

IES VE with CBECC-Com and Whole-Building Energy Modeling



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Agenda

IES VE with CBECC-Com and Whole-Building Energy Modeling

1. Introduction to IES and our Technology
2. IES VE with CBECC-Com
3. How do I model for Compliance and Design
4. Case Studies
5. Q & A

IES Ltd. – What we do

IES VE with CBECC-Com and Whole-Building Energy Modeling

1. Software

- Compliance
- Building Performance Analysis

2. Training

- Compliance (Utilities: 1 Day)
- Building Performance Analysis (2-3 Days)

3. (Sub)Consulting

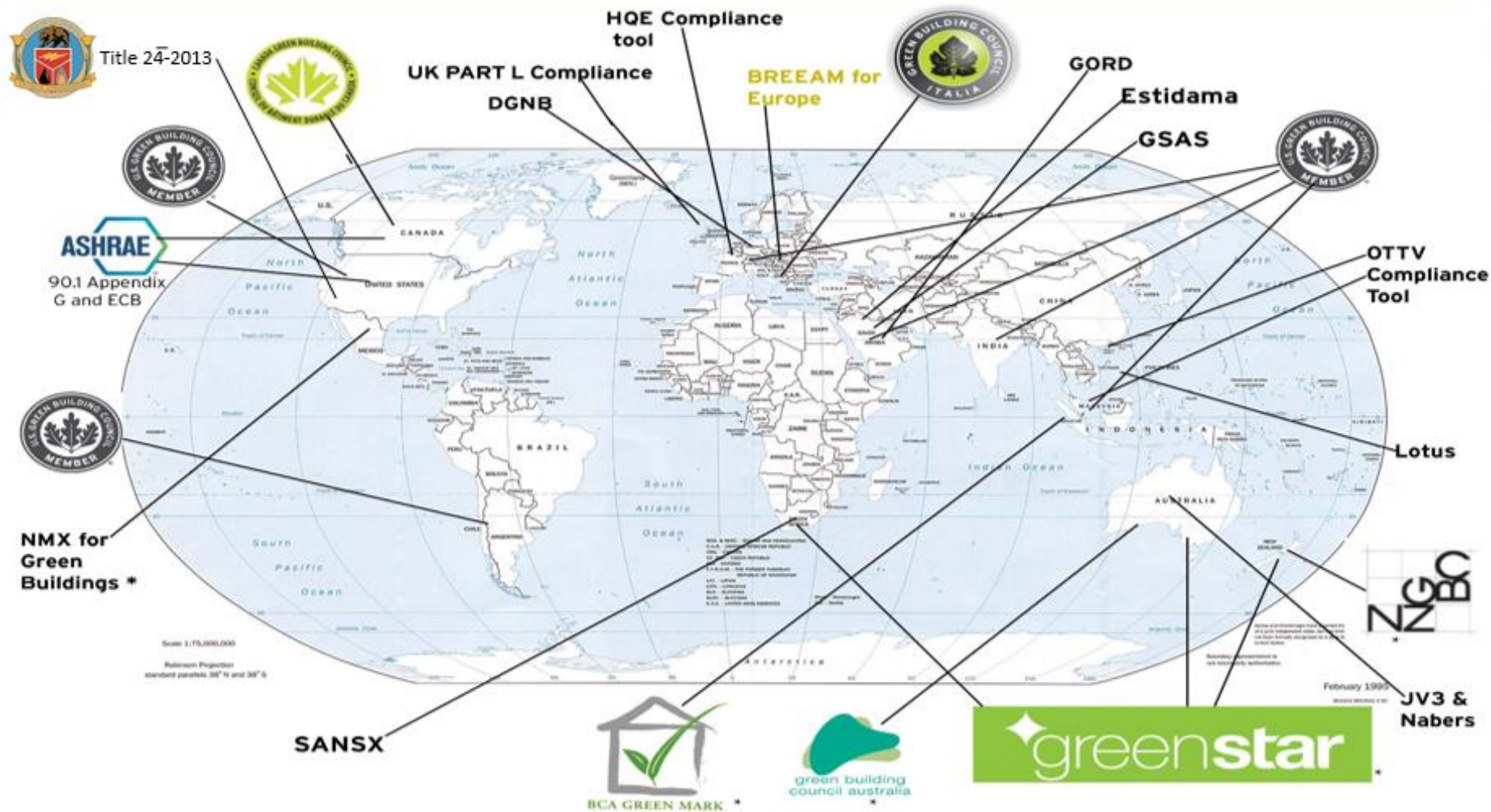
- Building Performance Analysis
- Compliance

4. Research & Development

- Masterplanning, existing buildings
- www.iesve.com

IES Ltd. – What we do


IES VE with CBECC-Com and Whole-Building Energy Modeling



* these systems are currently in discussion and awaiting approval


CEC - 2013 Approved Software

IES VE with CBECC-Com and Whole-Building Energy Modeling



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☒ This Site ☐ California

HOME ABOUT US EFFICIENCY FUNDING POWER PLANTS RENEWABLES RESEARCH TRANSPORTATION

Home >> title24 >> 2013standards

2013 Approved Computer Compliance Programs

Nonresidential Buildings, 2013 Standards		
Program Name	Comments	Contact Information
CBECC-Com V2 http://bees.archenergy.com/software.html	Please report any issues and concerns discovered while using this software using the instructions listed in the Quick Start Guide that is included with the software installation. Approved 4/22/2014.	California Energy Commission Building Standards Office 1516 9th Street, MS 37 Sacramento, CA 95814 ATTN: Sabaratnam Thamilsaran 916-651-2927 Sabaratnam Thamilsaran@energy.ca.gov
IES Virtual Environment 2013 Title-24 Feature Pack 1 (VE2013 Title-24 FP1) http://www.iesve.com/software/title24	Please contact Integrated Environmental Solutions (IES) at Title24@iesve.com . This Compliance Software was approved on 5/14/2014.	Integrated Environmental Solutions 101 Federal Street 19th Floor Boston, MA 02110 +1 617 426 1890 Title24@iesve.com

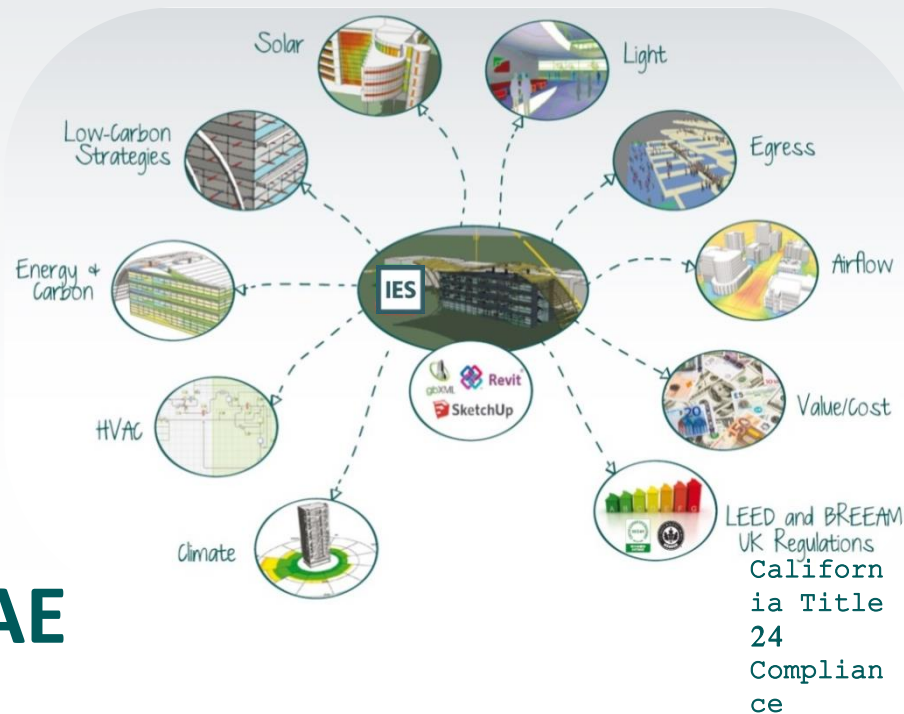
Reference: CEC at: www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html



Why use the IESVE software?

IES VE with CBECC-Com and Whole-Building Energy Modeling

1. Title 24 Compliance
2. Design & Optimization
3. HVAC Sizing
4. (Day)lighting Design
5. LEED Energy Modeling
6. AIA 2030, NZEB, ASHRAE
7. Occupancy Comfort (Thermal & Visual)
8. Save time/effort supporting multiple models m&s



(1) IES VE Navigators – E.g. Parametric Analysis

IES VE with CBECC-Com and Whole-Building Energy Modeling

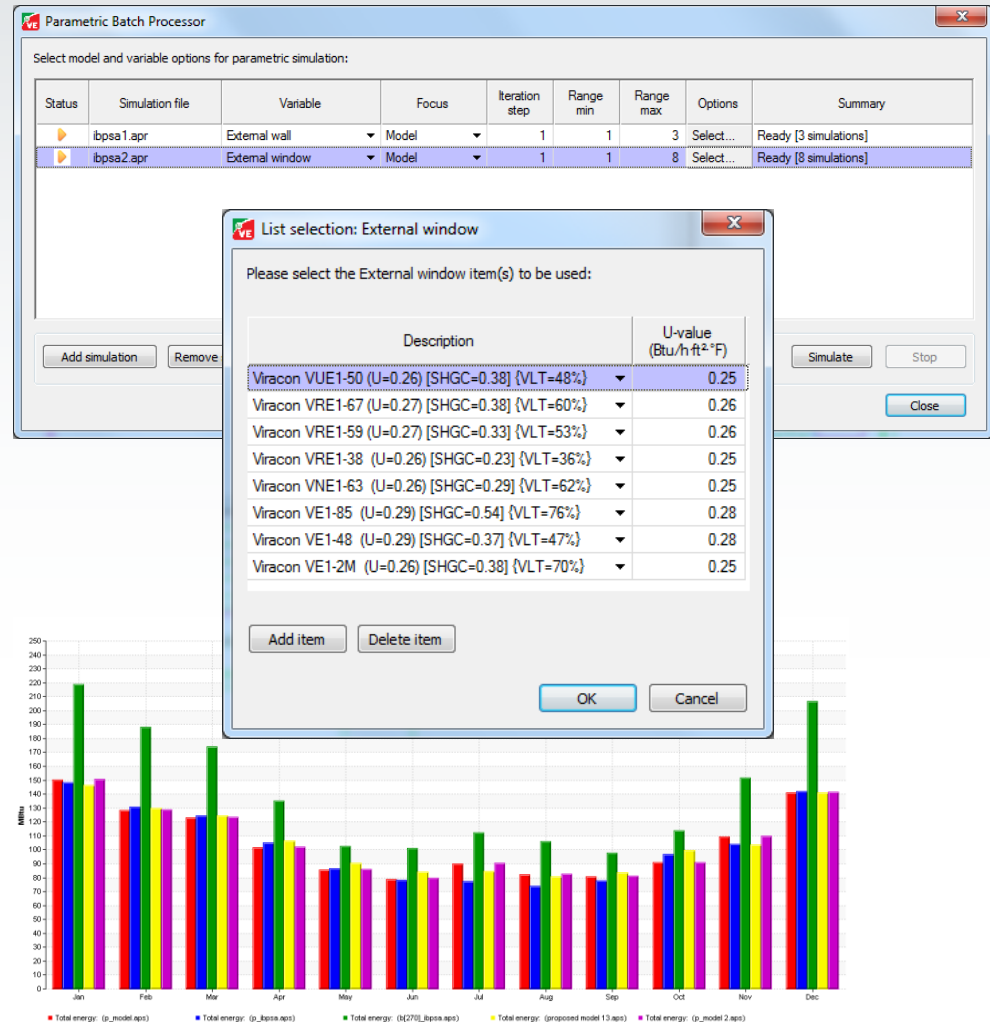
Applications **Navigators**

Parametric Batch Processor

When to use

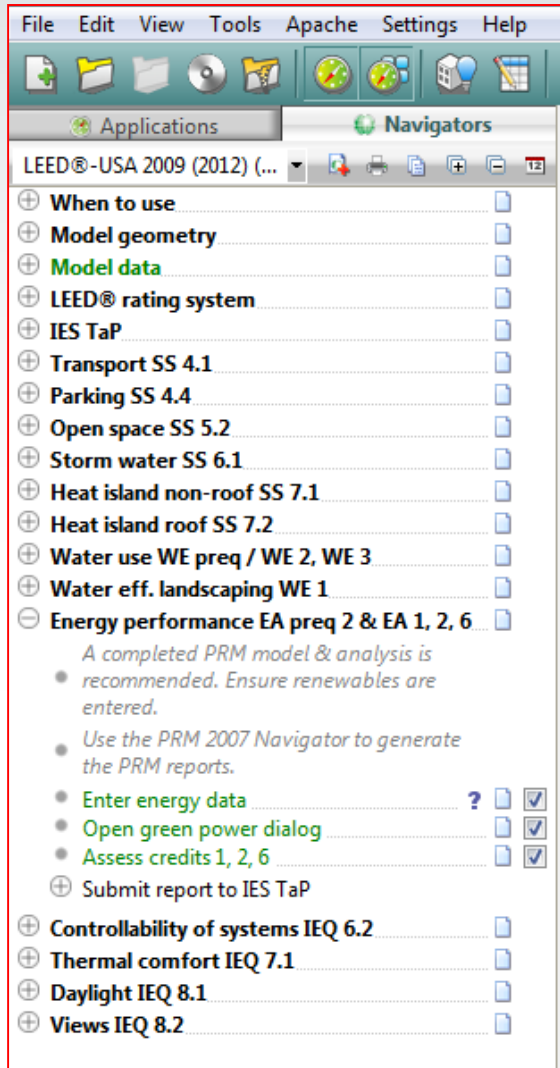
The tool allows multiple variants of a model or independent models to be created automatically and simulated with a single changing variable in a batch queue. The tool can also be used as simple batch queue for multiple models.

- Model geometry
- Model data
- Apache simulation settings**
 - Edit settings for each model
 - Add to queue (APR file)
 - Repeat for each model
- Select destination model for results
- Set model areas of interest (scale)
- Parametric Batch Processor settings**
 - Select APR file for batch item (row)
 - Select variable to change (or none)
 - Select scale of application
 - Set iteration step
 - Set range min/max
 - Options
 - Check summary
 - Repeat for each batch item (row)
 - Simulate
- Output**
 - View results



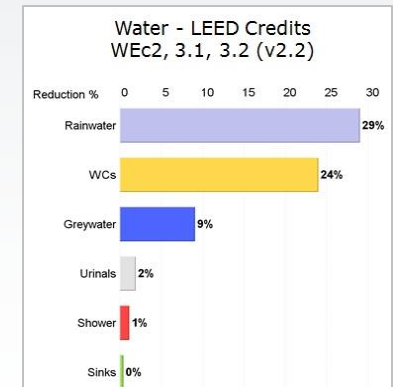
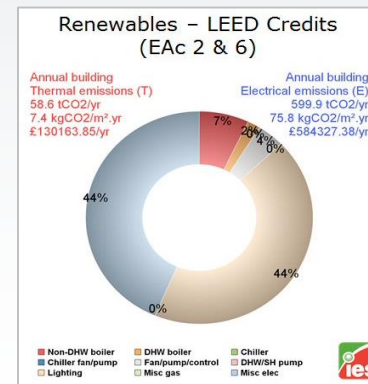
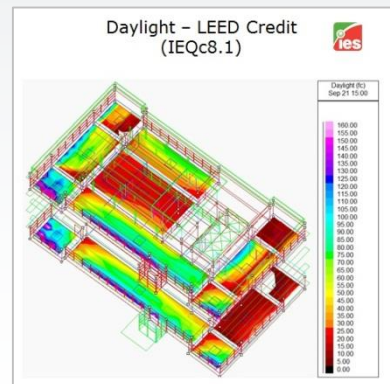
(1) IES VE Navigators – E.g. LEED® Navigator

IES VE with CBECC-Com and Whole-Building Energy Modeling



18 Credits (46-58 Points)

Daylighting & Views; Thermal Comfort; Controllability of Systems; Water Use & Water Efficiency; Transport; Parking; Heat Island Roof; Storm Water; Open Space; Increased Ventilation; Optimize Energy Performance and Green Power.



Result³:

LEED® EA 2

Cost reduction

8 credits

98%

Result:

Analysis #1...

