

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

Building Energy Simulation ♦ User News

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

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The Buzz

Call for Abstracts
SimBuild 2008 - To be held July 30 to August 01 in Berkeley, CA, on the campus of the University of California. Details at <http://gaia.lbl.gov/ocs/index.php/simbuild/2008>

Prize Winners!!
Congratulations to the five EnergyPlus users whose names were drawn at random after they completed our survey. Here are the winners of either a memory card or flash drive: Bob Ronan (Texas), Troy Peters (California), Michael Wilson (Canada), Annette Stumpf (Illinois) and Francisco Rodríguez Pérez-Curiel of Spain.

Happy Thanksgiving!!!
Turn to p. 11 for the Simulation Research Group's annual nod to "turkey day." ☺

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 . . .

OVERLAPPING SHADOWS ERROR

When I run a yearly simulation for my office building, I get the following warning:

```
***** ===== Recurring Surface Error Summary =====  
** The following surface error messages occurred.  
** Too many figures in shadow overlap errors occurring.  
** These occur throughout the year and may occur several times  
** for the same surfaces. You may be able to reduce them by  
** adding DIAGNOSTICSDoNotMirrorDetachedShading;  
** Warning ** Too many figures in a shadow overlap  
** Overlapping figure=003>006>O1>WF0, Surface Class=[Wall]  
** This error occurred 10 times.  
** Figure being Overlapped=009-03E, Surface Class=[Wall]  
** The too many figures errors occurred 10 times (total)  
** EnergyPlus Completed Successfully-- 10 Warning; 0 Severe Errors;  
** Elapsed Time=00hr 03min 33.00sec
```

I don't really understand what this warning means and how it affects the results of the simulation. These two walls are both aligned vertically (ideally they can be on the same vertical plane), but 009-03E is an exterior wall on the 4th floor and 003>006>O1>WF0 is an interior surface located on the 2nd floor. I tried to erase all my shading elements, but I still got the same warning.

Answer

This error means that the shadowing calculations have overrun some predefined limits on the number of overlapping shadows on a single surface. In the SHADOWING CALCULATIONS object, there is a second field "Max_figures_shadow" which allows you to increase this limit. The default is 15000. Try a large value, such as 20000, and see if this solves the problem.

VENTILATION OBJECTS

I would like to have three ventilation systems serving the same zone; each one with a different control. However, I think that EnergyPlus allows a maximum of two ventilation objects to serve one thermal zone. Is this true? Can I get around the two object limit?

Answer

Actually, only one simple Ventilation object per zone is allowed. Multiple ventilation objects are on the wish list.

Here are some possible work-arounds:

- Zone equipment (like Unit Ventilator) can serve as a second source of ventilation.
- A full air loop system can serve as a third source of ventilation.
- The simple Infiltration object can be considered the same as ventilation.
- If you really need to, it is possible to do a modeling trick where an additional Ventilation object is used on a small dummy zone. The dummy zone is connected to the main zone using a pair of Mixing objects.

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, meant to be used with the EnergyPlus simulation engine. HLCP is a for-purchase program. For details, please go to <http://www.hvacindia.com/hlcp/>

Ask an EnergyPlus Expert . . .

CURVED BLINDS

Is there a way to model curved blinds with EnergyPlus? Page 98 of the Input/Output Reference manual (4/9/07) states "Slat curvature, if present, is ignored."

Answer

It would not be exact, but you could use the "slat thickness" to model the curvature of the blind slat. In this case the slat thickness could be found by laying the slat on a flat surface and measuring the distance from the slat midpoint to the flat surface. Refer to the Input/Output Reference document for a complete discussion of Material:WindowBlind.

EXTERIOR FIXED LOUVERS

I need to model a shading device with the following composition:

- Approximately 20 fixed louvers that span the width of the window.
- Louvers are arranged on a slope, where the uppermost louvre at the top of shading device is closer to the window face (237mm from the window face at a height level with the window head) than the louver at the base of the sunshade (986mm from the window face at a height of 529mm above the window sill).
- Louvers between the uppermost and lowermost louvers are spaced evenly and linearly.

