This document responds to the comments presented by Mo Madini and Staff from Florida Department of Business and Professional Regulation on the online document: <u>www.floridabuilding.org/fbc/commission/FBC_1018/Energy_Tac/Staff-Comments.pdf</u>. The IESVE team thanks Mo and Staff for the comments (in *black text*), and encourage the interested parties to view the following responses (in green text).

Staff Comment #1: Compliance certificate box should be revised for consistency with Section C103.1.1 of the 6th Edition (2017) Florida Building Code, Energy Conservation

Response #1: There is space for name, signature, title, registration number, etc. for reviewer as shown in Figure 1 that is on the ECB Compliance Report from IESVE 2018.

Energy Cost Budget (EC	B) 2013 Compl	liance Repo	Ort Page 1 of 2	Energy Cost		ECB) 20)13 Com	pliance	Report	Page 2 of 2		
Project Name: Florida Solar Energy Center Project Address: 1679 Clearlake Road,				Project Name: Florida Solar E Contact Person: Joe Bloggs	nergy Center		Email: Joe Biog	gs@FBC.com	Telephone: (32	0.638-1410		
(18 Stories), Cocoa, Florida, 32922-5703		Date: 20-Sep-2018		Energy Results				100.000	reception of the	,,		
	e.Bloggs@FBC.com e.Bloggs@FBC.com	Telephone: (321) 638- Telephone: (321) 638-		Energy resolute		Propose	ed Building	Budget	Building	Proposed/		
City: Cocoa		Principal Heating Sou		End Use	Energy Type	Energy	Peak	Energy	Peak	Budget Energy		
Weather Data: USA_FL_Orlando.Executive.AP.722053_TI	IY3.epw	Fossi Electr				(kBtulyr)	(kBturh)	(kBtu/yr)	(kBtulh)	(%) (%)		
		Ø Solar	/site recovered	Lighting - conditioned	Electricity	2,505,895.4 4,173.4	891.0 0.9	3,023,653.2 8,183.2	943.4 1.7	17.1% 49.0%		
		Other		Space Heating	Gas	4,173.4 696,090.5	1,060.0	980,221.0	3,016.2	29.0%		
Space Summary	Over div.	Desceller 1		Space Cooling	Electricity	2,778,427.7 197,603.7	1,515.5	4,450,286.7	2,637.1	37.6% 79.1%		
Building Use	Conditioned Area (ft ²)	Unconditioned Area (ft ^a)	Total (ft ^o)	Heat Rejection Pumps	Electricity	197,603.7 49,096.7	32.1	947,164.7 347,046.0	397.3	79.1% 85.9%		
SPACE: Office - Open plan	460805.9	0	450805.9	Fans Interior	Electricity	868,597.2	264.8	1,924,982.0	996.2	54.9%		
SPACE: Storage - All Other Total	38400.5 499206.3	0	38400.5 499206.3	Receptacle Equipment Office Equipment	Electricity	66,661.4 6,892,521.8	23.6 2,122.7	66,661.5 6,554,428.8	23.6 2,122.7	0.0%		
Advisory Messages				Elevators Escalators	Electricity	105,783.3	34.1	105,783.3	34.1	0.0%		
	Proposed Building	Budget	Difference	Total building consumption		14,164,851.2		18,408,410.3		23.1%		
Number of hours heating loads not met (system/plant)	Design 0.0	Building 0.0	Proposed/Budget 0.0	Energy and Cost Summar		d Building	Rudent	t Building	0	d/Budget		
Number of hours cooling loads not met (system/plant)	0.0	0.0	0.0		Energy	Cost	Energy	Cost	Energy	Cost		
Number of warnings Number of errors	•		-	Electricity	(kBtu/yr) 13.468.760.6	(\$/yr) 2.020.314.1	(kBtu/yr) 17,428,189.3	(\$/yr) 2.614.228.4	(%) 22.7%	(%) 22.7%		
Number of defaults overridden				Gas	696,090.5	34,804.5	980,221.0	49,011.0	29.0%	29.0%		
Compliance Result				Total ex Onsite Generation	14,164,851.1	2,055,118.6	18,408,410.3	2,663,239.4	23.1%	22.8%		
The design detailed in the above-referenced plans complie Standard 90.1-2013 and the design energy cost does not e			CONDUCT OF CONDUCT	Elec Gen PV	-760,537.9	-114,080.7	0	0	0%	0%		
with the ANSI/ASHRAE/IES Standard 90.1-2013 ECB con		refore, this design DOES (COMPLY	Total inc Onsite Generation * These results use assumptions for s	13,404,313.2	1,941,037.9			27.2%	27.1%		
Individual certifying authenticity of the data provided in this						·,,,						
Signature	Title			Notes The results are based on 8760) simulated hours							
				60 Rooms included in the unm	et load hours check							
												Char
												Spac
												addi
											l	uuui
												note
												licer
												neer
Integrated Enformential Solutions				Integrated Environmental Sc	lutions							
Integrated Epronential Solutions				Integrated Environmental Sc	lutions							stan

