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Building Energy Efficiency Standards

2019 Pre-Rulemaking for Building Energy Efficiency Standards

Payam Bozorgchami, PE

Draft Proposal for Residential Attics

June 1, 2017

Acknowledgements

California Utilities Statewide Codes and Standards Team

CASE Authors:

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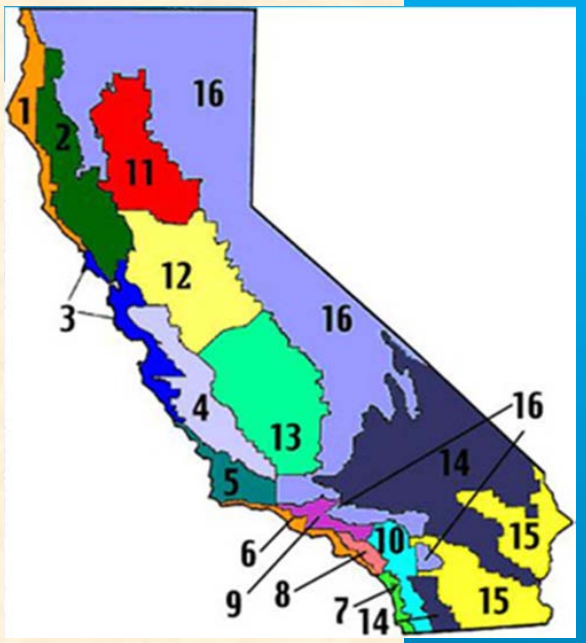
2016 Prescriptive Requirement

Prescriptive Package(s) in CZ 1, 2, 4, 8-16
High Performance Vented Attic (HPA)
(Based on a Tile Roof)



Option-B Below Deck

- R-13 Insulation Below Roof Deck
- R-38 Ceiling Insulation
- Radiant Barrier Not Required

OR

Option-A Above deck insulation

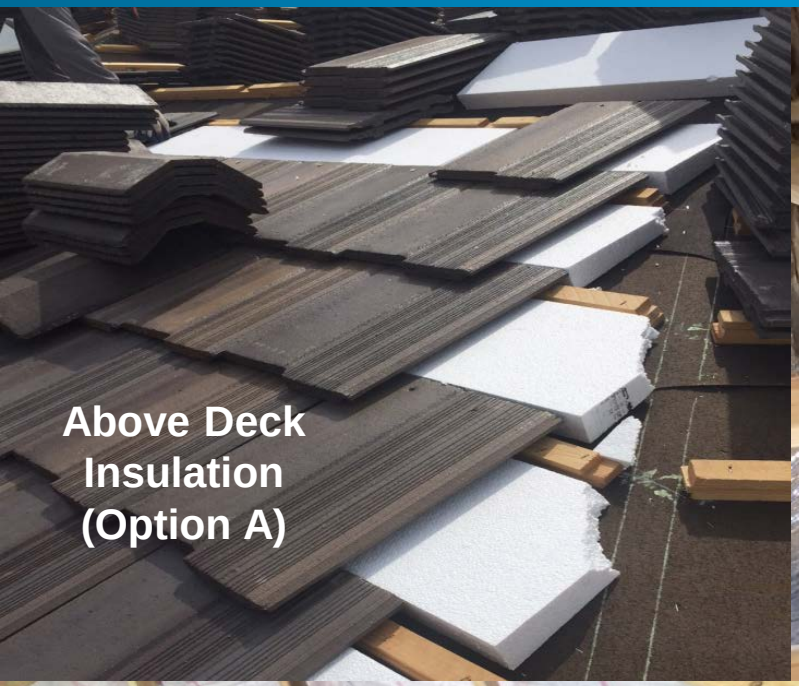
R-6 Insulation above the roof deck

OR

Option-C Ducts in Conditioned Space (DCS)*

- Locate ducts and air handler in conditioned space
- HERS verification of no duct leakage to outside

