



Compliance Software Update

IESVE-2024

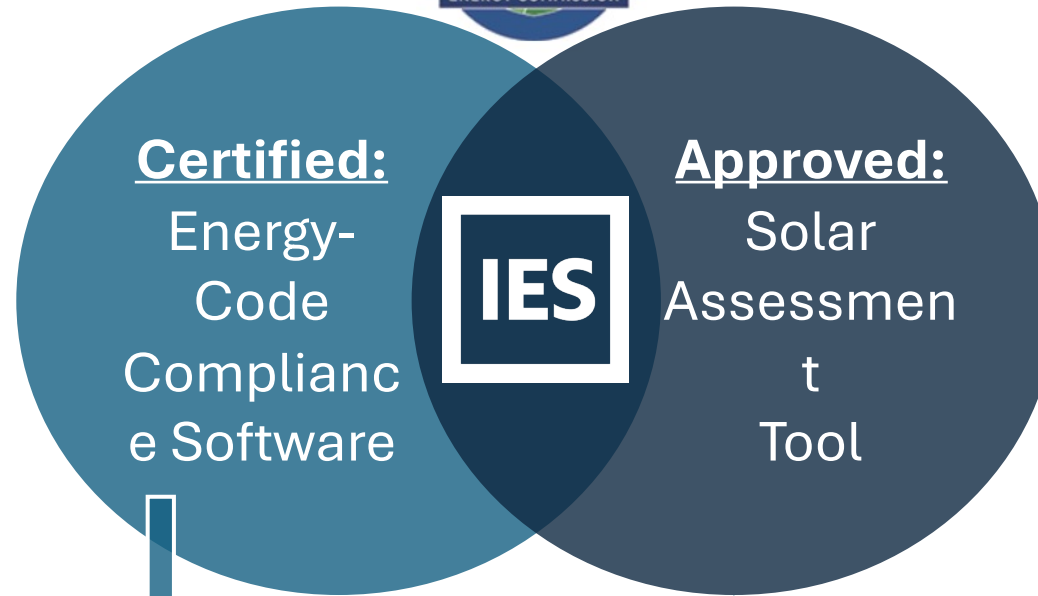
Liam Buckley

Liam.Buckley@iesve.com

www.iesve.com



Compliance Software: IESVE



- 1) Actual Design
- 2) Title 24 Proposed Design
- 3) Title 24 Standard Design

Compliance Software Update: IESVE-2024

1. Parametric Simulation Feature
2. Heat Pump Enhancement
3. Expanded US Performance Paths: ASHRAE 90.1 - Energy Cost Budget Method
4. California's Solar Assessment Tools

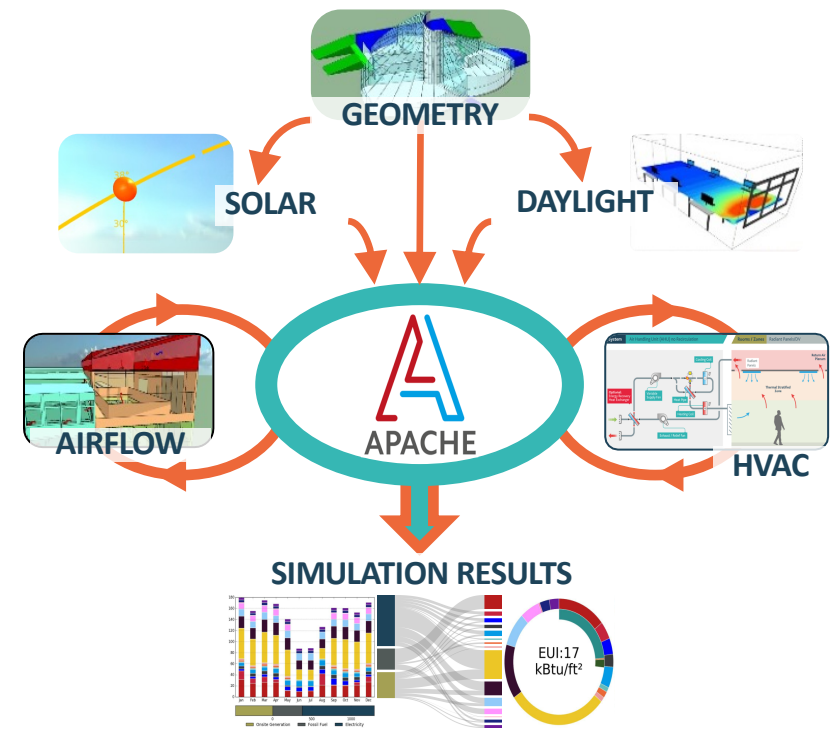
1) Parametric Simulation Feature

Highlights: Free integrated update, Automated, Data/Speed Enhancements

Input Categories & Permutation Options:

1. Site / Climate: Weather, Orientation
2. Geometry: %WWR, Shading Scenarios
3. Renewable Energy: PV panels, Wind
4. Envelope: Assemblies, Air Tightness, Operable Windows
5. Internal Gains: Lighting, Daylight Controls
6. HVAC: Setpoints, System Types

Outputs: Energy, Cost & Carbon



1) Parametric Simulation Feature - Weather

Parametric Simulation - 1-Tab Study*

File Tab Actions Help

File

- New Study
- Open Study...
- Save Study
- Save Study As...
- Delete Study

Action

- ↶
- ↷
- ↻
- ⚙

1-Tab Study (6)

Weather File	Shading Scenario	Solar Panel Area (ft ²)	External Window Const
New.York.City-La.Guardia-2020.epw	Shading scenario 1	0.000	U=0.20(1.14); SHGC=0.20; VT=
New.York.City-La.Guardia-2050.epw	Shading Scenario 2 - 1X Deep	7500.002	U=0.25(1.42); SHGC=0.25; VT=
New.York.City-La.Guardia-2080.epw	Shading Scenario 3 - 2X Deep	15000.047	U=0.30(1.70); SHGC=0.30; VT=
<i>Add new value...</i>	<i>Add new value...</i>	<i>Add new value...</i>	<i>Add new value...</i>

Lighting Max Sensible

Output Analysis Help

Temperature (°F)

Date: Fri 01/Jan to Fri 31/Dec

— Dry-bulb temperature: (USA_NewYorkManhattan_WeatherShift-2080.epw) — Dry-bulb temperature: (USA_NewYorkManhattan_WeatherShift-2050.epw) — Dry-bulb temperature: (USA_NewYorkManhattan_WeatherShift-2030.epw)

Dry-bulb temperature: (USA_NewYorkManhattan_WeatherShift-2080.epw) - °F

2080

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Dry-bulb temperature: (USA_NewYorkManhattan_WeatherShift-2050.epw) - °F

2050

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Dry-bulb temperature: (USA_NewYorkManhattan_WeatherShift-2030.epw) - °F

