



UPDATING VERMONT'S COMMERCIAL ENERGY CODE

Informational Webinar for Stakeholders

MARCH 12 & 14, 2014

http://publicservice.vermont.gov/topics/energy_efficiency/code_update



Welcome and Purpose

- ▶ To get stakeholder input on policy and process issues in the commercial energy code (CBES)
- ▶ To get stakeholder input on initial assumptions about commercial code requirements



Agenda

- ▶ 1:00 Introductions and purpose
- ▶ 1:15 Background, Process & Policy Issues
- ▶ 2:00 Technical Issues
- ▶ 2:30 Break
- ▶ 2:45 Technical Issues
- ▶ 3:45 Wrap-up
- ▶ 4:00 Adjourn



Introductions–Update Team

- ▶ Kelly Launder and Barry Murphy, *Vermont Public Service Department*
- ▶ Stu Slote and Tim Guiterman, *Navigant*
- ▶ Richard Faesy and Jim Grevatt, *Energy Futures Group*
- ▶ Jim Edelson, *New Buildings Institute*
- ▶ Eric Makela, *Britt/Makela Group*
- ▶ Mike DeWein, *Consultant*



Introductions–Attendees

- ▶ Who are you?
- ▶ What organization do you represent?
- ▶ What is your stake in the codes update?

Background



Background

- ▶ Energy code update required by Vermont Law
- ▶ Residential Building Energy Standards (RBES)
- ▶ Commercial Building Energy Standards (CBES)
- ▶ Every 3 years
- ▶ Process managed by Public Service Department

Background

▶ Act 89

- Town administrator requirements
 - Provide information
 - Certificate of Occupancy tied to code certificate
- Stretch code for residential
 - Adoption by local jurisdictions; optional
 - Act 250

Schedule for Update Process

- ▶ Effective early 2015
- ▶ Stakeholder meetings Spring 2014
- ▶ Legislative Committee on Rulemaking (LCAR) early fall, 2014 in order to meet target

Stakeholder Input

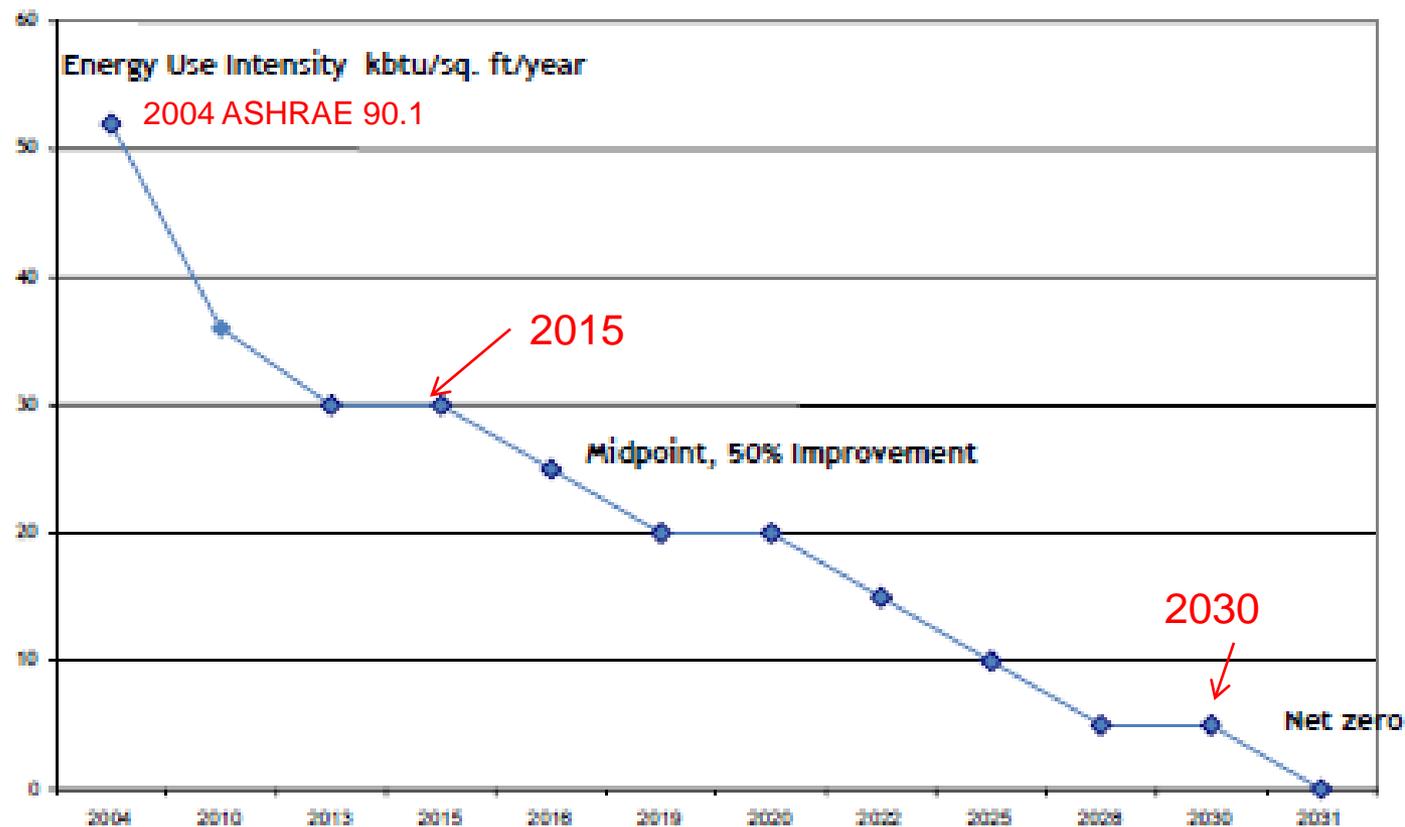
- ▶ Four public stakeholder meetings
 - Webinar held on February 19th
 - March 12 – Vermont College, Montpelier
 - March 14 – Vermont Fire Academy, Pittsford
 - May 7 – Burlington Electric Department
 - May 9 – Windsor Welcome Center
- ▶ Questions and comments to:
 - Barry Murphy, Public Service Department
802-828-3183
barry.murphy@state.vt.us

