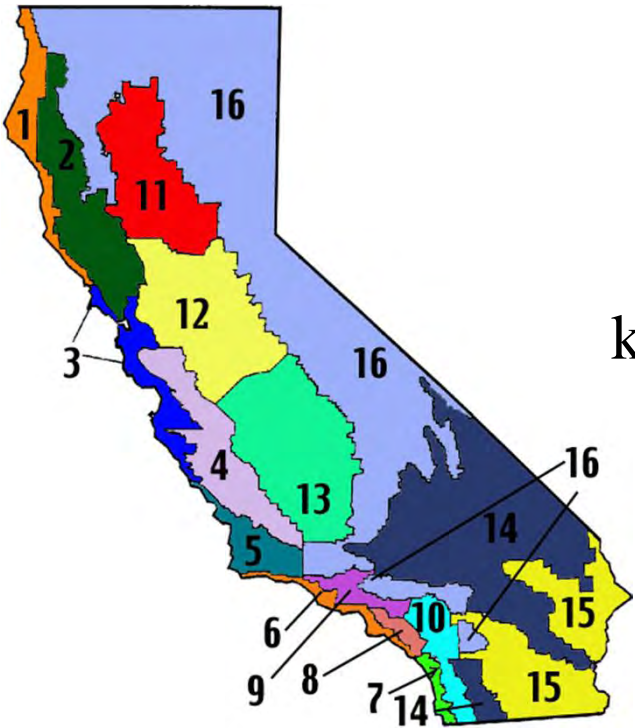
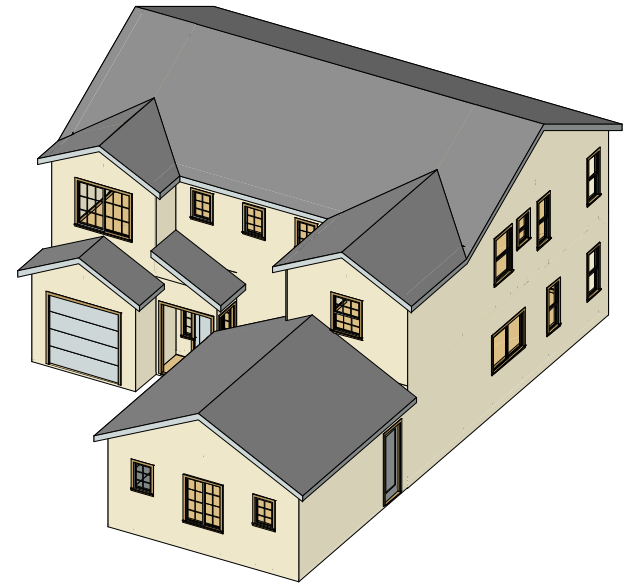


2013 Residential Standards For Energy Consultants



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Ken Nittler, PE



- É Owner of Enercomp and Micropas Author
- É Consultant to CEC 2001, 2005, 2008 and 2013 standards
- É Member CABEC, ASHRAE, NFRC
- É Past Board Member CABEC, NFRC
- É CABEC CEPE and CEA
- É Expert on computer simulation and fenestration energy performance

