



OpenStudio Overview – V1.4.0 New Features

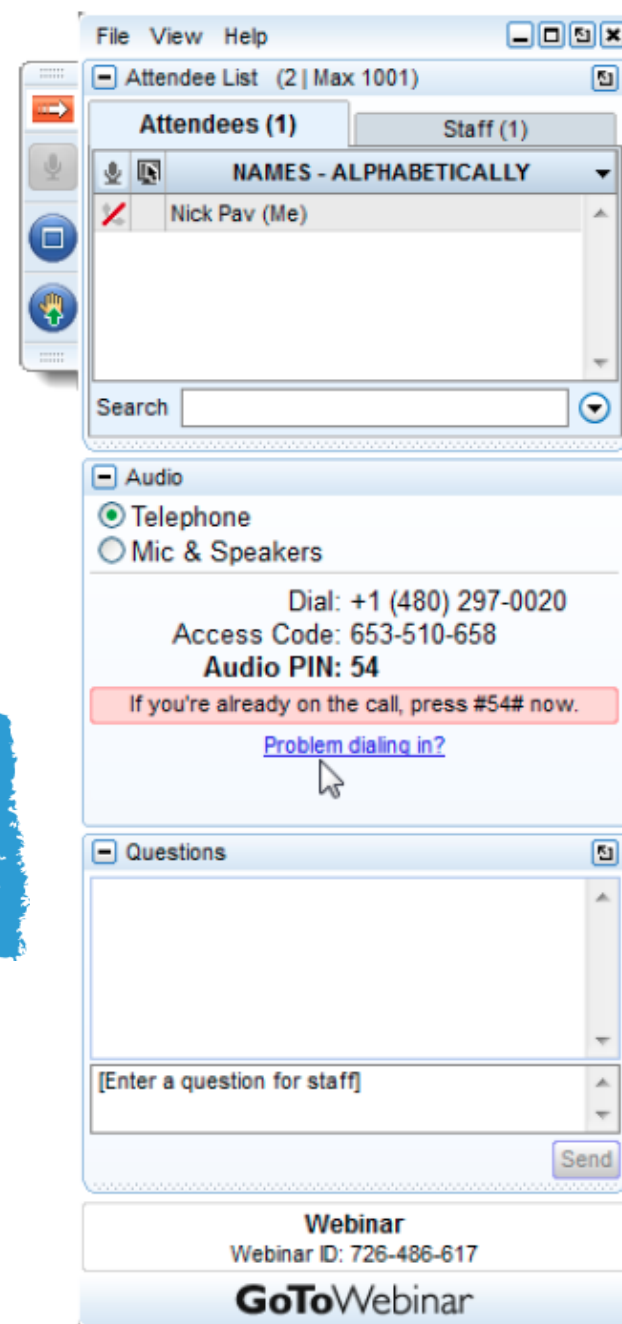
July 22nd, 2014 1:00 EST

Presented by: Chris Balbach, Vice President of R&D

PE, CEM, CMVP, BESA

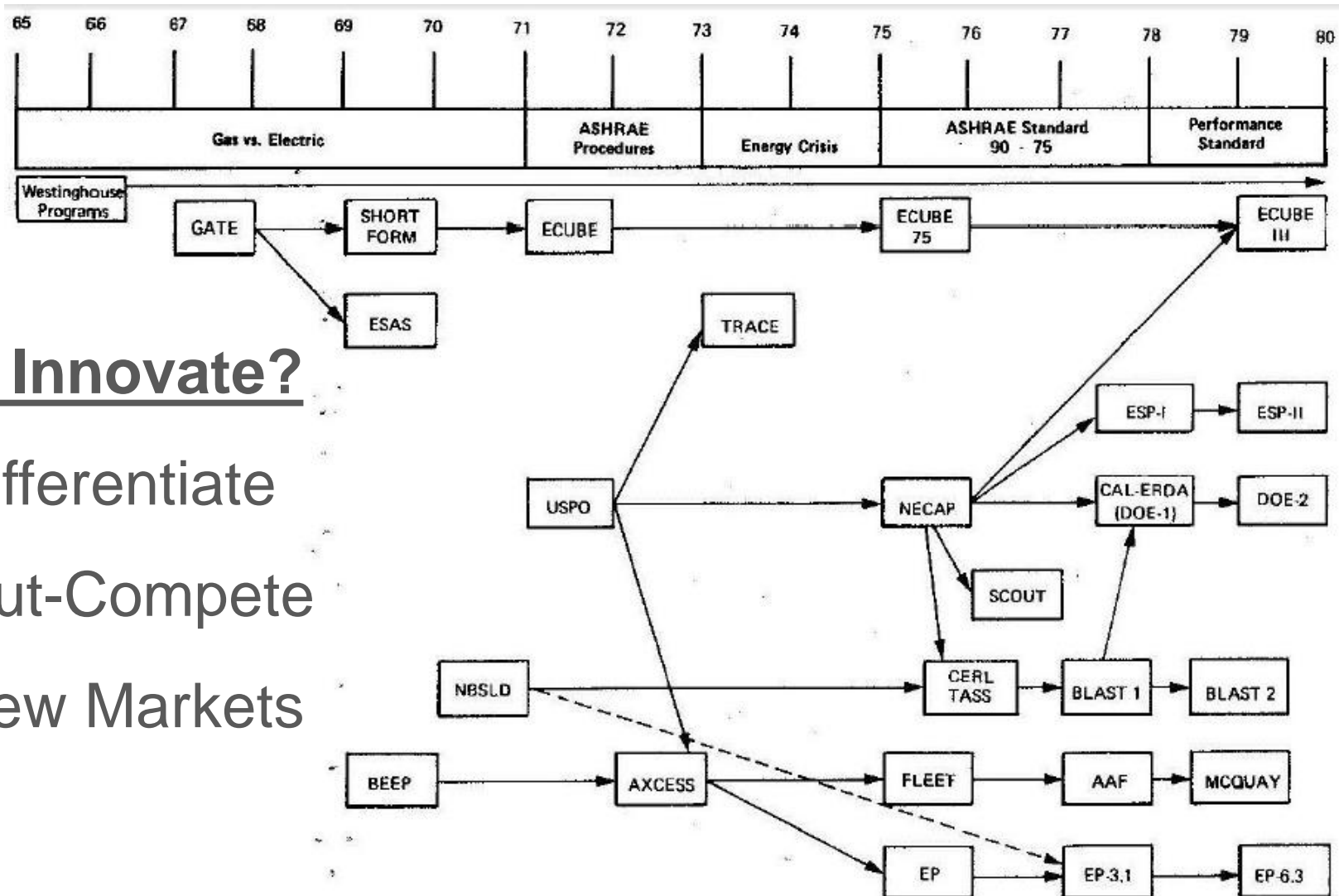
<http://www.OpenStudioTraining.com>

- If you have questions during the webinar please enter them using the questions pane.
- Unanswered questions will be answered offline and you will be sent a link to view them.