LEED® EQ 8.1 option 2

1 credit

Credit 1 (75%)

Pass

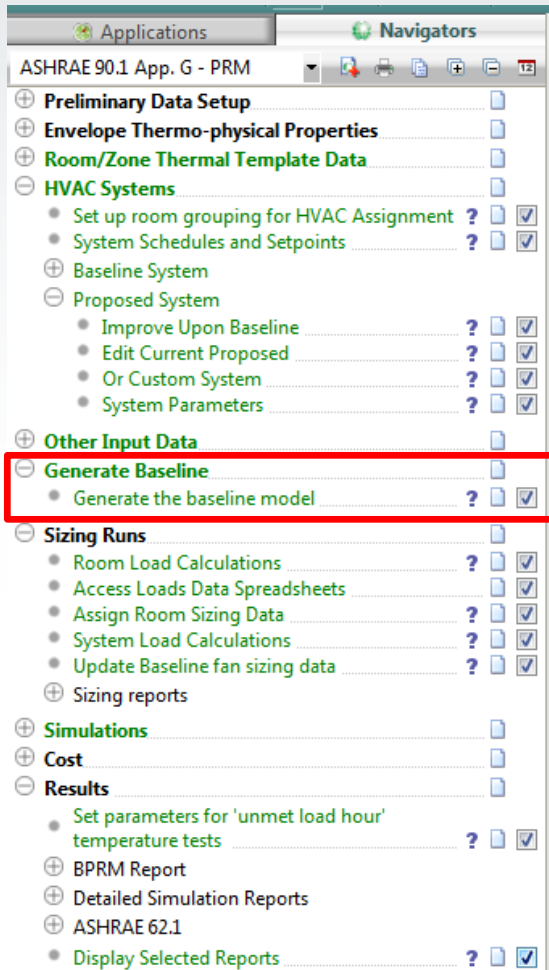
Spaces 81% pass

(1) IES VE Navigators – E.g. ASHRAE 90.1 Navigator

IES VE with CBECC-Com and Whole-Building Energy Modeling

LEED Energy Modeling; Navigator Workflow

ASHRAE 90.1 Navigator Output Reports:



IES Report

File

Edit

1.8.2 (b) Energy Cost & Consumption by energy Type - PRM Compliance

Table 1.8.2 (b) - Energy Cost

Energy Type	Units	Proposed Design		Baseline Design		Percent Savings	
		Energy Use	Cost	Energy Use	Cost	Energy Use	Cost
Electricity	kBtu	765,765.83	USD856.93	898,773.74	USD997.91	14.80	14.13
Gas	kBtu	392,064.43	USD5,429.96	509,876.62	USD7,056.93	23.11	23.05
Subtotal (Model Outputs):		1,157,830.26	USD6,286.89	1,408,650.36	USD8,054.84	17.81	21.95
On site Renewable Energy	Energy Generated (kBtu)	Renewable Energy Cost(USD)		Narrative			
Photovoltaic Panels	2,569.00	0.00		Generated from source			
Wind Power	78,049.71	0.00		Generated from source			
Combined Heat and Power	0.00	0.00		Generated from source			
Solar Water Heating	4,094.47	0.00		Generated from source			
Exceptional Calculations	Energy Savings	Cost Savings		Narrative			
Summary	Units	Proposed Design		Baseline Design		Percent Savings	
		Energy use	Cost	Energy use	Cost	Energy use	Cost
Total	kBtu	1,073,117.08	USD6,286.89	1,408,650.36	USD8,054.84	23.82	21.95

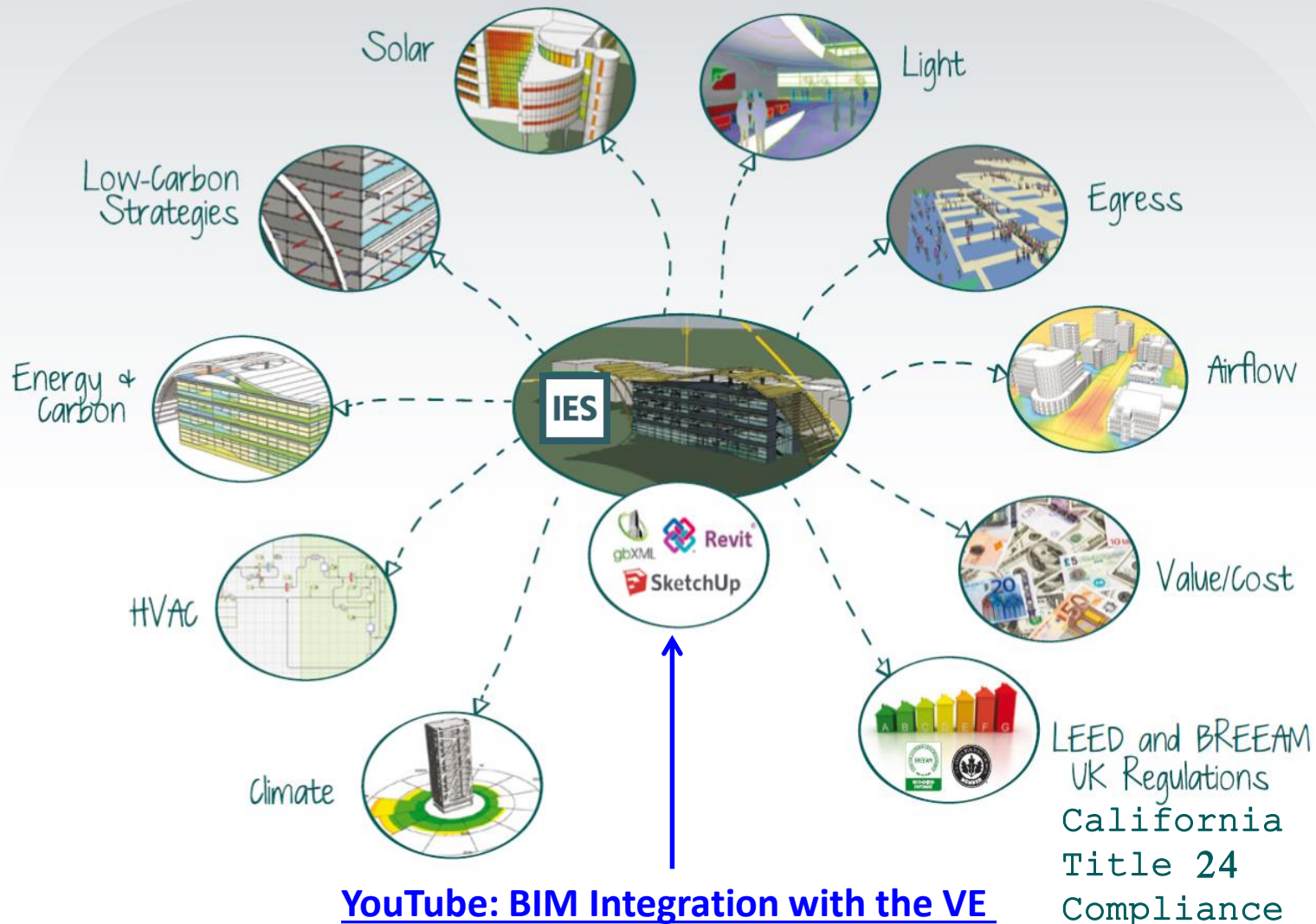
Copyright © 2010 Integrated Environmental Solutions Limited All rights reserved

Percent Savings	
Energy use	Cost
23.82	21.95

Percent Savings	
Energy use	Cost
23.82	21.95

(2) IES VE Applications – One Central Model

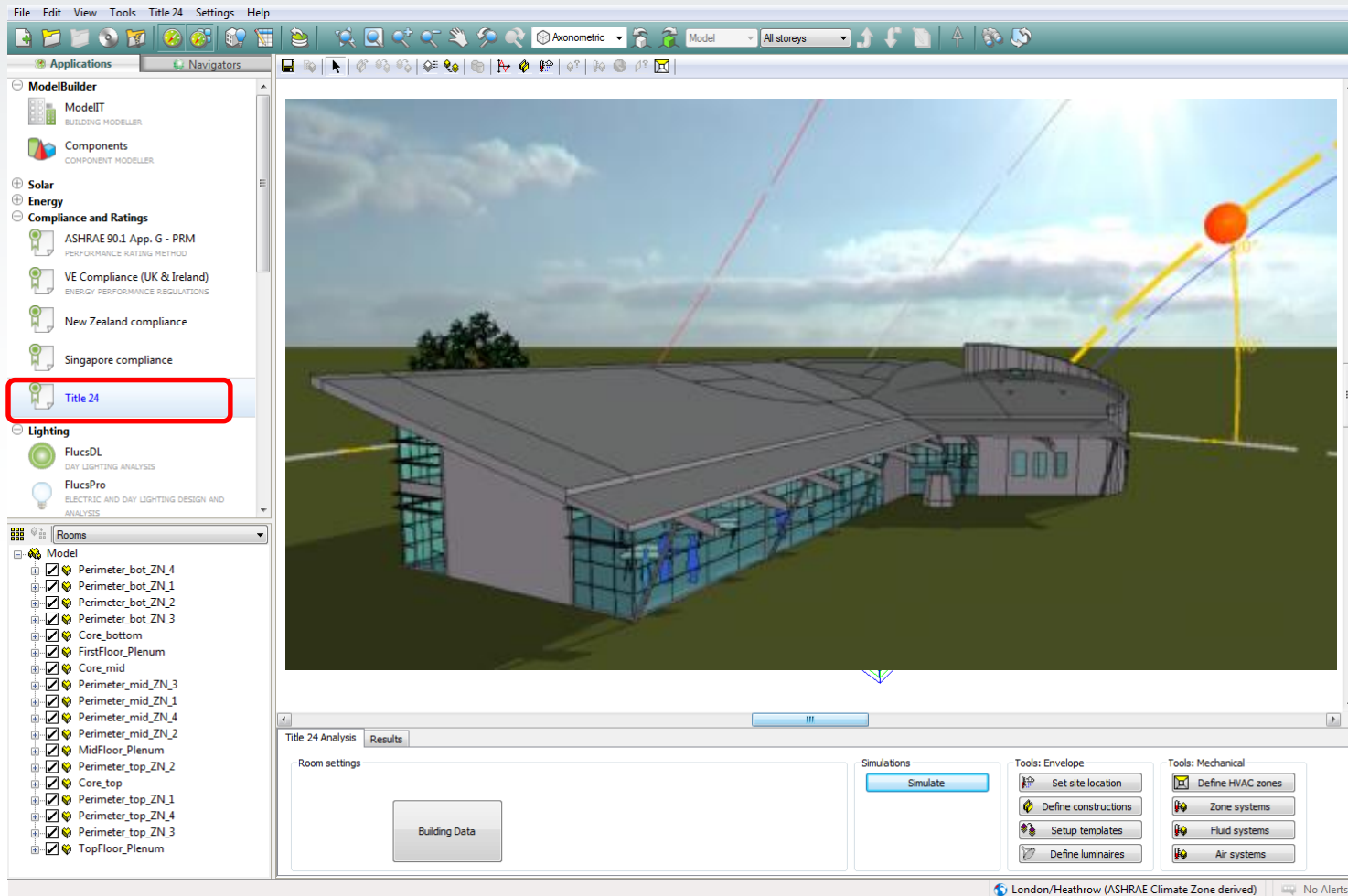
IES VE with CBECC-Com and Whole-Building Energy Modeling



(2) IES VE Applications: E.g. California Title 24

IES VE with CBECC-Com and Whole-Building Energy Modeling

IESVE Title 24 Application:



(2) IES VE Applications: E.g. California Title 24, Outputs

IES VE with CBECC-Com and Whole-Building Energy Modeling

Title 24 AnalysisResults

(kTDV/ft2-yr)

	Space heating	Space cooling	Fans	Heat rejection	Pumps	DHW	Lighting	Total	
Proposed	48.8	254.9	44.6	0	4.1	15.9	25.3	393.6	
Standard	48	215.1	214.7	0	0	6.8	61.9	546.5	
Margin	-0.8	-39.8	170.1	0	-4.1	-9.1	36.6	152.9	

PASS

Outputs

Summary

Unmet load hours

Certificate

Energy Use Summary							
End Use	Standard Design Site (MWh)	Standard Design Site (therms)	Standard Design (kTDV/ft2)	Proposed Design Site (MWh)	Proposed Design Site (therms)	Proposed Design (kTDV/ft2)	Compliance Margin (kTDV/ft2)
Space Heating		548.00	48.00	0.00	590.00	48.80	-0.80
Space Cooling	10.90		215.10	18.60		254.90	-39.80
Indoor Fans	19.50		214.70	3.70		44.60	170.10
Heat Rejection							
Pumps & Misc.				0.40		4.10	-4.10
Domestic HW		88.00	6.80		205.00	15.90	-9.10
Lighting	5.80		61.90	2.50		25.30	36.60
Compliance Total	36.20	636.00	546.50	25.20	795.00	393.60	152.90
Receptacle	7.60		87.00	7.60		87.00	
Process							
Process Ltg							
TOTAL	43.80	636.00	633.50	32.80	795.00	480.60	

CERTIFICATE OF COMPLIANCE - NONRESIDENTIAL PERFORMANCE COMPLIANCE METHOD

NRCC-PRF-01-E

Project Name: SMUD T24 Training

Calculation Date/Time:

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Compliance Scope: New Complete Building including Envelope, Lighting and HVAC

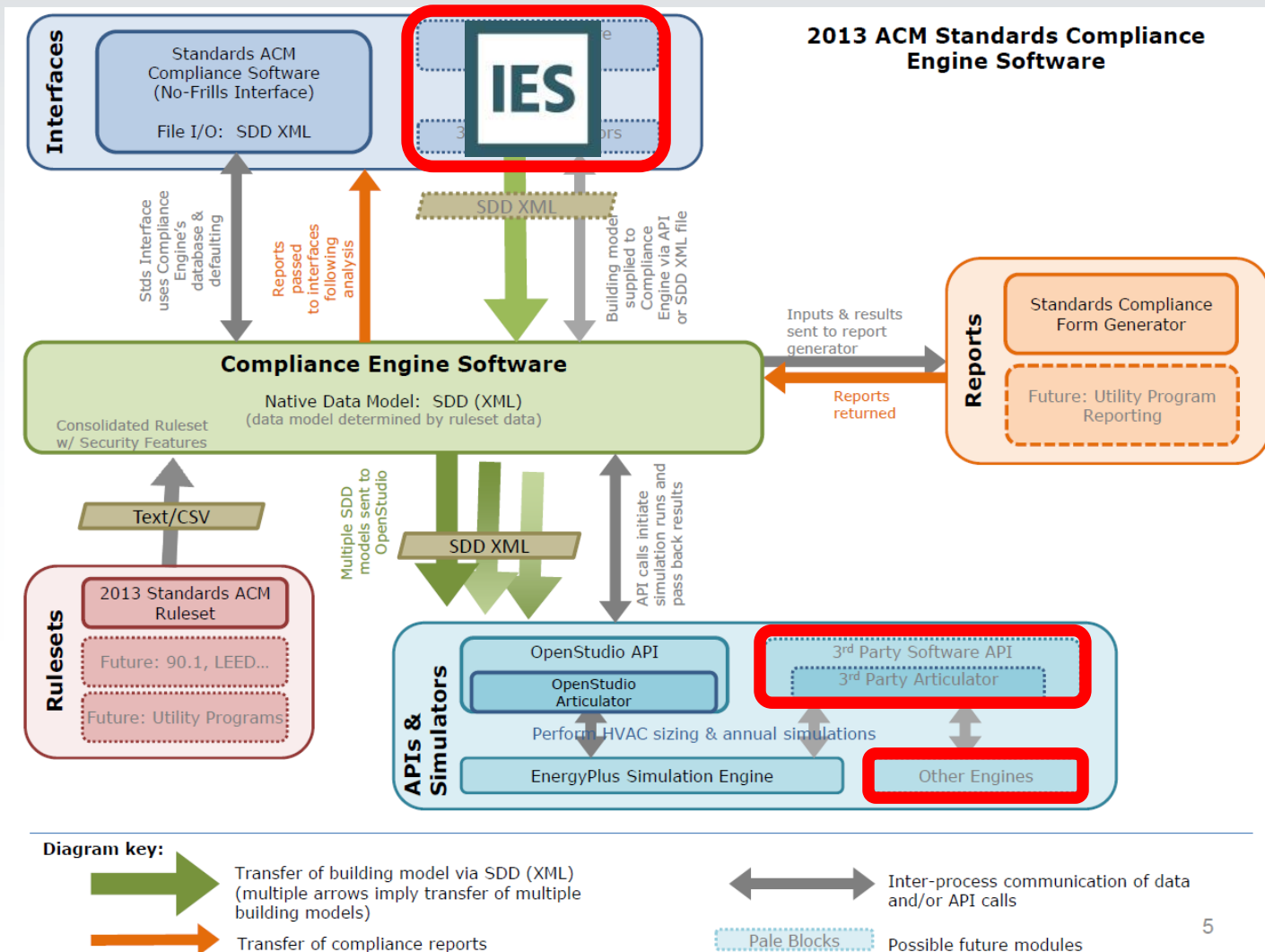
Input File Name:

B. COMPLIANCE RESULTS

01	BUILDING COMPLIES				
02	Special Features are Required -TBD				
03	HERS Verification is Required - TBD				
ANNUAL TDV ENERGY USE SUMMARY (kBtu/ft2/yr)					
	04	05	06	07	
Energy Component	Standard Design	Proposed Design	Compliance Margin	Percent Better than Standard*	
Space Heating	48.0	48.8	-0.8	-1.7%	
Space Cooling	215.1	254.9	-39.8	-18.5%	
Indoor Fans	214.7	44.6	170.1	79.2%	
Heat Rejection	—	—	—	—	
Pumps & Misc.	—	4.1	-4.1	NaN	
Domestic Hot Water	6.8	15.9	-9.1	-133.8%	
Lighting	61.9	25.3	36.6	59.1%	
COMPLIANCE TOTAL	546.5	393.6	152.9	28.0%	
Receptacle	87.0	87.0		0.0%	
Process	—	—		—	
Process Lighting	—	—		—	
TOTAL	633.5	480.6		24.1%	

How IESVE integrates with CBECC-Com

IES VE with CBECC-Com and Whole-Building Energy Modeling



5

Reference: CBECC at www.bees.archenergy.com/software.html

IES-VE Landscape with Title 24 and CBECC-Com

IES VE with CBECC-Com and Whole-Building Energy Modeling

T24 Compliance

Building Design & Performance Analysis

IES VE Model Geometry



CBECC-Com

- Climate
 - Zone Assignments
 - Constructions
 - Internal Gains
 - HVAC Systems
- ↓
- Ruleset Process (SSDXML)
- ↓
- Results / Reports

IES VE Suite of Analysis



Climate, envelope, etc.



