Energy Plus

The successor to DOE 2

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McQuay International

Acknowledgements

- The following organizations have contributed to the development of this workshop:
- U.S. Department of Energy – D.B. Crawley, Program Manager
- GARD Analytics – M.J. Witte, T.L. Cornell, R.H. Henninger
- University of Illinois at Urbana-Champaign – R.J. Liesen, C.O. Pedersen, R.K. Strand
- U.S. Army Corps of Engineers, Construction Engineering Research Laboratories – L.K. Lawrie
- Lawrence Berkeley National Laboratory – W.F. Buhl, F.C. Winkelmann
- Current funding - National Energy Technology Laboratory (NETL) under award number DE-FC26-06NT42768 by subcontract through the University of Central Florida/Florida Solar Energy Center
- Prior funding – National Renewable Energy Laboratory (NREL) and Lawrence Berkeley National Laboratory (LBNL)

EnergyPlus Team

- U.S. Department of Energy, DC
- Lawrence Berkeley National Laboratory, CA
- National Renewable Energy Laboratory, CO
- Oak Ridge National Laboratory, TN
- Florida Solar Energy Center, FL
- GARD Analytics, IL
- DHL Consulting, CO
- University of Illinois at Urbana-Champaign, IL
- COP Associates, MN
- Oklahoma State University, OK

EnergyPlus

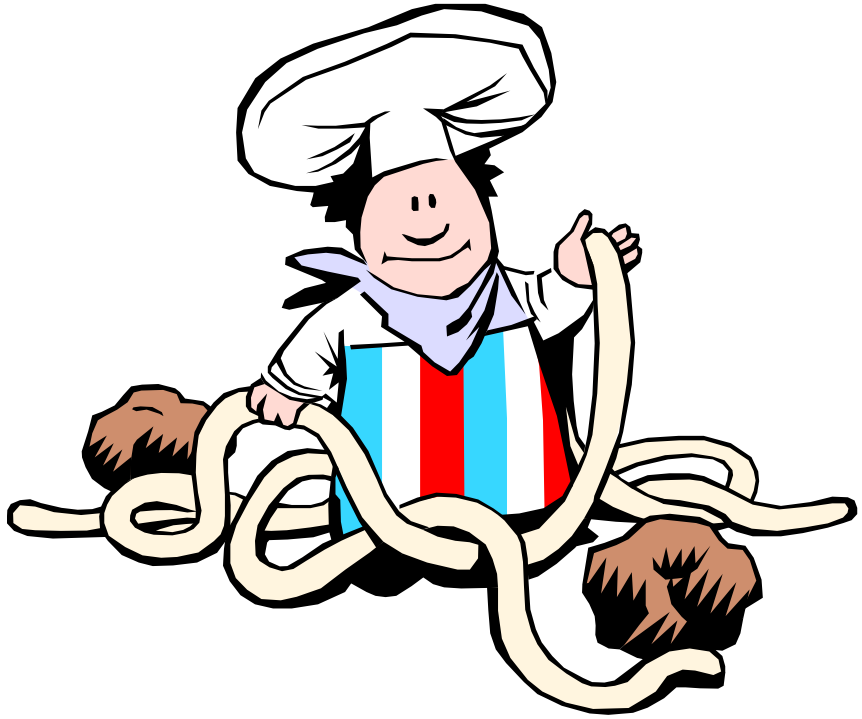
News Media Contact: FOR IMMEDIATE RELEASE

April 12, 2001

(WASHINGTON) Secretary of Energy Spenser Abraham today released a next generation building energy simulation computer program …..

Why Change?

- BLAST & DOE2 in obsolete FORTRAN
- “spaghetti” code
- Structure precluded maintenance and additions
- Neither could correctly handle feedback from the HVAC system to the zone conditions



Why Change?