Should I simply model in the geometry of the shades directly and use Surface:Shading:Attached, or will that result in a ridiculous amount of processing time? Are there any ways to approximate the effect of a shading device like this that won't excessively compromise the accuracy of the simulation?

Answer

Modeling as Surface:Shading:Attached is certainly the most accurate approach. If this occurs on only one window, the computing time should not be excessive.

If the same configuration occurs many times around the building, then it might be a problem. When using this approach, the default action of EnergyPlus is to mirror every shading surface, so that you do not have to worry about the facing direction of the shading surfaces. This is necessary because surfaces in EnergyPlus only cast shadows in one hemisphere (in the direction of the outward facing normal).

If computing time becomes an issue, you can use the diagnostics command to turn off this mirroring: DIAGNOSTICS,DoNotMirrorDetachedShading. However, if you do this, you **MUST** make sure that the azimuth and tilt of the slats is facing down and toward the window. Also, if the slats are light colored, you should turn on reflections using the solar distribution field in the BUILDING object. And you can specify the reflectance properties using Shading Surface Reflectance objects.

An approximate alternative would be to treat this as an exterior blind with large slats. See MATERIAL:WINDOWBLIND and WindowShadingControl.

New EnergyPlus Consultants

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Ask an EnergyPlus Expert . . .

INDOOR AIR QUALITY

Where do I find information about CO2, CO density?

Answer

For any information you want out of an EnergyPlus simulation, you look at the RDD (report Variable) and MDD (Meter variable) files. Also, check the "pollution calculations" in the Input/Output Reference.

As of V2.0 release, the simulations can also report:

- HVAC,Sum,Carbon Equivalent Pollution From NOx[kg]
- HVAC,Sum,Carbon Equivalent Pollution From CH4[kg]
- HVAC,Sum,Carbon Equivalent Pollution From CO2[kg]
- Zone,Meter,Carbon Equivalent:Facility [kg]
- Zone,Meter,CarbonEquivalentEmissions:Carbon Equivalent [kg]

Question

In the report field, I found the electric emission CO2, CO, and other contaminants in report meter. What do these contaminants mean and is this also IAQ information?

Answer

No, those are emissions associated with the use of energy. They are not related to indoor air quality at the building site but refer to pollution generated back at the power plant. EnergyPlus can model the energy performance implications of some measures intended to address IAQ, but it does not directly model IAQ. You may want to try the software from NIST called CONTAMW. Here's a direct link to the CONTAMW page: <http://www.bfrl.nist.gov/IAQanalysis/CONTAM/index.htm>. For further reference, here is a list of all downloadable software from the Building and Fire Research Laboratory at NIST at <http://www.bfrl.nist.gov/info/software.html>.

REPORTING CONTAMINANTS

Can EnergyPlus give me a detailed report of contaminants released from a building?

Answer

Please see "Report Environmental Impact Factors" in the Input/Output Reference (starting on p. 1351, pdf p. 1390) and the Engineering Reference (starting on p. 817, pdf p. 853). These report variables and meters simply take the environmental factors input by the user for electricity and fuels and multiply them by the site consumption of each particular energy source. Equations are currently not in the documentation, but they are all similar to the following.

For example, a building purchases electricity and natural gas, and has no on-site power generation

$$\text{CO2:Facility} = (\text{CO2EmissionFactorForElectricity} * \text{Electricity:Facility}) + (\text{CO2EmissionFactorForGas} * \text{Gas:Facility})$$

where

Electricity:Facility and Gas:Facility = the consumption meters for electricity and natural gas

CO2EmissionFactorForElectricity and CO2EmissionFactorForGas = the "CO2 emission factor" field in the Fuel Factors object. There are datasets of fuel factors in the Datasets folder: Electricity USA Environmental Impact Factors.idf and Fossil Fuel Environmental Impact Factors.idf .



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>

Ask an EnergyPlus Expert . . .