Standards Schedule



É Approval Spring 2012

É Manuals, Software Sprint 2013

É Implementation January 2014

*Following slides based on CEC staff
proposal from 10/15/2011 workshop*

www.energy.ca.gov/title24/2013standards

Major Topics

É Setting the Standard

É Time Dependent Valuation

É Mandatory Measures

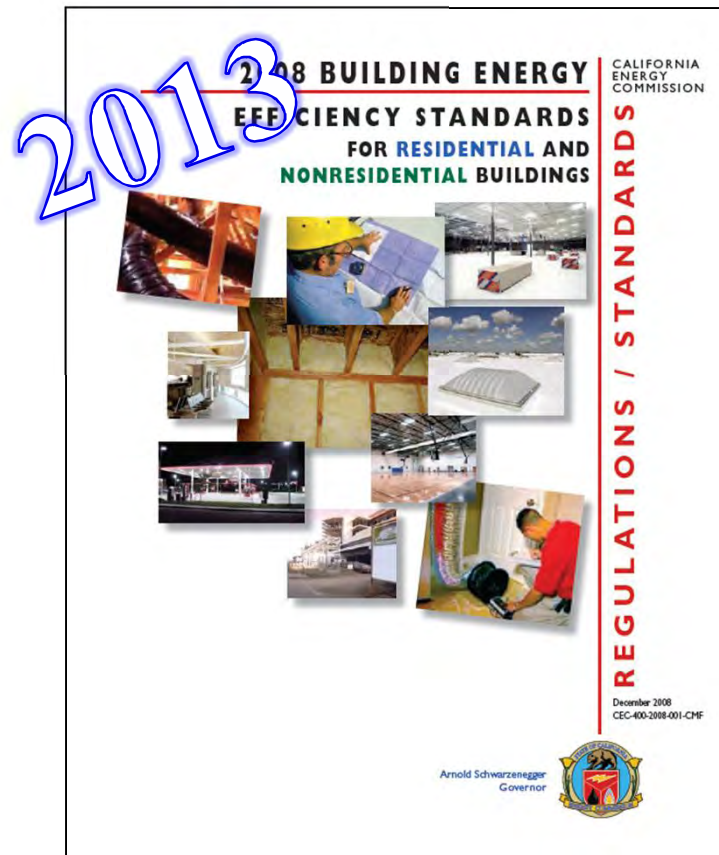
É Prescriptive Packages

É Computer Performance

É Impact

É Reach Code

Setting the Standard



Compelling Reasons

- É To reduce energy bills, increase energy delivery system reliability, and contribute to an improved economic condition for the state
- É To respond to AB32 legislation on path to net zero homes by 2020
- É To emphasize energy efficiency measures that save energy at peak periods and seasons and improve the quality of installation of energy efficiency measures

Setting the Standard

- É Standards are required to be life-cycle cost effective to homeowners over 30 years
- É Based on hundreds of thousands of computer runs
- É Significant Assumptions Needed
 - ó What will energy prices do in the future?
 - ó What energy analysis assumptions are reasonable?
 - ó What do the added measures cost?
- É Standards are life cycle cost effective to the homeowner over a wide range of assumptions

Stringency

- É On a path towards net zero homes by 2020
- É Typically, the last few standard updates have increased stringency the standards 15% or so

