal zones to align with the three air handlers, then you may also want to add a MIXING object if there is a net flow of outdoor air from the dining area(s) into the kitchen.

All of this assumes that the air handlers will be constant volume with continuous fan during occupied hours.

To EnergyPlus Documentation

<http://www.eere.energy.gov/buildings/energyplus/documentation.html>

Ask an EnergyPlus Expert

GAINS FROM PEOPLE, LIGHTS

How can I find the exact magnitude of gains (Watts) due to people, due to lights, etc.

Answer

In general, you want to check out the .rdd file (created by EnergyPlus) for a complete list of report variables available for the model. Then repeat the run with additional requests for specific report variables in which you are interested. Requests for results can be for many different time scales and appear in different places. First, get the .rdd file and include this in your input file:

```
Report, Variable Dictionary;
```

Also, we would suggest adding the following report requests to your input file. These next two objects will produce a separate "Tabular" report file that may have all the information you need.

```
Report:Table:Style, HTML;  
Report:Table:Predefined,  
Annual Building Utility Performance Summary,  
Input Verification and Results Summary,  
Equipment Summary;
```

For time series results you could use the following
(you could convert from J to W using the time step):

```
Report Variable, *, Zone Lights Electric Power, Timestep;  
Report Variable, *, Zone People Total Heat Gain, Timestep;
```

(you could convert from W/m² to W using the surface area).

```
Report Variable, *, Surface Ext Solar Beam Incident;
```

END-USE CATEGORY FOR DX COILS

For LEED M&V purposes I would like to assign a specific end-use category to the energy consumption associated with DX coils (compressors, condenser fans). However, I cannot find the option. Am I missing it somewhere?

Answer

Custom end-use categories are only supported for a limited set of components at this time. You can, however, create custom meters. The following object would collect all DX coil energy use (compressors and condenser fans) onto a single meter:

```
CUSTOM METER,  
Custom DX Cooling Meter, !- Name of Meter  
Electricity, !- Fuel Type  
, !- Key Name #1  
DX Cooling Coil Electric Consumption; !- Report Variable or Meter Name  
#1
```

This will not add a new line to the ABUPS end-use table, but it can be reported just as any other meter:

```
Report Meter,  
Custom DX Cooling Meter, !- Meter_Name  
monthly; !- Reporting_Frequency
```

Connections to all meters (master, end-use, and custom) are shown in the mtd output file.

Ask an EnergyPlus Expert

LIGHT SHELF SURFACE TEMPERATURE

I want to simulate the energy performance of a light shelf and I'm facing the following problem: the surface temperature of the internal portion of the shelf is very high. For example under the climate conditions of San Francisco, and when I'm using the provided example "DaylightingDeviceShelf.idf," the surface temperature of the shelf reaches 68C. This fact also influences the cooling (increased) and the heating (decreased) loads, due to the existence of a heat source into the space. Do you have any ideas on how to solve this problem?

Answer

The problem is that the input file "DaylightingDeviceShelf.idf" was designed to be the simplest example of how to use the DAYLIGHTING DEVICE:SHELF object. However, the input file does not necessarily represent a realistic building model. If you check the zone temperatures, they are also very high, peaking at 41C. The reason for all the hot temperatures (and cold ones in the winter) is that these zones are not conditioned; i.e., they do not have any heating or cooling systems. Nor do they have any mechanism for exchanging air with the outdoors -- no infiltration or ventilation. Therefore, because of the windows, you have a lot of solar gain in the summer with no way to remove the heat (although there is no insulation in the walls and the windows are single pane, so that helps a little). All of these things were left out for the sake of simplicity of the example.

The surface temperature of the inside shelf is naturally going to be even hotter than the zone because the direct beam of the sun strikes the surface during much of the day. (By the way, this probably does reflect the real behavior of light shelves.) I would expect that the inside shelf and the floor will be the hottest surfaces in the zone, which then give off their heat to the zone air by convection and to other surfaces by radiation. One thing that the light shelf model WILL NOT capture is the "fin effect" of an outside shelf. For example, if you have a light shelf constructed from a single slab of material, and it forms the inside part and the outside part of the same shelf, there will be some conduction losses that will cool down the inside shelf, assuming that it is hotter than the outside. So you might find that the simulated inside shelf is slightly hotter than reality. If that's a problem, you can decrease the Solar Absorptance of the finished surface material of the inside shelf; it won't absorb as much solar and won't heat up as much.