Field for Signature of Reviewer

Field for title, licensure, etc.

Staff Comment #2: Compliance report should be revised to provide for specific documentation of the proposed building design energy measures for the applicable building systems (building Envelope, Lighting, HVAC, Service Water Heating...etc.)

Staff Comment #3: Compliance report should document compliance with the mandatory requirements of Section 11; Energy cost Budget Method of ASHRAE 90.1 – 13.



Comparison of Proposed versus Budget Design

	Model Input parameter	Prop	Budget			
	Construction	Description	Input U value / % (area weighted)	Description	Input U value / % (area weighted)	
Exterior wall constru	uction	A3 External Wall	0.06	CZ1 Ext Wall (Non- Res) - Steel Framed; R-13.0; U=0.124 (0.704)	0.12	
Roof construction		A3 Roof	0.05	CZ1 Roof (Non- Res) - Ins Above Deck; R-20 c.i; U=0.048 (0.272)	0.05	
Floor/slab construct	ion	A1 Ground Floor Slab	0.11	Ground contact floor: U=F(0.73)*Floor perim. (131.234ft)/Floor area(1076.39ft ²)	0.05	
Floor/slab construct	ion			CZ1 Floor (Non- Res) - Steel Joist; R-0; U=0.350 (1.99)	0.35	
Window to gross wa	all ratio	Overall	31%	Overall	31%	
Window to gross wa	Il ratio	North / South / East / West	31 / 31 / 31 / 31%	North / South / East / West	31/31/31/31/31%	
Fenestration U-Value (ie (North)	A1 CZ1 External Window	1.00	CZ1 Window (Non- Res)Metal framing (fixed)U=0.57; SHGC=0.25; VT=0.275	0.57	
Fenestration U-Valu	ie (non - North)	A1 CZ1 External Window	1.00	CZ1 Window (Non- Res)Metal framing (fixed)U=0.57; SHGC=0.25; VT=0.275	0.57	
Fenestration SHGC	- North	A1 CZ1 External Window	0.19	CZ1 Window (Non- Res)Metal framing (fixed)U=0.57; SHGC=0.25; VT=0.275	0.25	
Fenestration SHGC	- non - North	A1 CZ1 External Window	0.19	CZ1 Window (Non- Res)Metal framing (fixed)U=0.57; SHGC=0.25; VT=0.275	0.25	
Fenestration visual	light transmittance (N)	A1 CZ1 External Window		CZ1 Window (Non- Res)Metal framing (fixed)U=0.57; SHGC=0.25; VT=0.275	0.28	
Fenestration visual	light transmittance	A1 CZ1 External Window	0.71	CZ1 Window (Non- Res)Metal framing (fixed)U=0.57; SHGC=0.25; VT=0.275	0.28	
Shading devices		Overhangs canopy on south facing glazing	Geometric	No shades	n/a	

Response to Comment #2 and #3: The auto-generated ECB Checklist Report has three sections that show the inputs of the proposed versus ECB Budget (Baseline). The first section shown in Figure 2 is the Envelope; the section in Figure 3 is the Model Input; the last section in Figure 4 is HVAC.