2013 Standards will exceed this – more on this at end of presentation

New TDV and Weather Data

É Consistent set of data using 2009 as basis

É TDV values coordinated statewide

É A few new representative cities

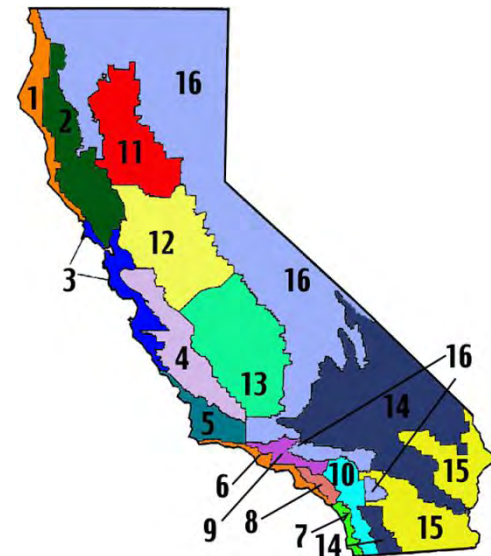
ó CZ 6 ó Torrance

ó CZ 8 ó Fullerton

ó CZ 14 ó Palmdale

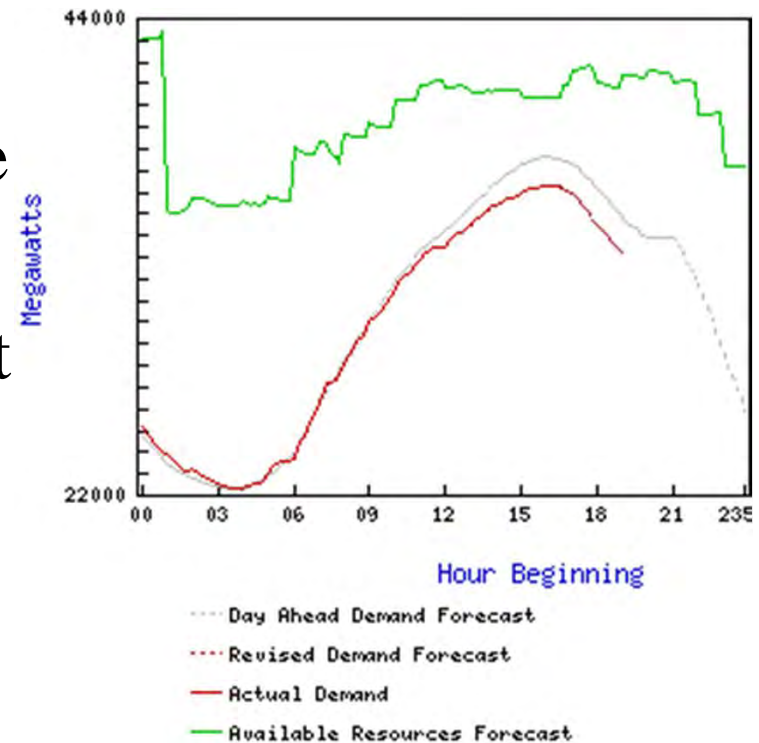
ó CZ 15 ó Palm Springs

ó CZ 16 ó Blue Canyon