2030

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Selected variables list: Details Openings Rooms Variables Options

Variable	Unit	Level	Range On	Limits		Div.
				low	high	
Dry-bulb temperature	°F	Weather	User	50	95	None

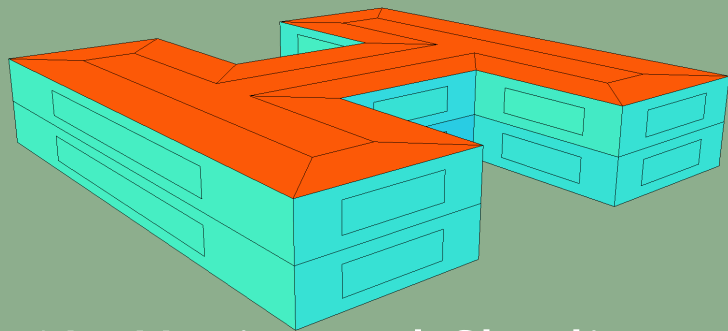
1) Parametric Simulation Feature - Architectural Shading

Parametric Simulation - 1-Tab Study*

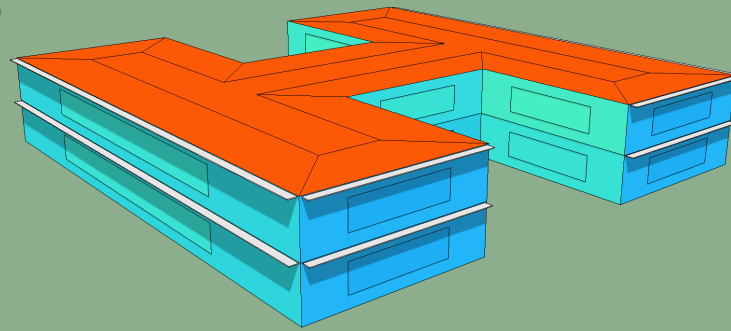
File Tab Actions Help

1-Tab Study (6)

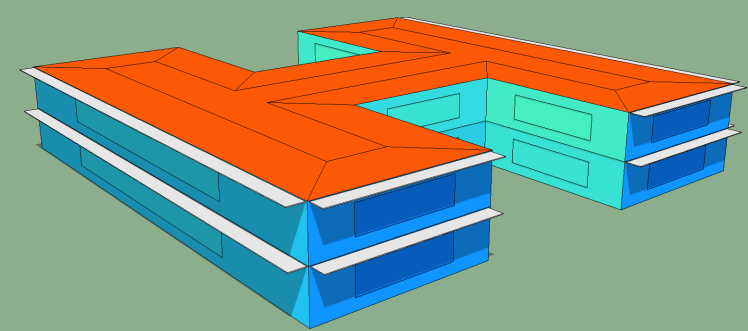
Weather File	Shading Scenario	Solar Panel Area (ft ²)	External Window Construction	Lighting Max Sensible Gain and Power Consumption (Individual Gain)	ApacheHVAC File (ASP)
New.York.City-La.Guardia-2020.epw	Shading scenario 1	0.000	U=0.20(1.14); SHGC=0.20; VT=0.60	0.600 W/ft ²	DOAS - Heat Pumps.asp
New.York.City-La.Guardia-2050.epw	Shading Scenario 2 - 1X Deep	7500.002	U=0.25(1.42); SHGC=0.25; VT=0.60	0.800 W/ft ²	DOAS with ERVs - Heat Pumps.asp
New.York.City-La.Guardia-2080.epw	Shading Scenario 3 - 2X Deep	15000.047	U=0.30(1.70); SHGC=0.30; VT=0.60	1.000 W/ft ²	VAV - Boiler and Chiller.asp
Add new value...	Add new value...	Add new value...	U=0.35(1.98); SHGC=0.35; VT=0.60	Add new value...	VAV with ERV - Boiler and Chiller.asp
			Add new value...		Add new value...



No Horizontal Shading



1X Horizontal Shading



2X Horizontal Shading

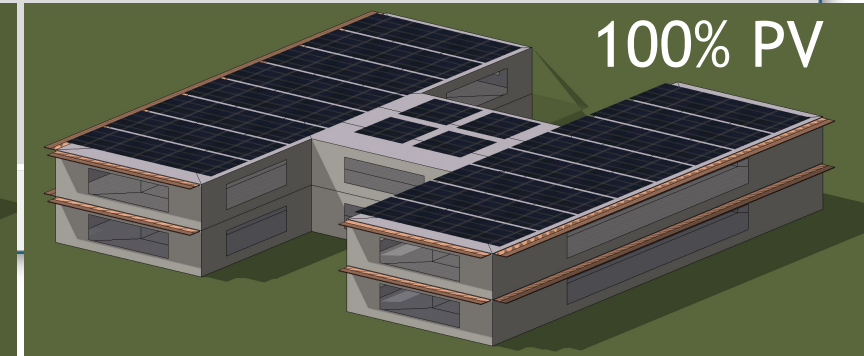
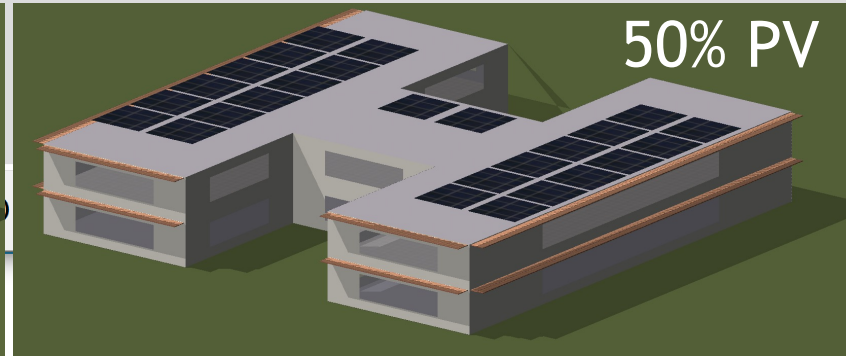
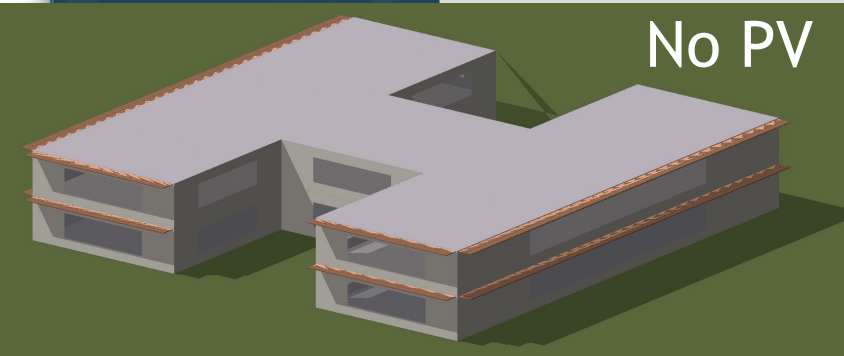
1) Parametric Simulation Feature - PV Panel Area