PURCHASED AIR AND INFILTRATION

I'm simulating a module with only one external, insulated wall that contains a double glazed window, which takes up 10% of the floor area. The rest of the walls, floor and ceiling are adiabatic. The orientation is South and there are no equipment or light loads. The model includes a constant infiltration flow rate of 0.04 m³/s, and uses Purchased Air without limits. Thermostat settings are 23.5 for cooling and 19.5 for heating (using dual setpoint with deadband). The system can operate 24 hours. Certain summer night hours indicate an outside temperature of 20C. However, for those same hours, and despite the infiltration rate, I get a report that the Purchased Air operated cooling in order to reach the setpoint. Is that possible?

Answer

It is quite possible, depending on how much heat gain your cell receives during the day and storage in the building elements. You could remove (turn off) the purchased air all together and allow the cell to float -- to see how high the temperature gets without benefit of cooling.

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

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/

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

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/>

Ask an EnergyPlus Expert . . .

DOE-2 TRANSLATOR FOR ENERGYPLUS

To translate DOE-2 models to EnergyPlus, download these zip files from the Yahoo group files area.

http://groups.yahoo.com/group/EnergyPlus_Support/files/Release_pieces/DOE2Translator.zip

Caveat -- this translator only works for DOE-2.1E input files and is limited to building envelope, internal gains, schedules, etc. It does not translate HVAC systems.

SOLAR WATER HEATING SYSTEM

I'm trying to find an idf example file of a hydronic system fed by a solar water heating system.

Answer

Example file SolarCollectorFlatPlateWater.idf serves a hot water storage tank with solar collectors. In this example the "use" side of the water heater feeds domestic hot water objects, but it could also feed hydronic coils by adding them to the demand side of the PLANT LOOP currently named "DHW" in the example.

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 in 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.

New DOE-2 Consultant in Pennsylvania

[Kevin Warren, P.E., CEM, LEED AP](#), [Warren Energy Engineering, LLC](#),
307 Baker Drive, Lincoln University, PA 19352 -- Tel: (610) 255-3798

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 kl Wellington@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).

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. It's a place to ask your questions and share information with other users. The YahooGroup 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

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> .
IBPSA-Germany website: <http://www.ibpsa-germany.org/>



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 plain-text document.

"From the Lab to the Marketplace"

A new website featuring the many Energy Efficient Technologies developed at Lawrence Berkeley Laboratory. Go to <http://eetd.lbl.gov/l2m2/>

Building Energy Events from the [Pacific Energy Center](#), San Francisco

Commissioning

Dec 04 [Commissioning and Design Resources for the Resourceful](#)

Daylighting

Nov 01 [Design Methods for Daylighting](#)

Incentive Programs

Nov 08 [Maximizing Lighting Energy Savings with Utility Rebates](#)

Lighting

Nov 08 [Maximizing Lighting Energy Savings with Utility Rebates](#)

Nov 27 [Introduction to Lighting Design](#)

Renewables

Nov 06 [Photovoltaic \(PV\) Site Analysis and System Sizing](#)

Nov 07 [Field Verification and Diagnostic Testing of Photovoltaic Systems for Installers](#)

Nov 29 [Photovoltaic \(PV\) Site Analysis and System Sizing](#)

The California Energy Commission is offering a FREE copy of the "HVAC Changeouts and Cool Roofs" DVD (*you don't need to be a California resident to get a DVD – ed.*).

The video is intended to assist in training building department staff, builders, and consumers on the State of California Title 24 Energy Efficiency requirements.

**FREE!!
Cool Roof
DVD**



The DVD contains interviews, slide presentations and other information on HVAC Changeouts and Cool Roof technologies, and how to achieve compliance with the law. Please call the Energy Commission's Title 24 Energy Hotline at 800-772-3300 or 916-654-5106 (outside California) to request your free copy of the DVD (as supplies last).

