

ASHRAE Standard 100 – 2015 Energy Efficiency in Existing Buildings

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ASHRAE Std. 100 – 2015

Energy Efficiency in Existing Buildings

- 1. The need for ASHRAE Std. 100**
- 2. What is Std. 100**
- 3. Compliance**
- 4. Next Steps – Include Canada in the tables**

ASHRAE Std. 100 – The Need

- **Existing Buildings**

- **In the US – Approx. 5.6 Million commercial buildings** (CBECS 2012)
- **In Canada – Approx. 0.5 Million commercial/institutional buildings** (SCIEU 2009)

- **Building Energy Use**

- **In 2014 - BC Hydro total domestic electricity sold was 53,018 Gigawatt-hours**
- **Residential, light industrial and commercial accounted for 69% of total electricity sold**

ASHRAE Std. 100 – The Need

**75% to 80% of All Buildings
That will exist in 2030
Exist Today**

**Our Greatest Opportunity to Reduce
Energy consumption & provide for a
Sustainable Future is in:**

Existing Buildings

ASHRAE Std. 100 – The Need

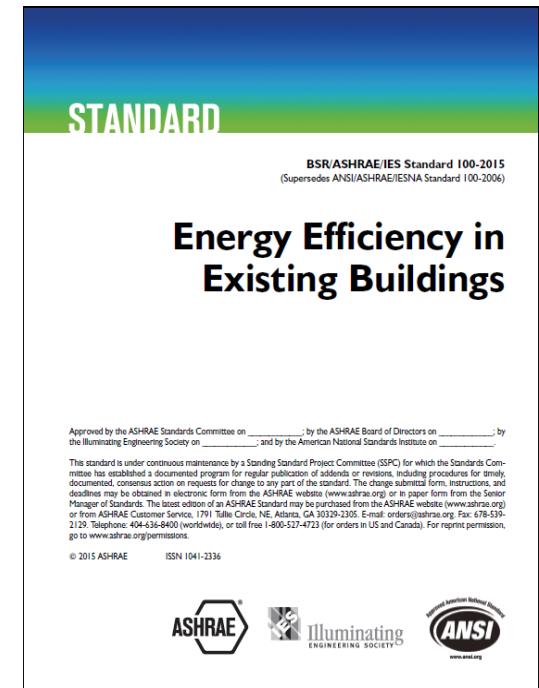
- **International Energy Conservation Code (IECC)**
- **ASHRAE Std. 90.1**
- **ASHRAE Std. 90.2**

Are energy codes and standards for the design and construction of **new buildings**

ASHRAE Std. 100 – What is it?

ASHRAE Standard 100 – 2015 Energy Efficiency in Existing Buildings

Provides the **minimum** requirements for energy efficient design and operation of **existing** residential, commercial, institutional and industrial buildings



ASHRAE Std. 100 – What is it?

- **Provides Guidance to building owners and operators on processes and procedures needed to the energy consumption of their buildings**
- **Provides a code ready standard that can be used by state and local jurisdictions to write directly into building codes**
- **Provides a verifiable process that federal & state authorities and utility companies can use to support tax incentive, rebate and other programs**

ASHRAE Std. 100 – What is it?

Basic Index

1. Purpose
2. Scope
3. Definitions
4. Compliance Requirements
5. Energy Management Plan
6. Operation and Maintenance Plan
7. Energy Use Analysis & Target Requirements
8. Energy Audits
9. Implementation & Verification
10. Residential Buildings & Dwelling Units

ASHRAE Std. 100 – What is it?