Options A, B, C Examples



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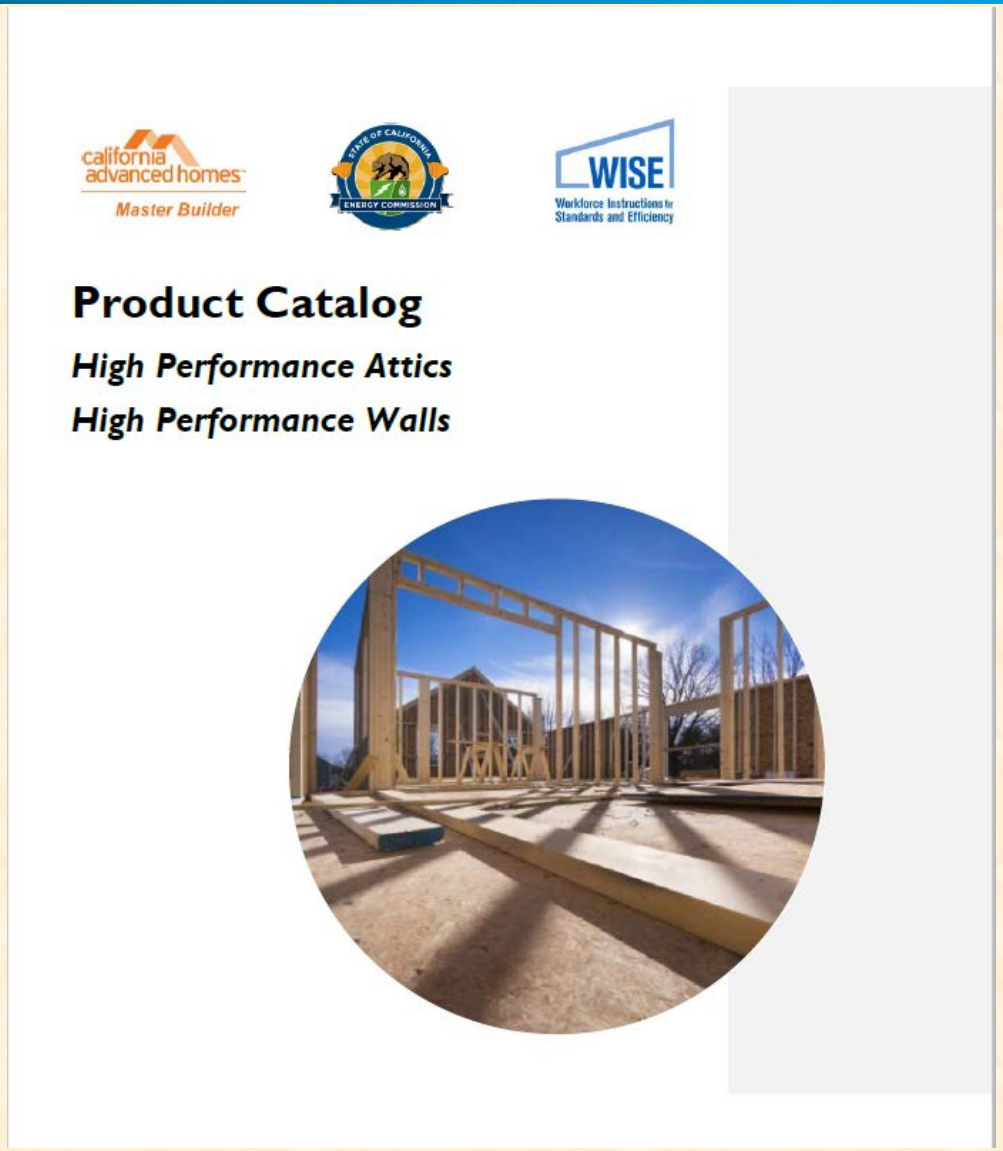
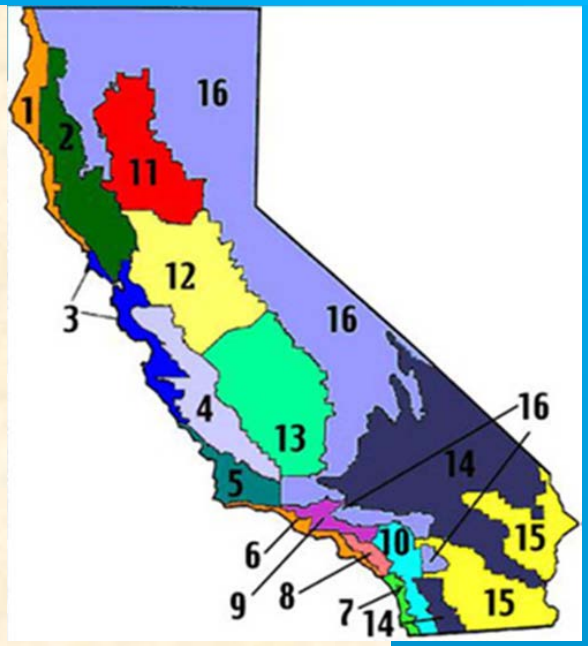
Source for some Products