If you are interested in simulating the energy performance of a real light shelf, I recommend that you study the example file to learn how to use the DAYLIGHTING DEVICE:SHELF object. Then, create your own model of a realistic building or zone to which you can add the DAYLIGHTING DEVICE:SHELF. You should get good results that way.

METERS

In the meters report, is "Purchased Cooling:Facility" the same as the Electricity consumption of the HVAC system?

Answer

No. "purchased cooling:facility" is cooling energy obtained from some off-site source of cooling. It applies to object types PURCHASED AIR and PURCHASED:CHILLED WATER.

To understand the meaning of each meter and submeter, see the .mtd output file. The first half of this output file lists every metered report variable and the meters to which it is connected. The second half provide the inverse, listing all the report variables connected to each meter. Reviewing this output file should help you understand the meaning of the various meters.

Ask an EnergyPlus Expert

REPORTS -- ELECTRIC ENERGY DEMAND

I have a general question. How is COOLING:ELECTRICITY {MAXIMUM}[W] in Report:Electric Energy Demand (ABUPS) related to Peak DES COOL LOAD (W) in the EnergyPlus zsz (or eio file)?

Answer

"Peak DES COOL LOAD (W)" in the zsz and eio output files is the peak sensible cooling requirement of the zone as computed for the design days in the input file.

"COOLING:ELECTRICITY {MAXIMUM}[W]" in Report :Electric Energy Demand (ABUPS), is the peak power consumption of all electric cooling equipment in the simulation over an entire weather file simulation. To see what specific components are part of COOLING:ELECTRICITY, see the mtd (meter details) output file.

EnergyPlus Version 1.4.0

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

Support Tools

Support software is listed on the main EnergyPlus website: www.energyplus.gov

Weather Data from 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 EnergyPlus users are answered promptly via email by program developers. To submit questions, join the EnergyPlus User Group (details below). A selection of questions/answers are compiled (yearly) into a downloadable PDF document: Q and A 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

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. To join, go to http://groups.yahoo.com/group/EnergyPlus_Support/

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

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).

Recent Reports: Proceedings of *SimBuild 2006*, held at MIT, Cambridge, Mass, August 2-4, 2006

[Methodology For Analyzing The Technical Potential For Energy Performance In The U.S. Commercial Buildings Sector With Detailed Energy Modeling](#)

Brent Griffith¹ and Drury Crawley²

¹National Renewable Energy Laboratory, Golden, CO

²U.S. Department of Energy, Washington, DC

ABSTRACT

This paper summarizes a methodology for developing quantitative answers to the question, "How low can energy use go within the commercial buildings sector?" The basic process is to take each building in the 1999 CBECS public use data files and create a baseline building energy model for it as if it were being built new in 2005 with code-minimum energy performance. The 1999 CBECS data form a statistical model of the commercial buildings sector by using a set of 5,430 buildings with weighting factors to indicate how many more such buildings are represented by each member. For each building, we used 1999 CBECS data on floor area, number of floors, census division, basic climatic design criteria, principal building activity, and number of employees.

The expanded building descriptions needed for detailed energy modeling with EnergyPlus were generated by applying ASHRAE Standard 90.1-2004 and augmenting with data from Huang and Franconi (1999), probabilistic assignments, and other assumptions. The technical potential of energy design measures, for the sector as a whole, were then evaluated by altering and rerunning the energy models, comparing perturbed results to each baseline, and then aggregating performance metrics. The primary benefit of the method is that the CBECS weighting factors provide a robust way of aggregating

national results from simulations of individual buildings. However, it is also challenging because it requires considerable computing resources. The methodology is recommended for future analyses when the results must properly reflect the national implications and when only a limited number of scenarios need to be investigated.

[Using Energyplus For California Title-24 Compliance Calculations](#)

Joe Huang¹, Norman Bourassa², Fred Buhl¹, Ender Erdem¹, Rob Hitchcock¹

¹Lawrence Berkeley National Laboratory, Berkeley CA

²California Energy Commission, Sacramento CA

ABSTRACT

For the past decade, the non-residential portion of California's Title-24 building energy standard has relied on **DOE-2.1E** as the reference computer simulation program for development as well as compliance. However, starting in 2004, the California Energy Commission has been evaluating the possible use of **EnergyPlus** as the reference program in future revisions of Title-24. As part of this evaluation, the authors converted the Alternate Compliance Method (ACM) certification test suite of 150 DOE-2 files to EnergyPlus, and made parallel DOE-2 and EnergyPlus runs for this extensive set of test cases. A customized version of DOE-2.1E named **doe2ep** was developed to automate the conversion process. This paper describes this conversion process, including the difficulties in establishing an apples-to-apples comparison between the two programs, and summarizes how the DOE-2 and EnergyPlus results compare for the ACM test cases.