References

1. Normative Annex A: Alternate Energy Intensity Targets
2. Informative Annex B: Timeline
3. Normative Annex C: Forms
4. Informative Annex D: Operation and Maintenance Requirements for Building Systems and Elements
5. Informative Annex E: **Energy Efficiency Measures**
6. Informative Annex F: Standard 100 Compliance Flow Chart
7. Informative Annex G: Climate Zones
8. Informative Annex H: Simple Payback and Life-Cycle Cost Analysis
9. Informative Annex I: Building Energy Modeling
10. Informative Annex J: Derivation of Building Energy-Use Intensity Targets
11. Informative Annex K: Alternative Methods for Energy Targets and Fuel Heat Conversion Values – Other Fuels
12. Normative Annex L: Operation and Maintenance Implementation

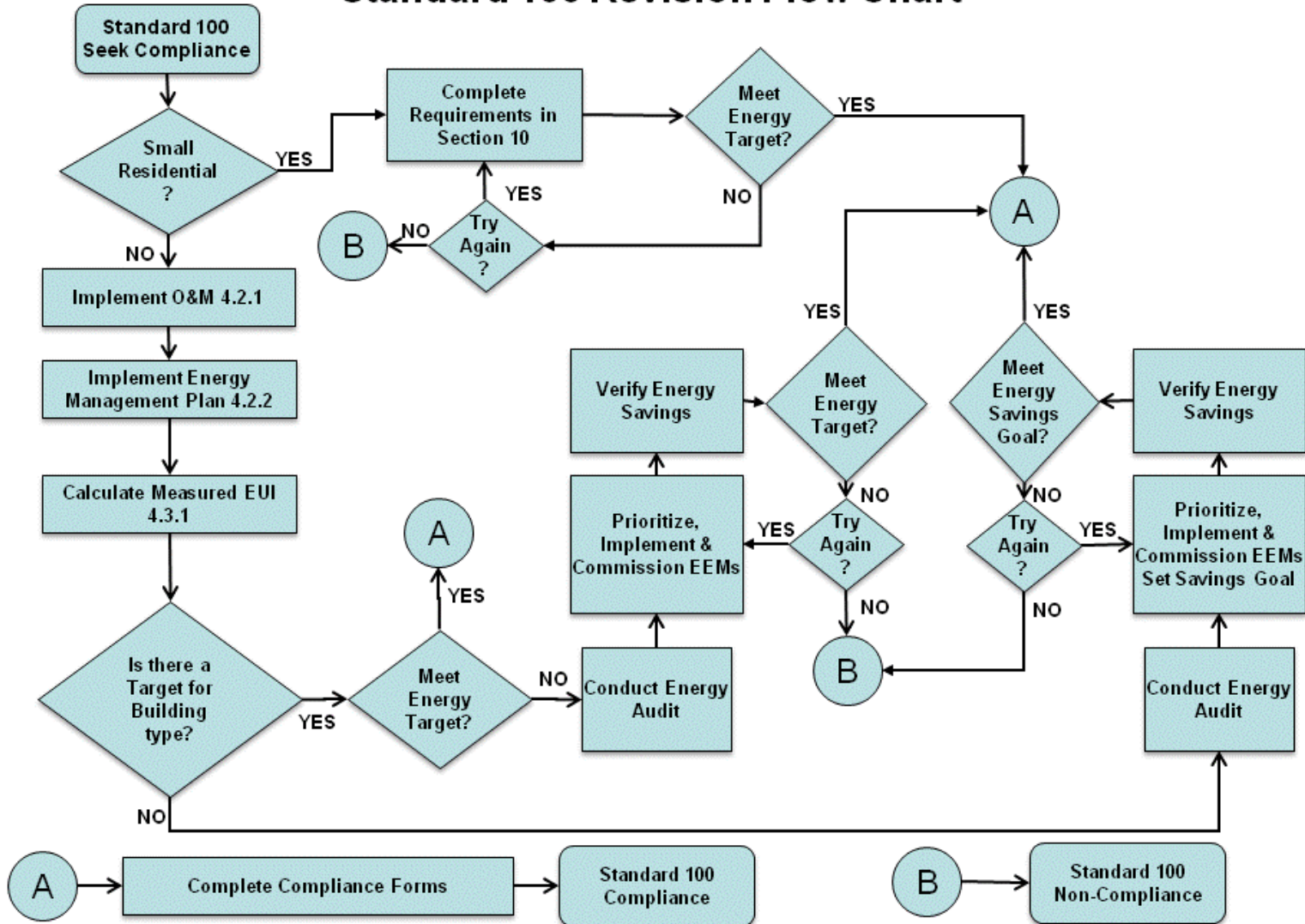
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Section 4