Parametric Simulation - 1-Tab Study*

File Tab Actions Help

1-Tab Study (6)

Weather File	Shading Scenario	Solar Panel Area (ft ²)	External Window Construction	Lighting Max Sensible Gain and Power Consumption (Individual Gain)	ApacheHVAC File (ASP)
New.York.City-La.Guardia-2020.epw	Shading scenario 1	0.000	U=0.20(1.14); SHGC=0.20; VT=0.60	0.600 W/ft ²	DOAS - Heat Pumps.asp
New.York.City-La.Guardia-2050.epw	Shading Scenario 2 - 1X Deep	7500.002	U=0.25(1.42); SHGC=0.25; VT=0.60	0.800 W/ft ²	DOAS with ERVs - Heat Pumps.asp
New.York.City-La.Guardia-2080.epw	Shading Scenario 3 - 2X Deep	15000.047	U=0.30(1.70); SHGC=0.30; VT=0.60	1.000 W/ft ²	VAV - Boiler and Chiller.asp
Add new value...	Add new value...	Add new value...	U=0.35(1.98); SHGC=0.35; VT=0.60	Add new value...	VAV with ERV - Boiler and Chiller.asp
			Add new value...		Add new value...



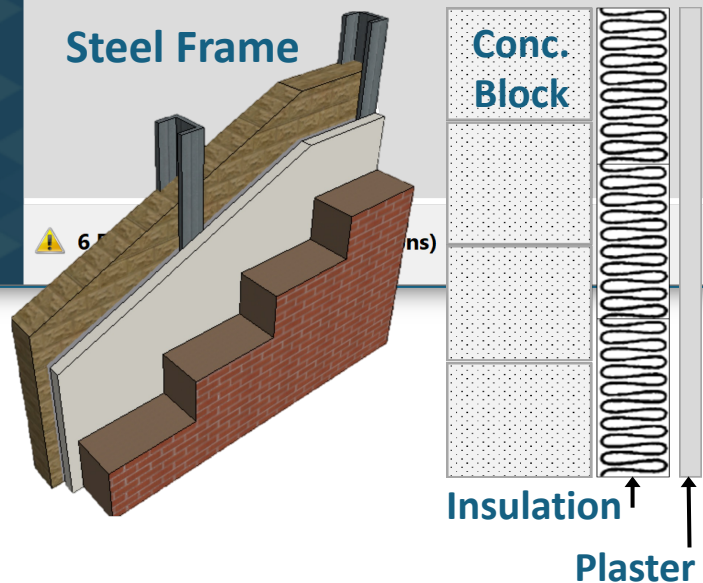
1) Parametric Simulation Feature - Envelope

Parametric Simulation - 1-Tab Study*

File Tab Actions Help

1-Tab Study (6)

Weather File	Shading Scenario	Solar Panel Area (ft ²)	External Window Construction	Lighting Max Sensible Gain and Power Consumption (Individual Gain)	ApacheHVAC File (ASP)
New.York.City-La.Guardia-2020.epw	Shading scenario 1	0.000	U=0.20(1.14); SHGC=0.20; VT=0.60	0.600 W/ft ²	DOAS - Heat Pumps.asp
New.York.City-La.Guardia-2050.epw	Shading Scenario 2 - 1X Deep	7500.002	U=0.25(1.42); SHGC=0.25; VT=0.60	0.800 W/ft ²	DOAS with ERVs - Heat Pumps.asp
New.York.City-La.Guardia-2080.epw	Shading Scenario 3 - 2X Deep	15000.047	U=0.30(1.70); SHGC=0.30; VT=0.60	1.000 W/ft ²	VAV - Boiler and Chiller.asp
Add new value...	Add new value...	Add new value...	U=0.35(1.98); SHGC=0.35; VT=0.60	Add new value...	VAV with ERV - Boiler and Chiller.asp
			Add new value...		Add new value...



MacroFlo Opening Types

MacroFlo Opening Types		Reference ID	Description	Exposure Type	Opening Category
XTRN0000	01 - No Natural Ventilation	XTRN0002	02 - Operable Windows	05. 1:1 semi-exposed wall	Window - top hung
XTRN0001	03 - Passivent Airscoop				
XTRN0002	02 - Operable Windows				

1) Parametric Simulation Feature - Lighting/Daylight

VE Parametric Simulation - 1-Tab Study*

File Tab Actions Help

1-Tab Study (6)

Weather File	Shading Scenario	Solar Panel Area (ft ²)	External Window Construction	Lighting Max Sensible Gain and Power Consumption (Individual Gain)	ApacheHVAC File (ASP)
New.York.City-La.Guardia-2020.epw	Shading scenario 1	0.000	U=0.20(1.14); SHGC=0.20; VT=0.60	0.600 W/ft ²	DOAS - Heat Pumps.asp
New.York.City-La.Guardia-2050.epw	Shading Scenario 2 - 1X Deep	7500.002	U=0.25(1.42); SHGC=0.25; VT=0.60	0.800 W/ft ²	DOAS with ERVs - Heat Pumps.asp
New.York.City-La.Guardia-2080.epw	Shading Scenario 3 - 2X Deep	15000.047	U=0.30(1.70); SHGC=0.30; VT=0.60	1.000 W/ft ²	VAV - Boiler and Chiller.asp
Add new value...	Add new value...	Add new value...	U=0.35(1.98); SHGC=0.35; VT=0.60	Add new value...	VAV with ERV - Boiler and Chiller.asp
			Add new value...		Add new value...

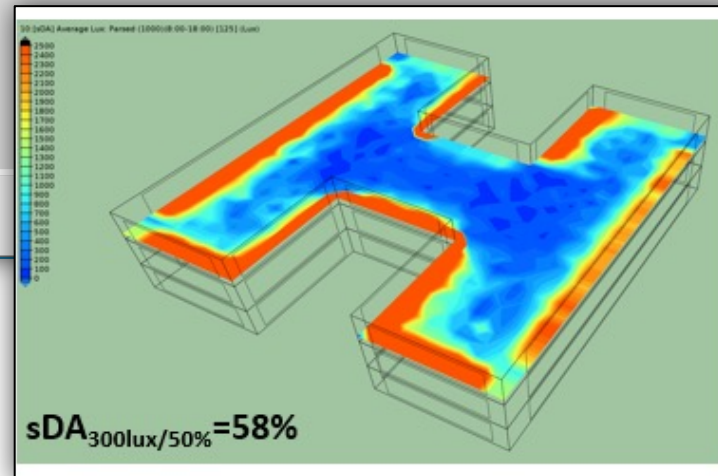
6 Parameters (1296 Permutations)

File

- New Study
- Open Study...
- Save Study
- Save Study As...
- Delete Study

Actions

- Apply run # to model...
- Import...
- Export...
- Configure tabs and columns...