History of Energy Simulation Programs

Simulation programs: Mathematical computer models based on physical and engineering fundamentals (IBPSA, 2011).



Why Innovate?

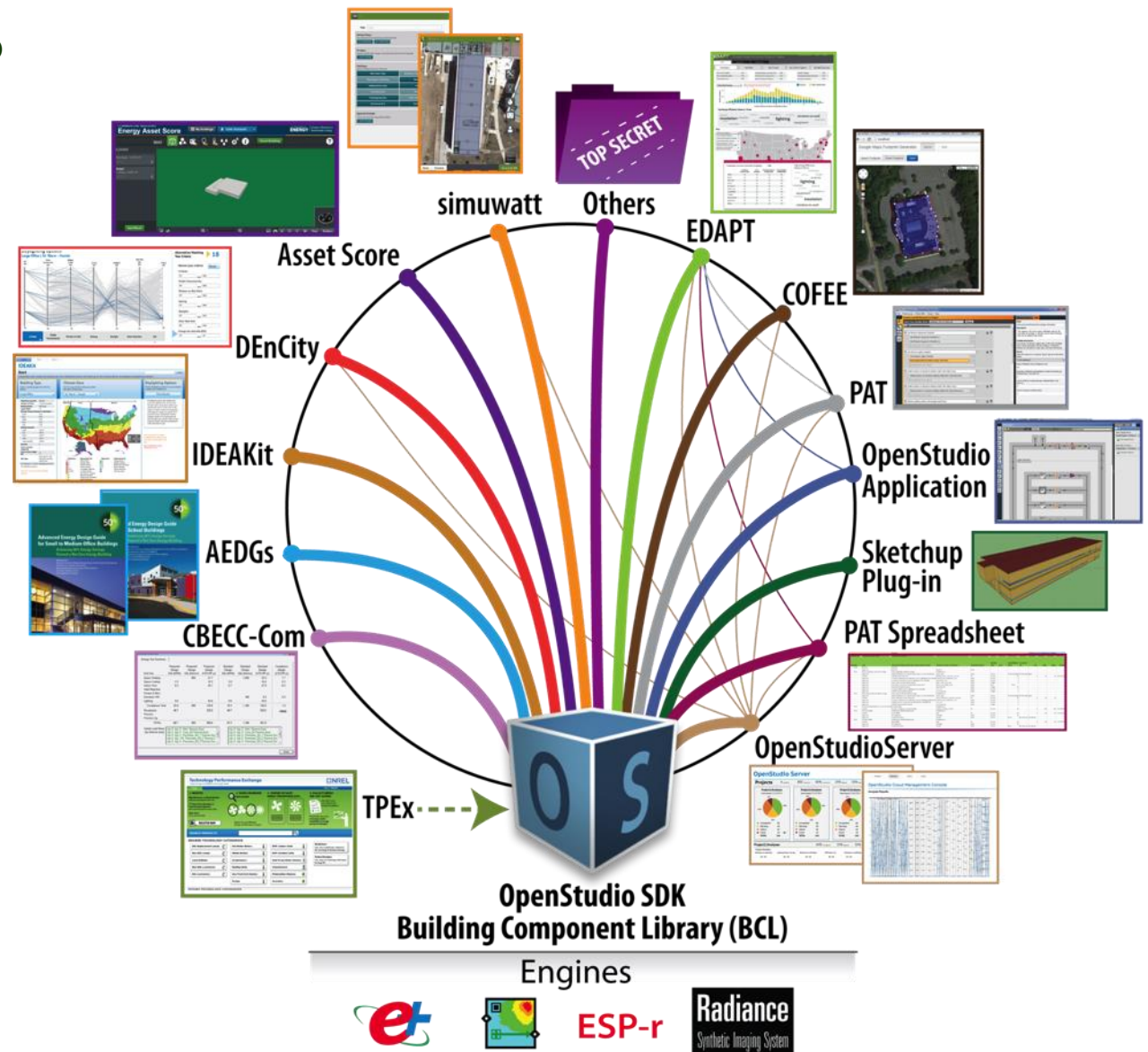
- 1) Differentiate
- 2) Out-Compete
- 3) New Markets

Energy Modeling Ecosystem

OpenStudio bridges the gap between capable but complex engines and the easy-to-use applications that drive energy savings.

- **Open Source**
- **Cross Platform**
- **Collaborative**

The Technology Performance Exchange (TPEX) and Building Component Library (BCL) provide the raw data that powers the ecosystem.



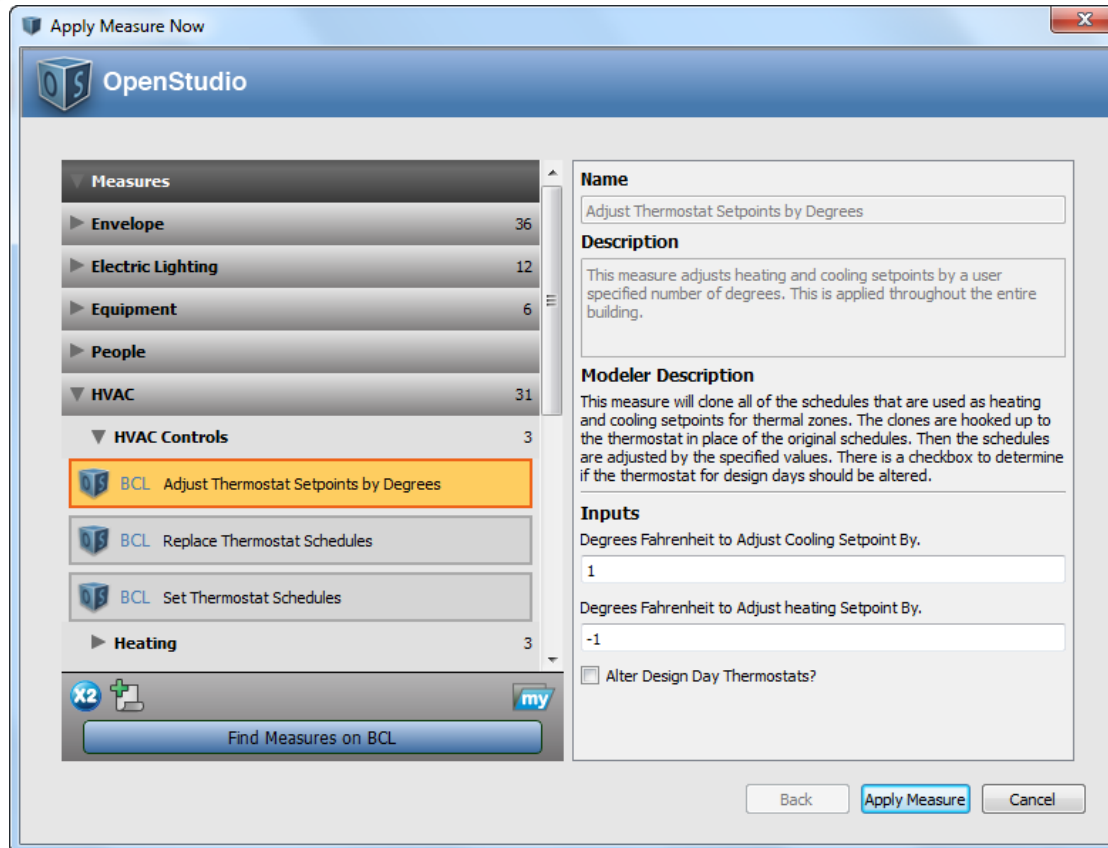
OpenStudio represents a **pathway** for innovation to occur