- All three major components: building, system, and plant are solved simultaneously
- In BLAST and DOE2, these are solved sequentially with no feedback between them

Shortcomings

- EnergyPlus is a stand-alone simulation program *without a 'user-friendly' graphical interface*
- EnergyPlus is not fast
- EnergyPlus does no design for you
- In order to use it effectively, you must be very well versed in both computer simulation and HVAC design

Strengths

- E+ is extremely flexible
- E+ is very precise and the simulations are close approximations of real world spaces and equipment
- E+ is constantly being updated and improved
- E+ is customizable
- Based on best features of BLAST and DOE-2.1E plus new capabilities

E+ Highlights

- Windows 2000/XP/Vista, Linux, Mac
- Realistic system controls
- Moisture adsorption simulation in building elements
- Interzone air flow simulation
- Low temp radiant heating/cooling simulation
- Interior surface convection simulation

E+ Highlights

- Thermal comfort modeling options
- Evaporative cooler models
- Steam absorption chiller
- Air flow sizing based on zone requirements
- Accurate sky illumination model for daylighting calculations

E+ Highlights

- Ability to read multiple interval per hour weather data files
- Plenum simulation
- Enhanced calculation of return air heat gain from lights
- Flat plate exhaust air heat recovery
- Lots of example input files
- User-customizable reports