Sky Resolution

The Sky Resolution is the number of patches the sky hemisphere is divided into for the calculation of the Daylight Coefficients used in the Dynamic Daylighting Simulations.

- 145 Patches
- 577 Patches
- 2305 Patches

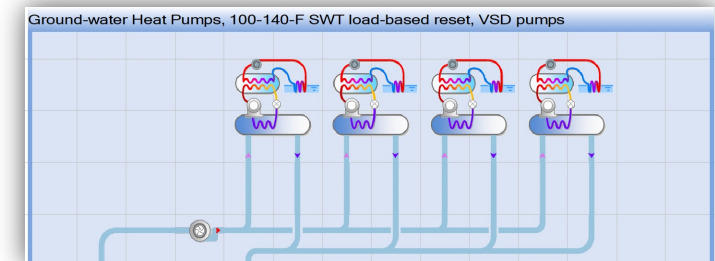
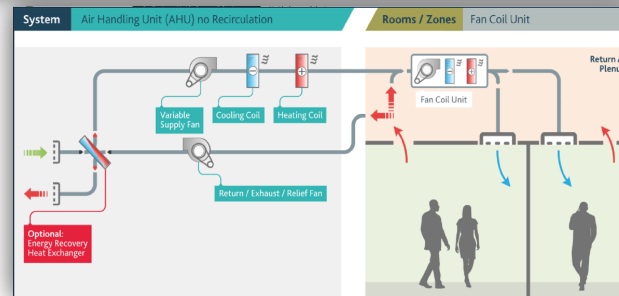
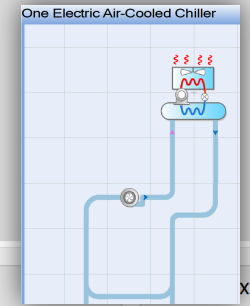
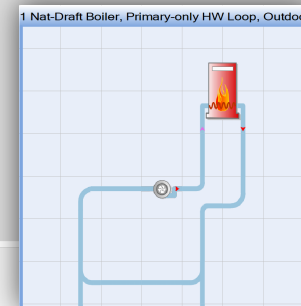
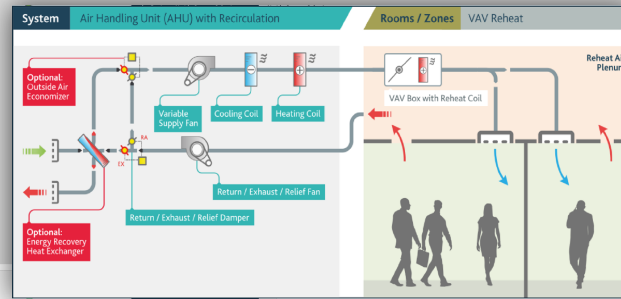
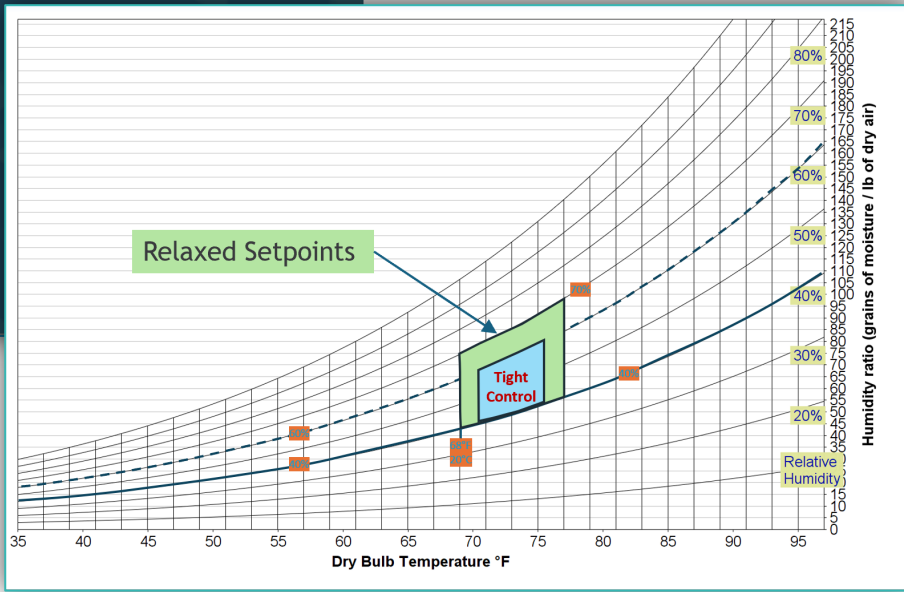
1) Parametric Simulation Feature - HVAC

Parametric Simulation - 1-Tab Study*

File Tab Actions Help

1-Tab Study (6)

Weather File	Shading Scenario	Solar Panel Area (ft ²)	External Window Construction	Lighting Max Sensible Gain and Power Consumption (Individual Gain)	ApacheHVAC File (ASP)
New.York.City-La.Guardia-2020.epw	Shading scenario 1	0.000	U=0.20(1.14); SHGC=0.20; VT=0.60	0.600 W/ft ²	DOAS - Heat Pumps.asp
New.York.City-La.Guardia-2050.epw	Shading Scenario 2 - 1X Deep	7500.002	U=0.25(1.42); SHGC=0.25; VT=0.60	0.800 W/ft ²	DOAS with ERVs - Heat Pumps.asp
New.York.City-La.Guardia-2080.epw	Shading Scenario 3 - 2X Deep	15000.047	U=0.30(1.70); SHGC=0.30; VT=0.60	1.000 W/ft ²	VAV - Boiler and Chiller.asp
Add new value...	Add new value...	Add new value...	U=0.35(1.98); SHGC=0.35; VT=0.60	Add new value...	VAV with ERV - Boiler and Chiller.asp
			Add new value...		Add new value...



1) Parametric Simulation Feature - 'Simulate' = (4-13)*Faster

The screenshot displays the 'Parametric Simulation - 1-Tab Study*' application window. The main interface includes a menu bar (File, Tab, Actions, Help) and a toolbar with options like 'New Study', 'Open Study...', and 'Save Study'. The central workspace shows simulation parameters: Weather File (New.York.City-La.Guardia-2020.epw), Shading Scenario (Shading scenario 1), Solar Panel Area (0.000 ft²), External Window Construction (U=0.20(1.14); SHGC=0.20; VT=0.60), Lighting Max Sensible Gain and Power Consumption (0.600 W/ft²), and ApacheHVAC File (DOAS - Heat Pumps.asp).