SOLAR

- Solar shading & simulation



DAYLIGHT

- Daylight harvesting simulation



AIRFLOW

- Natural ventilation simulation



HVAC

- Chilled beams, UFAD / DV,



Hourly, Annual Energy & CO2 Simulation



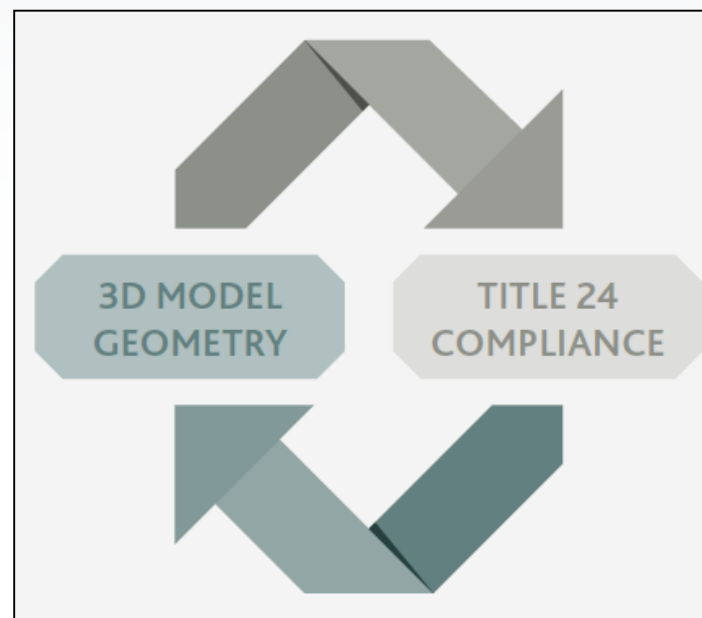
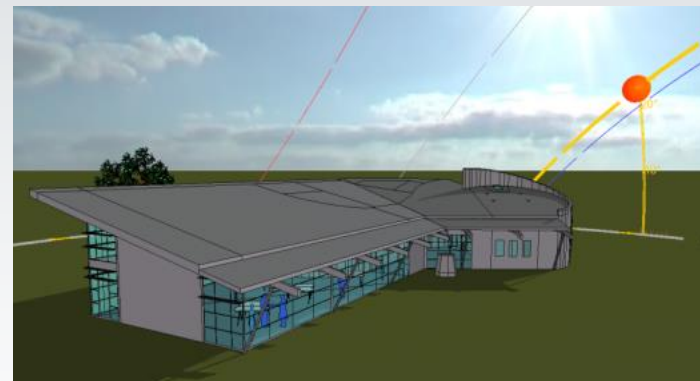
Results, Reports and Re-simulate

- Consider other HVAC, renewable energies, etc.

Why use IES-VE for Title 24 Compliance?

IES VE with CBECC-Com and Whole-Building Energy Modeling

1. Free 3D Model Application
2. T24 Application is \$250
3. Two Applications are Fully Interoperable, i.e. no data loss with geometry revisions.
4. Spreadsheet Interoperability (Ctrl+V)
5. Technical Support Provided



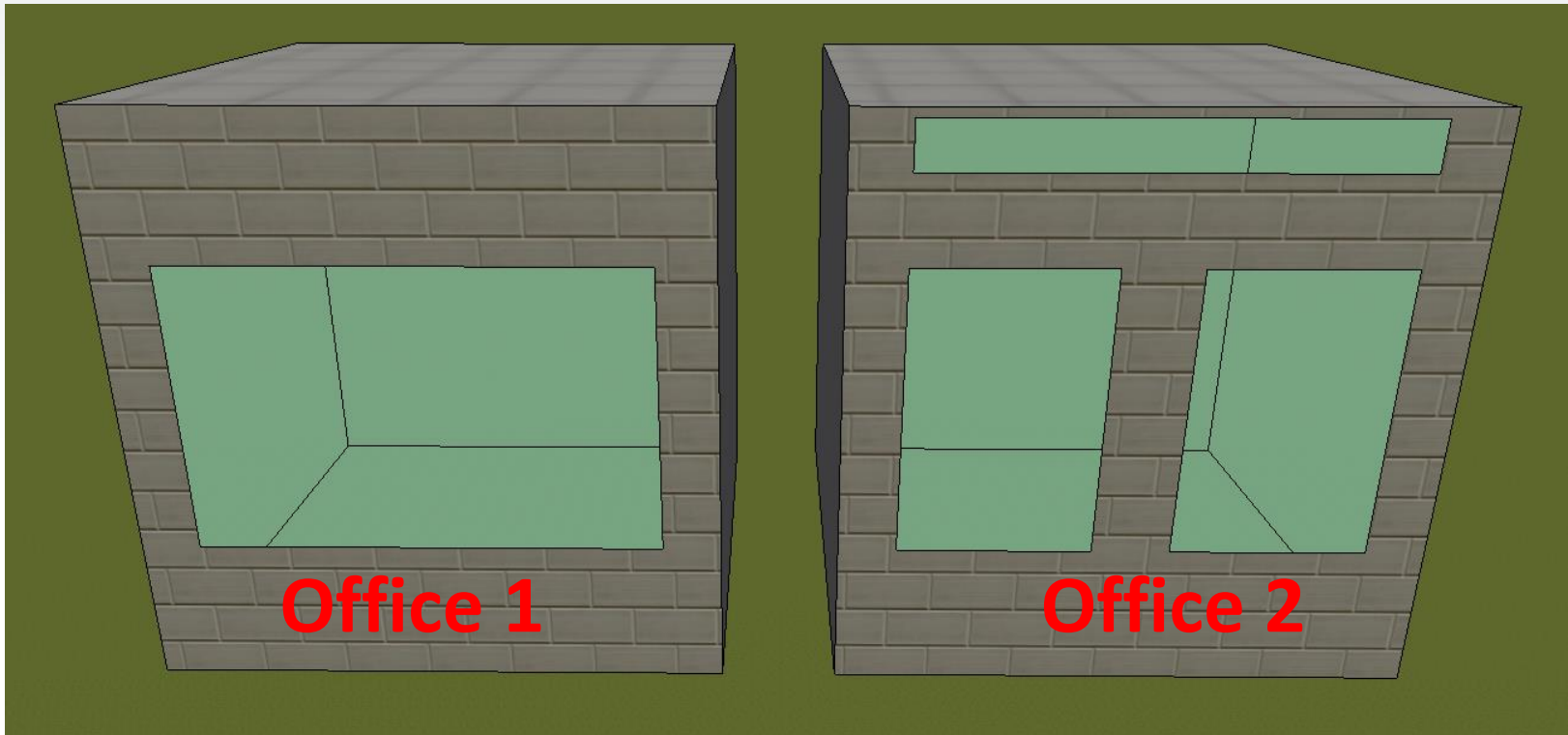
How to Model...

Model Geometry

IES VE with CBECC-Com and Whole-Building Energy Modeling

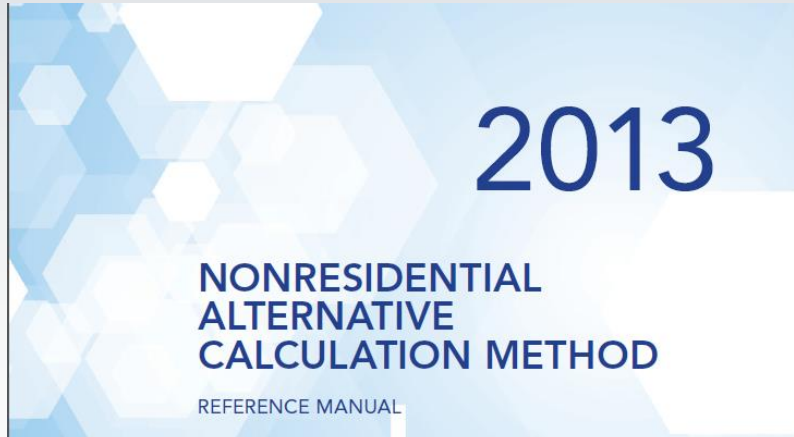
Q: Which office space has the higher heating load?

Both: San Diego – Office Gains – VE1-2M – 40% Glazing



Model Geometry

IES VE with CBECC-Com and Whole-Building Energy Modeling



Fenestration Geometry

Applicability

All fenestration

Definition

Fenestration geometry defines the **position** and dimensions of the fenestration surface within its parent surface and the identification of the parent surface. The orientation and tilt is inherited from the parent surface. The details of how the coordinate system is implemented may vary between Compliance Software programs.



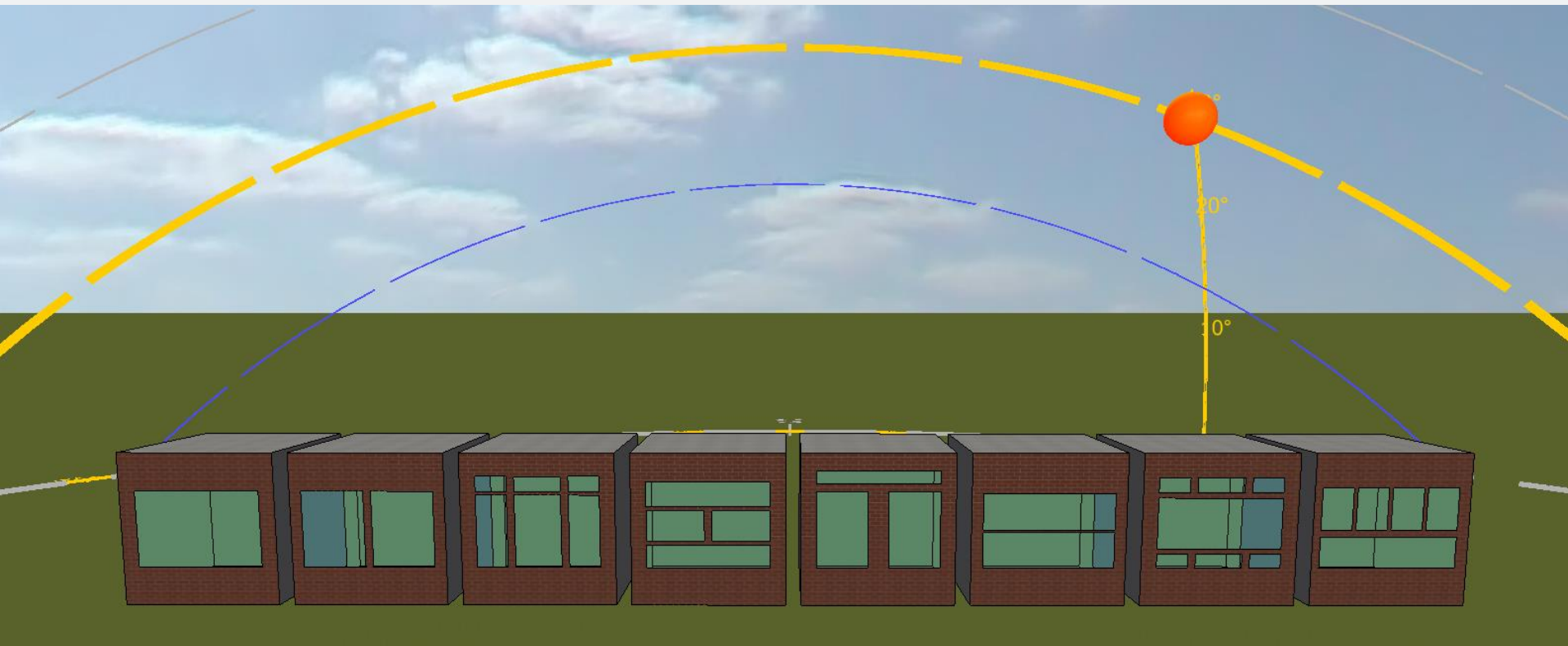
JUNE 2013
CEC-400-2013-004-SD **Version 2**
CALIFORNIA ENERGY COMMISSION
Edmund G. Brown Jr., Governor

Model Geometry

IES VE with CBECC-Com and Whole-Building Energy Modeling

Q: What about now... (highest heating load)?

- ALL 8: San Diego – Office Gains – VE1-2M – 40% Glazing

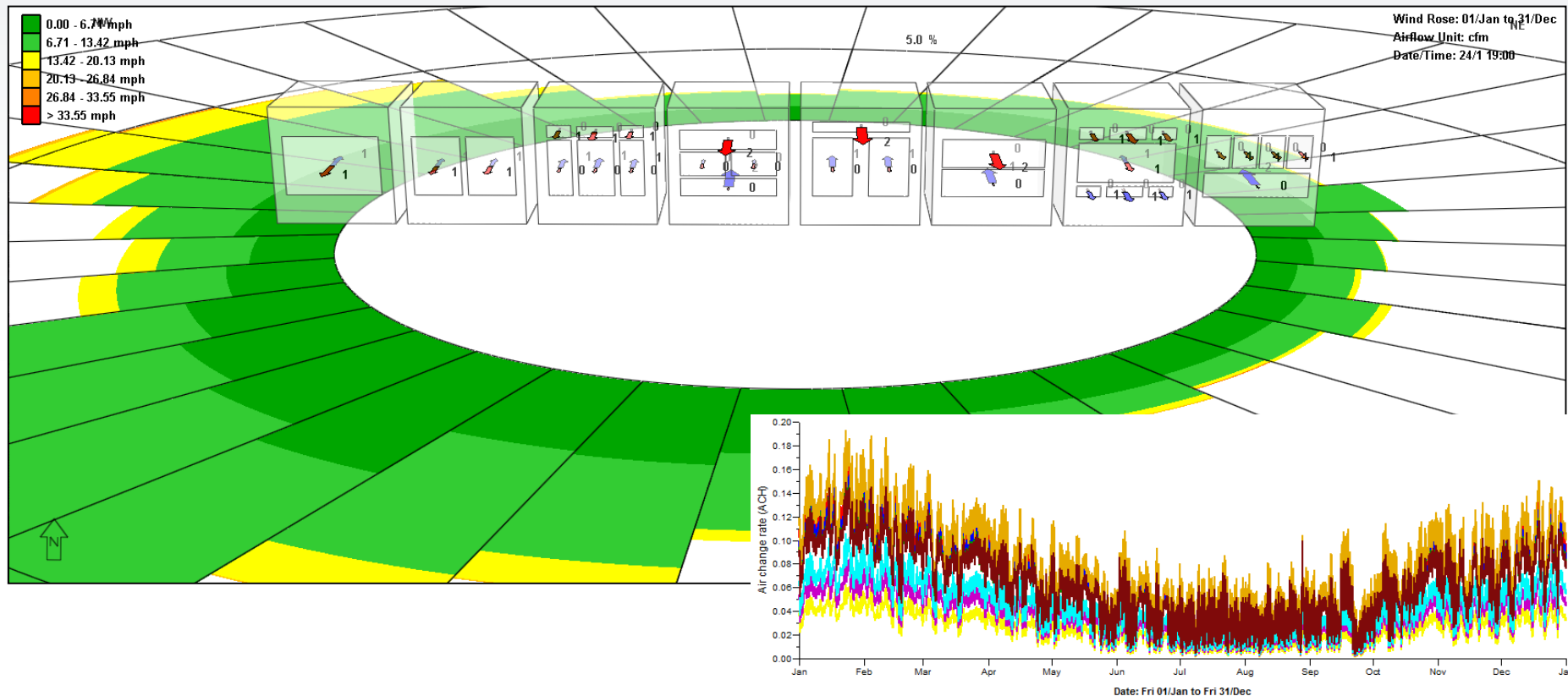


Model Geometry & Infiltration

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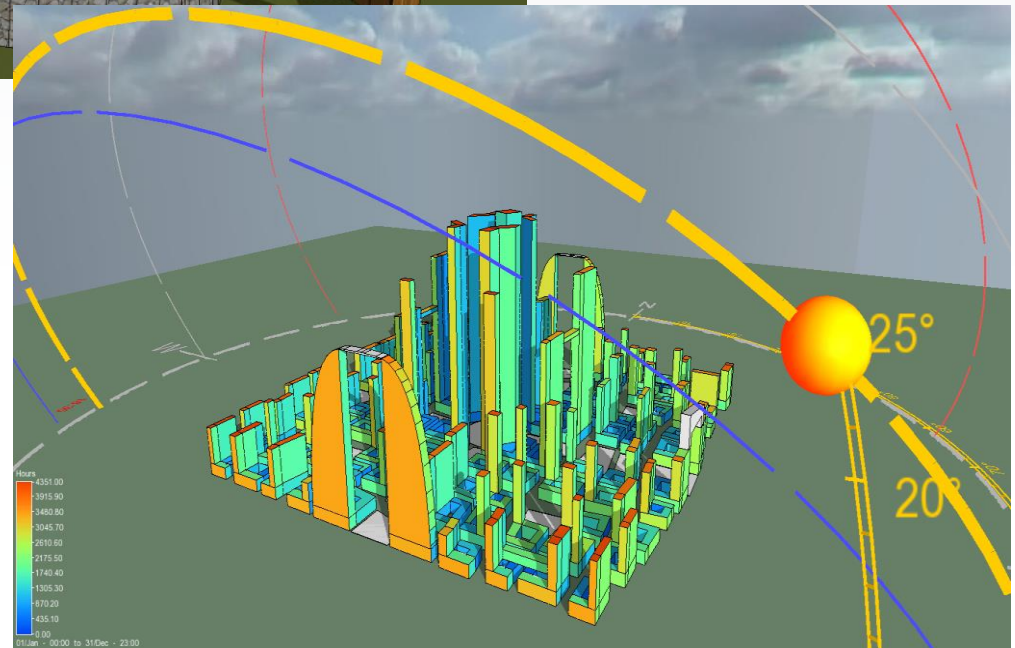
Q: What about now... (highest heating load)?