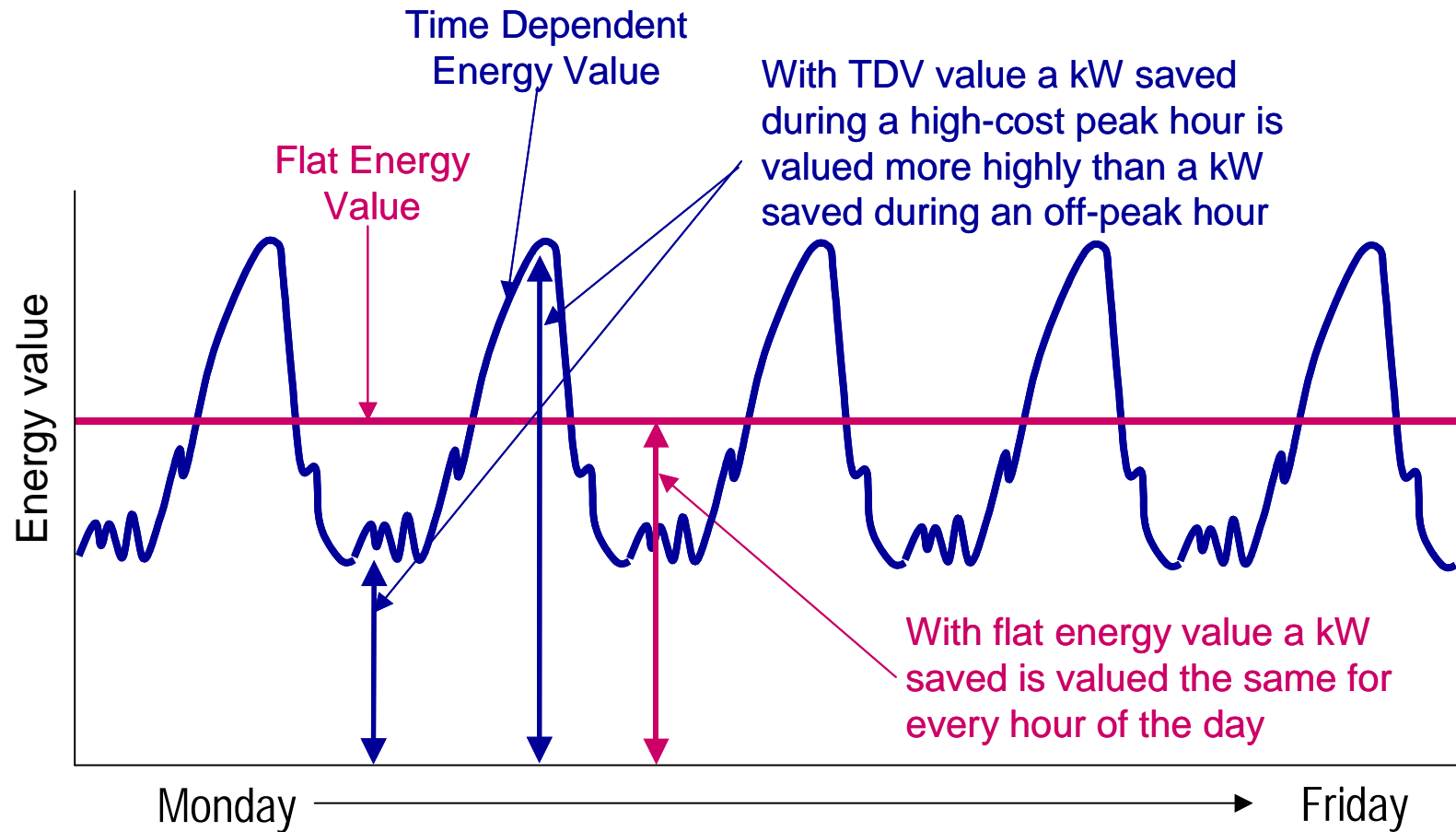
Time Dependent Valuation

- É The value of energy depends on when and where it is used
- É Concept of Time Dependent Valuation (TDV) added in 2005 standard
- É Automatically implemented in compliance software and used when establishing prescriptive standards

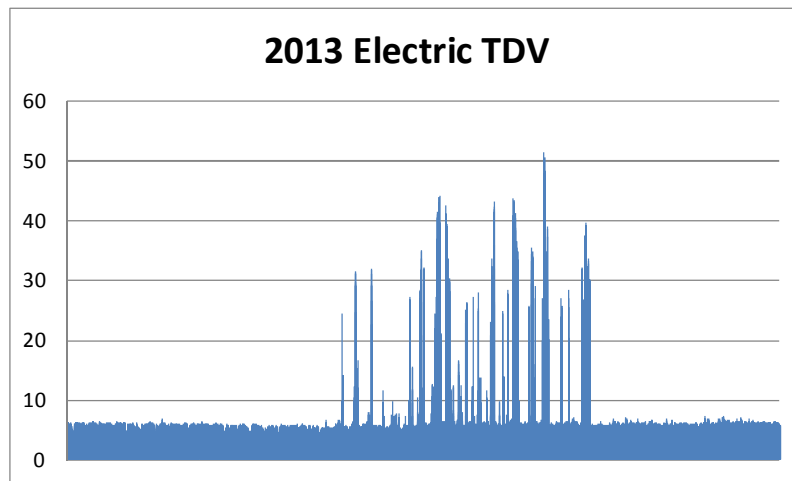
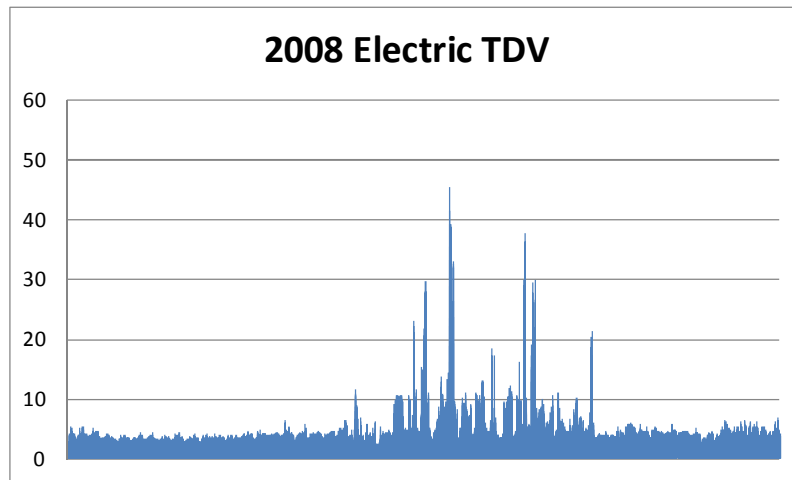