OS V1.4.0 - New Features (GUI Related)

- Change to OS workflow – “Apply Measures Now”
- OpenStudio Templates – Internal Loads and Constructions for ASHRAE 90.1 2007 and ASHRAE 90.1-2010
- New Unitary HVAC systems (+ Humidity Control)
- Primary / Secondary Piping Configurations
- PAT Spreadsheet Export to OpenStudio Analysis Spreadsheet
- Expanded Measures

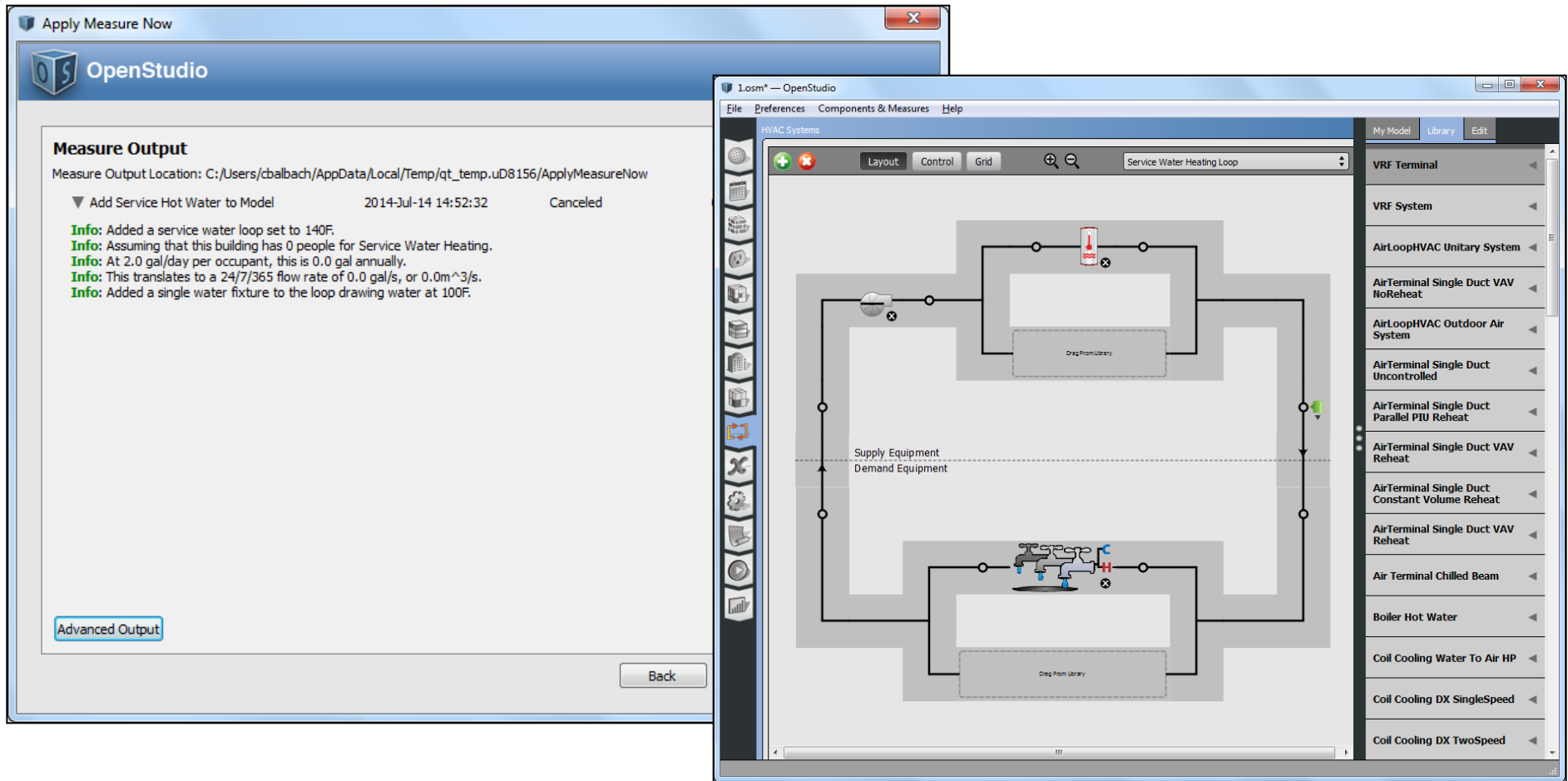


Apply Measures Now



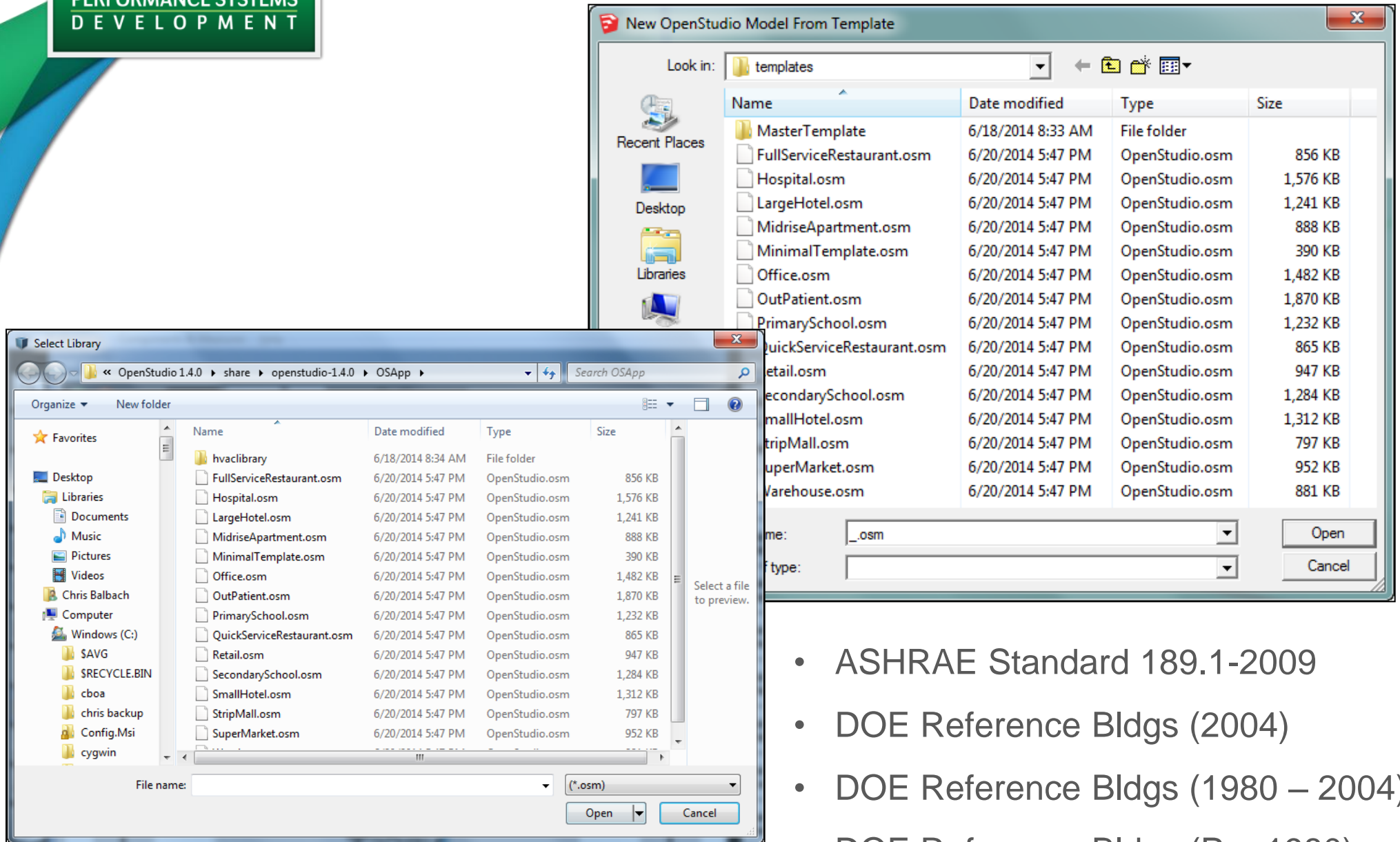
- “Inject” a measure to immediately alter the OS model
- Rapidly modify model (w/o requiring execution)

Apply Measures Now



- Can undo (revert to saved).....

Extended OpenStudio Templates



- ASHRAE Standard 189.1-2009
- DOE Reference Bldgs (2004)
- DOE Reference Bldgs (1980 – 2004)
- DOE Reference Bldgs (Pre 1980)

Additional resource definitions for **90.1-2007** and **90.1-2010**

OS Resource Objects

OS:SpaceType
 OS:DefaultConstructionSet
 OS:DefaultSubsurfaceConstructions
 OS:DefaultSurfaceConstructions
 OS:Construction
 OS:Materials
 OS:DefaultScheduleSet
 OS:ScheduleDay
 OS:DesignSpecification:OutdoorAir
 OS:Lights:Definition
 OS:Lights
 OS:People:Definition
 OS:People
 OS:ElectricEquipment:Definition
 OS:ElectricEquipment
 OS:SpaceInfiltration:DesignFlowRate
 OS:ThermostatSetpoint:DualSetpoint