Objectives and Approach

- ▶ Comprehensive Energy Plan says VT should establish a “...clear path to achieve a goal of having all new buildings built to net zero design by 2030.”
- ▶ “Path” means it’s not one step to net zero—rather incremental improvements to achieve net-zero goal (up to 5 more code updates before 2030)
- ▶ Balance any construction cost increases and construction/technology changes with reducing energy use

Vermont Energy Codes Over Time

Building Energy Performance Goals For ASHRAE 90.1 Standard



Source: NEEP Building Energy Codes Policy 3/1/2009

Code Compliance

- ▶ Lack of enforcement funding, BUT
- ▶ Several initiatives to increase compliance
 - Energy Efficiency Utility (EEU) programs: Efficiency Vermont, Vermont Gas and Burlington Electric Department
 - Act 89 – new requirements
 - Energy Code Assistance Center through Efficiency Vermont
 - Outreach to municipalities by Public Service Department and Efficiency Vermont
 - Exploring creation of an “Building Energy Code Collaborative”

Compliance Options for 2014 CBES

- ▶ Technical Approaches
 - Prescriptive 2014 CBES
 - *COMcheck* software approach
 - ASHRAE 90.1–2013
 - Performance Approach
 - Energy modeling to 90.1–2013 Appendix G
 - Stretch code could include a % improvement
- ▶ Mandatory Requirements
- ▶ Administrative Requirements
 - Affidavit/Certificate signed and posted in building
 - Copy filed with the Town Clerk
 - Copy to the PSD

Codes Coalition

- ▶ Advisory board to provide regular attention to code issues related to updates and compliance
- ▶ Value for stakeholders?
- ▶ Interest in volunteering?
- ▶ We'll know more at the May update

2011 CBES – Recap

- ▶ 2011 CBES is a mix of 2012 and 2009 IECC (and ASHRAE 90.1–2010 and 2007)
- ▶ Introduced new continuous air barrier requirements
- ▶ New metal building R-values; new vestibule requirements
- ▶ Functional performance testing for buildings >50K SF (Economizers, VAV fan control, Hydronic Controls)
- ▶ Expanded economizer requirements
- ▶ And more...

2011 CBES – Notes from the Field

- ▶ What's working?
- ▶ What's causing issues?
- ▶ Any examples/case studies of projects following 2011 CBES?