Figure 2: Auto-generated ECB Checklist Report from IESVE 2018 (Envelope)

	Model Input parameter	Propo	osed	Budget				
	MEP	Description	Input (area weighted)	Description	Input (area weighted)			
	Interior lighting power density	Total power density (Btu/h•ft ²)	3.41	Total power density (Btu/h•ft ²)	3.34			
	Day lighting controls	Radiance simulation	No	Radiance simulation	No			
	Exterior lighting power	Total power consumption (kBtu/h)	0.00	Total power consumption (kBtu/h)	0.00			
	Process lighting	Total power density (Btu/h•ft ²)	0.00	Total power density (Btu/h•ft ²)	0.00			
SA þ	Receptacle equipment	Total power density (Btu/h•ft ²)	3.41	Total power density (Btu/h•ft ²)	3.41			
	Elevators/escalators	Total power consumption (kBtu/h)	0.00	Total power consumption (kBtu/h)	0.00			
	Refridgeration equipment	Total power density (Btu/h•ft ²)	0.00	Total power density (Btu/h•ft ²)	0.00			
	Cooking equipment	Total power density (Btu/h•ft ²)	0.00	Total power density (Btu/h•ft ²)	0.00			
	Data processing/centre equipment	Total power density (Btu/h•ft ²)	0.00	Total power density (Btu/h•ft ²)	0.00			
	Other Lighting Controls	Continuous daylight dimming in perimeter office zones		Automated	sensors			

Figure 3: Auto-generated ECB Checklist Report from IESVE 2018 (Model Input)

	Model Input parameter	Prop	osed	Buc	dget		
	HVAC	Description	Performance SCop / SSEER Cfm / SFP / kW	Description	Performance SCop / SSEER Cfm / SFP / kW		
	Primary HVAC system	DOAS FCUs - Chilled Water & Hot Water		VAV - Reheat [DX cool - HW blr]	ECB System 04		
	Other HVAC system	Radiant panels	2 kW panels	n/a	n/a		
	Fan supply power	43 kW	40,000 cfm	45 kW	38,000 cfm		
	Fan power	CAV	45 kW	VAV	45 kW		
	Economiser control	Dry-bulb high-limit economizer with mixed-air target	55F	Dry-bulb high-limit economizer with mixed-air target	55F		
8 sv b	Demand control ventilation	DCV in Conference Rooms	1200 ppm CO2	n/a	n/a		
	Unitary equip cooling efficiency	n/a	n/a	DX Cooling	11 IEER		
	Unitary equip heating efficiency	n/a	n/a	n/a	n/a		
	Chiller	Electric Water Cooled Screw Chiller	5 COP	n/a	n/a		
	Chilled water loop and pump	Primary-secondary	4.4 W/gpm	n/a	n/a		
	Boiler	1 Condensing Boiler	92% Efficient	2 Boilers	230 kBtu/h each		
	Hot water loop and pump	Primary Only	19 W/gpm VSD	Primary only	19 W/gpm		
	Cooling tower	2-speed fan	1432 kBtu/h	n/a	n/a		
	Condenser water loop and pump	300 gpm	19 W/gpm	n/a	n/a		

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Figure 4: Auto-generated ECB Checklist Report from IESVE 2018 (HVAC)

Staff Comment #3: Compliance report should document compliance with the mandatory requirements of Section 11; Energy cost Budget Method of ASHRAE 90.1 – 13.

Response #3 Part 2: The auto-generated ECB Report is based on the layout and requirements prescribed by ASHRAE and the example compliance form on the ASHRAE website, <u>https://xp20.ashrae.org/UM90.1-2013/ECB-Method-</u> <u>Compliance-Form-2013.pdf</u> as shown in Figure 5.