TABLE 5.5-4 Building Envelope Requirements for Climate Zone 4 (A, B, C)*

Opaque Elements	Nonresidential		Residential		Semiheated	
	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value
<i>Roofs</i>						
Insulation Entirely above Deck	U-0.273	R-3.5 c.i.	U-0.273	R-3.5 c.i.	U-0.982	R-0.9 c.i.
Metal Building	U-0.369	R-3.3	U-0.369	R-3.3	U-0.551	R-1.8
Attic and Other	U-0.0.153	R-6.7	U-0.153	R-6.7	U-0.300	R-3.3
<i>Walls, Above-Grade</i>						
Mass	U-0.592	R-1.7 c.i.	U-0.513	R-2.0 c.i.	U-3.293	NR
Metal Building	U-0.642	R-2.3	U-0.642	R-2.3	U-0.761	R-1.8
Steel-Framed	U-0.365	R-2.3 + R-1.3	U-0.365	R-2.3 + R-1.3 c.i.	U-0.705	R-2.3
Wood-Framed and Other	U-0.504	R-2.3	U-0.365	R-2.3 + R-0.7 c.i.	U-0.504	R-2.3
<i>Walls, Below-Grade</i>						
Below-Grade Wall	C-6.473	NR	C-0.678	R-1.3 c.i.	C-6.473	NR
<i>Floors</i>						
Mass	U-0.496	R-1.5 c.i.	U-0.420	R-1.8 c.i.	U-0.780	R-0.7 c.i.
Steel-Joist	U-0.214	R-5.3	U-0.214	R-5.3	U-0.390	R-2.3
Wood-Framed and Other	U-0.188	R-5.3	U-0.188	R-5.3	U-0.376	R-2.3
<i>Slab-On-Grade Floors</i>						
Unheated	F-1.264	NR	F-0.935	R-1.8 for 600 mm	F-1.264	NR
Heated	F-1.489	R-2.6 for 600 mm	F-1.489	R-2.6 for 600 mm	F-1.766	R-1.3 for 300 mm
<i>Opaque Doors</i>						
Swinging	U-3.975		U-3.975		U-3.975	
Nonswinging	U-2.839		U-2.839		U-8.233	