California Generating Capacity for June 21st from www.caliso.com

TDV Issues



TDV Electric Multipliers



É 2013 average value is about 1.5 times the 2008 average value

É 2013 values have more peaks on cooling

É *This makes features that save electricity on cooling peak even more valuable to compliance*

Average TDV

	Natural Gas	Propane	Electric
2008	1.48	1.90	4.09
2013	1.60	4.11	6.23
Increase	8%	116%	52%

É TDV is really a proxy for energy cost

É *When TDV goes up, more energy efficiency features are cost effective*

É Construction crash has lowered installed costs, also making more features cost effective

Overview of Changes

É Based on staff proposal from 10/14/2011 workshop

É Only an overview ó many other details are being added or updated

É Are in the prerulemaking process ó things can change during adoption process

Features Now Mandatory

É Features moved from 2008 prescriptive to 2013 mandatory

É HERS Verified duct leakage in all zones

É HERS Verified air flow and fan watt draw on air conditioners

HERS Verification mandatory in most new construction

New Mandatory Features

- É Air filtration when used with ductwork
- É Return duct and air filter grill sizing
- É Water heating piping $\frac{3}{4}$ inch and larger must be insulated
- É Water heaters to have 120v power nearby
- É Maximum fenestration U-factor of 0.57
- É Solar ready requirements

Solar Ready



- É To provide for the future installation of a solar electric or solar thermal system.
- É 70 percent of the single family residences located in subdivisions - minimum area of 250 square feet
- É Multi-family buildings with eight or more dwelling units - minimum area equal to 30 percent of the total roof area

Updated Mandatory Measures

- É Wall R-value minimum to R15
- É Floor R-value minimum to R19
- É Roof R-value minimum to R-30
- É Lighting