- ALL 8: San Diego – Office Gains – VE1-2M – 40% Glazing



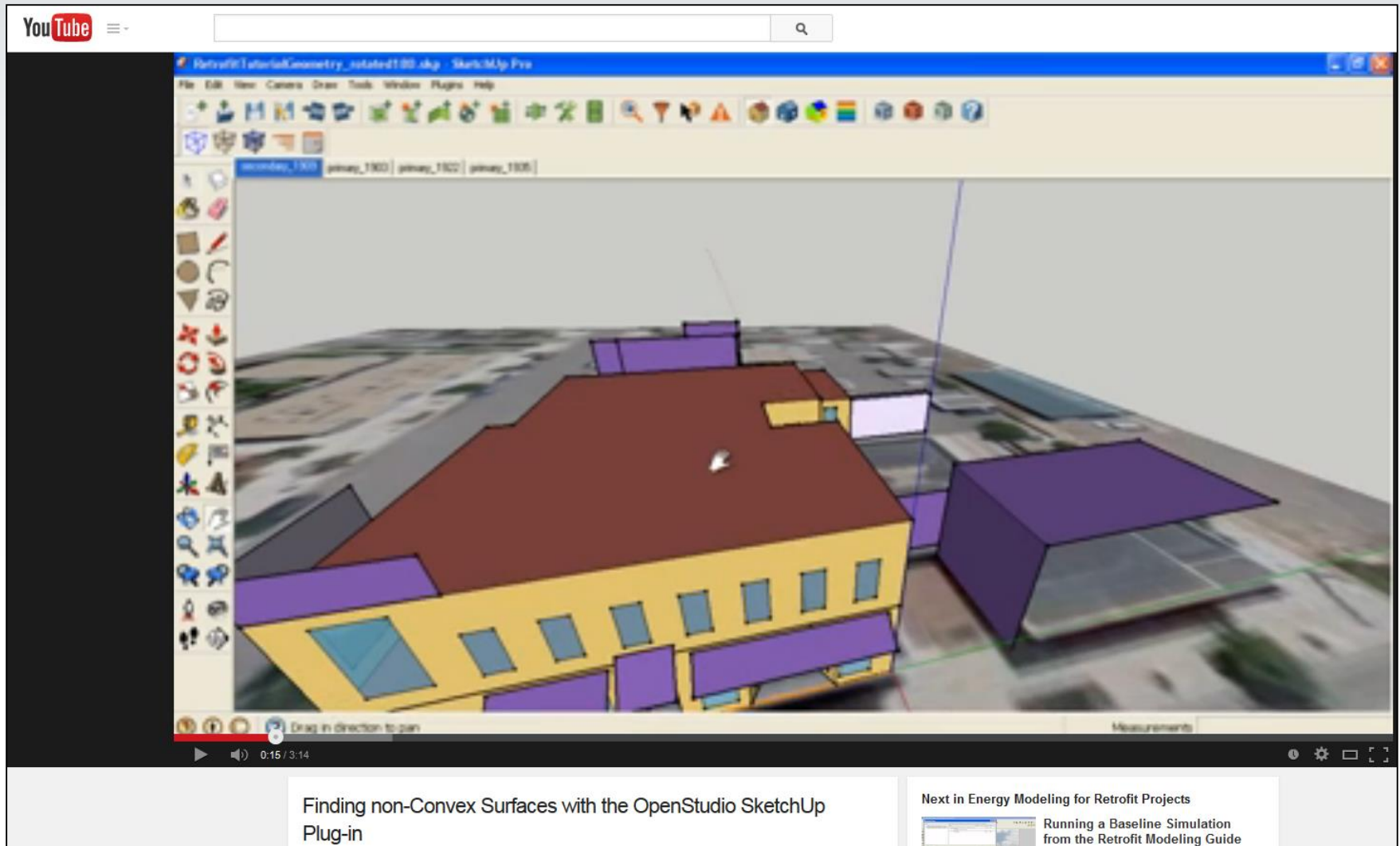
Model Geometry & Solar Gains

IES VE with CBECC-Com and Whole-Building Energy Modeling



Caution!! CBECC-Com uses OpenStudio

IES VE with CBECC-Com and Whole-Building Energy Modeling



The image shows a YouTube video player displaying a 3D architectural model of a building. The model is rendered in a yellow and purple color scheme, with a red roof. The building is situated on a flat, grey ground plane. The video player interface includes a search bar at the top, a video title, a progress bar, and a description area at the bottom.

Video Title: Finding non-Convex Surfaces with the OpenStudio SketchUp Plug-in

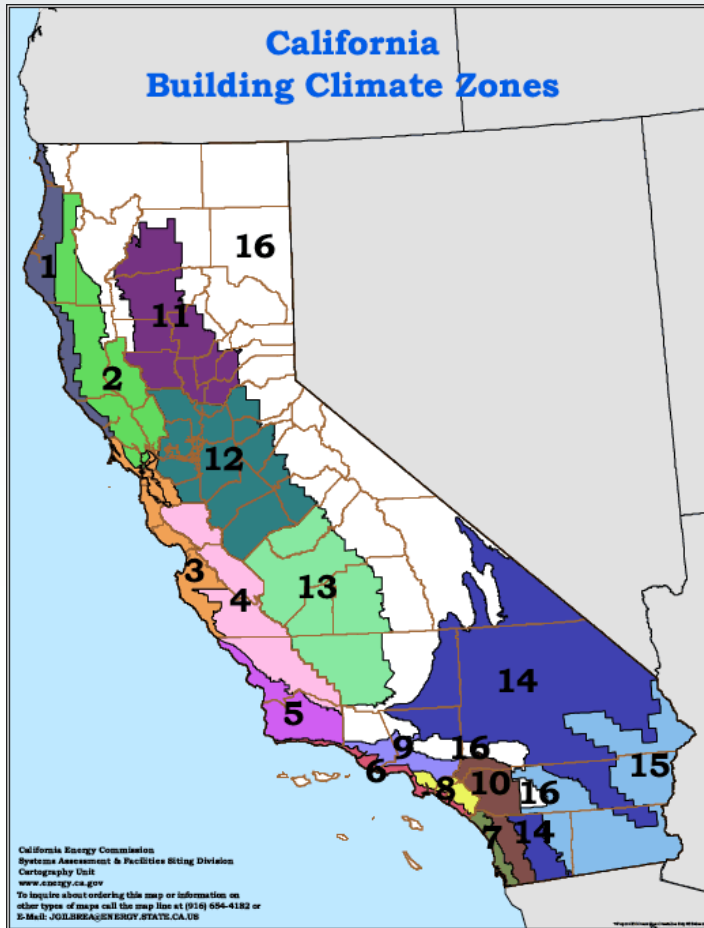
Next in Energy Modeling for Retrofit Projects

- Running a Baseline Simulation from the Retrofit Modeling Guide

Climatic Analysis & Weather Files

IES VE with CBECC-Com and Whole-Building Energy Modeling

Title 24 Site Location:



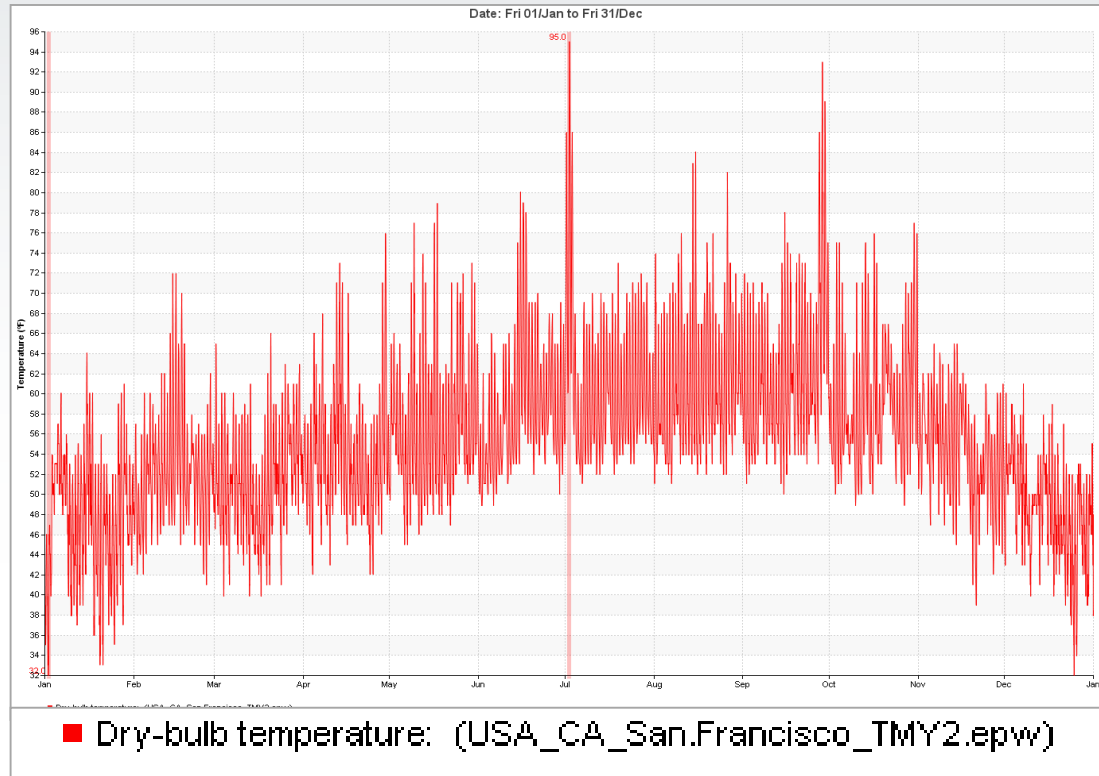
- New 2013 weather data set consists of 86 location specific weather files and 16 generic climate zone files.
- The 86 location specific weather files are intended for use in all code compliance simulations.
- The 16 climate zone weather files are the files for a single selected “reference location” for each climate zone.
- TDV factors are defined for each fuel type (electricity, natural gas, and propane) per climate zone.

Climatic Analysis & Weather Files

IES VE with CBECC-Com and Whole-Building Energy Modeling

Weather Data (8,760)

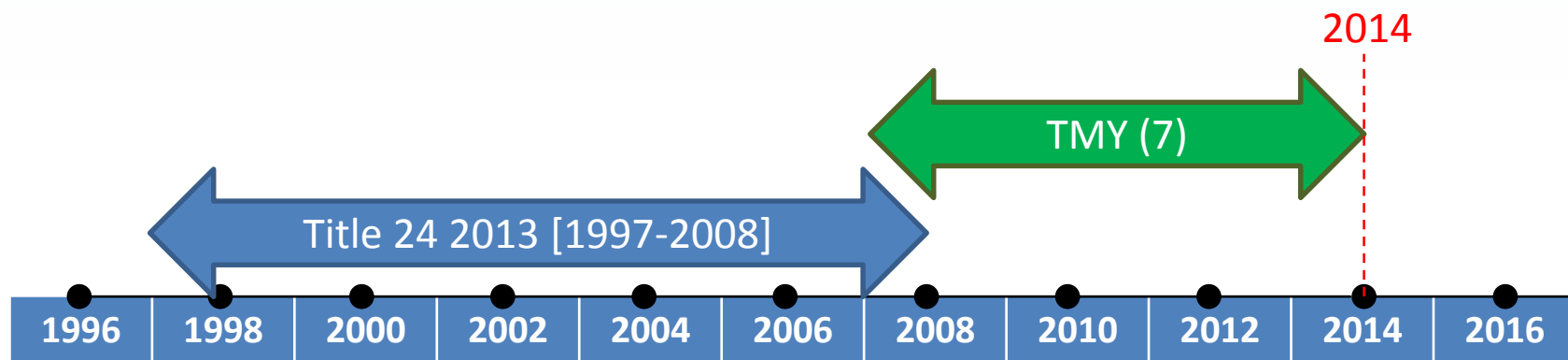
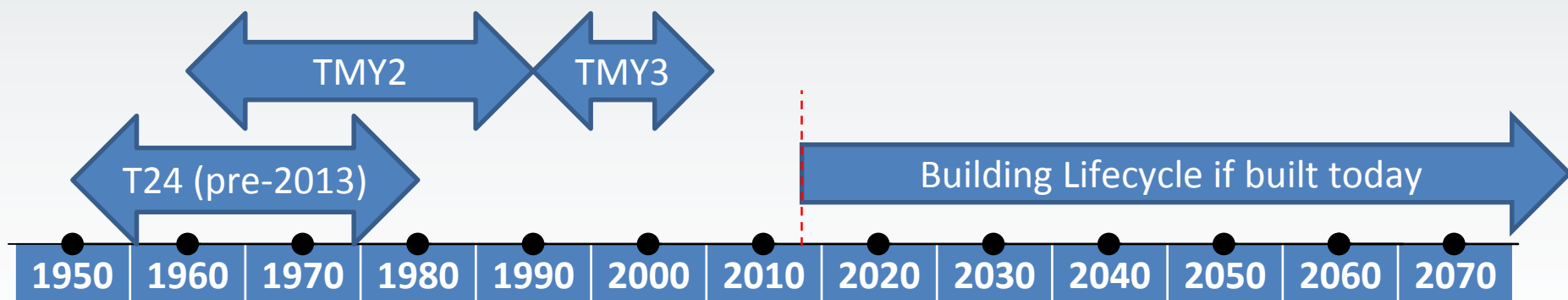
- **Dry-bulb temperature**
- Wet-bulb temperature
- External Dew-Point Temperature
- Wind Speed
- Wind Direction
- Direct Radiation
- Diffuse Radiation
- Global Radiation
- Solar Altitude
- Cloud Cover
- Atmospheric Pressure
- External Relative Humidity
- External Moisture Content



Climatic Analysis & Weather Files

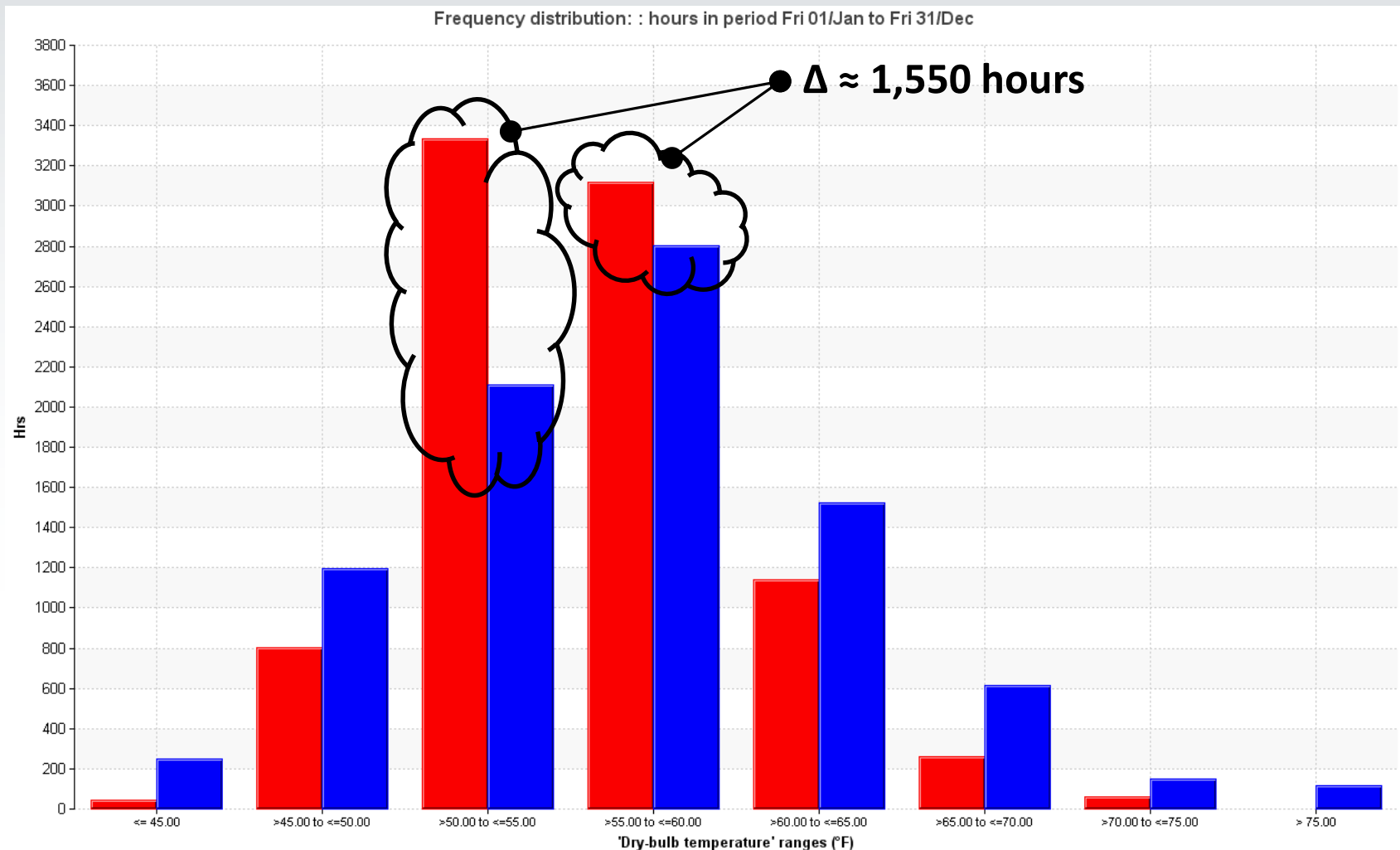
IES VE with CBECC-Com and Whole-Building Energy Modeling