Credit: ASHRAE 90.1-2007

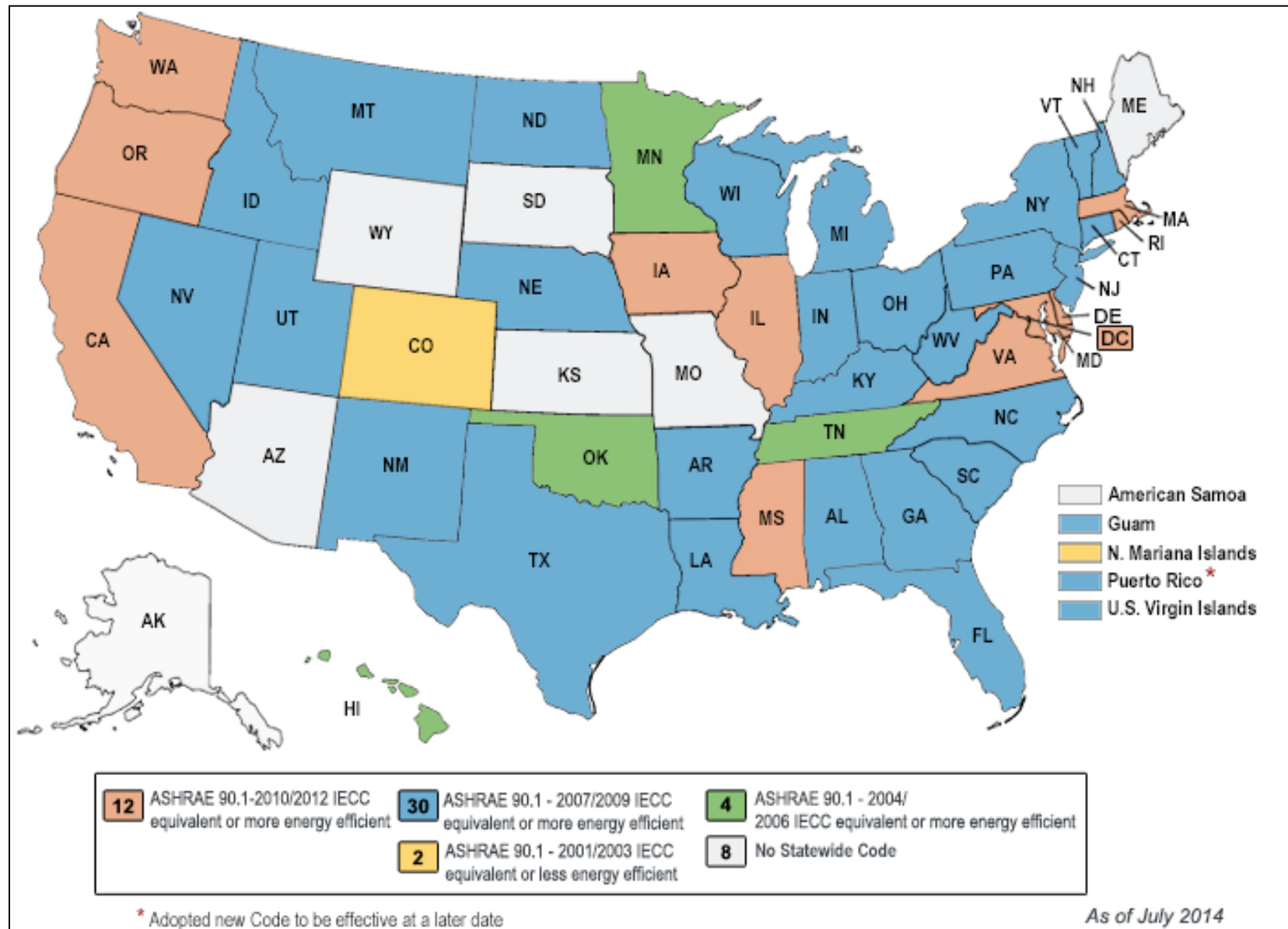
```

OS:Construction,
  {986989d3-a0b5-458d-a303-2bd0482e3989}, !- Handle
  ASHRAE 90.1-2007 ExtRoof IEAD ClimateZone 2-8, !- Name
  , !- Surface Rendering Name
  {059a9e1d-8fa3-46d9-9d65-2c7878aece55}, !- Layer 1
  {a58c3744-2d34-41f3-83c5-72b74935fd93}, !- Layer 2
  {56ba8b04-3cf1-46a3-aa00-da0a962d25c9}; !- Layer 3
  
```

Transformed into standardized, easy to apply objects

Includes “unregulated” loads – people density, EPD, etc.