2015 IECC as the Foundational Document for 2014 CBES

- ▶ Desire to be consistent between C&I and Res
- ▶ Lighting is significantly reorganized and measurably more efficient
- ▶ SHW is significantly revised and more efficient
- ▶ Modest changes/updates to HVAC
- ▶ Little change to envelope
- ▶ Introduces efficiency and renewable energy “packages”

2015 IECC as the Foundational Document (continued)

- ▶ Definitions and language throughout thoroughly clarified
- ▶ 2015 has section on renovation/remodel
- ▶ 2015 brings us in step with national update cycle
- ▶ Whether 2012 or 2015, Vermont can increase OR decrease stringency

Overview of 2014 CBES Chapters

- ▶ Chapter 1: Administration
 - Scope; Application; Enforcement
- ▶ Chapter 2: Definitions
- ▶ Chapter 3: General Requirements
- ▶ Chapter 4: *Reserved (Residential)*
- ▶ Chapter 5: Commercial Energy Efficiency
 - General; **Existing Buildings/Renovations/Repairs**; Envelope; Mechanical; Service Water Heating; Power/Lighting; **Additional Efficiency Package Options; System Commissioning**
- ▶ Chapter 6: Referenced Standards

Technical Issues

Proposed Base & Stretch Levels

- ▶ Overview of slide layouts

Item	2011 CBES	Base	Stretch
End use, section, etc.	What is in current VT code	Proposed level for base code	Proposed level for stretch code
-	-	Some requirements fulfill both base and stretch (or current code and proposed base)	

- ▶ Current / **Base** / *Stretch* or ~~deleted~~
- ▶ Work through major sections of commercial energy efficiency chapter (envelope, mechanical, etc.)

Envelope

Proposed Base & Stretch Levels

► Envelope

Item	2011 CBES	Base	Stretch
Continuous air barrier	3 options (materials, assemblies or testing)	No change, but reorganized text for clarity	2 options (a) Materials list plus leakage testing (i.e., blower door); <i>or</i> (b) Materials list plus air barrier commissioning
Insulation values	2009 and some 2012 IECC values	No change <i>or</i> 2012 IECC values (where better)	2015 IECC, ASHRAE 90.1–2013 or NBI Core Performance Tier 2 values as stretch

Proposed Base & Stretch Levels

- ▶ Envelope – **Base Code** / *Stretch Code*

COMPONENT	MAXIMUM OVERALL U-FACTOR		MINIMUM R-VALUES	
	All other	Group R	All other	Group R
Roofs				
Insulation entirely above deck	U-0.032 <i>U-0.028</i>		R-30ci <i>R-35ci</i>	
Metal buildings	U-0.049 U-0.031 <i>U-0.029</i>		See Assembly Descriptions R-25 + R-11 LS (Liner System) <i>R-30 + R-11 LS (Liner System)</i>	
Attic and other	U-0.027 U-0.021 <i>U-0.017</i>		R-38 R-49 <i>~R-60</i>	

Proposed Base & Stretch Levels

► Envelope – **Base Code** / *Stretch Code*

COMPONENT	MAXIMUM OVERALL U-FACTOR		MINIMUM R-VALUES	
	All other	Group R	All other	Group R
Walls, Above grade				
Mass	U-0.080 U-0.078	U-0.071	R-13.3ci	R-15.2ci
Metal building	U-0.054 U-0.052		R-11 + R-13ci or R-19.5ci R-13 + R-13ci or TBD	
Metal framed	U-0.064		R-13 + R-7.5ci or R-13ci	
Wood-framed and other	U-0.051 <i>U-0.036</i>		R-13 + R-7.5ci or R-20 + R-3.8ci or R-23 or R-15ci <i>R-13 + R-15.6ci or R-20 + R-10ci</i>	

Proposed Base & Stretch Levels

- ▶ Envelope – **Base Code** / *Stretch Code*

COMPONENT	MAXIMUM OVERALL U-FACTOR		MINIMUM R-VALUES	
	All other	Group R	All other	Group R
Walls, Below grade				
Below-grade wall	C-0.092		R-10ci	
Floors				
Mass	U-0.064 U-0.051	U-0.057 U-0.055	R-12.5ci R-15ci	R-14.6ci R-16.7ci
Joist/framing—metal	U-0.038	U-0.032	R-30	R-38
Joist/framing— wood and other	U-0.033		R-30	
Slab-on-grade floors				
Unheated slabs	F-0.480	F-0.450	R-10 for 48 in. below	R-15 for 48 in. below
Heated slabs	F-0.55		R-10 for entire slab	