EnergyPlus

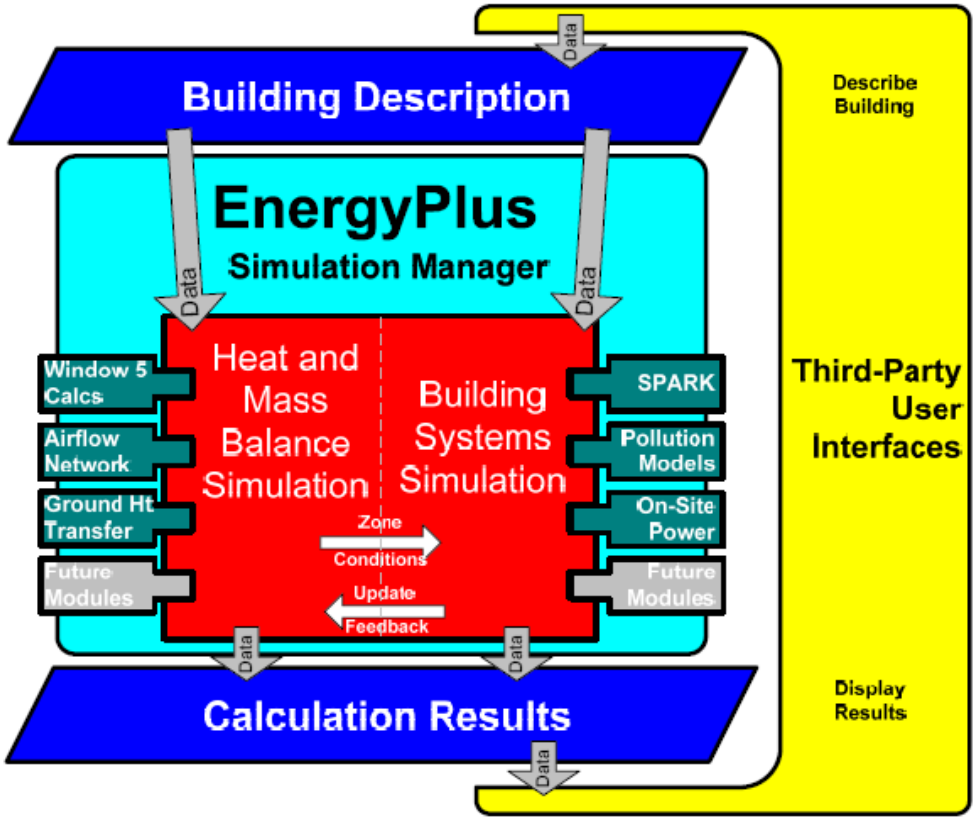


Figure 1. EnergyPlus -- the big picture

EnergyPlus

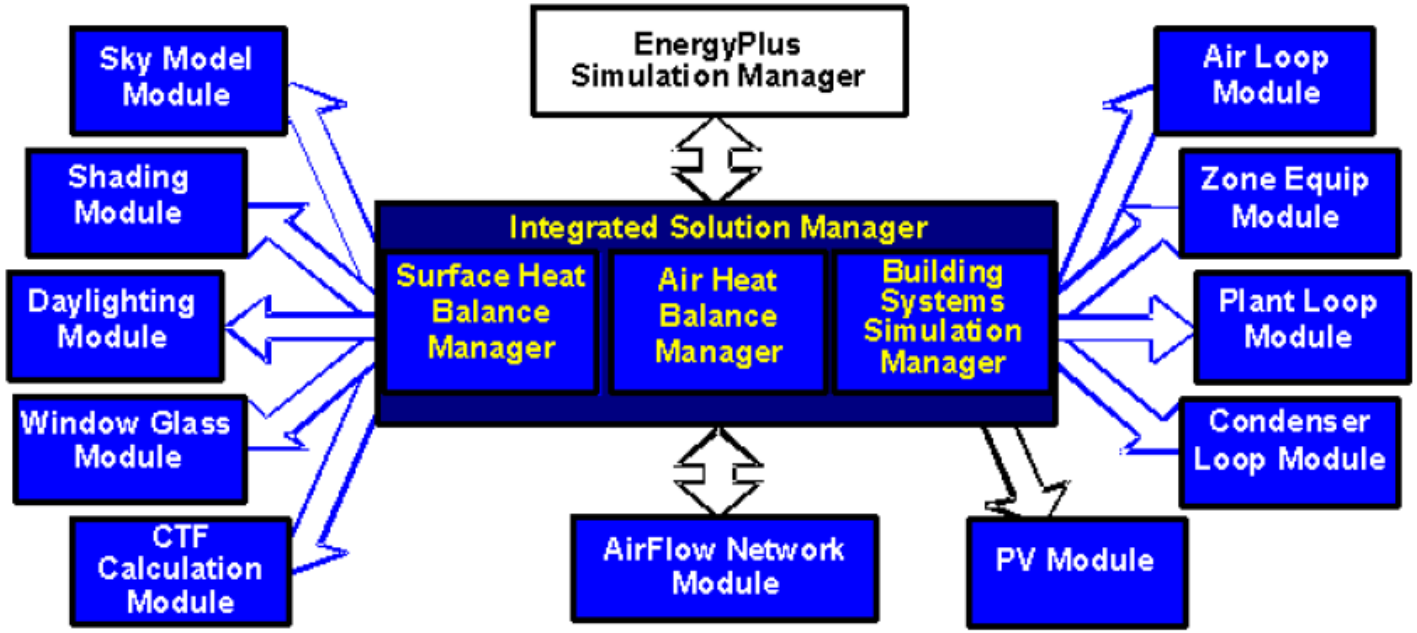
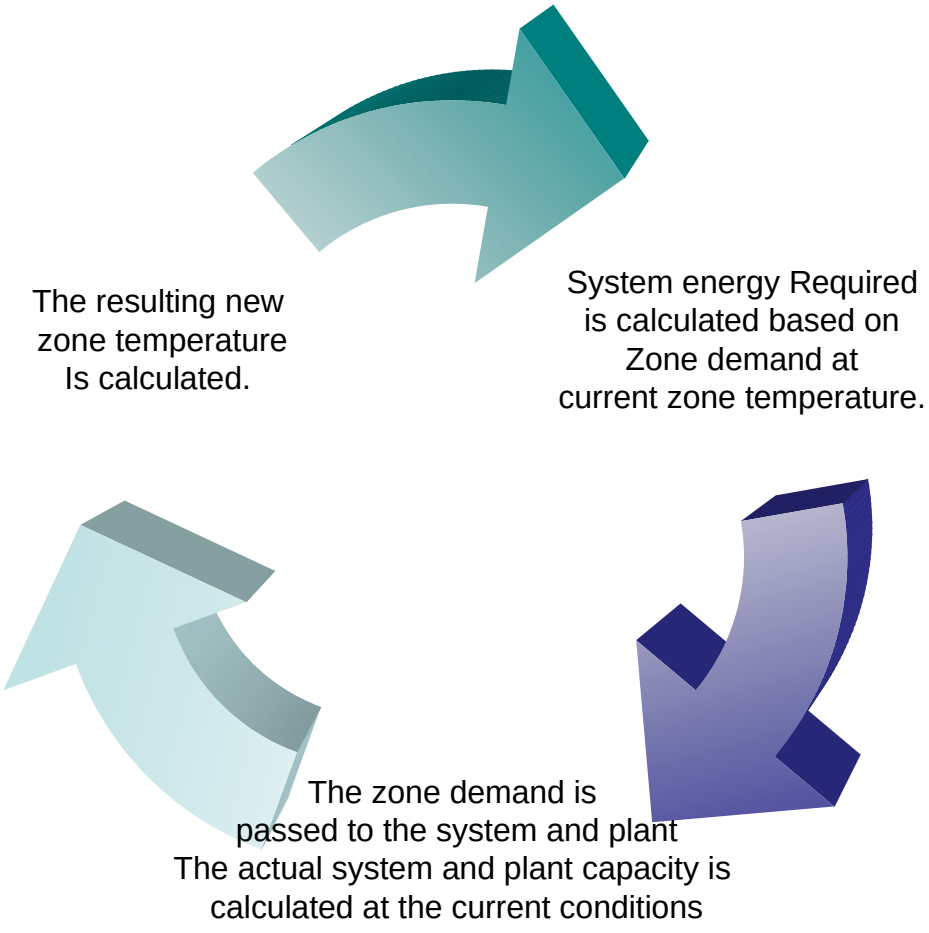