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, meant to be used with the EnergyPlus simulation engine. HLCP is a for-purchase program. For details, please go to <http://www.hvacindia.com/hlcp/>

Meetings - Conferences - Symposia

2007		
November 16	IBPSA-England Symposium	http://www.ibpsa-england.org/
January 19-23	ASHRAE Winter Meeting in New York City	http://www.ashrae.org
2008		
January 19-23	ASHRAE Winter Meeting in New York City	http://www.ashrae.org
May 03-08	Solar 2008	http://www.ases.org/solar2008/
June 16-18	8th Nordic Symposium on Building Physics	http://www.nsb2008.org/
June 21-25	ASHRAE Annual Meeting in Salt Lake City, UT	http://www.ashrae.org
July 30 – Aug 01	SimBuild 2008 (Univ.Calif at Berkeley)	http://gaia.lbl.gov/ocs/index.php/simbuild/2008
August 17-22	Indoor Air 2008	http://www.indoorair2008.org
2009		
January 24-28	ASHRAE Winter Meeting in Chicago, IL	http://www.ashrae.org
June 20-24	ASHRAE Annual Meeting in Louisville, KY	http://www.ashrae.org

Cool Website from Florida State University's "Molecular Expressions"

Powers of 10 ⑩ The Universe Within

View the Milky Way at 10 million light years from the Earth. Then move through space towards the Earth in successive orders of magnitude until you reach a tall oak tree just outside the buildings of the National High Magnetic Field Laboratory in Tallahassee, Florida.

After that, begin to move from the actual size of a leaf into a microscopic world that reveals leaf cell walls, the cell nucleus, chromatin, DNA and finally, into the subatomic universe of electrons and protons.

<http://micro.magnet.fsu.edu/primer/java/scienceopticsu/powersof10/>

Recent Reports From Lawrence Berkeley Laboratory

Evaluating the Energy Performance of the First Generation of LEED-Certified Commercial Buildings

Diamond, R., Opitz, M., Hicks, T., Vonneida, B., Herrera, S.

Abstract: Over three hundred buildings have been certified under the Leadership in Energy and Environmental Design (LEED) rating system for sustainable commercial buildings as of January 2006. This paper explores the modeled and actual energy performance of a sample of 21 of these buildings that certified under LEED between December 2001 and August 2005, including how extensively the design teams pursued LEED energy-efficiency credits, the modeled design and baseline energy performance, and the actual energy use during the first few years of operation. We collected utility billing data from 2003-2005 and compared the billed energy consumption with the modeled energy use. We also calculated Energy Star ratings for the buildings and compared them to peer groups where possible. The mean savings modeled for the sample was 27% compared to their modeled baseline values. For the group of 18 buildings for which we have both modeled and billed energy use, the mean value for actual consumption was 1% lower than modeled energy use, with a wide variation around the mean. The mean Energy Star score was 71 out of a total of 100 points, higher than the average score of 50 but slightly below the Energy Star award threshold of 75 points. The paper discusses the limitations inherent to this type of analysis, such as the small sample size of disparate buildings, the uncertainties in actual floor area, and the discrepancies between metered sections of the buildings. Despite these limitations,

the value of the work is that it presents an early view of the actual energy performance for a set of 21 LEED-certified buildings. Proc. ACEEE 2006 Summer Study. <http://epb.lbl.gov/homepages/RickDiamond/LBNL59853-LEED.pdf>



Introduction to Commercial Building Control Strategies and Techniques for Demand Response

"N. Motegi, M.A. Piette, D.S. Watson, S. Kiliccote, P. Xu"

Abstract: "Demand Response (DR) is a set of time-dependent program activities and tariffs that seek to reduce electricity use or shift usage to another time period. DR provides control systems that encourage load shedding or load shifting during times when the electric grid is near its capacity or electricity prices are high. DR helps to manage building electricity costs and to improve electric grid reliability.

This report provides an introduction to commercial building control strategies and techniques for demand response. Many electric utilities have been exploring the use of critical peak pricing (CPP) and other demand response programs to help reduce summer peaks in customer electric loads. This report responds to an identified need among building operators for knowledge to use DR strategies in their buildings. These strategies can be implemented using either manual or automated methods. The report compiles information from field demonstrations of DR programs in commercial buildings. The guide provides a framework for categorizing the control strategies that have been tested in actual buildings. The guide's emphasis is

on characterizing and describing DR control strategies for air-conditioning and ventilation systems. There is also good coverage of lighting control strategies. The guide provides some additional introduction to DR strategies for other miscellaneous building end-use systems and non-component-based DR strategies. The core information in this report is based on DR field tests in 28 non-residential buildings, most of which were in California, and the rest of which were in New York State. The majority of the participating buildings were office buildings. Most of the California buildings participated in fully automated demand response field tests."