Compliance Requirements

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Standard 100 Revision Flow Chart



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Section 4 – Compliance Requirements

1. Compliance Process

- Building Types
- Timeline
- Forms

2. Energy Management Plan

3. Operation and Maintenance Program

4. Building Energy Use

- Buildings *with* Energy Targets
- Buildings *without* Energy Targets

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Energy-Use Intensity (EUI) Targets

- 53 Building Types
- 16 Climate Zones
- Annex J

		EUIs by Building Type by Climate Zone (kBtu/sf-yr)															
		ASHRAE Climate Zone															
No.	Commercial Building Type	1A	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	6A	6B	7	8	
1	Admin/professional office	39	40	39	42	33	39	33	46	40	48	42	54	47	58	81	
2	Bank/other financial	55	57	56	59	46	55	47	65	56	57	68	59	76	67	115	
3	Government office	49	50	49	52	41	48	42	57	49	50	60	52	67	59	101	
4	Medical office (non-diaq)	33	34	33	35	28	33	28	39	34	34	41	36	46	40	69	
5	Mixed-use office	45	46	45	48	38	45	39	53	46	47	56	48	62	55	94	
6	Other office	38	39	38	40	32	37	32	44	38	39	47	40	52	46	78	
7	Laboratory	178	176	171	175	147	165	159	194	173	179	209	187	232	211	331	
8	Distribution/ship center	12	16	16	20	11	18	14	27	23	22	36	30	49	40	113	
9	Non-refrig warehouse	6	8	8	10	5	9	7	13	11	11	17	14	24	19	54	
10	Convenience store	135	146	135	152	127	139	141	166	150	157	178	162	193	179	263	
11	Convenience store+gas	108	118	109	122	102	112	114	133	121	126	144	130	156	144	212	
12	Grocery/food market	112	122	113	127	106	116	118	138	125	131	149	135	161	149	219	
13	Other food sales	34	37	34	38	32	35	36	42	38	40	45	41	49	45	66	
14	Fire/police station	66	65	63	64	54	61	59	71	64	66	77	69	85	78	122	
15	Other public order/safety	60	59	57	59	49	55	53	65	58	60	70	63	78	71	111	
16	Medical office (diagnostic)	33	32	32	32	30	32	27	32	30	28	30	31	30	31	35	
17	Clinic/other outpatient health	50	48	49	48	45	48	40	48	46	42	46	45	47	45	52	
18	Refrigerated warehouse	69	68	66	68	57	64	62	75	67	69	81	72	90	82	128	
19	Religious worship	23	23	22	23	19	22	21	25	23	23	27	25	30	28	43	
20	Entertainment/culture	23	23	22	23	19	21	21	25	23	23	27	24	30	28	43	
21	Library	61	61	59	60	50	57	55	67	60	61	72	64	80	73	114	
22	Recreation	26	26	25	26	22	24	24	29	26	26	31	28	34	31	49	
23	Social/meeting	28	27	26	27	23	26	25	30	27	28	32	29	36	33	51	
24	Other public assembly	28	28	27	28	23	26	25	31	27	28	33	30	37	33	52	
25	College/university	62	61	60	62	45	58	50	72	60	65	78	65	90	78	147	
26	Elementary/middle school	38	37	36	37	30	35	32	41	36	36	42	37	46	41	72	
27	High school	45	45	44	46	33	42	37	52	44	47	57	48	66	57	107	
28	Preschool/daycare	49	48	46	48	39	45	41	52	46	47	54	47	60	53	93	
29	Other classroom education	25	25	25	25	18	24	21	29	25	26	32	27	37	32	60	
30	Fast food	261	268	263	277	237	266	253	305	280	284	332	301	364	333	497	
31	Restaurant/cafeteria	141	145	141	150	126	143	137	166	151	156	179	163	195	181	213	
32	Other food service	77	79	77	82	69	78	75	91	83	85	98	89	107	99	146	
33	Hospital/inpatient health	142	143	140	141	134	138	130	143	129	135	139	126	142	130	144	
34	Nursing home/assisted living	84	83	81	83	69	78	75	91	82	84	99	88	109	100	118	
35	Dormitory/fraternity/sorority	40	43	42	47	31	43	40	58	48	54	65	55	75	66	119	
36	Hotel	50	51	48	52	47	49	48	55	52	52	57	55	61	59	85	
37	Motel or inn	55	53	52	51	48	50	46	52	50	48	53	50	56	52	69	
38	Other lodging	53	50	50	49	46	48	44	49	48	46	50	48	53	50	66	
39	Vehicle dealership/showroom	49	50	49	53	38	48	42	60	52	52	68	58	78	69	124	
40	Retail store	28	29	28	30	21	27	24	34	30	30	39	33	45	40	71	
41	Other retail	49	50	49	52	37	48	42	59	52	52	67	58	78	69	124	
42	Post office/postal center	43	42	41	42	35	39	38	46	41	43	50	45	56	51	79	
43	Repair shop	28	28	27	28	23	26	25	31	28	28	33	30	37	34	53	
44	Vehicle service/repair shop	33	33	32	32	27	31	29	36	32	33	39	35	43	39	61	
45	Vehicle storage/maintenance	14	14	14	14	12	13	13	16	14	14	17	15	19	17	27	
46	Other service	60	60	58	59	50	56	54	65	59	60	71	63	78	71	112	
47	Strip shopping mall	59	59	58	62	46	57	51	71	62	63	82	70	94	84	151	
48	Enclosed mall	56	56	55	59	44	54	49	68	59	60	78	67	90	80	144	
		ASHRAE Climate Zone															
Residential Building Type		1A	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	6A	6B	7	8	
49	Mobile home	38	40	40	45	30	41	38	54	45	51	62	52	71	62	112	
50	SF-detached	28	30	30	33	22	30	28	40	34	38	46	38	52	46	83	
51	SF-attached	32	34	34	38	25	35	32	46	39	43	53	44	60	53	96	
52	Apartment building (2-4 units)	47	50	50	56	37	51	47	68	57	64	77	65	89	78	101	
53	Apartment building (5+ units)	32	34	34	38	25	35	32	46	39	43	53	44	60	53	96	