Q: What Weather Data do you use? TMY 2, TMY 3, AMY



Climatic Analysis for San Francisco

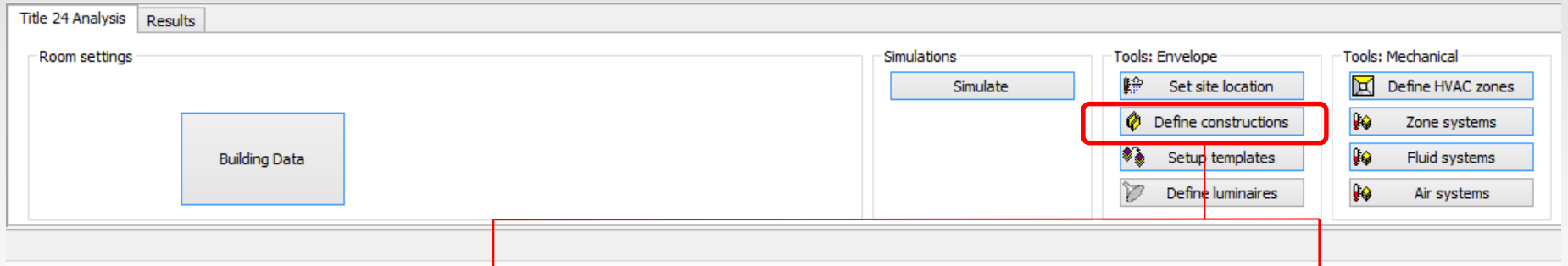
IES VE with CBECC-Com and Whole-Building Energy Modeling



TMY 7 versus **Title 24** climate files (dry bulb °F)

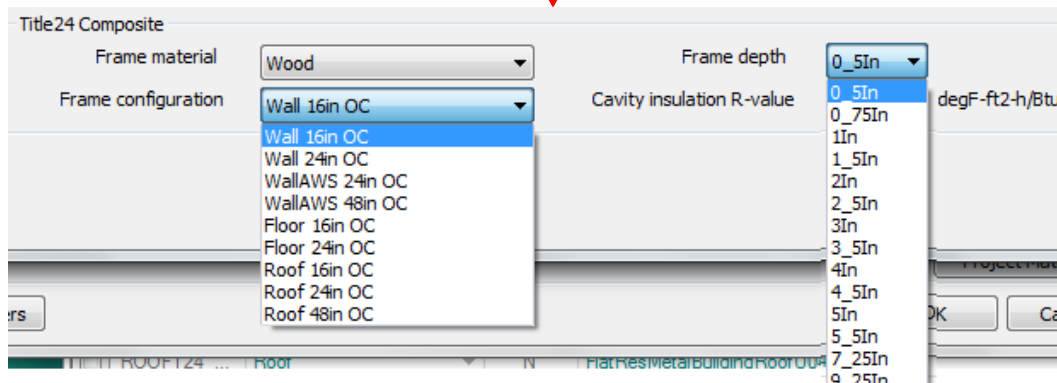
IES-VE Title 24 Envelope

IES VE with CBECC-Com and Whole-Building Energy Modeling



Construction layers

Material (outside to inside)	Thickness in	Conductivity Btu-in/h-ft ² ·°F	Density lb/ft ³	Specific Heat Capacity Btu/lb·°F	Resistance ft ² ·h·°F/Btu	Vapour Resistivity (perm-in) ⁻¹	Category
[T24_0356] Metal Standing Seam - 1/16 in.	0.06"	4.001	488.220	0.1200	-	-	Asphalts &
[T24_0194] Expanded Polystyrene - EPS - 3 1/2 in.	3.50"	0.240	1.000	0.2700	-	-	Boards, Sheets



IES-VE Envelope

IES VE with CBECC-Com and Whole-Building Energy Modeling

Glazing:

Description: Viracon VE1-2M (U=0.26) [SHGC=0.38] {VLT=70%} ID: GDPK61 External Internal

Performance

Net U-value (including frame) 0.2610 Btu/h·ft²·°F U-value (glass only) 0.2600 Btu/h·ft²·°F ASHRAE

Net R-value 3.8466 ft²·h·°F/Btu g-value (EN 410) 0.3850 Visible light normal transmittance 0.7

Surfaces

Frame

Percentage 1.00 Absorbance 0.7 Outside surface area ratio 1.0000 Type Metal

U-value 0.3647 Btu/h·ft²·°F Resistance 1.892 ft²·h·°F/Btu Inside surface area ratio 1.0000

LCA frame materials Edit

Shading device

Local shade ? None External shade ? None Internal shade ? None

Regulations

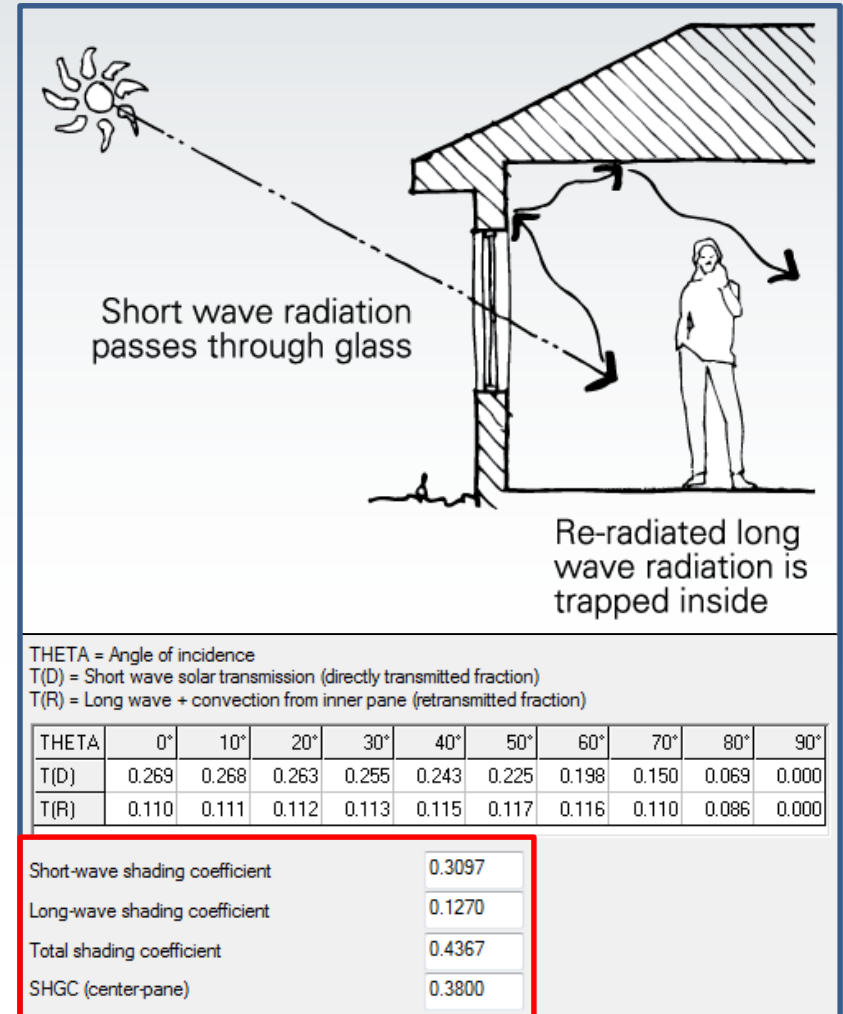
Dwellings

Construction layers (outside to inside)

Material	Thickness in	Conductivity Btu-in/h·ft²·°F	Type	Gas	Convection coefficient Btu/h·ft²·°F	Resistance ft²·h·°F/Btu	Transm.	Outside Reflect.	Inside Reflect.	Refractive Index	Outside Emiss.	Inside Emiss.
[PK611] Outer layer	0.25"	0.222	Uncoated				0.330	0.310	0.640	1.526		
Cavity	0.51"					1.844						
[CF611] Inner layer	0.25"	6.101	Uncoated				0.780	0.070	0.070	1.526		

Product Type Fixed window Cert Method NFRC Rated Tint Clear ☒ Diffusing?

Assm Context Manufactured Divider True Divided Lite ☐ Greenhouse/Garden? ☐ Glass block?



IES-VE Title 24 Daylighting

IES VE with CBECC-Com and Whole-Building Energy Modeling

Daylighting – automatic calculation:

General Interior lighting Daylight control Infiltration

☐ Skylit area

Daylit area 0.00

Illuminance RefPt coord X 0.00 Y 0.00 Z 0.00

Controlled power 0.00 W

Illuminance SetPoint 0.00 lux

☒ Primary sidelit area

Daylit area 775.85

Illuminance RefPt coord X 7.64 Y 54.58 Z 2.50

Controlled power 580.69 W

Illuminance SetPoint 287.50 lux

☐ Secondary sidelit area

Daylit area 636.95

Illuminance RefPt coord X 0.00 Y 0.00 Z 0.00

Controlled power 0.00 W

Illuminance SetPoint 0.00 lux

Standard

Minimum daylit area (Standard 140.3 (c)) 0.00 ft2

Skylit req. exception fraction 0.00

Excluded area 0.00 ft2

Exception - none -

Control Parameters

Control Type Continuous

MinDimLtgFrac 0.30

MinDimPwrFrac 0.20

Number control steps 0

Glare azimuth 0.00

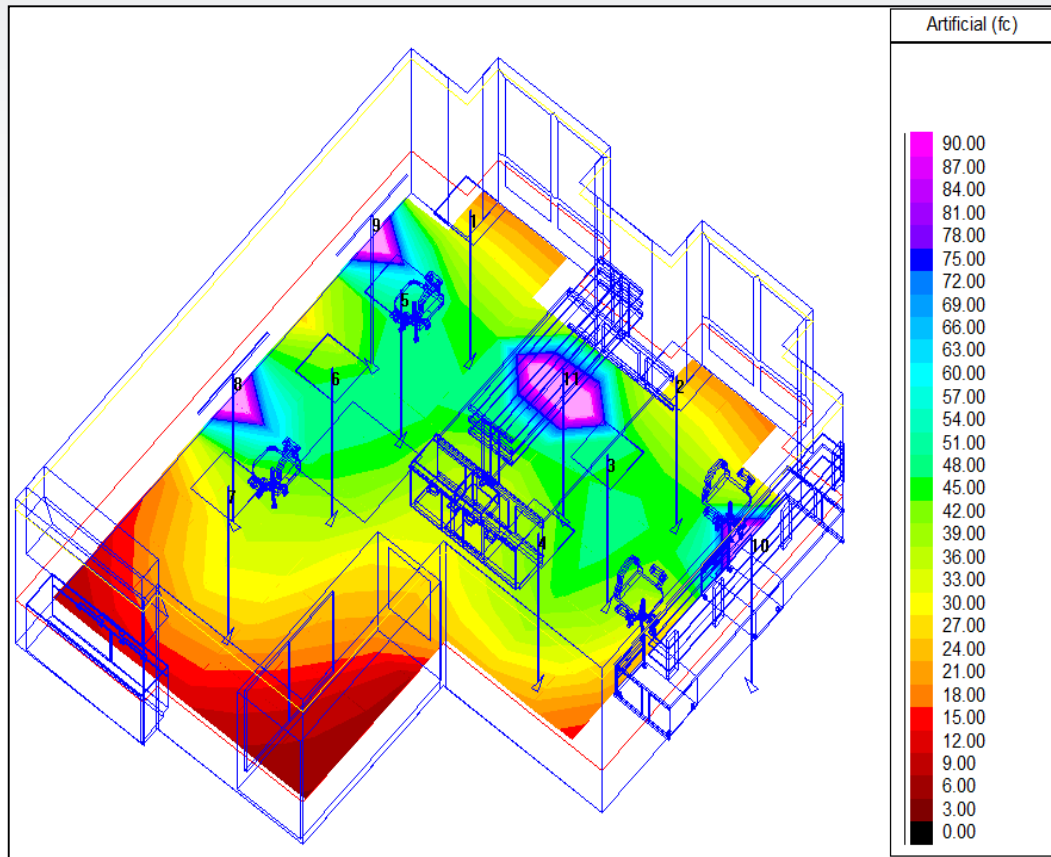
Max glare index 0.00

IES-VE Daylight & Energy Simulation

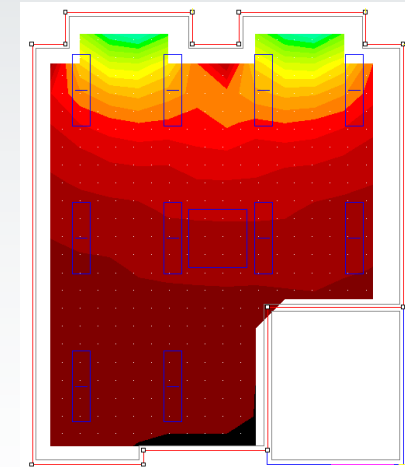
IES VE with CBECC-Com and Whole-Building Energy Modeling

(Day)lighting Simulation & Design

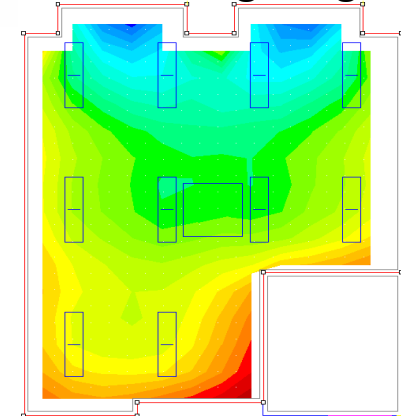
Luminaire simulations on a room by room basis



Daylighting Only



Combined Daylighting +
Artificial Lighting

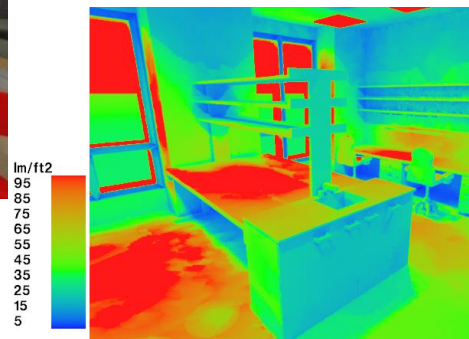
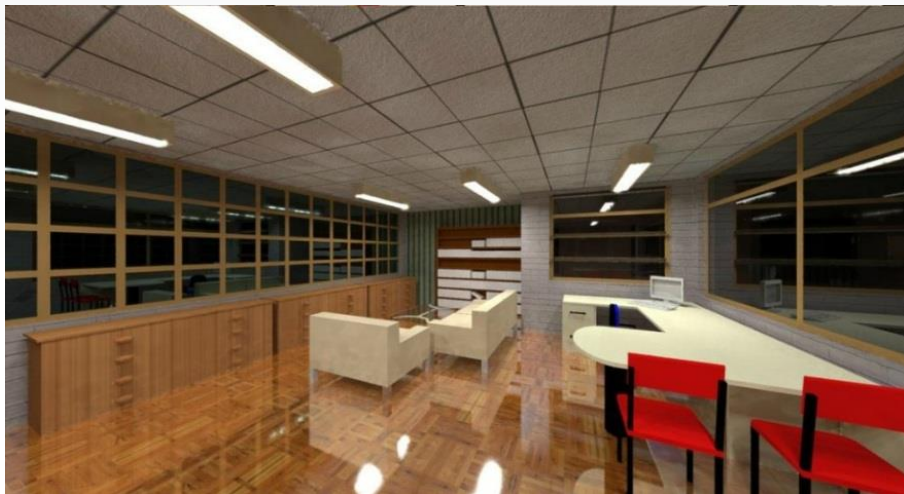


IES-VE Daylight & Energy Simulation

IES VE with CBECC-Com and Whole-Building Energy Modeling

Daylight Harvesting, Glare & Daylight Autonomy

- Task Lighting
- Detailed Daylight Tracking
- Link to HVAC Loads Sizing and Energy Simulation