Proposed Base & Stretch Levels

- ▶ Envelope – **Base Code** / *Stretch Code*

COMPONENT	MAXIMUM OVERALL U-FACTOR		MINIMUM R-VALUES	
	All other	Group R	All other	Group R
Opaque doors				
Swinging		U-0.37		N/A
Roll-up or sliding		U-0.20		N/A
Upward-acting, sectional		N/A		R-10

- ▶ No changes proposed



Proposed Base & Stretch Levels

► Envelope (*continued*)

Item	2011 CBES	Base	Stretch
Window Solar Heat Gain Coefficient (SHGC)	SHGC only considers projection factor	SHGC to consider projection factor <i>and</i> orientation	More stringent (lower) SHGC values than base
Skylights in High Bay Areas	None	All high bay areas over 2500 sq. ft. must be 75% daylit	

Proposed Base & Stretch Levels

► Fenestration – Base Code / *Stretch Code*

Vertical fenestration (40% 30% maximum of above-grade wall)	
Framing materials other than metal with or without metal reinforcement or cladding	
U-factor	0.35 Fixed fenestration: 0.36 / 0.29 <i>(0.22 if 30–40% WWR and 50% floor area daylit)</i> Operable fenestration: 0.43 Entrance doors: 0.77
Metal framing with or without thermal break	
— Curtain wall/storefront U-factor	0.42
— Entrance door U-factor	0.80
— All other U-factor	0.50
SHGC—all frame types	SEW N
PF < 0.25	0.40 0.53
0.25 ≤ PF < 0.5	NR 0.48 0.58
PF ≥ 0.5	NR 0.64 0.64
Skylights (3% maximum)	
U-factor	0.60 0.50
SHGC	0.40

Mechanical

Proposed Base & Stretch Levels

► Mechanical

Item	2011 CBES	Base	Stretch
HVAC Energy Recovery	Mandatory for systems with airflow >5000 cfm	Expand range of exhaust energy recovery down to 10% of outdoor air rate	Required for ventilation systems with high airflow rates (>1000 CFM)
HVAC System Controls	Thermostatic controls with setback capability in each zone.	<ul style="list-style-type: none">-Part load requirements for water-cooled centrifugal chillers;-Deadband of at least 5 F for thermostatic controls;-Isolate zone control requirements for large zones;-Snow and ice melt system controls <i>[See following slides]</i>	



Proposed Base & Stretch Levels

▶ Mechanical

Item	Key Change
Deadband of at least 5 F for thermostatic controls;	If a zone has a separate heating and a separate cooling thermostatic control located within the zone, the heating setpoint must be prevented (by limit switch, mechanical stop or DDC program) from exceeding the cooling setpoint and to maintain a deadband of 5F
Isolate zone control requirements for large zones;	Requires LARGE zones to be split into isolation areas for finer control to prevent wasted energy. Requires isolation devices and controls to automatically shut off the supply of conditioned air and outdoor air to, and exhaust air from, the isolation area



Proposed Base & Stretch Levels

▶ Mechanical

Item	Key Change
Snow and ice melt system controls	Freeze protection systems (heat tracing on outdoor piping, heat exchangers, etc.) must automatically shut off above 40F or if conditions of the fluid will prevent freezing

Proposed Base & Stretch Levels

- ▶ **Mechanical – Zone Isolation language**
- ▶ **Zone isolation.** HVAC systems serving *zones* that are over 25,000 square feet in floor area or that span more than one floor and designed to operate or be occupied non-simultaneously shall be divided into isolation areas. Each isolation area shall be equipped with isolation devices and controls configured to automatically shut off the supply of conditioned air and outdoor air to and exhaust air from the isolation area. Each isolation area shall be controlled independently by a device meeting the requirements of [*Automatic Setback/Shutdown capabilities section*]. Central systems and plants shall be provided with controls and devices that will allow system and equipment operation for any length of time while serving only the smallest isolation area served by the system or plant.
- ▶ **Exceptions:**
 - ▶ 1. Exhaust air and outdoor air connections to isolation areas when the fan system to which they connect does not exceed 5000 cfm.
 - ▶ 2. Exhaust airflow from a single isolation area of less than 10 percent of the design airflow of the exhaust system to which it connects.
 - ▶ 3. Isolation areas intended to operate continuously or intended to be inoperative only when all other isolation areas in a *zone* are inoperative.