A 'Simulation' dialog box is open, showing resolution options: 'All Days', '1 Week/Month' (selected), and '1 Week/Season'. The simulation period is set from '1 January' to '31 December'.

A 'Tasks' window is also open, displaying a list of simulation tasks with columns for Name, ID, Progress, Status, Output, Model, and Cores. The 'Cores' column is highlighted with a red box, showing values of 1 for all tasks.

At the bottom right, a 'Simulate' button is highlighted with a blue box, alongside 'Cancel' and 'Save & Exit' buttons.

G2.2.1

The *simulation program* shall be approved by the *rating authority* and shall, at a minimum, have the ability to explicitly model all of the following:

a. 8760 hours per year.

11.4.1.1

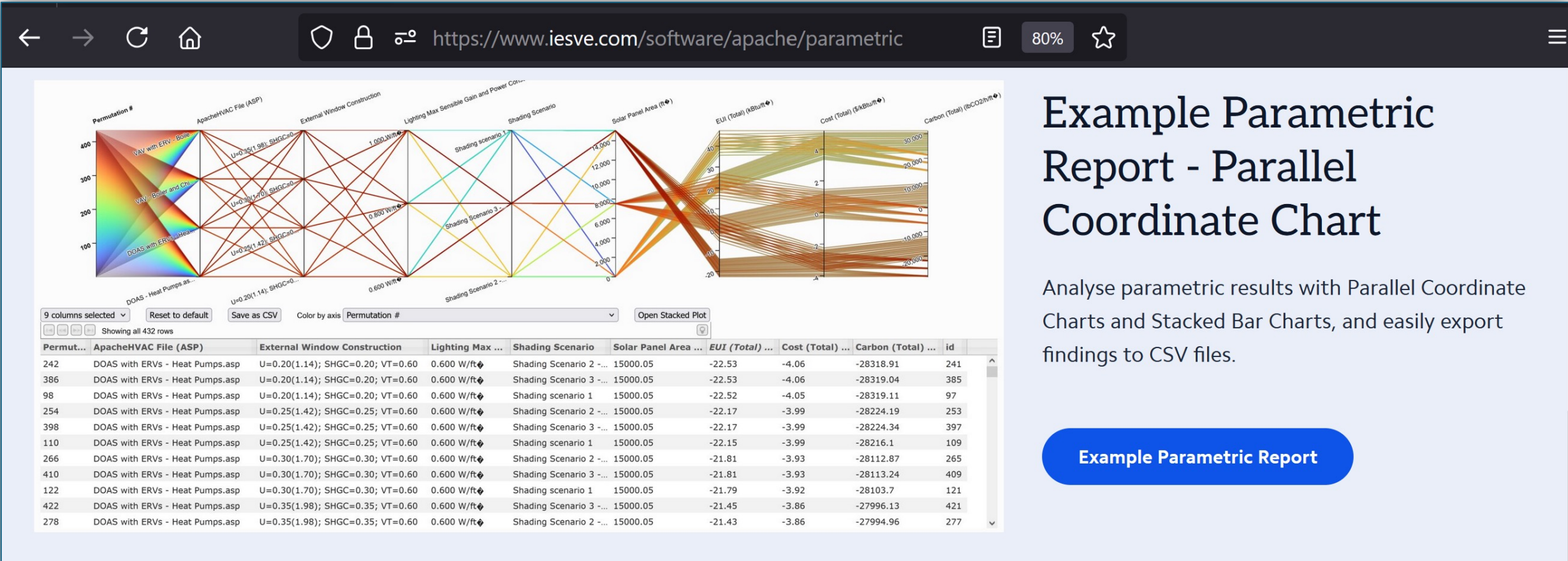
The *simulation program* shall be approved by the *adopting authority* and shall, at a minimum, have the ability to explicitly model all of the following:

a. A minimum of 1400 hours per year.

b. Hourly variations in occupancy, lighting power, miscellaneous equipment power

1) Parametric Simulation Feature - Output Reports

- CSV energy end-use data, Stacked Bar Chart and Parallel Coordinate Chart (Example for you: www.iesve.com/software/apache/parametric)



The screenshot displays the Apache Parametric software interface. At the top, a browser address bar shows the URL <https://www.iesve.com/software/apache/parametric>. The main area features a parallel coordinate chart with nine columns representing different simulation parameters: Permutation #, ApacheHVAC File (ASP), External Window Construction, Lighting Max Sensible Gain and Power Cor..., Shading Scenario, Solar Panel Area (ft²), EUI (Total) (kBtu/ft²), Cost (Total) (\$/kBlum), and Carbon (Total) (tCO2/ft²). The chart shows multiple lines representing different simulation permutations, with colors corresponding to the permutation number. Below the chart, there is a control panel with options like '9 columns selected', 'Reset to default', 'Save as CSV', 'Color by axis', and 'Open Stacked Plot'. A data table is visible at the bottom, showing the results for various permutations.

Permut...	ApacheHVAC File (ASP)	External Window Construction	Lighting Max ...	Shading Scenario	Solar Panel Area ...	EUI (Total) ...	Cost (Total) ...	Carbon (Total) ...	id
242	DOAS with ERVs - Heat Pumps.asp	U=0.20(1.14); SHGC=0.20; VT=0.60	0.600 W/ft ²	Shading Scenario 2 - ...	15000.05	-22.53	-4.06	-28318.91	241
386	DOAS with ERVs - Heat Pumps.asp	U=0.20(1.14); SHGC=0.20; VT=0.60	0.600 W/ft ²	Shading Scenario 3 - ...	15000.05	-22.53	-4.06	-28319.04	385
98	DOAS with ERVs - Heat Pumps.asp	U=0.20(1.14); SHGC=0.20; VT=0.60	0.600 W/ft ²	Shading scenario 1	15000.05	-22.52	-4.05	-28319.11	97
254	DOAS with ERVs - Heat Pumps.asp	U=0.25(1.42); SHGC=0.25; VT=0.60	0.600 W/ft ²	Shading Scenario 2 - ...	15000.05	-22.17	-3.99	-28224.19	253
398	DOAS with ERVs - Heat Pumps.asp	U=0.25(1.42); SHGC=0.25; VT=0.60	0.600 W/ft ²	Shading Scenario 3 - ...	15000.05	-22.17	-3.99	-28224.34	397
110	DOAS with ERVs - Heat Pumps.asp	U=0.25(1.42); SHGC=0.25; VT=0.60	0.600 W/ft ²	Shading scenario 1	15000.05	-22.15	-3.99	-28216.1	109
266	DOAS with ERVs - Heat Pumps.asp	U=0.30(1.70); SHGC=0.30; VT=0.60	0.600 W/ft ²	Shading Scenario 2 - ...	15000.05	-21.81	-3.93	-28112.87	265
410	DOAS with ERVs - Heat Pumps.asp	U=0.30(1.70); SHGC=0.30; VT=0.60	0.600 W/ft ²	Shading Scenario 3 - ...	15000.05	-21.81	-3.93	-28113.24	409
122	DOAS with ERVs - Heat Pumps.asp	U=0.30(1.70); SHGC=0.30; VT=0.60	0.600 W/ft ²	Shading scenario 1	15000.05	-21.79	-3.92	-28103.7	121
422	DOAS with ERVs - Heat Pumps.asp	U=0.35(1.98); SHGC=0.35; VT=0.60	0.600 W/ft ²	Shading Scenario 3 - ...	15000.05	-21.45	-3.86	-27996.13	421
278	DOAS with ERVs - Heat Pumps.asp	U=0.35(1.98); SHGC=0.35; VT=0.60	0.600 W/ft ²	Shading Scenario 2 - ...	15000.05	-21.43	-3.86	-27994.96	277

