Edwin Lee

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OBJECTIVE

To leverage my skills as a proficient programmer, mechanical engineer, and numerical analyst in the field of advanced building and system simulation.

EDUCATION

Doctor of Philosophy, Mechanical Engineering
Oklahoma State University, Stillwater, OK .... May 2013
THESIS - A Generalized Pipe Heat Transfer Model for Whole Building Simulation Applications
GPA 4.00

Master of Science, Mechanical Engineering
Oklahoma State University, Stillwater, OK .... May 2008
THESIS - Development, Implementation, and Verification of a Buried Pipe Model in EnergyPlus
GPA 4.00

Bachelor of Science, Mechanical Engineering
Oklahoma State University, Stillwater, OK .... May 2006
GPA 3.52

ENGINEERING EXPERIENCE

Research Engineer .... May 2013 – Present
National Renewable Energy Laboratory, Golden, CO
- Contributed to the Technology Performance Exchange (TPEx) via Data Entry Form development, dataset processing, and development of the logic and scripts to convert TPEx datasets into components on the Building Component Library
- Began leading technical development of EnergyPlus, overseeing the technical changes accompanying the translation from FORTRAN to C++, and StarTeam to GitHub

Graduate Assistant .... January 2006 – May 2013
Oklahoma State University, Stillwater, OK
- A complete re-write of the EnergyPlus central plant simulation, including solution algorithms, pump model re-work, and updating component model design
- Developed a generalized horizontal ground heat exchanger model that includes interaction with a basement zone, specifically for use with foundation heat exchangers
- Performed experimental measurement and modeling of transport delay phenomena in piping systems
- Worked closely with the Center for the Built Environment at University of California, Berkeley, providing simulation support for Underfloor Air Distribution System research with EnergyPlus

Engineering Consultant .... Fall 2007, Summer 2009
Oak Ridge National Laboratory, Oak Ridge, TN
- Utilized EnergyPlus to investigate wall constructions for residential applications
- Constructions included frame walls, solid wood walls, and phase change materials

Engineering Intern .... Summer 2005
Specific Systems, Tulsa, OK
- Introduced to design and manufacturing of modular HVAC equipment
- Designed and fabricated parts
- Performed various mechanical and structural analysis on designs
- Aided in the construction of a thermal test chamber

COMPUTER SKILLS

- Proficient with Windows and Linux Operating System Environments
- Scripting Languages: Batch (Windows), Bash (Linux), Python, Ruby
- Programming Languages: FORTRAN, C, C++, VB.Net, VBA, Modelica, (Including Language Interop)
- GUI Development: VB.Net (Windows), Python (Cross-platform)
- Other software tools:
  - Office suites, including LibreOffice and MS Office, Gnumeric
  - Software version control tools, including Borland Starteam, Git, Subversion, and Bazaar
  - Publication tools, including LaTeX and GnuPlot
  - Software Tools, including EES, MathCAD, R, Fluent, AutoCAD, LibreCAD and Octave (Matlab)
  - Virtual machine utilization

ENERGYPLUS DEVELOPMENT

- Generalized buried pipe heat transfer model
- Plant pressure algorithms
- Central plant solver overhaul

- Development of a new testing framework
- Overseeing technical efforts for Fortran to C++ translation and StarTeam to GitHub transition

PUBLICATIONS

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[1] Ramprasad Chandrasekharan, Edwin S Lee, Daniel E Fisher, and Pratik S Deoka. An enhanced simulation model for building envelopes with phase change materials. *ASHRAE Transactions*, 119(2), 2013.

[2] Lorenzo Cremaschi and Edwin Lee. Design and heat transfer analysis of a new psychrometric environmental (ihamber testing. *Transactions*, 114(2):619–631, 2008.

[3] James R Cullin, Lu Xing, Edwin Lee, Jeffrey D Spitler, and Daniel E Fisher. Feasibility of foundation heat exchangers for residential ground source heat pump systems in the united states. *ASHRAE Transactions*, 118(1), 2012.

[4] James R Cullin, Edwin Lee, et al. Preliminary investigation of the effect of horizontal piping on the performance of a vertical ground heat exchanger system. *ASHRAE Transactions*, 119:302, 2013.

[5] Ryan Davies, Matt Mitchell, and Edwin Lee. A high-speed portable ground heat exchanger model for use in various energy simulation software. *Macalester Journal of Physics and Astronomy*, 11(1):4, 2023.

[6] Anthony D Fontanini, Jose L Castro Aguilar, Matt S Mitchell, Jan Kosny, Noel Merket, Jason W DeGraw, and Edwin Lee. Predicting the performance of radiant technologies in attics: Reducing the discrepancies between attic specific and whole-building energy models. *Energy and Buildings*, 169:69–83, 2018.

[7] David Goldwasser, Daniel Macumber, Andrew Parker, Edwin Lee, Rob Guglielmetti, and Larry Brackney. The life cycle of an openstudio measure: Development, testing, distribution, and application. In *ASHRAE & IBPSA-USA SimBuild Conference 2016*, volume 7, pages 222–229. ASHRAE/IBPSA-USA, 2016.

[8] Lixing Gu, Don Shirey, Richard Raustad, Bereket Nigusse, Chandan Sharma, Linda Lawrie, Rich Strand, Curt Pedersen, Dan Fisher, Edwin Lee, et al. Advancement of doe's energyplus building energy simulation program. Technical report, University Of Central Florida, 2011.

[9] Jan Kośny, David W Yarbrough, William A Miller, Kenneth E Wilkes, and Edwin S Lee. Analysis of the dynamic thermal performance of fiberous insulations containing phase change materials. In *11th International Conference on Thermal Energy Storage, Effstock*, 2009.