Energy Cost Budget (ECB) Compliance R	Report	Page 1 of 2	Energy Cost B	udget (E	ECB) C	complia	ance Re	eport	Page 2 of 2	Energy Cost Budget (ECB) 2013 Compliance Repo	rt Dam 1 of 2	Energy Cost	Budget /	ECP) 2012	Complian	oo Bono	art 0
Project Name:				Project Name:							Ellergy Cost Budget (ECB) 2013 Compliance Repo	IL Page For 2	Energy Cost	Duuyei (i	2013	Compilar	ce Repu	
Project Address:		Date:		Contact Person:		Em	ait:		Telephone:		Project Name: Florida Solar Energy Center		Project Name: Florida Solar En	ergy Center				
Designer of Record:	Email:	Telephone:									Project Address: 1679 Clearlake Road, Date: 20-Sep-2018		Contact Person: Joe Bloggs		Ema	I: Joe.Bloggs@FBC.o	m Telephone	e: (321) 638-1410
ontact Person:	Email:	Telephone:		Energy and Cost Summary	by Fuel Type	e*					(18 Stories), Cocca, Piorida, 32922-5703 Caller, 20/06/p-2010 Designer of Record: Joe Bloggs Email: Joe Bloggs@FBC.com Telephone: (321) 638-1	410	Energy Results					
łv:		Principal hea	ing source:			Proposed	Building	Budget E	luilding	Proposed /	Contact Person: Joe Bloggs Email: Joe Bloggs@FBC.com Telephone: (321) 638-1				Proposed Build	ng	ludget Building	Propose
eather Data:		Fossil fu				Energy	Peak	Energy	Peak	Budget	City: Cocce Principal Heating Source		End Use	Energy Type	Energy	Peak Ener	y Peak	Budge
		Electricit		End Use	Energy Type	10 ⁶ Btu/yr (GJ/yr)	10 ³ Btu/h (kW)	10 ⁶ Btu/yr (GJ/yr)	10 ³ Btu/h (kW)	Energy (%)	Weather Data: USA_FL_Orlando.Executive.AP.722053_TMY3.epv Q Fossil / Electric				(kBtulyr) (i	(Btulh) (kBtu	r) (kBtult	h) Energ
		Solar/site		Lighting-conditioned							2 Solaris		Lighting - conditioned	Electricity	2,505,895.4	891.0 3,023,6		4 17.11
		Other		Lighting—unconditioned							Other		Lighting - unconditioned	Electricity		0.9 8,183		49.0%
		June		Space heating (1)							Space Summary		Space Heating Space Cooling	Gas Electricity		.080.0 980.22 .515.5 4.450.2		
				Space heating (2)							And Hand Unserfaced	Total BD	Heat Rejection	Electricity		176.6 947,16		
ce Summary				Space cooling							Building Use Area (th') Area (th')	Total (# ²)	Pumps	Electricity		32.1 347,04		
		conditioned Area		Pumps							SPACE: Office - Open plan 460805.9 0 SPACE: Storage - All Other 38400.5 0	460805.9 38400.5	Fans Interior Receptacle Equipment	Electricity		254.8 1,924,9 23.6 66,66		
ting Use		ft ² or m ²)	Total	Heat rejection							Total 499205.3 0	499206.3	Office Equipment	Electricity		122.7 6.554,4		
				Fans-interior ventilation							•		Elevators Escalators	Electricity		34.1 105,78	3.3 34.1	0.0%
				Fans—interior exhaust							Advisory Messages Proposed Building Budget	Difference	Total building consumption		14,164,851.2	18,408,	10.3	23.19
											Design Building	Proposed/Budget	Energy and Cost Summary	y by Fuel Type				
				Fans—parking garage							Number of hours heating loads not met (system/plant) 0.0 0.0	0.0		Proposed	d Building	Budget Building	Pr	roposed Budget
	Total			Service water heating							Number of hours cooling loads not met (system)plant) 0.0 0.0	0.0		Energy		inergy Cos	Energ	
				Office equipment							Number of warnings Number of errors		Electricity	(k8tu/yr) 13.468.760.6		Btulyr) (\$/y (28,189.3 2,614,2		
				Elevators and escalators							Number of defaults overridden		Gas	696,090.5		0,221.0 49,01		
visory Messages				Refrigeration (food, etc.)							Compliance Result		Total ex Onsite Generation	14,164,851.1	2,055,118.6 18,4	08,410.3 2,683,2	8.4 23.1%	6 22.8%
	Proposed Building	Budget	Difference	Cooking (commercial)							The design detailed in the above-referenced plans complies with the mandatory provisions of ANSI/ASHRAE/IES		Elec Gen PV	-760,537.9	-114,080.7	0 0	0%	0%
	Design E	Building F	roposed/Budget								Standard 90.1-2013 and the design energy cost does not exceed the energy cost budget. Therefore, this design DOES C	OMPLY	Total inc Onsite Generation		1,941,037.9 18.4			
mber of hours heating loads not met (system/plant)				Total building consumption							with the ANSI/ASHRAE/IES Standard 90.1-2013 ECB compliance methodology. Individual certifying authenticity of the data provided in this analysis:		* These results use assumptions for sh					-
mber of hours cooling loads not met (system/plant)																		
nber of warnings				Energy Summary by End L							Signature Title		Notes The results are based on 8760	nime (shed hours				
mber of errors					Proposed B	Building	Budget B	uilding	Proposed /	Budget			60 Rooms included in the unme					
mber of defaults overridden					Energy (10 ⁵ Btu/yr	Cost	Energy (10 ⁵ Btu/yr	Cost	Energy	Cost								
					or GJ/yr)	(\$/yr)	or GJ/yr)	(\$/yr)	(%)	(%)								
npliance Result				Electricity														
lesign detailed in the above-referenced plans complies w	th the mandatory provisions of ANSI	/ASHRAE/IES		Natural gas														
dard 90.1-2013 and the design energy cost does not exce the ANSI/ASHRAE/IES Standard 90.1-2013 ECB complia	ed the energy cost budget. Therefore	e, this design D	DES COMPLY	Other fossil fuel														
idual certifying authenticity of the data provided in this and				District steam														
notal centrying admeniatry of the data provided in this and	iyois.			Total nonsolar														
ature	Title																	
				Solar or site recovered														
				Total including solar														
				* These results use assumptions for	r showing complia	ince during a typ	pical year; actual	l energy costs m	ay be substantia	lly different.								
											Integrated Environmental Solutions		Integrated Environmental Sol	lutions				
1-2013 User's Manual				90.1-2013 User's Manual														