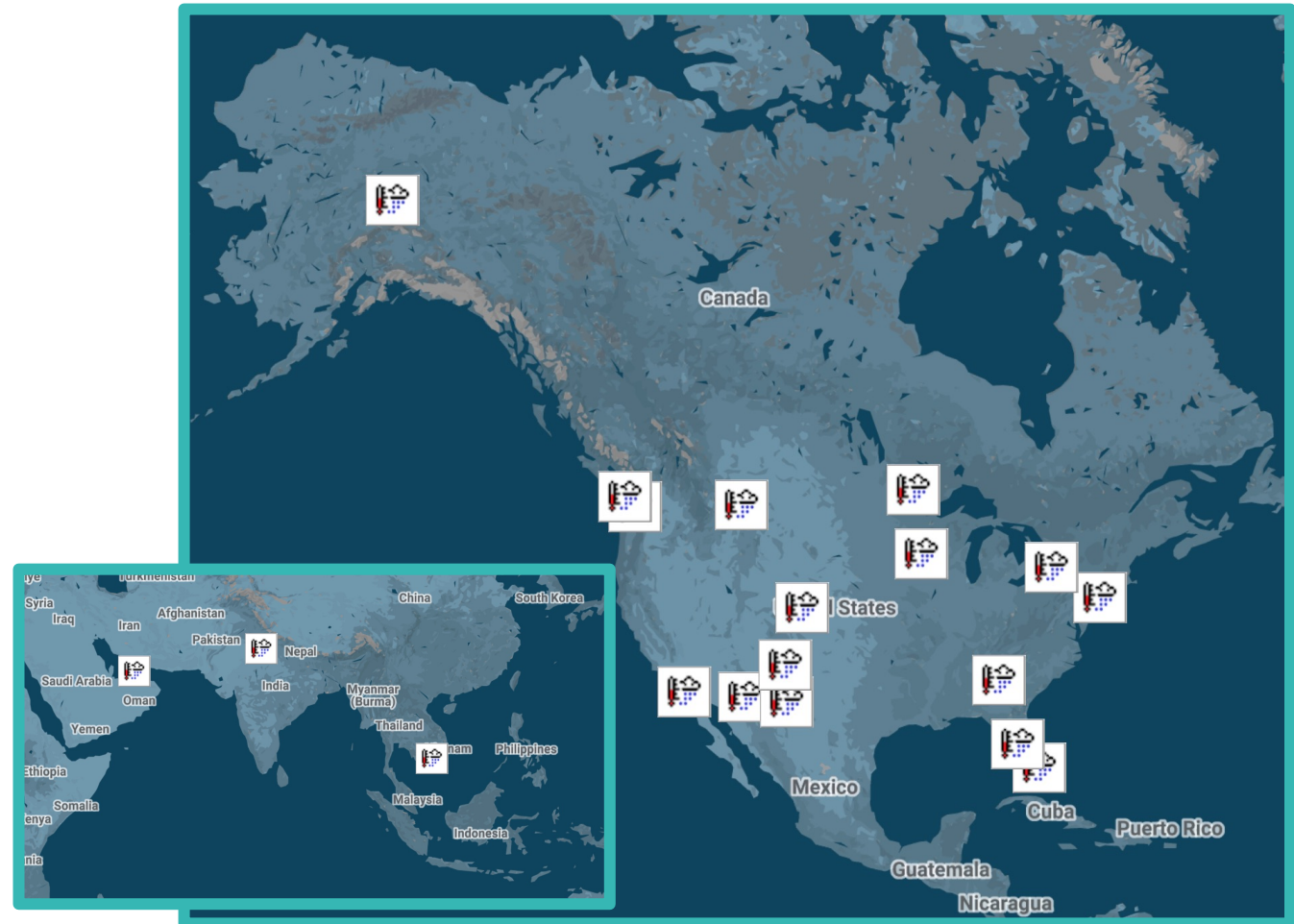
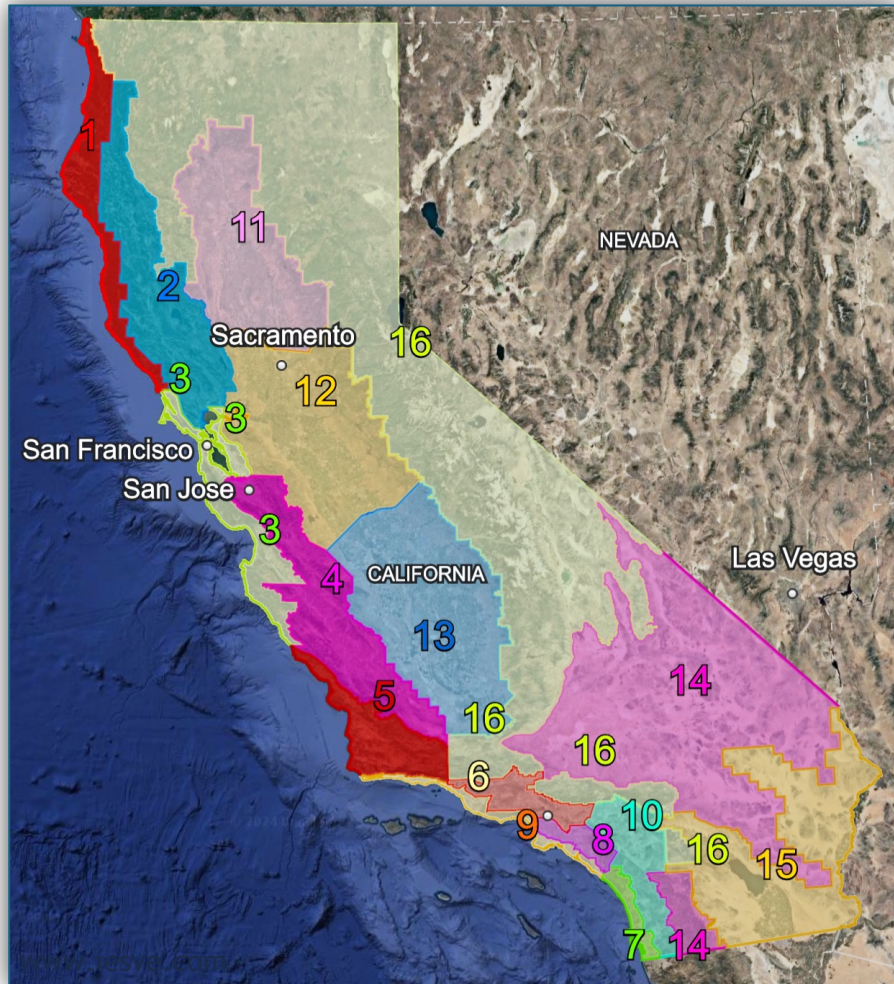
Example Parametric Report - Parallel Coordinate Chart

Analyse parametric results with Parallel Coordinate Charts and Stacked Bar Charts, and easily export findings to CSV files.