http://www.wisewarehouse.org/

2019 Proposed Prescriptive



Residential Roof Deck Insulation

(Based on a Tile Roof)

•Option B

- Prescriptive R-value assume R-19 below the deck
  - o CZs 4 and 11-16 for low-rise residential buildings
  - o CZs 4, 8, 9 and 11-15 for multifamily

Roofs with no airspace (Asphaltic roofs) R=25

- **Option A**
  - o Prescriptive R-value R-8 for continuous insulation.

Roofs with no airspace (Asphaltic roofs) R=10 + Radiant Barrier

NOTE: Not a Prescriptive requirement in all climate zones

Prototype Buildings

Minimally Compliant with 2016 Standards

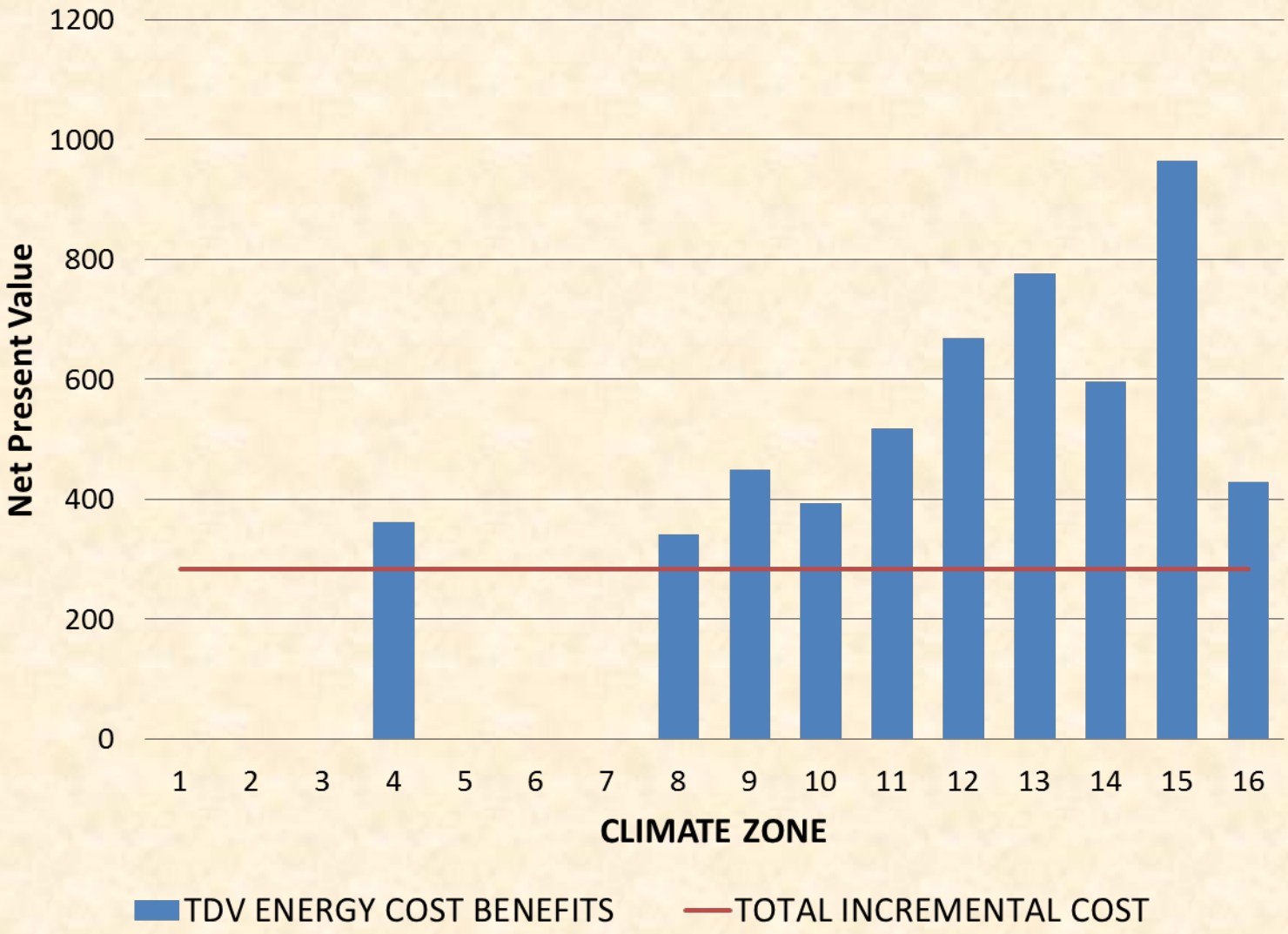
Item	Description	Unit	New Construction 2,100 ft^2	New Construction 2,700 ft^2	New Construction Multi-family 6,960 ft^2
1	Roof Deck Area	Square feet	2,520	1,740	4,176
2	Wall Area	Square feet	1,018	2,130	3,760
3	Wall Area between house and garage	Square feet	250	250	0
4	Wall Area between house and attic	Square feet	0	42	0
5	Window Area	Square feet	420	540	1044
6	Door Area between house and garage	Square feet	20	20	0