Proposed Base & Stretch Levels

► Mechanical

Item	2011 CBES	Base	Stretch
Economizer Functional Testing	None	<ul style="list-style-type: none">-Fault detection and diagnostics requirements;-Low-leakage damper rating and labeling required;-Water-side economizer requirements for non-fan cooling systems	
Duct Leakage	Duct sealing for low, medium and high pressure systems and pressure classification on construction documents		<ul style="list-style-type: none">-Maximum leakage lowered from 6 to 4 for high pressure systems-No more than 5% of ductwork can be located outside of thermal envelope



Proposed Base & Stretch Levels

► Mechanical

Item	2011 CBES	Base	Stretch
Duct Insulation	Min R-8 insulation in unconditioned spaces and R-10 when outside of building		R-8 insulation in unconditioned spaces and R-12 when located outside the building
Pipe Insulation	Minimum pipe insulation table tied to fluid temps and insulation		More rigorous requirements

Service Water Heating



Proposed Base & Stretch Levels

▶ Service Water Heating

Item	2011 CBES	Base	Stretch
SHW Piping Insulation		Minimum pipe insulation table tied to fluid temps and insulation	Includes a pipe length limit (Table C404.5.1) option or a water volume option

- ▶ **Maximum allowable pipe length method.** The maximum allowable piping length from the nearest source of heated water to the termination of the fixture supply pipe for plumbing fixtures and plumbing appliances shall be in accordance with the maximum piping length column in following table.

Proposed Base & Stretch Levels

- ▶ Service Water Heating – Piping volume and maximum piping lengths

NOMINAL PIPE SIZE (inch)	VOLUME (liquid ounces per foot length)	MAXIMUM PIPING LENGTH (feet)	
		WATER FROM A WATER HEATER	WATER FROM A RECIRCULATION LOOP OR HEAT TRACED PIPE
1/4	0.33	50	50
5/16	0.5	50	48
3/8	0.75	50	32
1/2	1.5	43	16
5/8	2	32	12
3/4	3	21	8
7/8	4	16	6
1	5	13	5
1 ¼	8	8	3
1 ½	11	6	2
2 or larger	18	4	1



Proposed Base & Stretch Levels

- ▶ Service Water Heating – Piping volume and maximum piping lengths

Maximum allowable pipe volume method. The water volume in the piping shall be calculated in accordance with *[specified method]*. The maximum volume from the nearest source of heated water to the termination of the fixture supply pipe for a *plumbing fixture* or *plumbing appliance* shall be 0.5 gallon (1.89 L) where the source of heated water is a water heater; and 0.19 gallon (0.7 L) where the source of heated water is a recirculating system or heat-traced piping.

Proposed Base & Stretch Levels

▶ Service Water Heating (*continued*)

Item	2011 CBES	Base	Stretch
Demand Recirculation Pumps	Requirement to shut off automatically or manually when not in operation		<ul style="list-style-type: none">-Recirculation system design requirements-Recirculation system controls requirements
Waste Water Energy Recovery and Commissioning	None	Building with high hot water loads to meet 40% of peak hot water demand with either on-demand, waste water heat recovery or solar hot water system	Service water heating systems commissioning and completion requirements

Lighting

Proposed Base & Stretch Levels

▶ Lighting Power Densities (LPDs)

Item	2011 CBES	Base	Stretch
Lighting Power Density (LPD)	Based on 2012 IECC	2015 IECC (90.1–2013) as both base and stretch values.	One of the efficiency packages is improved LPDs (90% of LPD in table)

▶ See following tables for changes to LPDs

Proposed Base & Stretch Levels

- ▶ Interior lighting power allowances: Building area method (1 of 7)

BUILDING AREA TYPE	LPD (w/sq. ft.)
Automotive facility	0.9 0.80
Convention center	1.2 1.01
Courthouse	1.2 1.01
Dining: bar lounge/leisure	1.3 1.01
Dining: cafeteria/fast food	1.4 0.9
Dining: family	1.6 0.95
Dormitory	1.0 0.57
Exercise center	1.0 0.84
Fire station	0.8 0.67
Gymnasium	1.1 0.94
Health care clinic	1.0 0.90

Proposed Base & Stretch Levels

- ▶ Interior lighting power allowances: Building area method (2 of 3)