[Example Parametric Report](#)

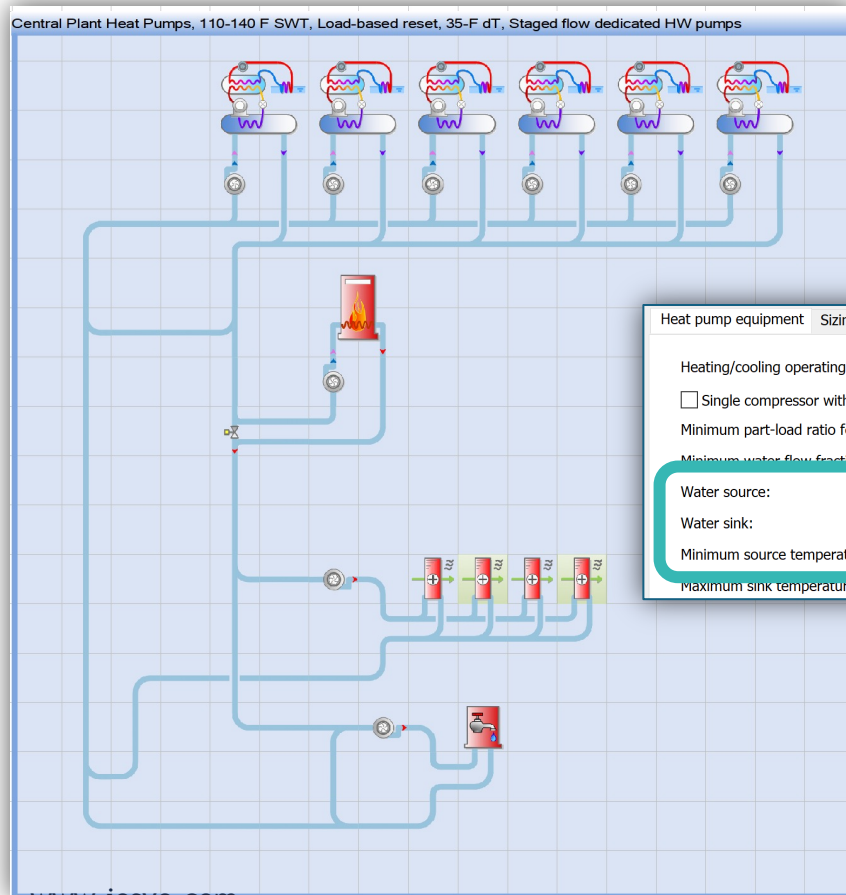
1) Parametric Simulation Feature - Future Feature

– *Locations*, for prototypical analysis by Climate Zones



2) Heat Pump Enhancements: Sink/Source

- Individual WW Heat Pump access to ambient Heat Transfer Loops, twice, as a Sink and/or Source.
- HWL (WWHPs) to gain access to heat rejected by WAHPs or WS-VRFs; or other heating equipment.



Heat pump equipment Sizing and design conditions Reference condition Performance curves

Heating/cooling operating mode control: Load Priority -

Single compressor with fixed speed/output

Minimum part-load ratio for continuous operation: 0.05

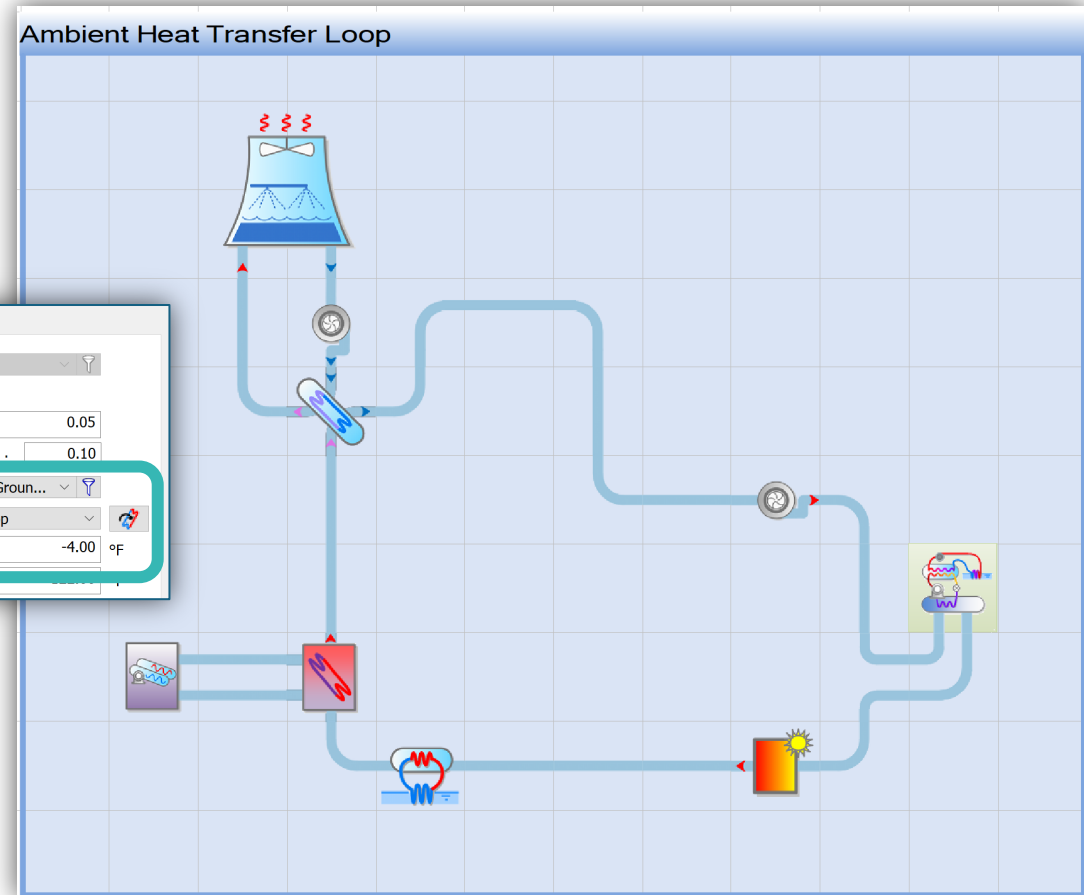
Minimum water flow fraction: HWL: 0.10 CHW: 0.10

Water source: Profile Generic Yearly Absolute - Groun...