Incremental costs for the proposed Measure

Measures	2,100 ft^2 Single Family Prototype (1 Story)	2,700 ft^2 Single Family Prototype (2 Story)	8-Unit 6,960 ft^2 Multifamily Prototype
R-19 Below-Deck Batt HPA vs. R-13	$341	$245	$565

Costs are based on builder reported R-19 vs R-13 incremental costs of $.08/ft2 of roof deck area. This was increased by 15% to $.093/ft2 and labor addition of 1 hour per 1050 ft2 of roof deck area was added times the hourly rate. Insulation contractor is experienced with HPA, which not all are at this time.

Lifecycle Cost-effectiveness Summary per Dwelling Unit -(2,430 ft² blended prototype)



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Lifecycle Cost-effectiveness Summary per Dwelling Unit -(2,430 ft² blended prototype)

Climate Zone	Benefits TDV Energy Cost Savings + Other PV Savings (2020 PV $)	Costs Total Incremental Present Valued (PV) Costs (2020 PV $)	Benefit-to-Cost Ratio
1	n/a	n/a	n/a
2	n/a	n/a	n/a
3	n/a	n/a	n/a
4	$362	$283	1.28
5	n/a	n/a	n/a
6	n/a	n/a	n/a
7	n/a	n/a	n/a
8	$342	$283	1.21
9	$449	$283	1.59
10	$394	$283	1.39
11	$517	$283	1.83
12	$668	$283	2.36
13	$777	$283	2.75
14	$596	$283	2.11
15	$965	$283	3.41
16	$428	$283	1.51

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First-Year Energy Impact per single family (2,430 ft² blended prototype)

