Simple Building Calculator

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NEED

- 50% of floor space and 94% of buildings are < 50,000 ft²
- Custom energy analysis for small buildings with simple HVAC systems can be costly compared to savings
- There is a need to analyze both retrofits and high efficiency new buildings with simple inputs
- Prescriptive approaches may have diminishing returns and do not directly achieve performance targets
- Performance approach allows flexibility, accounts for integrated design, and achieves greater savings



METHODOLOGY

I. Sensitivity Analysis – to identify prominent energy impact parameters for specific building types



SOLUTION

Simple Building Calculator

- Web-based tool for small and simple commercial buildings
- Generates quick, interactive energy estimates of efficiency measures.
- Needs simple inputs of most impactful building components.
- Provides quick scenario comparisons
- Helps explore options to reach a performance target

II. Model Specification – building energy simulation to capture individual and interactive energy impacts – Latin hypercube sampling algorithm- 3000 simulations.



SBC FEATURES

Input Parameters:	Climate Zones:
 Envelope 	• 2A (hot, humid)

Project Info	Simple Building Calculator Project Scenario Visualization Manual
Project Name:	New Scenario
Course Designed	Standard
Sample Project	ASHRAF 90.1 2019

Window SH

invelope Leakage (cfm/ft2@75pa)

How to?

Max Tech Case
 Worst Case

enario Repor

Building Type: OfficeMedia

ompare with Standard

te EUI by Energy Source Breakdown

37.26

37.26

32.33

4.93

Base Baseline Metric

ASHRAE 90.1

Electricity (kitu)
 Natural Gac (kitu)

Design

Roof U-factor (Btu/h-ft2-F)

lb Co2e/kWh

kwh/kwh

therm/therm

Load

III. Regression Development multi-

variate polynomial regression coefficient sets for each combination of climate zone, building type, HVAC system type.

- LINCIOPE
- Internal Load
- Occupancy Controls
- HVAC

Building Types:

- Office
- Retail

Outputs:

- Site energy
- Source energy
- Energy cost
- Carbon emissions
- Scenario comparison
- Energy code comparison

- 4 (mixed, maritime)

Scenario Snapshot

Name: New Scenario

Floor Area: 50000 (ft2)

Climate Zone: 8

Status: active

General (kBtu/ft2)

Auxiliary (kStu/ft2)

Cool (kBtu/ft2)

Building Type: OfficeMedium

EUI: 37.26 (kBtu/ft2-year)

Time: 2022-07-08T17:37:18.654Z

Heating (Electricity) (kBtu/ft2)

Heating (Natural Gas) (k8tu/ft2)

8 (subarctic)



19,96

9.008

Electricity Source Conversion Factor:

Natural Gas Source Conversion Factor:

Continue New Project

itivity Diagram

Site EUI Sensitivity Analys

05A; 1.25

ERV: 0.85 ERV: 0.85

OSA

Econ

cCOP hEt

FanCtrl

anExtra FanPwr LPD

Aplug Aos Adl URoof Leak SHGC

findow UWall FSlab

SRR

WWR WWR: 0.25 WW

35 (kBtu/ft2)

enario Compariso



 $= \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_m x_m + \beta_{11} x_1^2$ $+ \beta_{22}x_2^2 + \beta_{mm}x_m^2 + \beta_{12}x_1x_2 + \beta_{mn}x_mx_n$

IV. Model Development & Validation feature selection and training



■2A ■4C ■8

ENtot = ELcool + ELaux+ ELgen + ELheat+ NGheat



V. Web-tool Development integration of



regression model and front-end web architecture



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