Expanded OpenStudio Templates

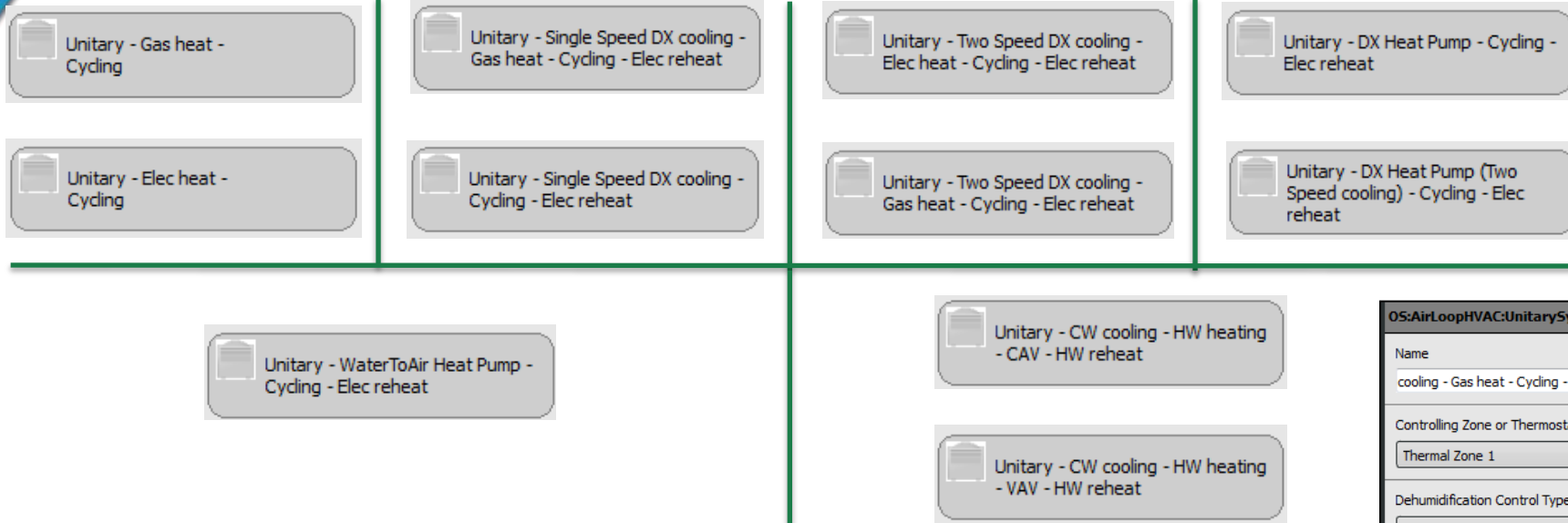


<http://www.energycodes.gov/adoption/states>

Rapid attribution of 'baseline' building components to model



New Unitary HVAC Systems



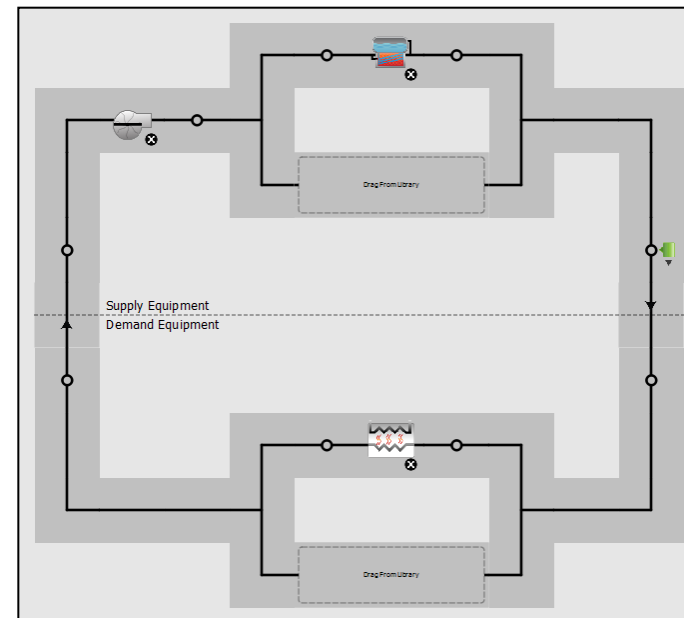
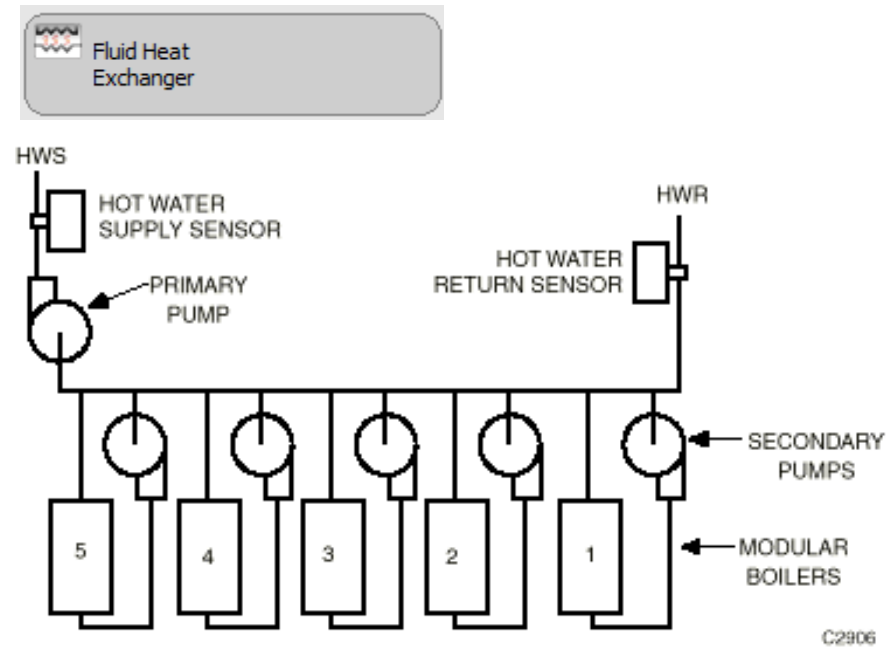
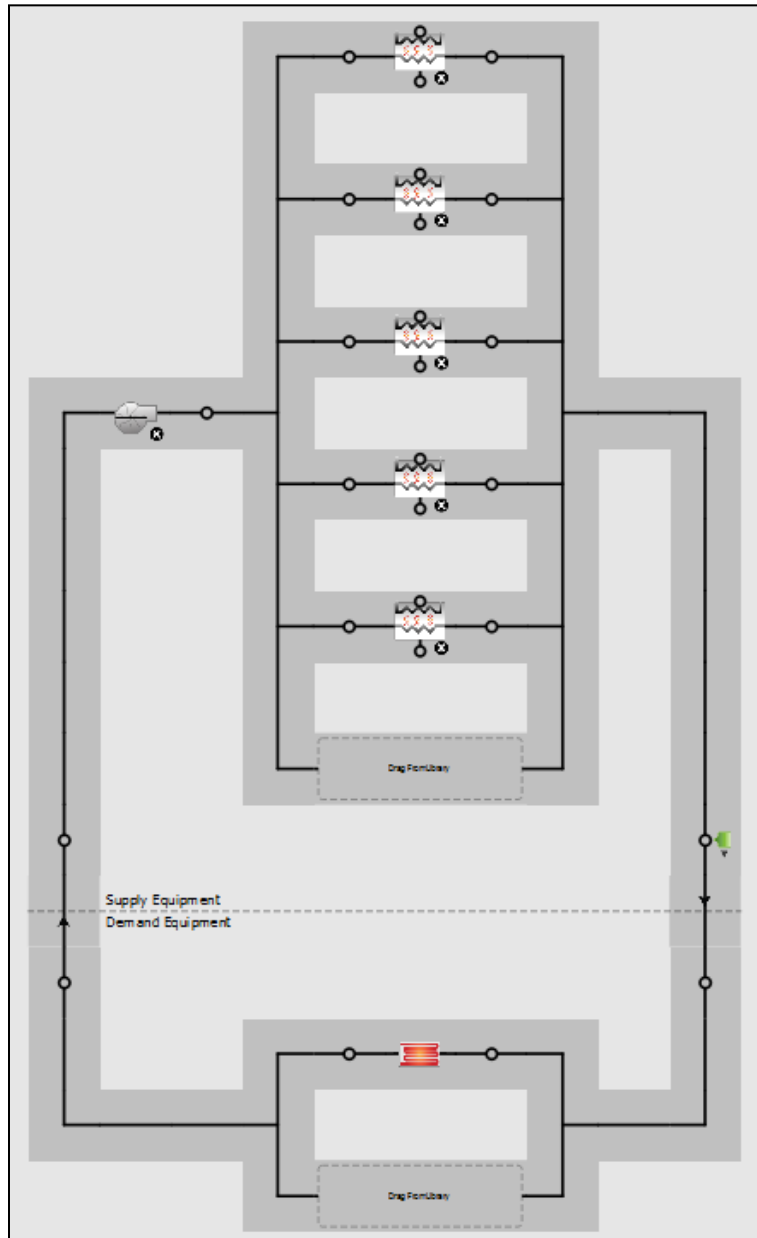
Unitary systems combine fan, cooling and heating sections into a single 'packaged' piece of equipment for simplified application and installation.