Water sink: Heat transfer loop Ambient Heat Transfer Loop

Minimum source temperature for heating mode: Heat transfer loop -4.00 °F

Maximum sink temperature for cooling mode operation:



3) Expanded US Performance Paths: ASHRAE's ECB Method

- California *Adjacent* Compliance Modeling Paths
- Practitioner industry in US pivoting away from Stable Baseline
- ASHRAE 90.1 ECB (2016 & 2019), complimenting PRM methods
- 90.1 ECB Automation:
 - Workflow Navigator
 - Libraries, Templates, Systems
 - Budget Building Creation
 - Compliance Reports
- Approved Florida Building Commission
 - Oct 15th Business Meeting (URL)

The image shows a software interface for ASHRAE 90.1-2019 compliance modeling. On the right, a 'Navigators' pane lists various workflow steps: Preliminary Data Setup, Envelope Thermo-physical Properties, Space/Zone Thermal Template Data, Room Load Calculations, Generate ASHRAE 90.1 Baseline/Budget Model, HVAC System Selection and Sizing, Other Input Data, Simulations (Daylight Simulation, Energy Simulation), Thermal Comfort (ASHRAE 55), Utility Infrastructure & Cost, and Results. The 'ASHRAE' logo is prominently displayed over the workflow list.

On the left, a 'Results' window titled 'ECB Model Fenestration and Rotation Check' displays the following data:

Category	Value	Unit
Eastern aspect glazed area	149.96	m ²
Western aspect glazed area	49.99	m ²
Total glazed area	321.87	m ²

Below the results, there are checkboxes for 'Rotations required' and 'Exceptions'.

On the right, a report titled 'Energy Cost Budget (ECB) 2016 Compliance Report' (Page 6 of 6) is shown. It includes the IES Integrated Environmental Solutions logo and a table titled 'Energy and Cost Summary by Fuel Type*':

	Proposed Building		Budget Building		Proposed/Budget	
	Energy Use (kBtu/yr)	Energy Cost (\$/yr)	Energy Use (kBtu/yr)	Energy Cost (\$/yr)	Energy (%)	Cost (%)
Electricity	1,435,831.9	105,200.1	2,830,819.4	209,460.5	49.3%	49.8%
Gas	1,999,621.4	60,003.0	2,382,440.1	71,490.3	16.1%	16.1%
Total ex Onsite Generation	3,435,453.3	165,203.1	5,213,259.5	280,950.8	34.1%	41.2%
Elec. Gen PV	-558,116.5	-14,047.54	0.0	0.0	0.0%	0.0%
Total inc Onsite Generation	2,877,336.8	151,155.6	5,213,259.5	280,950.8	44.8%	46.2%

* These results use assumptions for showing compliance during a typical year; actual energy costs may be substantially different. Electricity usage and costs account for user defined transformer losses.

4) Solar Assessment Tools

- Discussion on 2028 shading software changes (2028 JA11), or partially sooner
- Discussion, with feedback from:
 - Industry
 - Approved Software Vendors
 - *Could 'X' be modeled?*

CERTIFICATE OF COMPLIANCE - NONRESIDENTIAL PERFORMANCE COMPLIANCE					
Nonresidential Performance Compliance Method					
F1. REQUIRED PV SYSTEMS					
01	02	03	04	05	
DC System Size (kWdc)	Exception ¹	Module Type	Array Type	Power Electronics	
0.73	NA	Custom	Fixed	none	
0.73	NA	Custom	Fixed	none	
5.02	NA	Custom	Fixed	none	
5.02	NA	Custom	Fixed	none	
5.02	NA	Custom	Fixed	none	

Compliance Forms | Title 24 Solar Shading Report

Solar Shading Report Page 1 of 1

Customer: Liam Buckley | Designer: Liam Buckley | Organization: POSE
 Address: 2721 N Main Street, Walnut Creek, CA 94597 | Coordinates: (38.61000N, 121.50000W) | Report Date: 08/22/2023

Annual Irradiance

IES Solar PV Summary

Array	Panel Area (ft²)	Azimuth (degrees)	Pitch (degrees)	Annual Solar Access (%)
East	1821.0	90.0	18.8	100.00
West	1821.0	270.0	18.8	99.99
South	807.0	180.0	25.0	99.97
Horizontal	8000.0	0.0	0.0	99.79

Note: This table assumes that all panels have the same Azimuth and Pitch. Any PV panel with an Annual Solar Access of less than 70% is non-compliant (highlighted in red).

Liam Buckley, certify that I have generated this shading report to the best of my abilities, and I believe its contents to be accurate.

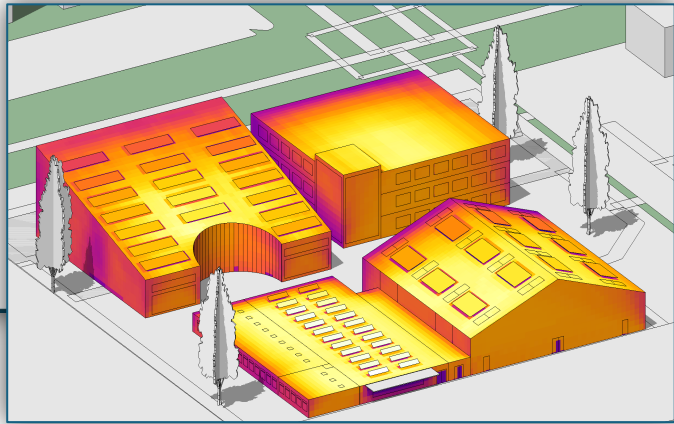


CALIFORNIA ENERGY COMMISSION

Approved Solar Assessment Tools

The following solar assessment tool has been approved by CEC for use as specified in JA11.4(a)

- Aurora Solar Inc. - Website [↗](#)
 - Aurora Solar Inc. - Shade Report Guide (Ultimate Guide) [↗](#)
- Helioscope - Website [↗](#)
- IESVE Software - Website [↗](#)
- OpenSolar - Website [↗](#)
- Scanfly - Website [↗](#)
- Solar Pathfinder - Website [↗](#)
- Solargraf - Website [↗](#)
- Solmetric Suneye - Website [↗](#)
- Sunrun Lightmile - Website [↗](#)



Thank you

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