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Section 5

Energy Management Plan

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Section 5 – Energy Management Plan

- Annual building net energy use shall be monitored and recorded as an EUI, Energy Use Intensity
- Equipment replacement minimum standards are equal to
 - ASHRAE Std. 90.1, *Energy Standard for Buildings, Except Low-Rise Residential Buildings*, and
 - ASHRAE Std. 90.2, *Energy Standard for Residential Buildings*

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Section 6

Operation and Maintenance

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Section 6 – Operation and Maintenance

- For compliance – Establishing an O & M Program is mandatory
- **Annex L** defines the minimum O&M requirements
- Requirements are targeted to be
 - Feasible for buildings of all sizes and occupancies
 - Practical for the average owner
 - Achieve energy efficiency

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Section 7

Energy Use Analysis and Targets

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Sect 7 – Energy Use Analysis and Targets

- Authority Having Jurisdiction can pick level of compliance in reference to Benchmark for Target and can be set on both a Site or Source basis
- Owner to conduct energy use analysis from utility bills to get Baseline EUI, Energy Use Intensity, (kBTU/ft²-yr) or (MJ/m²-yr)

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Sect 7 – Energy Use Analysis and Targets

- **If building type is listed in Target List, compare Baseline to Target**
 - **If Baseline \leq Target, requirement of Sec. 7 met**
 - **If Baseline $>$ Target, must complete Sec 8 & 9**
- **If building type not listed in Target list, must complete Sec 8 & 9**

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Section 8

Energy Audit Requirements

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Section 8 – Energy Audit Requirements

- Energy Audit requirements for buildings w/o Targets
- Energy Audit requirements for buildings Don't Meet Targets
- Energy Audit Levels
 - Level 1 Audit
 - Level 2 Audit