- 1) Add Air Loop
- 2) Drag, Drop and Configure
- 3) Add O/A Manager, Energy Recovery



OS:AirLoopHVAC:UnitarySystem	
Name	cooling - Gas heat - Cycling - Elec reheat
Controlling Zone or Thermostat Location	Thermal Zone 1
Dehumidification Control Type	None
Availability Schedule Name	Always On Discrete
Supply Fan Name	Fan On Off 10
Fan Placement	BlowThrough
Supply Air Fan Operating Mode Schedule Name	
Heating Coil Name	Coil Heating Gas 2
DX Heating Coil Sizing Ratio	1
Cooling Coil Name	Coil Cooling DX Two Speed 2
Use DOAS DX Cooling Coil	No

Primary / Secondary Plant Piping and Pumping Configurations



x (5)

Available from NREL Github Repository

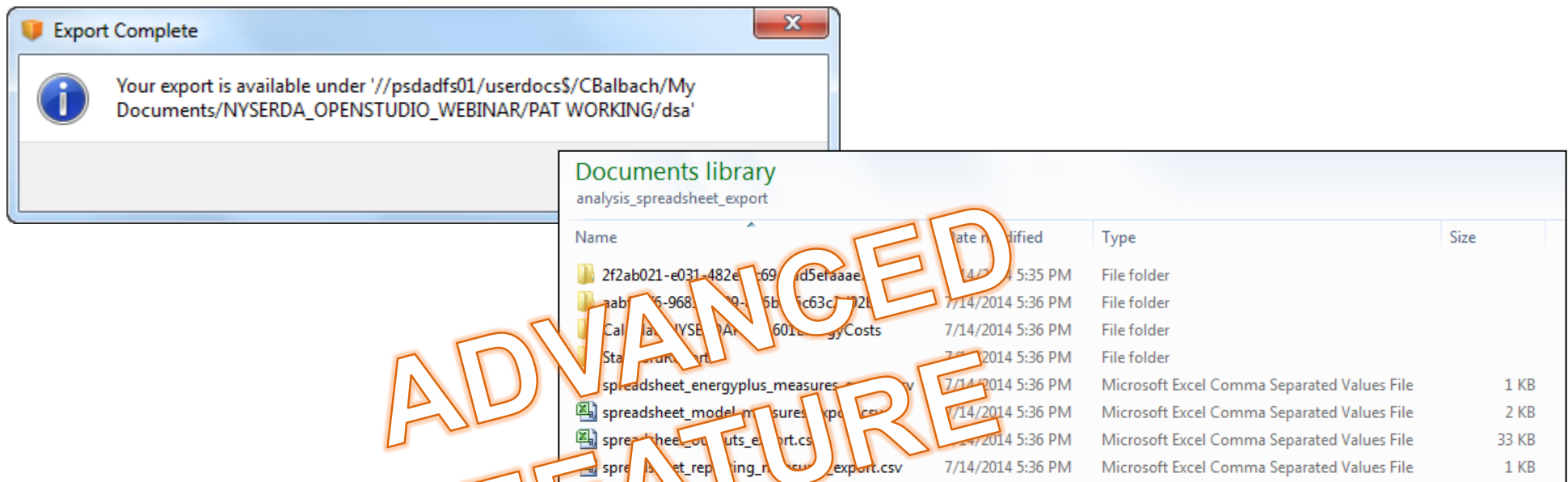
<https://github.com/NREL/OpenStudio-analysis-spreadsheet>

Alternative interface to
“PAT on the Cloud”

Spreadsheet Version	0.2.3			Do NOT change this unless advised This is the tag that is applied to your running instances so that you can identify which instances are yours. Choose which OpenStudio Server Version to Use. Do NOT change this unless advised. Note that this is not the OpenStudio version. See mappings here: http://developer.nrel.gov/downloads/buildings/openstudio/rsrc/amis_v2.json
User Id	new_user			(snake-cased). If you use this name in other spreadsheets, then you are able to submit multiple jobs to the same compute cluster.
OpenStudio Server Version	1.6.1			
Cluster Name	Default Cluster	2 Cores - Recommended for Server		
Server Instance Type	m3.large	8 Cores - Worker Only - Recommended for Worker	\$0.14/hour	Use a minimum of 2 cores for server. Depends on how many simulations. If you are testing, then you can select a smaller instance.
Worker Instance Type	c3.xlarge		\$0.42/hour	Number of worker nodes to start.
Worker Nodes	0			
Running Setup				
Analysis Name	Office Sampling			Display name of the analysis
Measure Directory	./TrainingMeasures			
Export Directory	./analysis			
Allow Multiple Jobs	TRUE			
Use Server As Worker	TRUE			
Simulate Data Point File	simulate_data_point.rb			
Run Data Point Filename	run_openstudio_workflow_monthly.rb			
Problem Definition				
Problem Type	1hs			
Analysis Type				
Algorithm Setup				
Configuration Values		Allow individual variables / all_variables		refer to override the Defaults (Column B)
Sample Method	all_variables	all_variables		
Number of Samples	6	positive integer (if individual, total simulation is this times each variable)		

Inputs										Continuous Variable Description										Discrete Variable Description									
Variable	Measure	Display Name	Measure Directory	Measure Name	Parameter Name in Measure	Sampling Method	Variable Type	Units	Static/Default Value	Enumerations	Min	Max	Mean	Std Dev	Delta	Discrete Values	Discrete Weights	Discrete Distribution	Data Source										
TRUE	createBuilding	Ratio of North/South Facade Length	701d72ce-8e72-44a7-a0b0-d043cd5b5d0d	Ratio of North/South Facade Length	ratio_n_s_facade_length_ratio	static	Double		20000		1.8	2.2	2	0.667					triangle_uncertain										
argu	totalBuildingFloorArea	Number of Floors	701d72ce-8e72-44a7-a0b0-d043cd5b5d0d	Number of Floors	num_floors	static	Integer		2																				
argu	totalBuildingFloorArea	Floor to Floor Height (ft)	701d72ce-8e72-44a7-a0b0-d043cd5b5d0d	Floor to Floor Height (ft)	floor_to_floor_height_ft	static	Double		10																				
argu	totalBuildingFloorArea	Rotation (deg)	701d72ce-8e72-44a7-a0b0-d043cd5b5d0d	Rotation (deg)	rotation_deg	static	Double		0																				
argu	totalBuildingFloorArea	Thermal Zones from Spaces?	701d72ce-8e72-44a7-a0b0-d043cd5b5d0d	Thermal Zones from Spaces?	make_zones	static	Bool		TRUE																				
argu	totalBuildingFloorArea	Window to Wall Ratio by Facade	701d72ce-8e72-44a7-a0b0-d043cd5b5d0d	Window to Wall Ratio by Facade	setWindowToWallRatioByFacade	static	Double		0.4																				
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Export populates required sections of OS Analysis Spreadsheet