Figure 1. EnergyPlus Program Schematic

Feedback Simulation



Realism in Simulation

- Simultaneous simulation of loads, systems and plant
- Air and water loops solved iteratively each time step
- Provides tighter coupling between the air and water-side of the system and plant
- Allows capacity limits to be modeled more realistically
- Loads “not met” result in zone temperature and humidity changes

Version 3.0 released 11/08

- Refrigerant properties added for R404a, R410a and R507c
- New library of compressor performance curves and condensing boiler curves
- Title 24 stuff (if you're into that…)
- Thermal chimney model added
- Single speed CT with bypass added
- Radiant-convective baseboard added

Version 3.0 released 11/08

- Underground pipe object added
- Dry fluid cooler object added
- Both mixed and stratified thermal storage tanks now available
- Energy cost calculations now include option for real time pricing
- Additional economic reporting of energy and demand for each charge

Version 3.0 released 11/08

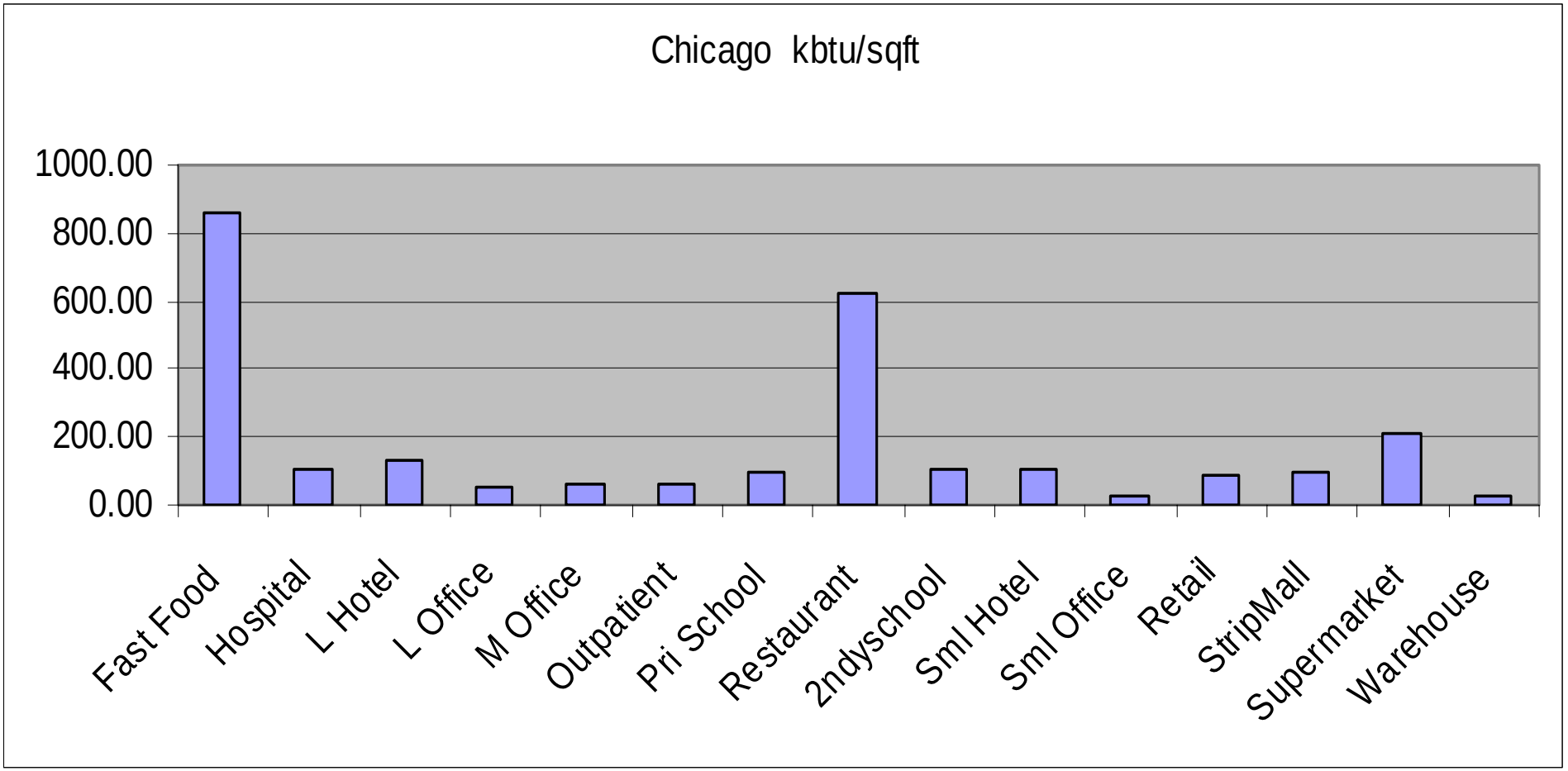
- This is the seventeenth version
- They come out about twice each year around April and November