BUILDING AREA TYPE	LPD (w/sq. ft.)
Hospital	1.2 1.05
Hotel/ Motel	1.0 0.87
Library	1.3 1.19
Manufacturing facility	1.3 1.17
Motion picture theater	1.2 0.76
Multifamily	0.7 0.51
Museum	1.1 1.02
Office	0.9 0.82
Parking garage	0.3 0.21
Penitentiary	1.0 0.81
Performing arts theater	1.6 1.39

Proposed Base & Stretch Levels

- ▶ Interior lighting power allowances: Building area method (3 of 3)

BUILDING AREA TYPE	LPD (w/sq. ft.)
Police station	1.0 0.87
Post office	1.1 0.87
Religious building	1.3 1.0
Retail	1.4 1.26
School/University	1.2 0.87
Sports arena	1.1 0.91
Town hall	1.1 0.89
Transportation	1.0 0.70
Warehouse	0.6 0.66
Workshop	1.4 1.19



Proposed Base & Stretch Levels

- ▶ Interior lighting power allowances: Space by Space Method
- ▶ Too detailed to itemize in slides
- ▶ Changes to wording in tables (for clarity)
- ▶ Added space types
- ▶ Clarified space types
- ▶ Adjusted values

Proposed Base & Stretch Levels

► Lighting and Controls

Item	2011 CBES	Base	Stretch
Occupancy Sensors	For buildings >5000 sq. ft. Controlled either by time schedule, occupant sensor or signal from BAS system	-Occupancy sensors in classrooms, conference rooms, lunch and break rooms, private offices, restrooms, warehouse spaces, storage rooms and janitorial closets. -Important reorganization of controls language -Sensors control 50% of load in stairways, parking garages (per ASHRAE)	
Sleeping Unit Controls	Requires master switch at main entry controlling all permanently installed luminaires and switched receptacles		



Proposed Base & Stretch Levels

▶ Lighting and Controls

Item	2011 CBES	Base	Stretch
Daylight Controls	Lighting within daylight zones shall be individually controlled from general area lighting.		Spaces with a total of more than 150 watts of general lighting within sidelight and toplight daylight zones shall include daylight responsive controls

Electrical Power & Energy Consumption

Proposed Base & Stretch Levels

▶ Electrical Power/Energy Consumption

Item	2011 CBES	Base	Stretch
Vertical & Horizontal Transport	None	Elevator cabs: Luminaires to exceed 35 lumens per watt. Ventilation fans less than 0.33 watts/cfm Escalators and moving walks: Automatic controls to reduce speed to minimum permitted when not in use	
Controlled Receptacles	None	-Automatic controls in at least 50 percent of the 125 volt 15- and 20-Ampere receptacles in private offices, computer classrooms and individual workstations and labeled “Automatic Control Receptacle” -Considering “load segregation” requirement (dedicated panels for end-uses)	

Proposed Base & Stretch Levels

▶ Electrical Power/Energy Consumption

Item	2011 CBES	Base	Stretch
Computer/ Server Rooms	None	2015 IECC ventilation requirements	NBI Core Performance Tier 2: Separate economizer, HVAC controls, humidification and fan power limitation and controls for computer rooms over 5 tons
Kitchen Ventilation and Exhaust Systems	None	Replacement air introduced directly into the exhaust hood cavity shall not exceed 10 percent of the hood exhaust airflow rate	



Proposed Base & Stretch Levels

▶ Electrical Power/Energy Consumption

Item	2011 CBES	Base	Stretch
Laboratory Exhaust Systems	None	Requirement responds to the special needs of a laboratory exhaust and ventilation system. Includes an associated table of specifications and conditions for lab applications/uses	
Refrigerated Display Case Lighting	None	2015 IECC: Either automatic time switch or motion sensor controls required	

Commissioning



Proposed Base & Stretch Levels

- ▶ Commissioning and Verification
- ▶ Distinct section

Item	2011 CBES	Base	Stretch
Functional Testing and Commissioning	For buildings >50K SF: Economizers, VAV fan control, and hydronic controls	Required for lighting controls, mechanical systems over 480 kBtu cooling and 600 kBtu heating	Add specificity for testing of lighting controls and defines role of registered design professional

Additional Efficiency Package Options

Proposed Base & Stretch Levels

▶ Efficiency Packages

- Base code: require minimum of one package
- Stretch code: require minimum of two packages

◦ Six Packages

1. Efficient lighting (90% of stated LPD values)
2. Efficient HVAC (e.g., 10% improvement)
3. Enhanced digital lighting controls
4. On-site renewables
5. Dedicated outdoor air system
6. Reduced energy use in service water heating



Proposed Base & Stretch Levels

- ▶ **Efficient lighting (90% of stated LPD values) (1 of 6)**

Reduced lighting power density. The total interior lighting power (watts) of the building shall be determined by **using 90 percent of the lighting power values** in Table 505.5.2(1) or by using 90 percent of the interior lighting power allowance calculated by the Space by Space method in section 505.5.2.