<http://btech.lbl.gov/papers/59975.pdf>



Automated Critical Peak Pricing Field Tests: 2006 Pilot Program Description and Results

"M.A. Piette, D. Watson, N. Motegi, S. Kiliccote"

Abstract: "During 2006 Lawrence Berkeley National Laboratory (LBNL) and the Demand Response Research Center (DRRC) performed a technology evaluation for the Pacific Gas and Electric Company (PG&E) Emerging Technologies Programs. This report summarizes the design, deployment, and results from the 2006 Automated Critical Peak Pricing Program (Auto-CPP). The program was designed to evaluate the feasibility of deploying automation systems that allow customers to participate in critical peak pricing (CPP) with a fully-automated response. The 2006 program was in operation during the entire six-month CPP period from May through October. "

<http://btech.lbl.gov/papers/62218.pdf>

Happy Thanksgiving from the Simulation Research Group



When the frost is on the pumpkin
and the autumn leaves start to fall,
our thoughts here at the Berkeley
Lab naturally turn to holiday
cookery. However, the holiday table
can be fraught with danger from
improperly prepared/stored food.

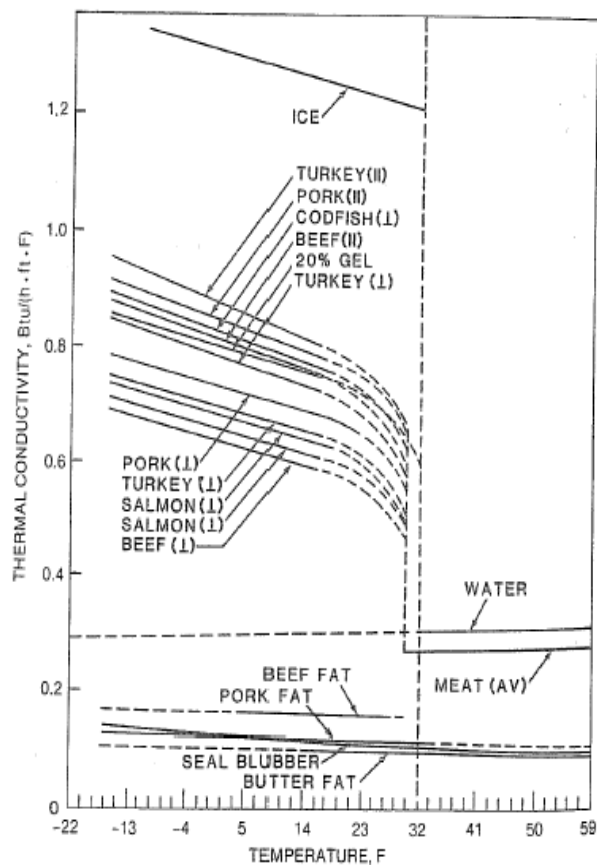
So, before you tackle that
Thanksgiving turkey, wrestle with
the Christmas ham or brace yourself
to create Uncle Olaf's Lutefisk
Surprise, it is important that you
understand the thermal conductivity
of the food you're cooking.

We think that this attractive
ASHRAE chart is an invaluable
kitchen reference and suggest you
paste it to your refrigerator door.
If you bear in mind that the simple
formula of

$1 \text{ Btu/hr-ft}^{\circ}\text{F} \cong 17.3 \text{ mw/cm-}^{\circ}\text{C}$
works equally well if the heat flow is
parallel or perpendicular to the
structure of the fiber, you will be
assured of non-poisonous results
(well, lutefisk is always a wild card).

Happy Holidays from
The Simulation Research Group!
Fred, Ender, Michael and Kathy

Thermal Conductivity of Meats, Fats, Gelatin Gel and Water[©]



|| heat flow parallel to fiber structure
⊥ heat flow perpendicular to fiber structure