Climate Zone	Electricity Savings (kWh/yr)	Peak Electricity Demand Reduction (kW)	Natural Gas Savings (therms/yr)	TDV Energy Savings (TDV kBtuyr)
1	n/a	n/a	n/a	n/a
2	n/a	n/a	n/a	n/a
3	n/a	n/a	n/a	n/a
4	7	0.03	3	2,095
5	n/a	n/a	n/a	n/a
6	n/a	n/a	n/a	n/a
7	n/a	n/a	n/a	n/a
8	16	0.05	1	1,979
9	27	0.06	2	2,595
10	30	0.05	2	2,275
11	52	0.04	4	2,988
12	24	0.06	5	3,864
13	65	0.07	4	4,491
14	46	0.05	4	3,448
15	125	0.09	1	5,577
16	14	0.02	9	2,472

TDV Energy Cost Savings over 30-year period (2,430 ft² blended prototype)

Climate Zone	30-Year TDV Electricity Cost Savings (2020 PV $)	30-Year TDV Natural Gas Cost Savings (2020PV $)	Total 30-Year TDV Energy Cost Savings (2020PV $)
1	n/a	n/a	n/a
2	n/a	n/a	n/a
3	n/a	n/a	n/a
4	$230	$133	$362
5	n/a	n/a	n/a
6	n/a	n/a	n/a
7	n/a	n/a	n/a
8	$300	$43	$342
9	$388	$61	$449
10	$311	$83	$394
11	$367	$150	$517
12	$476	$193	$668
13	$619	$158	$777
14	$451	$145	$596
15	$943	$22	$965
16	$100	$328	$428

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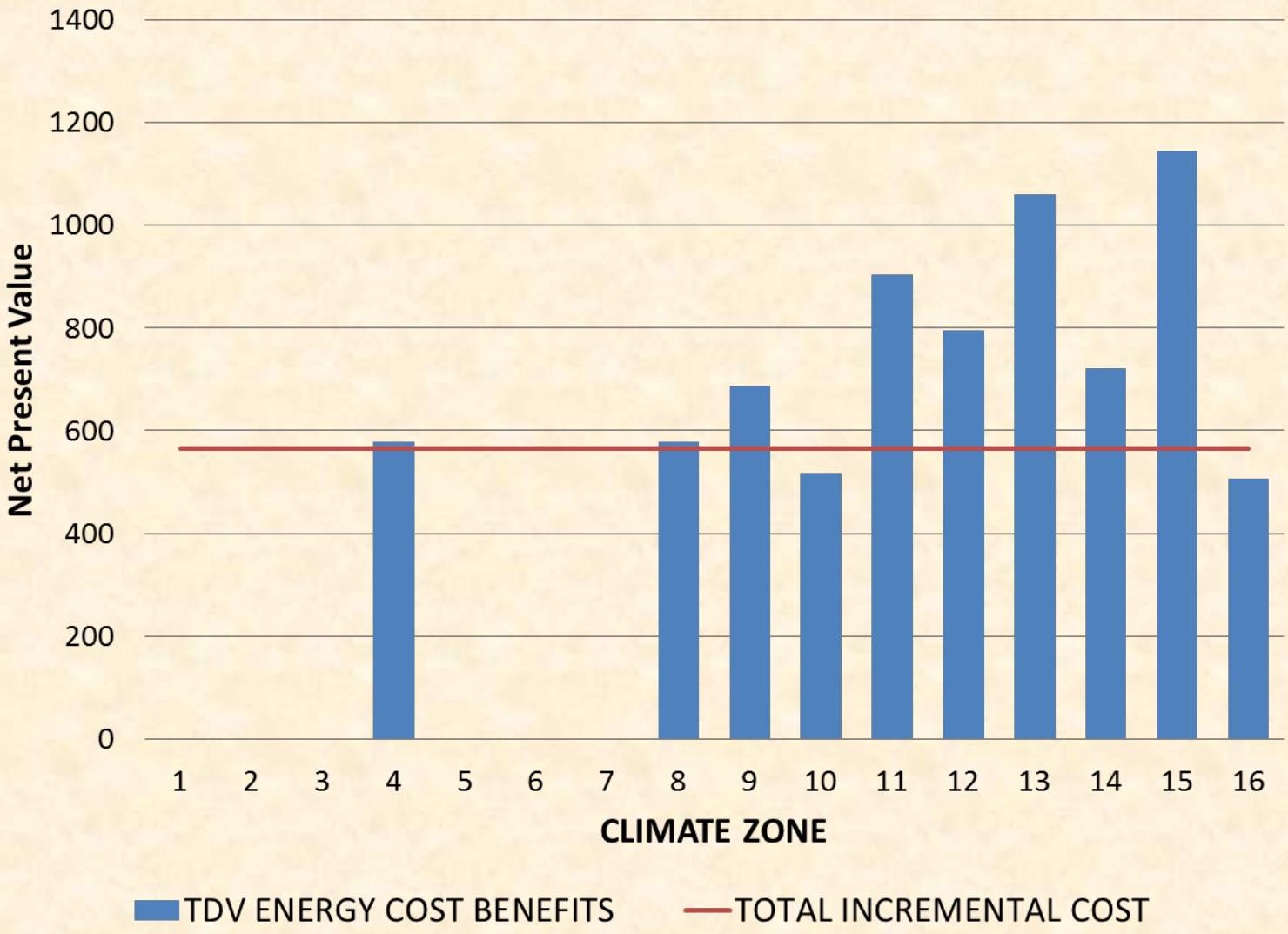
Lifecycle Cost-effectiveness Summary per 8-Unit (Multifamily Building)