- EISA included work for EUI
- DOE used NREL, PNNL to develop benchmark building
- .idf files released in November
- SSPC 90.1 has been assisting DOE
- Fifteen building types are in the benchmark
- Sixteen weather zones are in the benchmark

- Fast Food
- Hospital
- Large Hotel
- Large Office
- Medium Office
- Outpatient Health Care
- Primary School
- Restaurant
- Secondary School
- Small Hotel
- Small Office
- Stand-Alone Retail
- Strip Mall
- Supermarket
- Warehouse

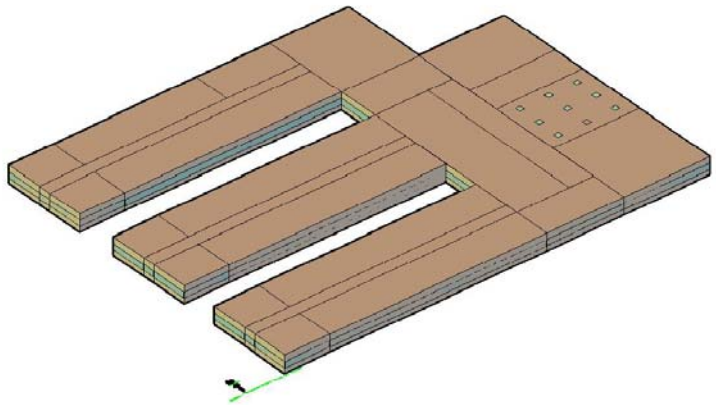
- Miami
- Houston
- Phoenix
- Atlanta
- Los Angeles
- Las Vegas
- San Francisco
- Baltimore
- Albuquerque
- Seattle
- Chicago
- Boulder
- Minneapolis
- Helena
- Duluth
- Fairbanks