Figure 5: Example report from ASHRAE Website and Auto-generated ECB report from IESVE 2018

Staff Comment #4: Baseline energy measures should be locked and users should not be allowed to edit them.

Response #4 Part 1: Baseline energy measures for the ECB Budget Building should <u>not</u> be locked, as per the **2017 Florida Building Code - Energy** [see <u>https://codes.iccsafe.org/public/document/FEC2017/chapter-4-ce-</u> <u>commercial-energy-efficiency</u>] Section C407.6. Note that the **2017 Florida Building Code - Energy** (8 requirements) removed this requirement from the previous **2014 Florida Energy Code** (9 requirements). Please see Figure 6 below for reference.

014 Florida Energy Code vst Printing: Mar 2015) CHAPTER 4 [CE]COMMERCIAL ENERGY EFFICIENCY	2017 Florida Building Code - Energy Conservation, Sixth Edition (First Printing: Jul 2017)
D7.6 Calculation software tools. Culation procedures used to comply with this section shall be software tools capable of calculating the annual energy consumption of all building elements t differ between the standard reference design and the proposed design and shall include the following capabilities. Computer generation of the standard reference design using only the input for the proposed design. The calculation procedure shall not allow the standard reference design using only the input for the proposed design.	CHAPTER 4 [CE] COMMERCIAL ENERGY EFFICIENCY
user to directly modify the building component characteristics of the <i>standard reference design</i> , 2: Building operation for a full calendar year (8,760 hours). 3: Climate data for a full calendar year (8,760 hours) and shall reflect <i>approved</i> coincident hourly data for temperature, solar radiation, humidity and wind speed for the building location. 4. Ten or more thermal zones. 5. Thermal mass effects.	 that differ between the <i>standard reference design</i> and the <i>proposed design</i> and shall include the following capabilities. Building operation for a full calendar year (8,760 hours). Climate data for a full calendar year (8,760 hours) and shall reflect <i>approved</i> coincident hourly data for temperature, solar radiation, humidity and wis speed for the building location. Ten or more thermal zones. Thermal mass effects. Hourly variations in occupancy, illumination, receptacle loads, thermostat settings, mechanical ventilation, HVAC equipment availability, service I water usage and any process loads.
 Bourly variations in occupancy, illumination, receptacle loads, thermostat settings, mechanical ventilation, HVAC equipment availability, service hot water usage and any process loads. Part-load performance curves for mechanical equipment. Capacity and efficiency correction curves for mechanical heating and cooling equipment. Printed <i>code official</i> inspection checklist listing each of the <i>proposed design</i> component characteristics from Table C407.5.1(1) determined by the analysis to provide compliance, along with their respective performance ratings (e.g., <i>R</i>-value, <i>U</i>-factor, SHGC, HSPF, AFUE, SEER, EF, etc.). 	 water usage and any process loads. 6. Part-load performance curves for mechanical equipment. 7. Capacity and efficiency correction curves for mechanical heating and cooling equipment. 8. Printed code official inspection checklist listing each of the proposed design component characteristics from Table C407.5.1(1) determined by tanalysis to provide compliance, along with their respective performance ratings including, but not limited to, <i>R</i>-value, <i>U</i>-factor, SHGC, HSPF, AFU SEER, EF. C407.6.1 Specific approval.
	Performance analysis tools meeting the applicable subsections of Section C407 and tested according to ASHRAE Standard 140 shall be permitted to approved by the Florida Building Commission. The code official shall be permitted to approve tools for a specified application or limited scope accordance with Section C101.4.3.