[10] Jan Kosny, David Yarbrough, Phil Childs, Som Shrestha, William Miller, Jerry Atchley, Marcus Bianchi, John Smith, Tom Fellinger, Elizabeth Kossecka, et al. Theoretical and experimental thermal performance analysis of building shell components containing blown fiberglass insulation enhanced with phase-change material (pcm). In *11th International Conference on Thermal Performance of the Exterior Envelopes of Whole Buildings, Buildings XI*, 2010.

[11] Edwin Lee. Development, verification, and implementation of a horizontal buried pipe ground heat transfer model in energyplus. Master's thesis, Oklahoma State University, 2008.

[12] Edwin S Lee, Daniel E Fisher, and Jeffrey D Spitler. Efficient horizontal ground heat exchanger simulation with zone heat balance integration. *HVAC&R Research*, 19(3):307–323, 2013.

[13] Edwin Scott Lee. *An improved hydronic loop system solution algorithm with a zone-coupled horizontal ground heat exchanger model for whole building energy simulation*. PhD thesis, Oklahoma State University, 2013.

[14] M Piette, B Hooper, T Hong, D Macumber, SH Lee, Y Chen, N Long, E Lee, IR Dela Cruz, MA Piette, et al. The bayren integrated commercial retrofits (bricr) project: An introduction and preliminary results. Technical report, Lawrence Berkeley National Lab.(LBNL), Berkeley, CA (United States), 2018.

[15] Paul Raftery, Edwin Lee, Tom Webster, Tyler Hoyt, and Fred Bauman. Effects of furniture and contents on peak cooling load. *Energy and Buildings*, 85:445–457, 2014.

[16] JD Spitler, J Cullin, M Bernier, M Kummert, P Cui, X Liu, E Lee, and D Fisher. Preliminary intermodel comparison of ground heat exchanger simulation models. In *Proceedings of 11th International Conference on Thermal Energy Storage*, volume 6, pages 14–17. Stockholm: Effstock, 2009.

[17] Daniel Studer, Katherine Fleming, Edwin Lee, and William Livingood. Enabling detailed energy analyses via the technology performance exchange. Technical report, National Renewable Energy Lab.(NREL), Golden, CO (United States), 2014.

[18] Daniel Studer, John H Barkyoumb, Edwin Lee, Brian L Ball, Stephen Frank, Eugene Holland, Jeffrey Green, William Robinson, Jeff Brown, and Jennifer Golda. Leveraging shore-side, building energy simulation tools for use in the shipboard environment. *Naval Engineers Journal*, 130(2):129–140, 2018.

[19] Liping Wang, Lichen Wu, Leslie Keith Norford, Amir A Aliabadi, and Edwin Lee. The interactive indoor-outdoor building energy modeling for enhancing the predictions of urban microclimates and building energy demands. *Building and Environment*, 248:111059, 2024.

[20] Tom Webster, Tyler Hoyt, Edwin Lee, Allen Daly, Fred Bauman, Stefano Schiavon, Kwang Ho Lee, Wilmer Pasut, and Dan Fisher. Influence of design and operating conditions on underfloor air distribution (ufad) system performance. 2012.

[21] Zeyu Xiong, Edwin S Lee, and Daniel E Fisher. Development of a horizontal slinky ground heat exchanger model. *ASHRAE transactions*, 119(2), 2013.

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ASHRAE MEMBERSHIP

Student Member 2005-2013; Student Branch President 2007-2012; Member 2013-Present
TC 4.7 Simulation and Component Modeling Chair 2019-2023

HONORS

Phi Kappa Phi Honor Society . . . . Superior Scholarship
A. B. Still Memorial Scholarship . . . . Performance in Mechanical Engineering
Two-time ASHRAE Memorial Scholarship . . . . Performance and Research Interests
Conoco-Phillips Memorial Scholarship . . . . Performance in Graduate Studies
Central Oklahoma ASHRAE Chapter Graduate Fellowship . . . . Performance in Graduate Studies

SPECIFIC PROJECT EXAMPLES

EnergyPlus Focus   A graphical tool to improve work-flow during development of EnergyPlus

- Ability to modify reporting frequency/contents to any idf without opening the file
- Test suite tool to provide specific testing of particular file types and configurations
- Parametric tool using the EPMacro preprocessor, allows a generic number of parameters
- Direct access to calculate a mathematical difference summary of two EnergyPlus output files
- An IDF analyzer that compares directories of IDFs
- Ability to run an EnergyPlus simulation on any input file with a single click using a compiled EnergyPlus library

Plant Parameter Estimation   A tool to regress manufacturer's data into EnergyPlus inputs

- Ability to paste in tabulated and correction factor data
- Creates a graphical report showing the resulting parameter quality
- Modular code allows for easy extension for new model types
- Multithreaded code allows the graphical interface to run while background operations perform the curve fit or parameter estimation

Buried Pipe Heat Transfer Tool   A graphical tool for performing buried pipe simulations

- Formal XML input/output program structure
- Utilizes the same model that is implemented in EnergyPlus for buried pipe simulations
- Graphical mesh display and temperature/thermal property distribution

Data Acquisition   A graphical Python application for monitoring data acquisition

- Monitors data acquisition from a serial/USB port RS-232 device
- Records raw data signals, converts to an analog, and processes into physical measurements where applicable
- Running graphs on-screen show each measurement status
- Implemented on a Linux machine, portable to other operating systems

IDD/IDF Library   Multi-language library for accessing/manipulating idd and idf files

- VB.Net based library parses IDD and IDF with extensive error handling
- VB.Net application includes GUI and file comparison tools
- Python cross platform library is lightweight, simple, with minimal error handling
- Python application allows quick processing of well-formed idfs including multiple file comparisons