New Prescriptive Features

É Whole house fans in climate zones 8-14

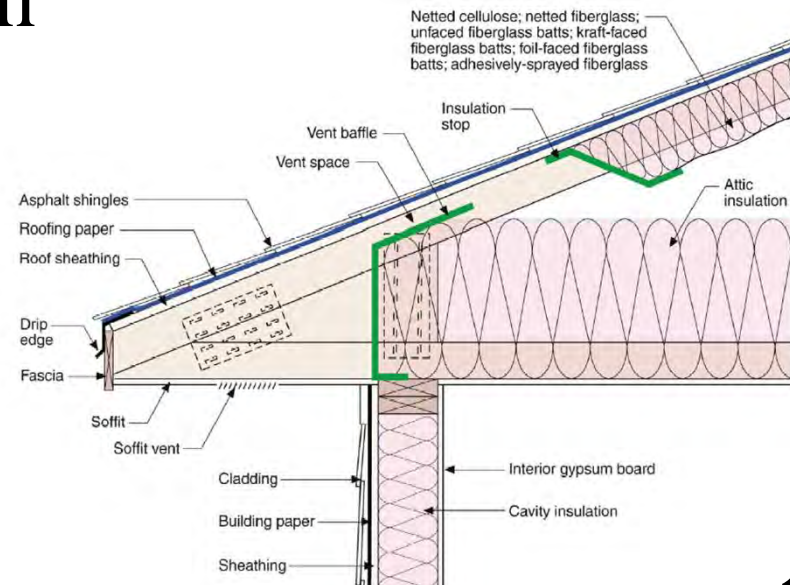
É HERS Verified Quality Insulation

Installation in zones 1-5, 10-16

É Roof deck insulation

ó R4 above

ó R13 below



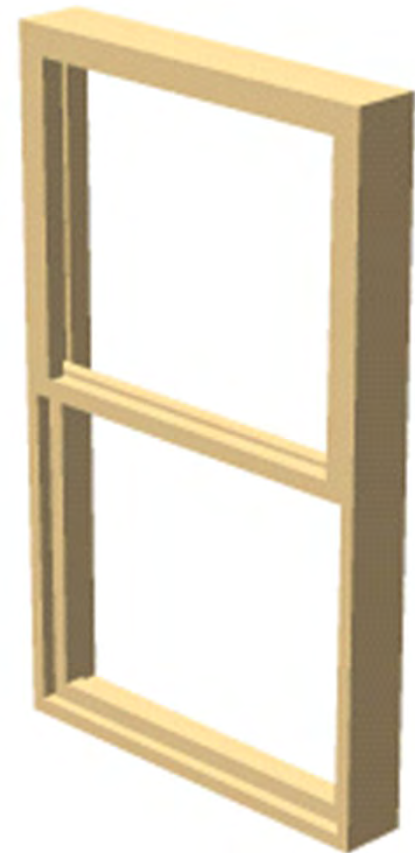
Fenestration

É 0.32 U-factor

É 0.25 SHGC in cooling climates

É No SHGC requirement in zones 1, 3, 5

É Switch of zone 5 to no requirement, zone 16 to 0.25 SHGC



Insulation

É Walls

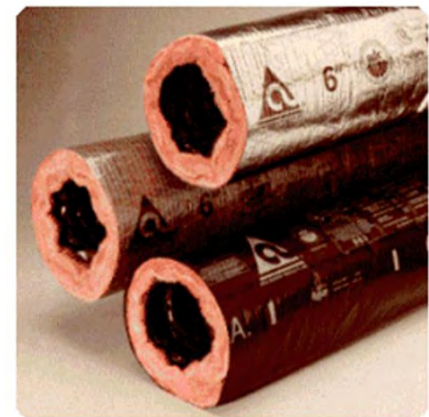
- ó R15+R4 foam 2x4 in zones 5-10

- ó R21+R4 foam 2x6 in zones 1-4 and 11-16

É Ducts

- ó R-6 in climate zones 6-8

- ó R-8 otherwise



Equipment Efficiencies

É New federal rules for implementation 2014-2015

É Furnace AFUE 0.80

É Air conditioners 14 SEER/12.2 EER or 14 SEER/11.7 EER depending on size

É Storage water heaters 0.62 for 50 gallon

Computer Performance

É New California Simulation Engine (CSE)

- ó All surfaces modeled as mass elements

- ó Detailed models of airflow and fenestration

- ó Time step 2 minutes instead of 1 hour

É Common standard design and forms generation

É Must be used by all approved software

É New public domain software in works

2013 Server Farm

É Prototype software runs multiple cores across multiple computers



How Much Tighter?

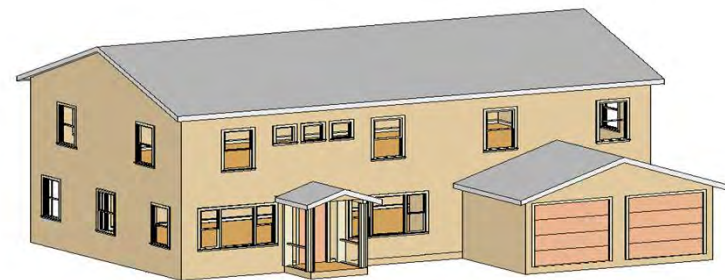
É Savings 2013 compared to 2008 for single family weighted by size, roof type and housing starts