Proposed Base & Stretch Levels

- ▶ **Efficient HVAC (2 of 6)**
 - Equipment shall exceed federal minimums by 10%

Proposed Base & Stretch Levels

▶ Enhanced digital lighting controls (3 of 6)

Enhanced digital lighting controls. Interior lighting in the building shall have the following **enhanced lighting controls** which shall be located, scheduled, and operated in accordance with Section 505.2.2.

1. Luminaires shall be capable of **continuous dimming**.
2. Luminaires shall be capable of being **addressed individually**. Where individual addressability is not available for the luminaire class type, a controlled group of no more than 4 luminaires shall be allowed.
3. No more than 8 luminaires shall be controlled together in a *daylight zone*
4. Fixtures shall be controlled through a **digital control system** that includes the following function:
 - 1.1. Control reconfiguration based on digital addressability
 - 1.2. Load shedding
 - 1.3. Individual user control of overhead general illumination in open offices
 - 1.4. Occupancy sensors shall be capable of being reconfigured through the digital control system.
5. **Construction documents** shall include submittal of a Sequence of Operations, including a specification outlining each of the functions in Item 4 of Section 506.4.
6. **Functional testing** of lighting controls shall comply with Section 508.



Proposed Base & Stretch Levels

▶ On-site renewables (4 of 6)

- Total minimum ratings of on-site renewable energy systems shall comply with one of the following:
 - At least 1.75 btu / 0.50 watts per sq. ft. of conditioned floor area *or*
 - No less than 3% of energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 5; derived from qualified on-site renewable source

Proposed Base & Stretch Levels

► Base/Stretch Renewables

	Base	Stretch
Buildings under base floor threshold (TBD)	One package from Section 506. If On-Site Renewables is not chosen as that package, project must also meet Solar Ready documentation.	Two packages from Section 506 and project must meet Solar Ready documentation. Alternatively, Section 506.5 satisfies this requirement in full.
Buildings equal to or greater than base floor threshold (TBD)	On-site renewables installed to meet requirements of Section 506.5	Section 506.5 plus one other package in Section 506

Proposed Base & Stretch Levels

- ▶ **Dedicated outdoor air system (5 of 6)**
 - Buildings covered by Section 503.4 [*Complex HVAC Systems*] shall be equipped with an independent ventilation system designed to provide no less than the minimum 100 percent outdoor air to each individual occupied space as specified by the International Mechanical Code, to each individual occupied space.
 - The ventilation system shall be capable of total energy recovery. The HVAC system shall include supply-air temperature controls that automatically reset the supply-air temperature in response to representative building loads, or to outdoor air temperatures.
 - The controls shall reset the supply air temperature at least 25 percent of the difference between the design supply-air temperature and the design room air temperature.



Proposed Base & Stretch Levels

- ▶ **Reduced energy use in service water heating (6 of 6)**
 - **Load fraction.** The building service water heating system shall have one or more of the following that are sized to provide at least 60 percent of hot water requirements, or sized to provide 100 percent of hot water requirements if the building must otherwise comply with Section C403.4.6:
 - **1. Waste heat recovery** from service hot water, heat recovery chillers, building equipment, process equipment, or a combined heat and power system.
 - **2. Solar water heating systems.**

Q&A and Wrap-Up

Other issues

- ▶ Q & A

Wrap-up

- ▶ Identify areas for further discussion

Contacts

- Tim Guiterman, Navigant
- Stu Slote, Navigant
- Jim Edelson, New Buildings Institute

Follow up with:

Barry Murphy, Public Service Department

802-828-3183

barry.murphy@state.vt.us

[http://publicservice.vermont.gov/topics/
energy_efficiency/code_update](http://publicservice.vermont.gov/topics/energy_efficiency/code_update)