Benchmark EUI

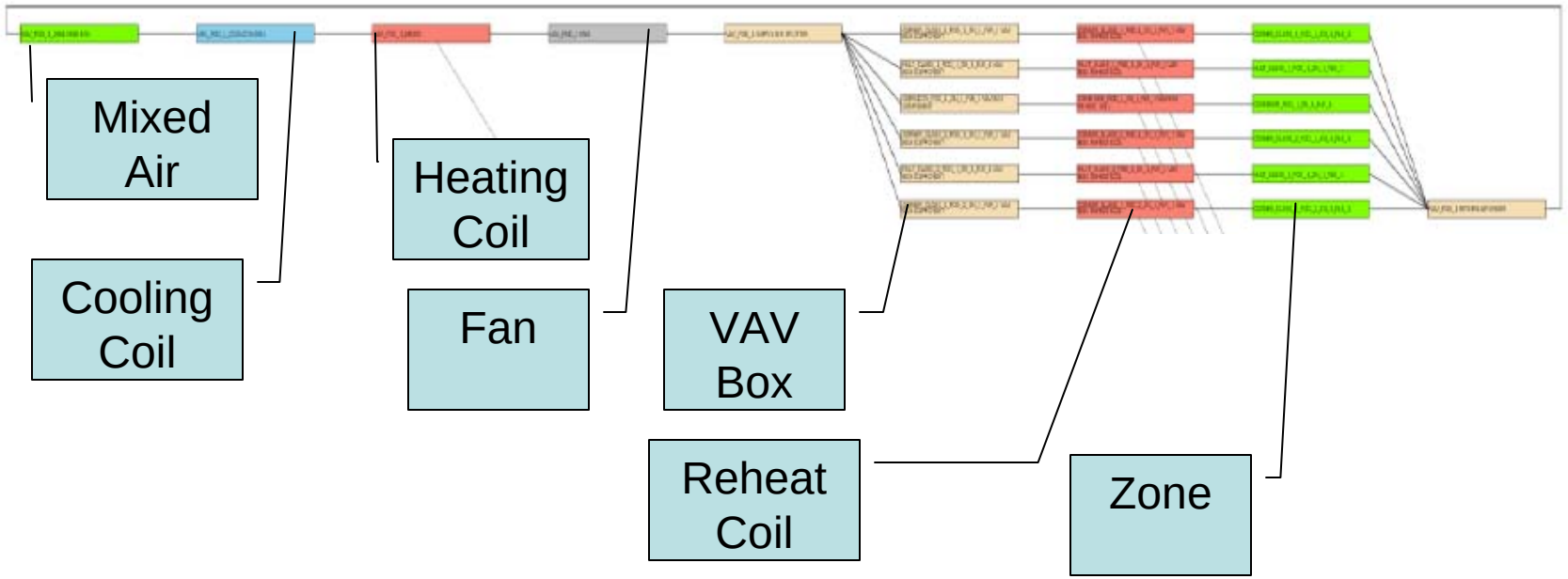


Primary School

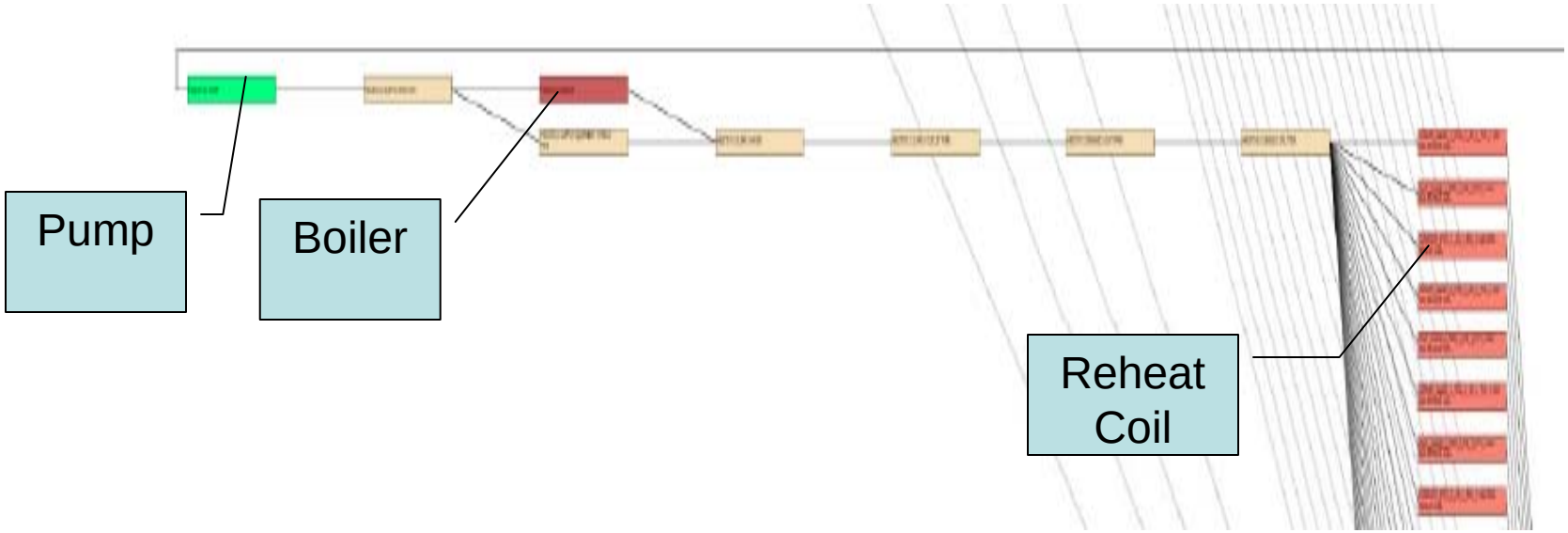
- ***E+*** produces a standard 3D dwf file
- Some software can produce .idf files e.g. Google sketch



Air Loop Simulation



Heating Water Loop



Take away points

- EnergyPlus is the simulation engine of the future
- EnergyPlus is the most accurate simulation available
- Standard benchmarks are now available