Export Complete

Your export is available under '///psdads01/userdocs\$/CBalbach/My Documents/NYSERDA_OPENSTUDIO_WEBINAR/PAT WORKING/dsa'

Documents library
analysis_spreadsheet_export

Name	Date modified	Type	Size
2f2ab021-e031-482e-b69d-5e9aaae...	7/14/2014 5:35 PM	File folder	
aab016-968...	7/14/2014 5:36 PM	File folder	
Cal... NYSE... Ar... 601...	7/14/2014 5:36 PM	File folder	
Sta...	7/14/2014 5:36 PM	File folder	
spreadsheet_energyplus_measures...	7/14/2014 5:36 PM	Microsoft Excel Comma Separated Values File	1 KB
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Define and Configure Optimization Algorithm(s)

Define and Configure Objective Function(s)

Define Distributions of Input Parameter Space

Manage execution of large scale simulation studies

<https://bcl.nrel.gov/>

Components

Total Components: 47467

The components are designed to provide data to the energy modeler and simplify the process of gathering inputs. The range of components goes from whole buildings to detailed files, like duct sealing components.

search

Browse Components



Measures

Total Measures: 125

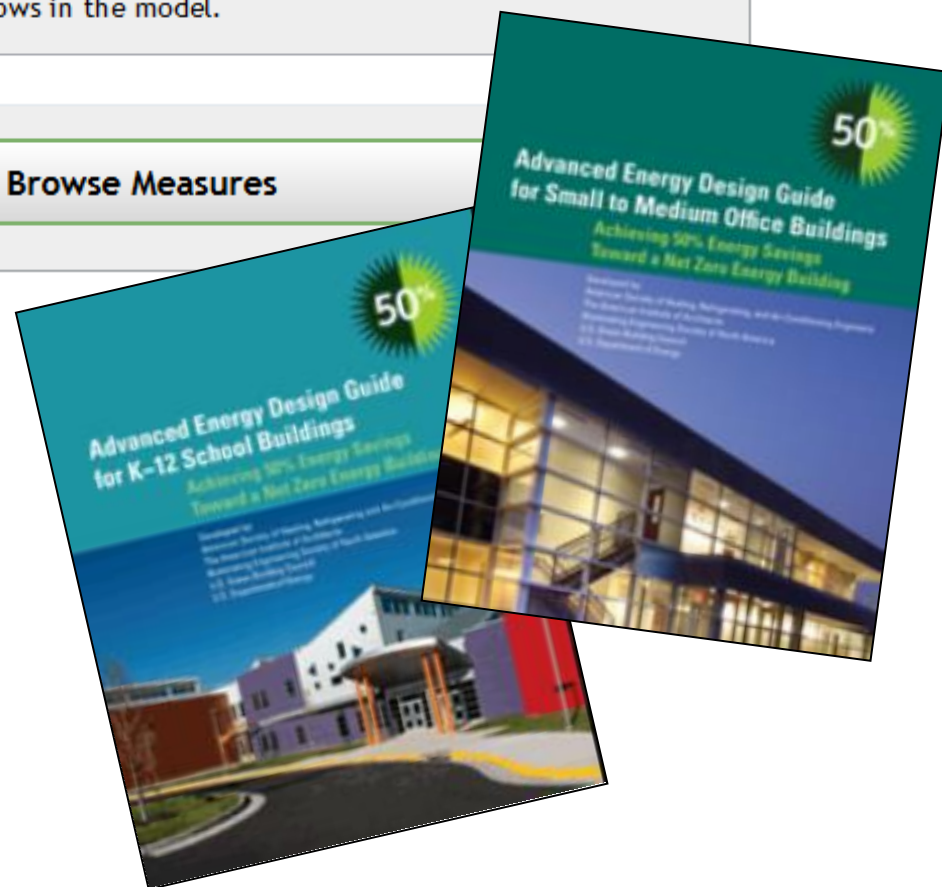
Energy saving measures are scripts that have been created to apply an energy conservation measure on an energy model. An example measure is adding overhangs to all south-facing windows in the model.

Browse Measures

AEDG K-12 & Office Measures

OS Measure Roadmap:

https://docs.google.com/spreadsheet/cc?key=0AhCALIzwiaGPdHhhaInfQktXUWtacjJwCHVoZ3Fsanc&usp=drive_web#gid=1



AUG

16

Wed

2014

Introduction to Energy Modeling with OpenStudio – FREE LIVE DEMO

(NYSERDA focused)

@ Free Webinar

Jul 16 @ 1:00 pm – 2:00 pm

JUL

22

Tue

2014

Discover New Features in OpenStudio v1.4.0

@ Free Webinar

Jul 22 @ 1:00 pm – 2:00 pm

AUG

14

Thu

2014

Sneak Peek – Open Studio

@ Free Webinar

Aug 14 @ 12:30 pm – 1:00 pm



Scheduled OpenStudio Trainings

<http://psdconsulting.com/training/ny-state-trainings/>

SEP 15 Mon 2014	OpenStudio 2-day Training @ New York, NY - Green Light NY, Suite 609 Sep 15 – Sep 16 all-day	+
OCT 8 Wed 2014	OpenStudio 2-day Training @ Binghamton, NY - Binghamton University Oct 8 – Oct 9 all-day	+
OCT 16 Thu 2014	OpenStudio 2-day Training @ Syracuse, NY - Syracuse Center of Excellence (COE) Oct 16 @ 9:00 am – Oct 17 @ 5:00 pm	+
SEP 9 Tue 2014	Leveraging and Extending OpenStudio – Measure Authoring – ASHRAE Atlanta @ ASHRAE Atlanta Sep 9 @ 8:00 am – 5:00 pm	+
DEC 16 Tue 2014	OpenStudio 2-day Training @ Washington, DC - Catholic University of America - School of Architecture and Planning Dec 16 – Dec 17 all-day	+

OpenStudio Consulting and Support Services

- **OpenStudio Component & Measure Development**
- **OpenStudio API Assistance**
- **Strategic OpenStudio Consulting**
- **Support for OpenStudio Deployment**



OpenStudio

www.openstudiotraining.com

Thank You for Participating!

For more information:

<http://psdconsulting.com/calendar>

or

<http://psdconsulting.com/training/ny-state-trainings/>