É33% TDV

É 53% kW

É 43% kWh

É 15% Therms



TDV Energy Budgets using 2013 calculations

Climate	2008 Standard (kTDV/ft2)					2013 Standard (kTDV/ft2)				
	Heating	Cooling	Fan	DHW	Total	Heating	Cooling	Fan	DHW	Total
01	31.57	0.00	1.12	13.81	46.49	25.92	0.00	1.12	12.70	39.73
02	27.81	6.59	1.12	13.33	48.85	20.39	2.61	1.12	12.27	36.39
03	16.99	3.36	1.12	13.29	34.76	11.13	0.75	1.12	12.24	25.24
04	21.31	12.36	1.12	13.11	47.90	15.34	5.69	1.12	12.07	34.21
05	22.10	0.00	1.12	13.26	36.47	9.72	0.01	1.12	12.21	23.06
06	7.94	12.36	1.08	12.84	34.23	5.90	4.30	1.08	11.82	23.10
07	2.35	10.77	1.12	12.46	26.70	1.64	3.54	1.12	11.48	17.79
08	5.88	23.45	1.08	12.65	43.07	4.21	10.12	2.59	11.65	28.58
09	8.57	38.81	1.08	12.54	61.00	6.04	17.79	2.42	11.55	37.81
10	9.58	40.99	1.07	12.55	64.19	7.00	20.08	2.20	11.56	40.85
11	21.10	62.86	1.12	12.87	97.95	15.77	38.65	1.92	11.85	68.20
12	21.81	33.81	1.12	13.04	69.78	16.44	12.51	2.10	12.01	43.06
13	18.91	63.19	1.12	12.45	95.67	13.85	39.88	2.05	11.48	67.27
14	19.37	54.07	1.07	12.89	87.41	15.63	34.47	1.77	11.87	63.74
15	1.28	111.50	1.08	11.18	125.04	0.37	84.16	1.08	10.33	95.94
16	40.99	25.85	1.07	14.38	82.29	41.63	4.81	1.07	13.21	60.72
Statewide	13.09	29.74	1.10	12.77	56.70	9.64	14.77	1.80	11.77	37.97
Average	17.35	31.25	1.10	12.92	62.61	13.19	17.46	1.56	11.90	44.10
Min	1.28	0.00	1.07	11.18	26.70	0.37	0.00	1.07	10.33	17.79
Max	40.99	111.50	1.12	14.38	125.04	41.63	84.16	2.59	13.21	95.94

Note: Fan includes whole house fan energy that offsets cooling energy in 2013 standards

TDV Energy Budgets using 2013 calculations

Climate	Savings (kTDV/ft2) (2008 - 2013)					Percent (2008 - 2013) / 2008				
	Heating	Cooling	Fan	DHW	Total	Heating	Cooling	Fan	DHW	Total
01	5.65	0.00	0.00	1.11	6.76	18%	0%	0%	8%	15%
02	7.42	3.98	0.00	1.06	12.46	27%	60%	0%	8%	26%
03	5.86	2.61	0.00	1.05	9.52	34%	78%	0%	8%	27%
04	5.97	6.67	0.00	1.04	13.68	28%	54%	0%	8%	29%
05	12.37	-0.01	0.00	1.05	13.41	56%	0%	0%	8%	37%
06	2.04	8.07	0.00	1.02	11.13	26%	65%	0%	8%	33%
07	0.70	7.23	0.00	0.98	8.91	30%	67%	0%	8%	33%
08	1.67	13.33	-1.51	1.00	14.49	28%	57%	-139%	8%	34%
09	2.53	21.02	-1.34	0.99	23.19	30%	54%	-124%	8%	38%
10	2.58	20.91	-1.13	0.99	23.35	27%	51%	-105%	8%	36%
11	5.32	24.21	-0.80	1.02	29.75	25%	39%	-71%	8%	30%
12	5.37	21.30	-0.98	1.03	26.72	25%	63%	-87%	8%	38%
13	5.06	23.30	-0.93	0.97	28.40	27%	37%	-83%	8%	30%
14	3.75	19.60	-0.70	1.02	23.67	19%	36%	-65%	8%	27%
15	0.91	27.35	0.00	0.85	29.10	71%	25%	0%	8%	23%
16	-0.63	21.04	0.00	1.17	21.57	-2%	81%	0%	8%	26%
Statewide	3.45	14.98	-0.71	1.01	18.73	29%	56%	-65%	8%	33%
Average	4.16	13.79	-0.46	1.02	18.51	29%	48%	-42%	8%	30%
Min	-0.63	-0.01	-1.51	0.85	6.76	-2%	0%	-139%	8%	15%
Max	12.37	27.35	0.00	1.17	29.75	71%	81%	0%	8%	38%

Note: Fan includes whole house fan energy that offsets cooling energy in 2013 standards

Reach Code

- É Referenced in Green Building Code
- É Tier 1 ó 15% better with 10,000 kWh limit
- É Tier 2 ó 30% better with 8,500 kWh limit
- É Can use PV to meet kWh limit
- É Also need
 - ó HERS design rating (?)
 - ó QII required
 - ó High efficacy lighting indoor and outdoor