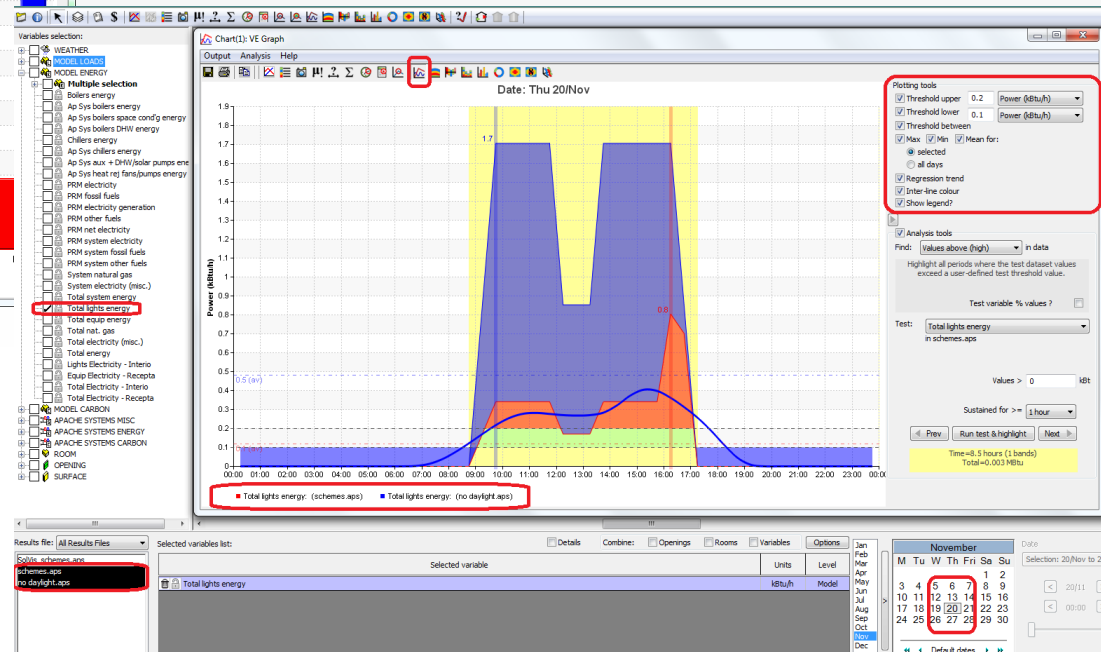
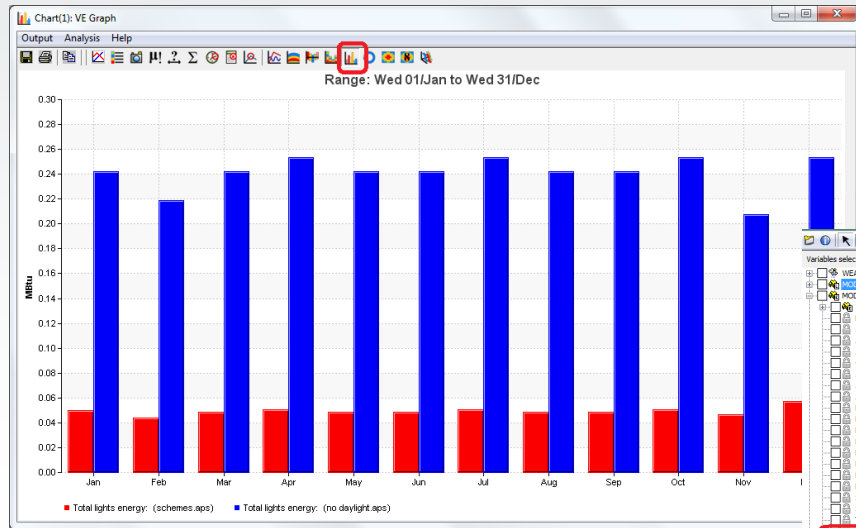


IES-VE Coupling Daylight & Energy Simulation

IES VE with CBECC-Com and Whole-Building Energy Modeling

Annual Monthly Lighting Energy
with & without daylight harvesting

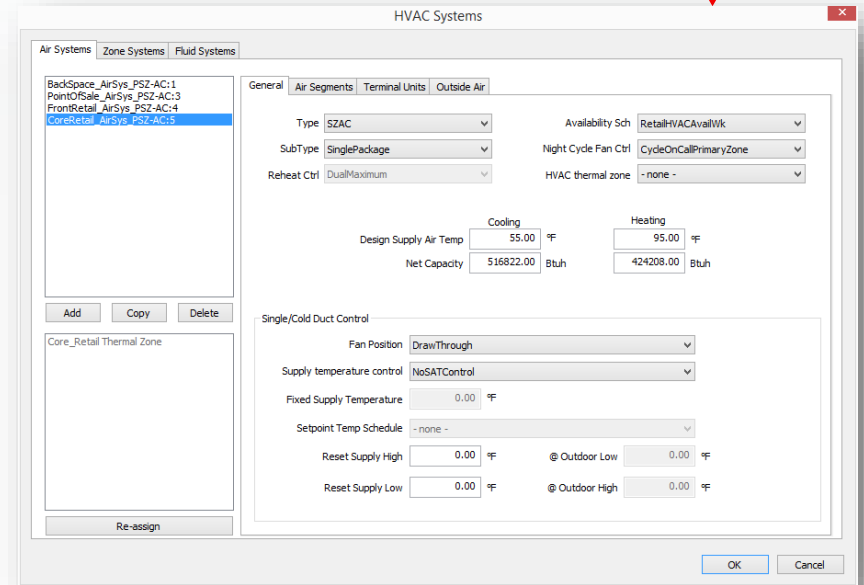
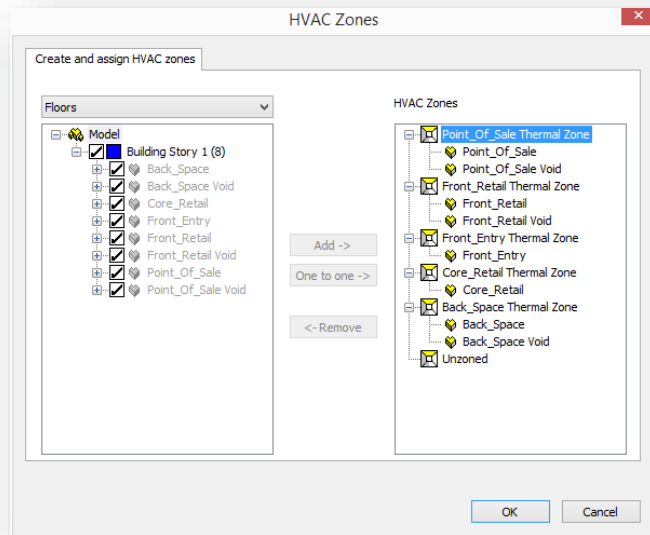
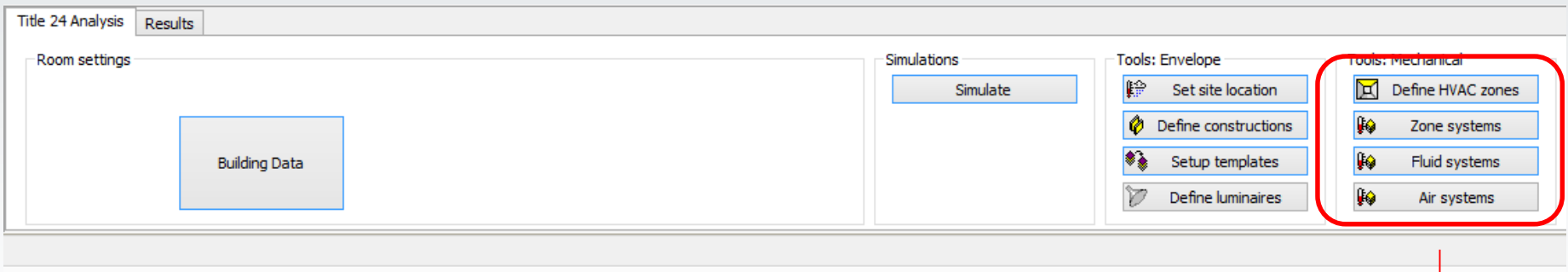
Daily Lighting Energy
with & without daylight harvesting



IES-VE Title 24 HVAC

IES VE with CBECC-Com and Whole-Building Energy Modeling

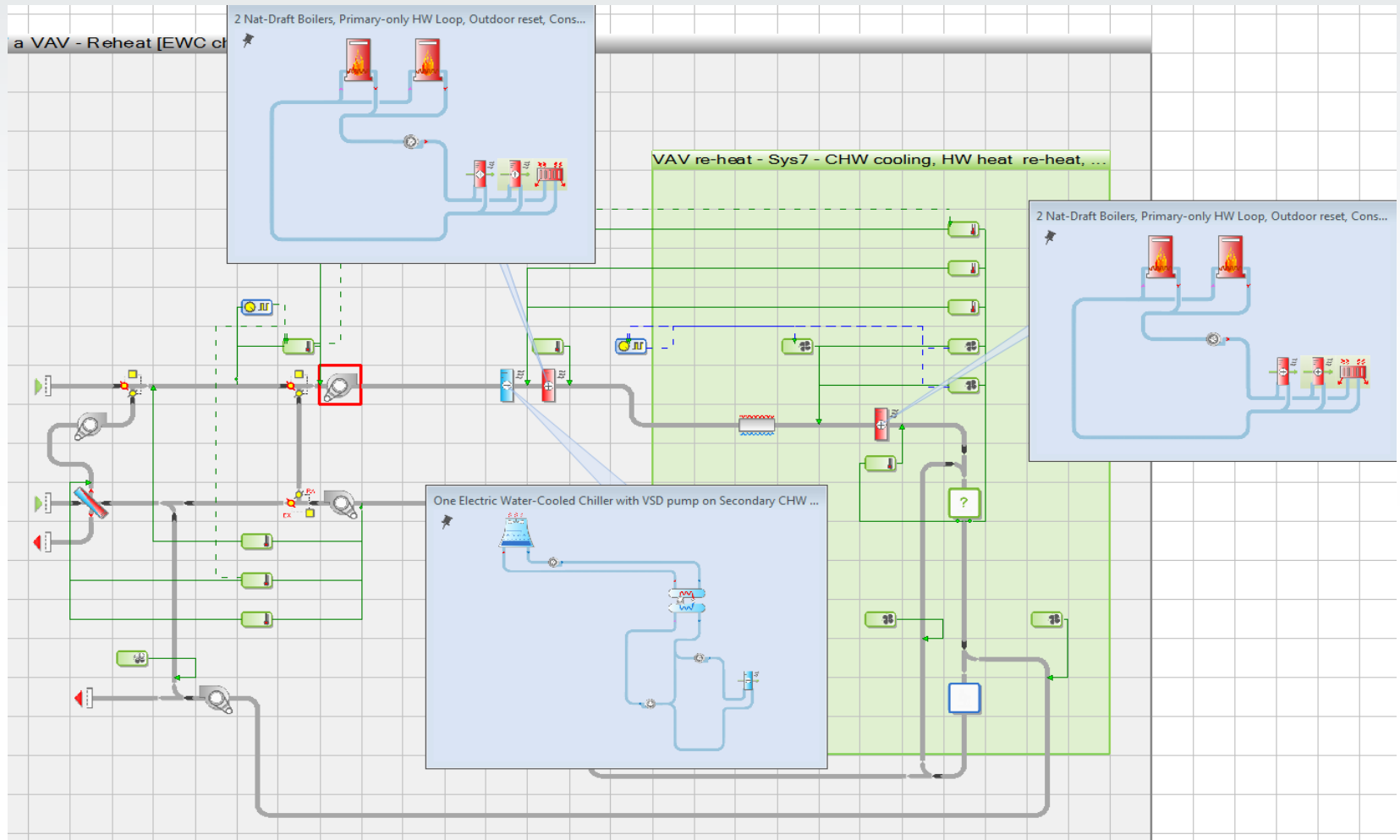
Zoning & HVAC:



IES-VE HVAC Systems Sizing and Simulation

IES VE with CBECC-Com and Whole-Building Energy Modeling

ASHRAE Baseline/Reference HVAC Systems

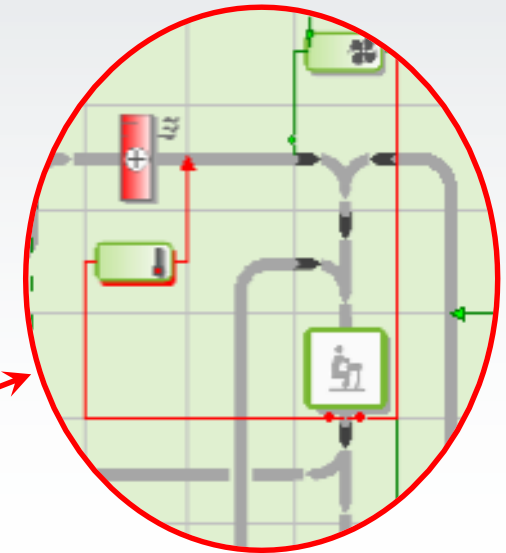
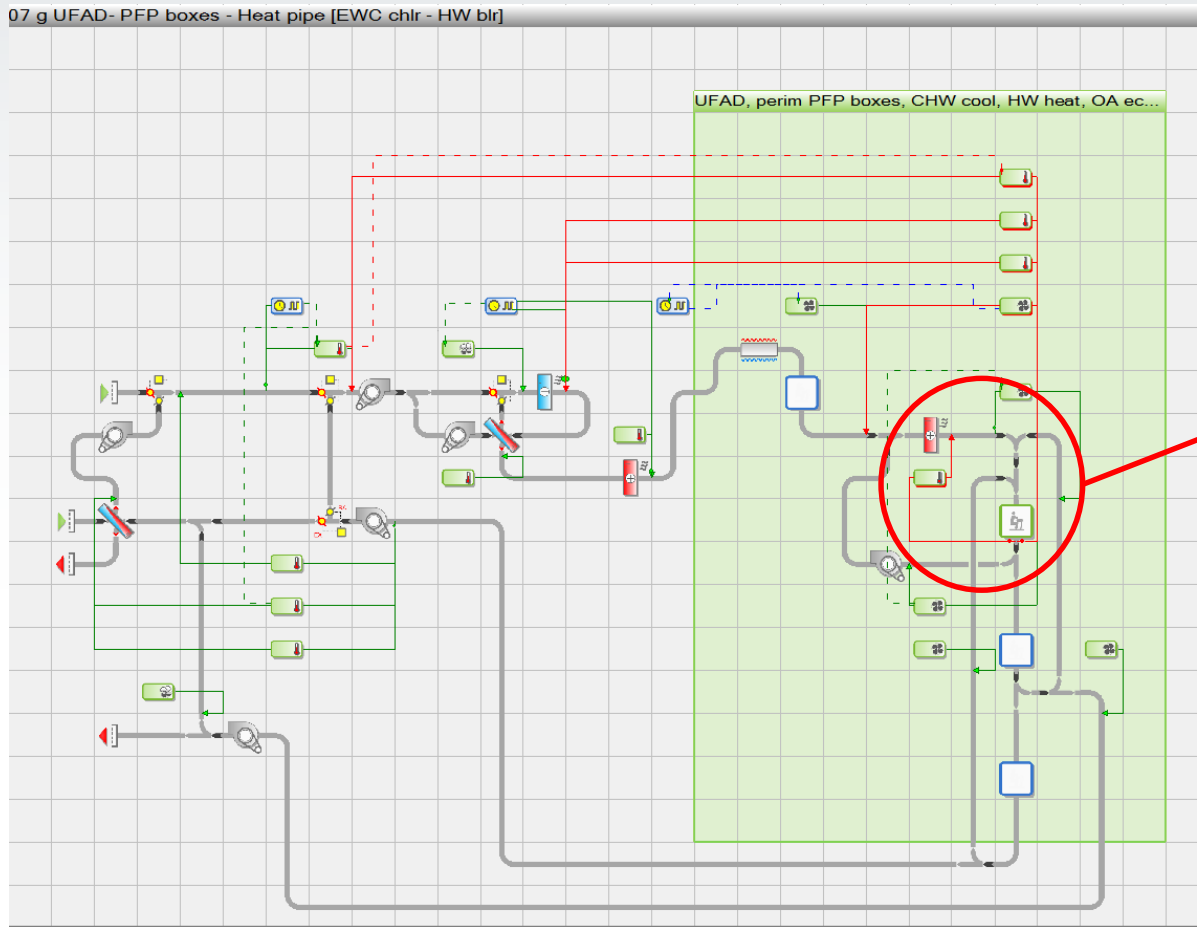


IES-VE HVAC Systems Simulation

IES VE with CBECC-Com and Whole-Building Energy Modeling

Underfloor Air Distribution (Displacement Vent.)

07 g UFAD- PFP boxes - Heat pipe [EWC chlr - HW blr]



**HVAC Control
Sensor Location
at Occupied
room/zone LAC**

IES-VE HVAC Systems Sizing and Simulation

IES VE with CBECC-Com and Whole-Building Energy Modeling

HVAC Optimization, performance curves

Chilled water loop

Reference: One Electric Water-Cooled Chiller with VSD pump on Secondary CHW Loop

Sizing status: Design calculation successful.