American Council for an Energy-Efficient Economy (ACEEE)

April 12-13 [Energy Efficiency Finance Forum](#) (New York City)

July 24-27 [2007 Summer Study on Energy Efficiency in Industry](#)
to be held in White Plains, NY

DOE-2.1E, Version 124

DOE-2.1E (version 124) 1,000-Zone version for Windows from ESTSC; other vendors of DOE-2 based programs are listed at <http://SimulationResearch.lbl.gov/>

Free DOE-2 Documentation <http://gundog.lbl.gov/dirsoft/d2getdoc.html>

DOE-2 Basics Manual (2.1E) <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 \(txt file\)](#) -- All changes and bug fixes in a text document.

New DOE-2 Consultants

Pongsak Chaisuparasmikul Ph.D
Illinois Institute of Technology
3140 South Michigan Avenue, #604
Chicago, IL 60616-3807 U.S.A.
Tel: 312 225 4610, Fax: 775 368 3267
pongsak_archenergy@sbcglobal.net
<http://www.pongsak-chaisuparasmikul.com>

Antonio Westenberger
Av. Angelica, 672 - 12o.and. - Cj.A
01228-000 Sao Paulo - SP
Brazil
Web site: www.3abr.net
Tel: (55-11)3825-6640
E-mail: antonio.westenberger@3abr.net

Ray L. Worthen P.E.
5208 W Frontier
Morgan, Utah 84050
ray.worthen@hill.af.mil

Philip Wemhoff
9765 MacArthur Court North
Jacksonville, Florida 32246
wemhoff@buildingsleuth.com

[Peter D'Antonio, P.E.](#)
PCD Engineering Services, Inc.
184 Wetterhorn Way
Longmont, CO 80501
Tel: 303.678.1108, Fax: 303.678.1142

2007 Technical Seminars Presented by Southern California Gas Company Located at the Energy Resource Center in Downey, California

http://www.socalgas.com/business/resource_center/erc_home.shtml

April 12	6th Annual Municipal Green Building Conference & Expo
April 13	LEED 101: Getting Started with LEED
April 13	Understanding LEED Project Costs & Returns
May 8	EnergyPro Training: Indoor & Outdoor Lighting
May 8	EnergyPro Training: Envelope and Windows
May 9	EnergyPro Training: Advanced
May 9	EnergyPro Training: Mechanical
July 20	EnergyPro Training: Envelope and Windows

Meetings - Conferences - Symposia

2007		
May 21-25	CIB World Building Congress 2007	cdejager@saice.org.za
June 10-14	CLIMA 2007	http://www.clima2007.org/portal/
June 13-15	Roomvent 2007	http://www.roomvent2007.org
June 23-27	ASHRAE Annual Meeting (Long Beach, CA)	http://www.ashrae.org
September 03-06	Building Simulation 2007 – IBPSA China	http://www.ibpsa.org

**2007 Energy Efficiency Seminars
Presented by San Diego Gas and Electric Company
<http://www.sdge.com>**

April 18	HVAC, Direct Digital Control (DDC) Open Systems
May 16	Cooling Tower Design and Operation
May 23	Cooling Water Treatment Management for Energy Conservation
May 30	Understanding & Diagnosing HVAC Electrical Systems (Part 1)
May 31	Understanding & Diagnosing HVAC Electrical Systems (Part 2)
July 24	Fundamentals of Energy Efficiency in Food Service

April 2007 Educational Programs

Pacific Gas & Electric Company, San Francisco, California

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

BUILDING ENVELOPE

Apr 18 [2005 Title 24 Nonresidential Building Envelope Requirements](#)

H V A C

Apr 25 [Natural Ventilation and HVAC](#)

TITLE 24

Apr 18 [2005 Title 24 Nonresidential Building Envelope Requirements](#)

COMMISSIONING (Cx)

Apr 17 [Identifying and Assessing Common Retrocommissioning Opportunities](#)

RENEWABLES

Apr 24 [Photovoltaic \(PV\) Site Analysis and System Sizing](#)