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Lifecycle Cost-effectiveness Summary per 8-Unit (Multifamily Building)

Climate Zone	Benefits TDV Energy Cost Savings + Other PV Savings (2020 PV $)	Costs Total Incremental Present Valued (PV) Costs (2020 PV $)	Benefit-to-Cost Ratio
1	n/a	n/a	n/a
2	n/a	n/a	n/a
3	n/a	n/a	n/a
4	$578	$565	1.02
5	n/a	n/a	n/a
6	n/a	n/a	n/a
7	n/a	n/a	n/a
8	$578	$565	1.02
9	$686	$565	1.21
10	$518	$565	0.92
11	$903	$565	1.60
12	$795	$565	1.41
13	$1,060	$565	1.88
14	$722	$565	1.28
15	$1,144	$565	2.02
16	$506	$565	0.90

First-Year Energy Impact per 8-Unit (Multifamily Building)

Climate Zone	Electricity Savings (kWh/yr)	Peak Electricity Demand Reduction (kW)	Natural Gas Savings (therms/yr)	TDV Energy Savings (TDV kBtuyr)
1	n/a	n/a	n/a	n/a
2	n/a	n/a	n/a	n/a
3	n/a	n/a	n/a	n/a
4	37	0.07	3	3,341
5	n/a	n/a	n/a	n/a
6	n/a	n/a	n/a	n/a
7	n/a	n/a	n/a	n/a
8	60	0.06	1	3,341
9	71	0.07	1	3,967
10	56	0.05	2	2,993
11	83	0.07	4	5,220
12	64	0.07	5	4,594
13	106	0.09	4	6,125
14	70	0.06	4	4,176
15	162	0.10	0	6,612
16	37	0.04	7	2,923

TDV Energy Cost Savings over 30-year period 8-Unit (Multifamily Building)

Climate Zone	30-Year TDV Electricity Cost Savings (2020 PV $)	30-Year TDV Natural Gas Cost Savings (2020PV $)	Total 30-Year TDV Energy Cost Savings (2020PV $)
1	n/a	n/a	n/a
2	n/a	n/a	n/a
3	n/a	n/a	n/a
4	$458	$120	$578
5	n/a	n/a	n/a
6	n/a	n/a	n/a
7	n/a	n/a	n/a
8	$542	$36	$578
9	$638	$48	$686
10	$433	$84	$518
11	$747	$157	$903
12	$614	$181	$795
13	$903	$157	$1,060
14	$578	$144	$722
15	$1,143	$12	$1,144
16	$241	$265	$506

KEY WEB-LINK

2019 Title 24 Utility-Sponsored Stakeholder
http://title24stakeholders.com/

Building Energy Efficiency Program
http://www.energy.ca.gov/title24/

Comments to be submitted to
https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=17-BSTD-01.

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Questions?