Chilled water loop | Pre-cooling | Chiller set | Heat rejection

General

Design outdoor dry-bulb temperature: 50.00 °F

Design outdoor wet-bulb temperature: 45.00 °F

Location of pre-cooling loop: Secondary return

Pre-cooling capacity

☒ Autosize [% of ChWIL capacity]: 25.00 Capacity: 1638.10 kBtu/h A

Heat rejection devices

☒ Water source heat exchanger

☒ Ambient device: Fluid cooler

Water source heat exchanger | Cooling tower with heat exchanger | Fluid cooler

Design parameters

Fluid cooler type: Wet/Dry ☒ Dry ☐

Cooling capacity, Q/hrdes: ☐ Autosize 3412.141 kBtu/h A

Outdoor dry-bulb temp. for wet/dry mode switch: 50.00 °F

Approach: 7.99 °F

Loop supply temperature: 52.99 °F

Range: 6.25 °F

Wet-bulb delta T: 1.80 °F

Fan power, Wfan: 10.50 kW

Fan electric input ratio, Wfan/Qhrdes: 0.0105

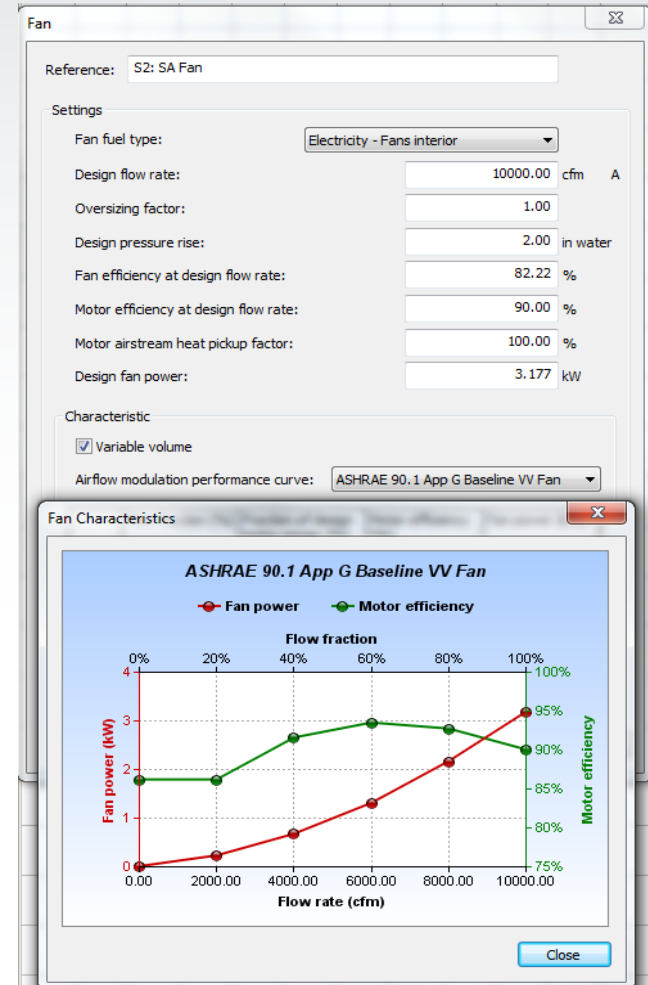
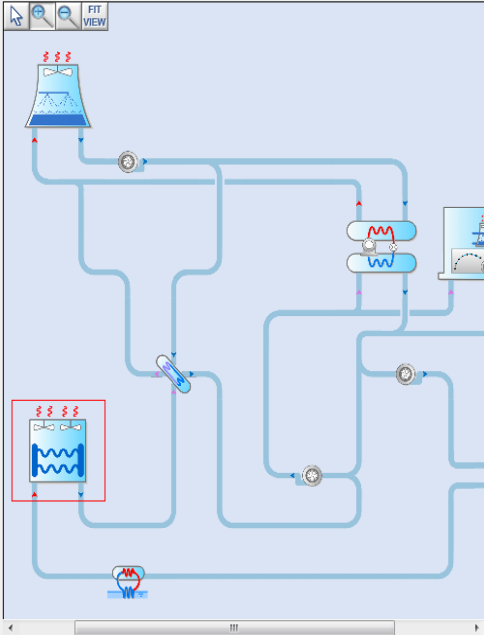
Fan control: Two-speed fan

Low-speed fan flow fraction: 0.50

Low-speed fan power fraction: 0.30

Spray pump power, Wpump: 1.00 kW

Spray pump electric input ratio, Wpump/Qhrdes: 0.0010

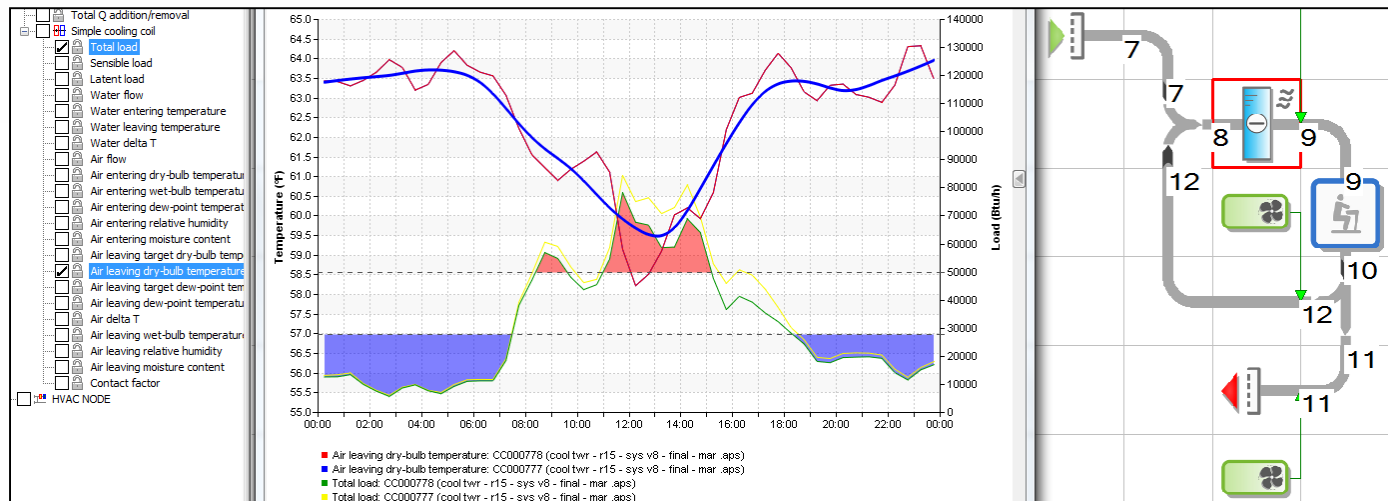
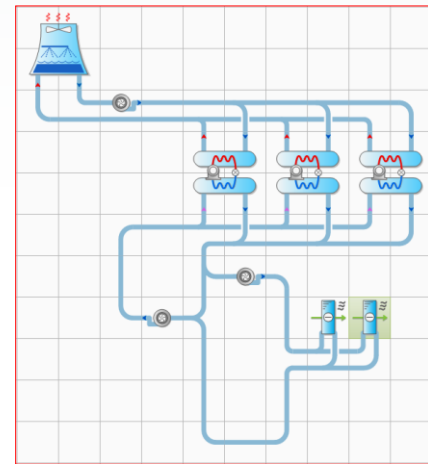
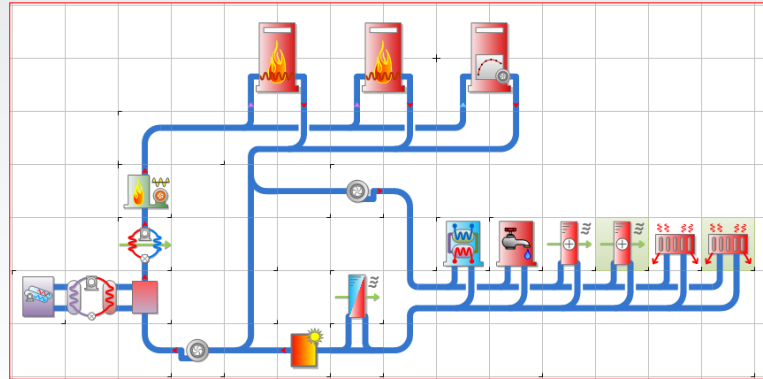


IES-VE HVAC Systems Sizing and Simulation

IES VE with CBECC-Com and Whole-Building Energy Modeling

HVAC Optimization: tracking plant performance

- Extensive pre-defined library
- System & Zone Level Sizing
- 62.1 Ventilation
- HVAC Sizing Reports
- Node-sizing airside network
- Expanded Waterside Capabilities
- Ability to cope with Innovative Systems



IES-VE (Natural Ventilation)

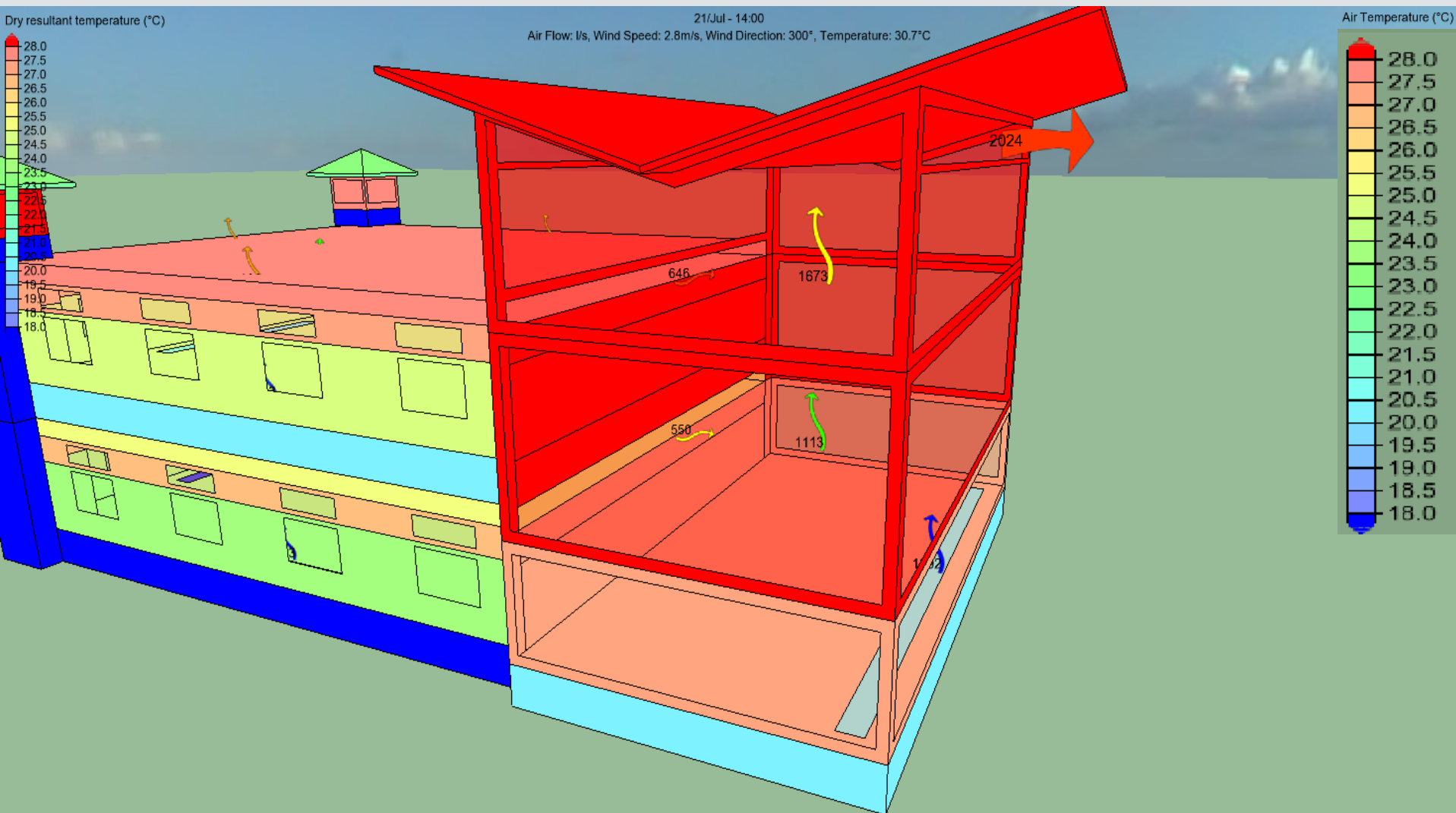
IES VE with CBECC-Com and Whole-Building Energy Modeling

Passive Building Design – Airflow



IES-VE (Thermal Comfort)

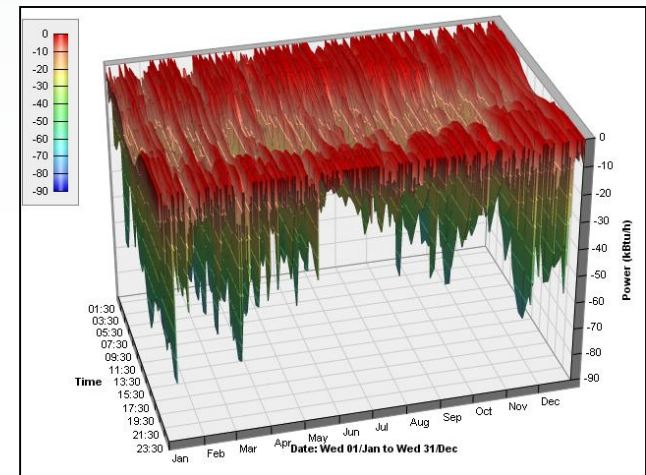
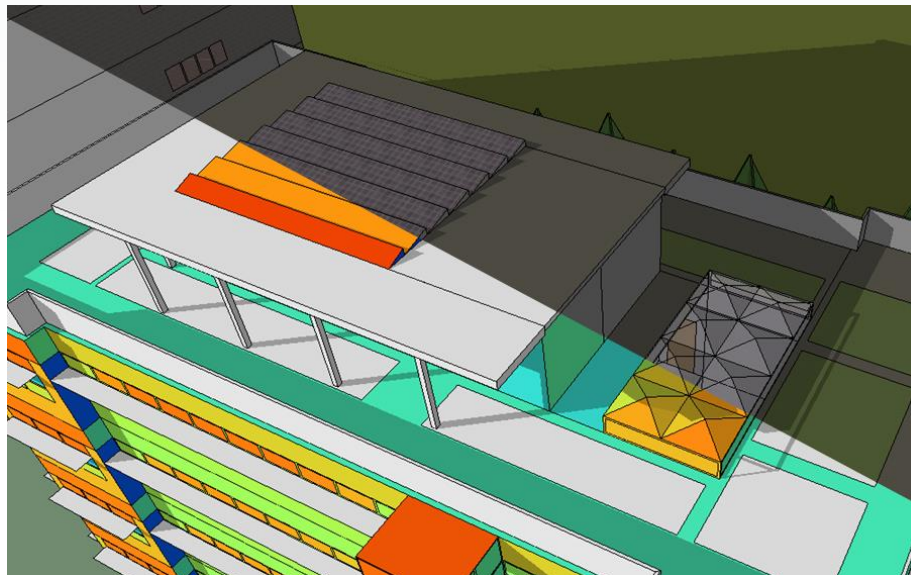
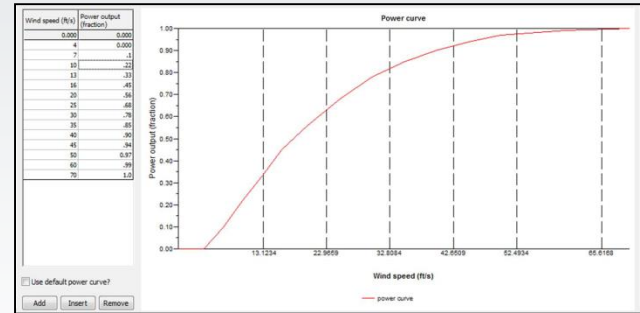
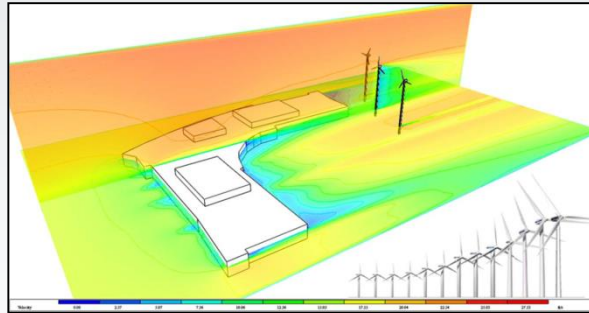
IES VE with CBECC-Com and Whole-Building Energy Modeling



IES-VE Renewable Energy Simulation

IES VE with CBECC-Com and Whole-Building Energy Modeling

Wind Turbines, Photovoltaic & Solar HW Panels



IES-VE Title 24

IES VE with CBECC-Com and Whole-Building Energy Modeling

Title 24 Reports:

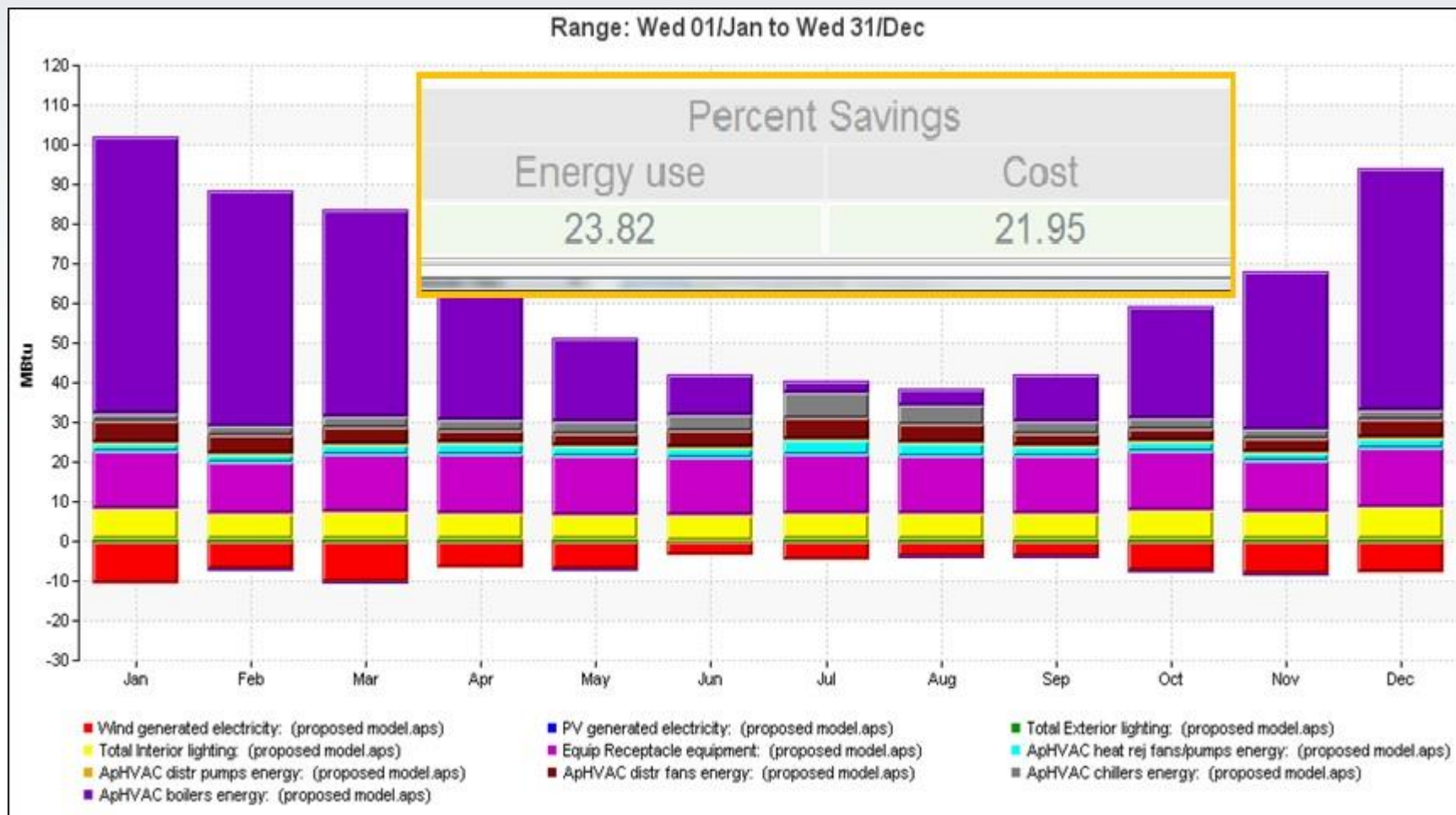
- Simulation errors & warnings
- Unmet hours (by thermal zone)
- Energy consumption by end-use
- TDV energy comparison (Proposed v. Standard)
- Standard Design report (Certificate of Compliance)

CERTIFICATE OF COMPLIANCE - NONRESIDENTIAL PERFORMANCE COMPLIANCE METHOD				NRCC-PRF-01-E	
Project Name: 030006-OffMed-Baseline			Calculation Date/Time:		Page 1 of 7
Compliance Scope : New Complete Building including Envelope, Lighting and HVAC Input File Name:					
A. GENERAL INFORMATION					
01	Project Address	-specify-	21	Compliance Software	Virtual Environment 2014 version 6.4.0.12
02	City	-specify-	22	Compliance Manager Version	BEMCmpMgr 2013-2 (601)
03	Zip code	90505	23	Rule Set Filename	Constructed At Runtime
04	Climate Zone	ClimateZone6	24	Building Type	Nonresidential
05	Building Front Orientation	0	25	Construction Type	
06	Number of Above Grade Stories	3	26	North Wall Area (ft2)	6,386
07	Number of Below Grade Stories	0	27	East Wall Area (FT2)	4,257
08	Number of Dwelling Units	0	28	South Wall Area (ft2)	6,386
09	Total Conditioned Floor Area (ft2)	53,628	29	West Wall Area (ft2)	4,257

IES-VE Custom Energy Outputs

IES VE with CBECC-Com and Whole-Building Energy Modeling

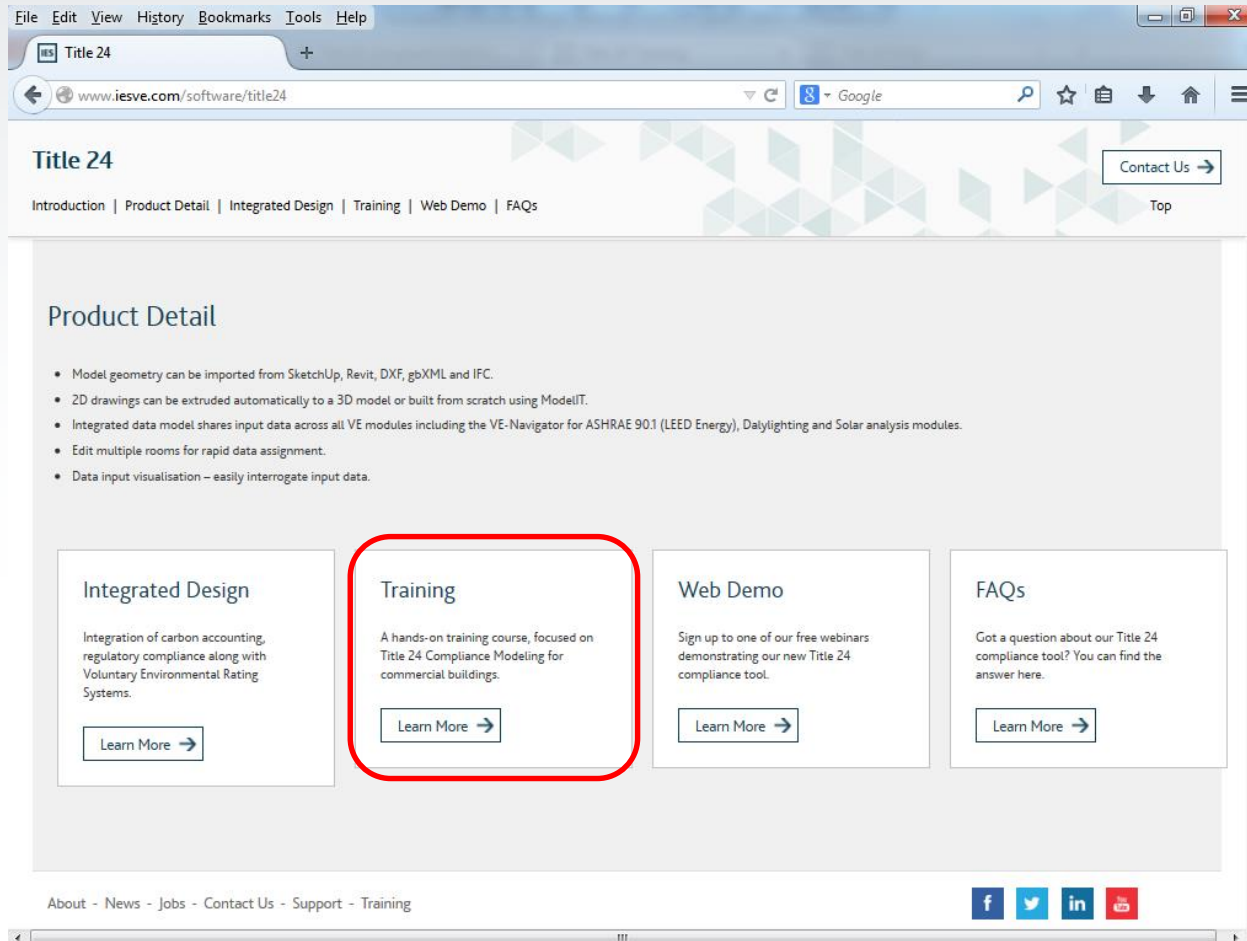
Building Energy Results Visualizations



IES-VE Title 24 Compliance Training

IES VE with CBECC-Com and Whole-Building Energy Modeling

www.iesve.com/software/title24



[San Francisco](#)

[\(PG&E\)](#)

November 10th

[LA/Edison \(SCE\)](#)

November 6th

[San Diego \(SDGE\)](#)

November 18th

[Sacramento](#)

[\(SMUD\)](#)

TBC

Web-training



IES-VE Title 24 Compliance Training

IES VE with CBECC-Com and Whole-Building Energy Modeling

Title 24 Training Agenda (9am-5pm)

- Introduction & distribution of training materials
- Overview of IES-VE software tools and Title 24 compliance workflow
- Model Management & Model Geometry:
 - Interoperability and Geometry Imports
 - 'build from scratch' workflow with tips & tricks
- Lunch (12:15-1:00pm)
- Building Data, Climate and Building Constructions Modeling
- Organization of Building Templates, room data, gains and profiles/schedules
- HVAC Zoning, air systems and fluids systems modeling
- Performing simulations, generating summary output reports and documentation



Example (AE) Training Agenda:

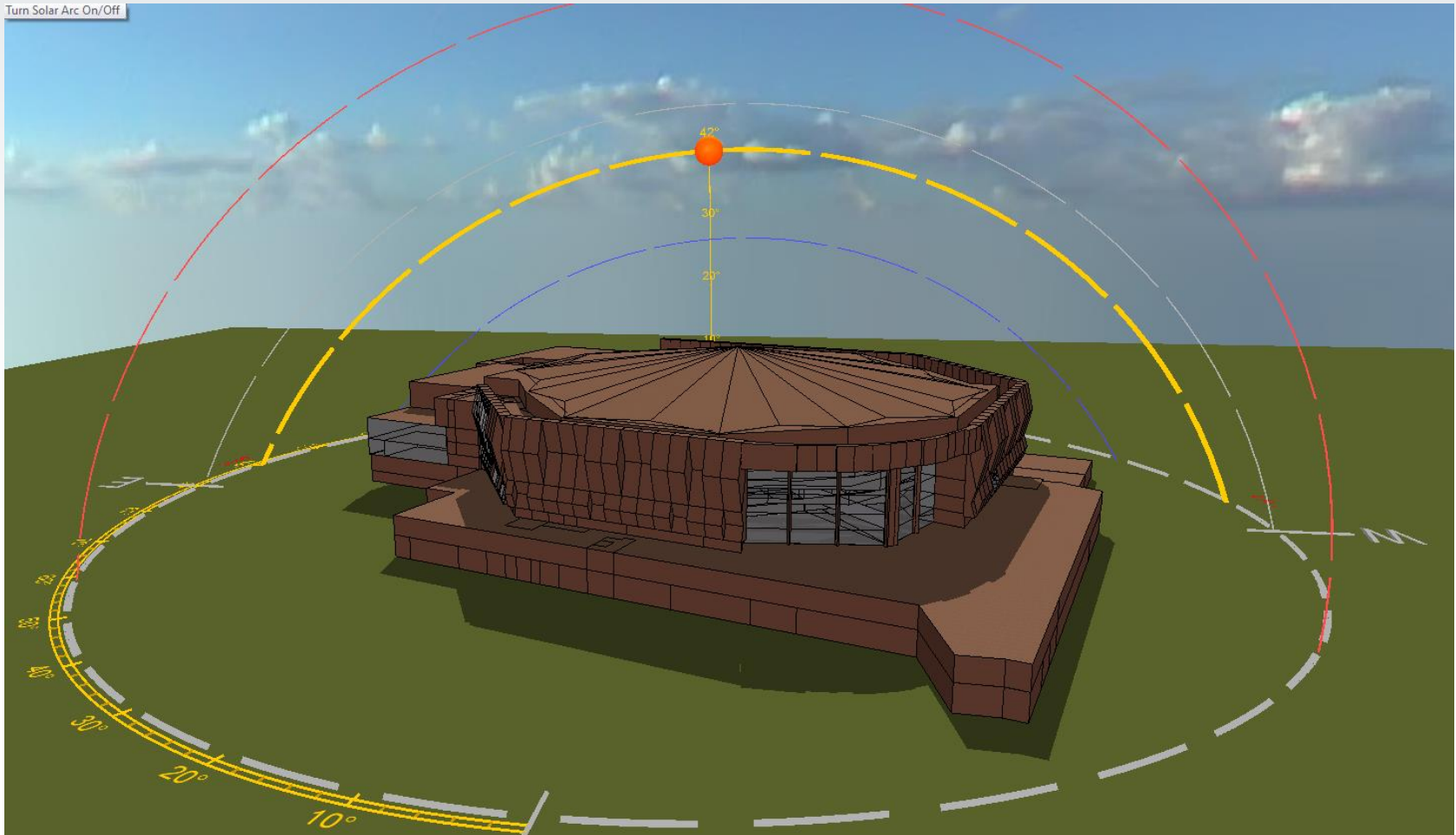
IES VE with CBECC-Com and Whole-Building Energy Modeling

Day 1 – Geometry & Daylight	Day 2 – Energy Simulation	Day 3 – Airflow & HVAC
Introduction SketchUp/Revit to IESVE work-flow Model Massing in IES-VE Climate Analytics	Water Efficiency, Solar Shading Simulation Energy Simulation (simple) Internal Gains Profiles/Schedules Envelope & Materials Studies	Intro to HVAC HVAC Loads HVAC Systems Sizing Whole Building Energy Simulation PRM Outputs & Reports ASHRAE 62.1 & 90.1
Lunch (60 minutes)		
Daylight Analysis Lighting Design Daylight for LEED Glare Analysis 3-D Daylight Simulation	Energy Simulation Occupancy Thermal Comfort Renewable Energy Analysis Natural Ventilation (bulk airflow) CFD Simulation (microscopic airflow)	Title 24 Compliance
Discussion (15 minutes)		

Case Study: Kings Basketball Arena

IES VE with CBECC-Com and Whole-Building Energy Modeling

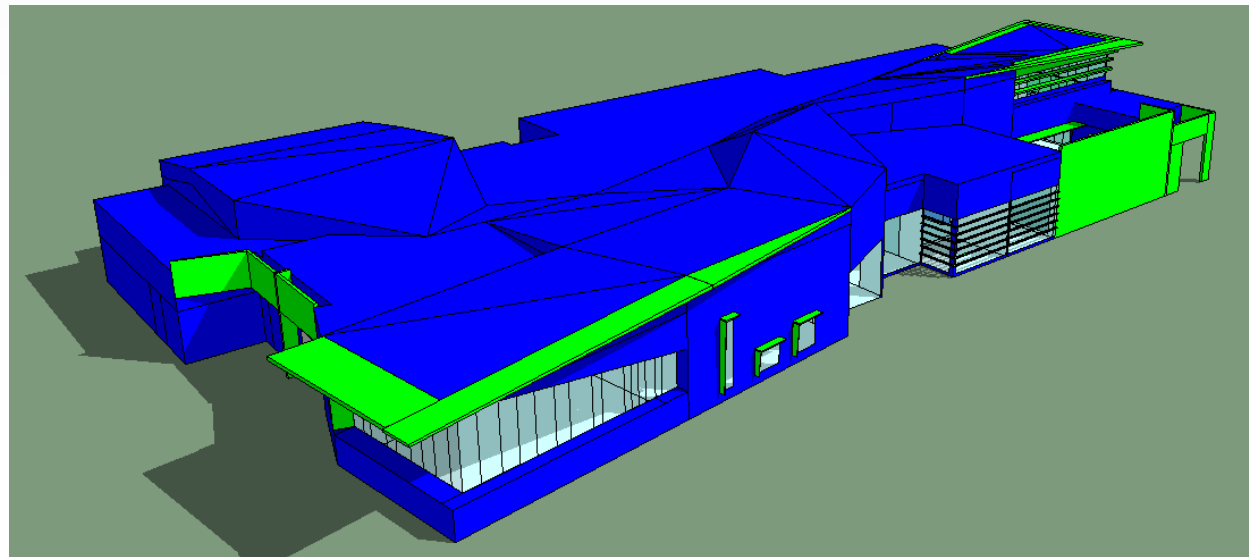
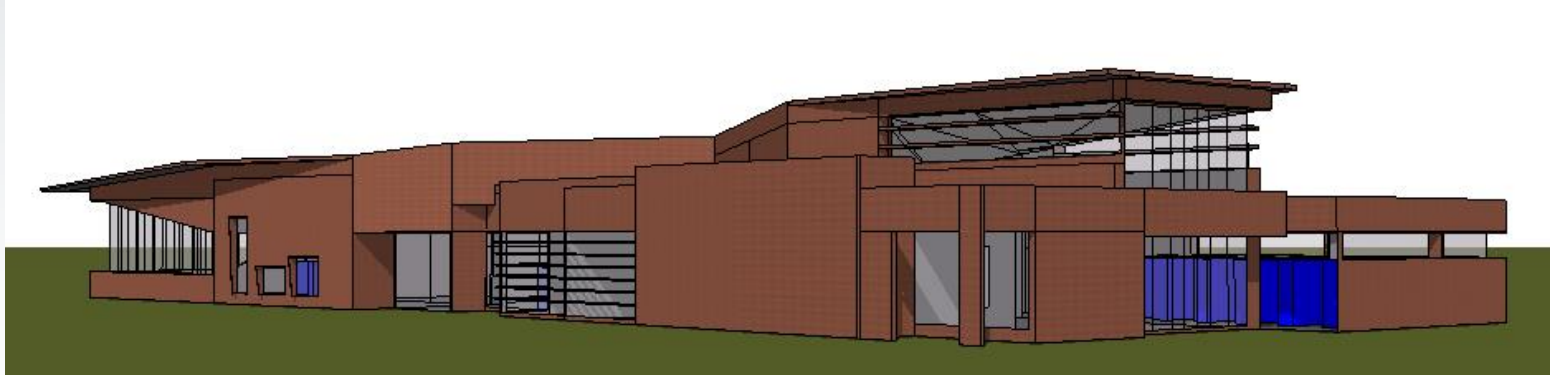
Case Study: SMUD & AECOM



Case Study: South Wittier Library, Los Angeles

IES VE with CBECC-Com and Whole-Building Energy Modeling

LEED Platinum Case Study: Green Dinosaur





INTEGRATED
ENVIRONMENTAL
SOLUTIONS

Questions / Comments



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