Figure 6: The 2014 and 2017 Florida Energy Code, Chapter 4 [CE]COMMERCIAL ENERGY EFFICIENCY

Staff Comment #4: Baseline energy measures should be locked and users should not be allowed to edit them.

RESPONSE #4 Part 2: In addition, ASHRAE Standard 90.1-2013 ECB Method does also <u>not</u> require any baseline energy measures to be locked.

Finally, many jurisdictions will require the baseline/budget/standard building's coil sizes and airflows to be increased in the event of excessive unmet load hours. It is important to note that the Unmet Load Hour check safeguards any equipment from being undersized in proposed and baseline/budget buildings. For example, see Figure 7 for California's State Energy Code recommendations for this scenario on the baseline (Standard) model:

2.6.1 Specifying HVAC Capacities for the Proposed Design

As shown in Figure 2, the proposed design shall have no more than 150 unmet load hours. If this requirement is violated, the software shall require the user to make changes to the proposed design building description to bring the unmet load hours equal to or below 150. This process is not automated by the software. There are two tests that must be met:

- Space loads must be satisfied: Space temperatures in all zones must be maintained within one half of the throttling range (1°F with a 2°F throttling range) of the scheduled heating or cooling thermostat setpoints. This criterion may be exceeded for no more than 150 hours for a typical year.
- System loads must be satisfied: Plant equipment must have adequate capacity to satisfy the HVAC system loads. This criterion may be exceeded for no more than 150 hours for a typical year.

If either the space or system loads do not meet the above criteria, the equipment in the proposed design shall be resized by the user such that the criteria are met. If the space conditioning criteria are not met because the HVAC equipment in the proposed design lacks the capability to provide either heating or cooling, equipment capable of providing the needed space conditioning must be specified by the user.

Equipment sizes for the proposed design shall be entered into the model by the energy analyst and shall agree with the equipment sizes specified in the construction documents. When the simulations of these actual systems indicate that specified space conditions are not being adequately maintained in one or more thermal zone(s), the user shall be prompted to make changes to equipment sizes or zones as necessary. This occurs when the unmet load hours exceed 150 for the year. The use of equipment sizes that do not match the actual equipment sizes as indicated on construction documents triggers an Exceptional Condition that is noted on the compliance forms.

2.6.2 Sizing Equipment in the Standard Design

For sizing heating and cooling equipment capacities, the compliance software shall use design day schedules as specified in Section 5.3. For cooling capacity sizing, compliance software shall use the OnDay schedule from Appendix 5.4B for occupant, lighting and equipment schedules, respectively. For heating capacity sizing, compliance software shall use the OffDay schedule from Appendix 5.4B for occupant, lighting and equipment schedules, respectively.

Equipment in the standard design is automatically oversized by the program (25% for heating and 15% for cooling). If the automatic oversizing percentage is not sufficient to meet demands, then Unmet load hours are evaluated at the building level by looking at the unmet load hours for each of the thermal zones being modeled. The zone with the greatest number of unmet load hours shall not exceed 150.

If the number of total unmet load hours for cooling and/or heating exceeds 150, then equipment capacities of cooling and/or heating equipment must be increased by the software incrementally.

1. The first step is to determine whether heating or cooling unmet load hours are the bigger problem. If heating unmet load hours are the bigger problem, upsize the heating equipment capacity. If cooling UMLH is the problem, upsize the cooling equipment capacity.

2. If the cooling is undersized, the equipment is resized by first increasing the design airflow of all zones with significant unmet load hours (greater than 150 for an individual zone) by 10%, i. Then the equipment capacity for the system(s) serving the affected zones is increased to handle the increased zone loads. For central plant the chiller(s) are towers are resized proportionally to handle the increased system loads.

If heating is undersized, the same procedure is followed, with zones resized first, then heating secondary equipment and then boilers as necessary.

The capacity of the boiler or furnace shall be increased in 5% increments and the simulation re-run until the loads are met. For heat pumps the capacity of the coil is increased so that the additional load is not met by auxiliary heat.

Figure 7: California Energy Code Recommendation for Removing Unmet Load Hours