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Section 9

Implementation and Verification Requirements

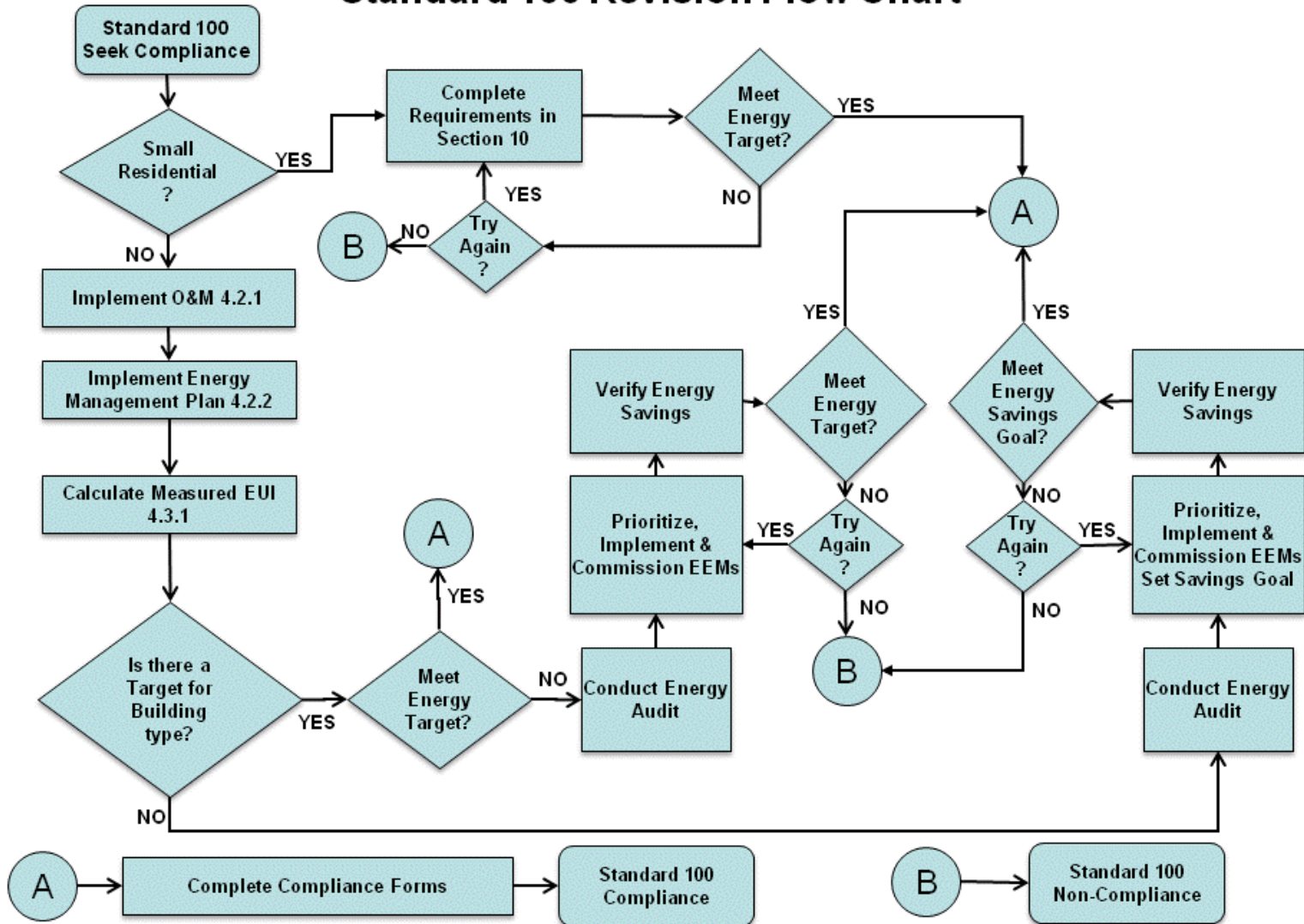
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Section 9 – Implementation & Verification

- **Developing/Implementing an Energy Efficiency Plan**
 - **Goals**
 - **Capital Improvement Plan**
 - **Energy Efficiency Priorities**
 - As required to meet EUI of buildings with targets
 - Optimized Bundle of EEMs with simple payback less than or equal to 5 years for buildings w/o targets
 - **Implement EEMs**
 - **Training of Building staff**
 - **Multiple Buildings**

ASHRAE Std. 100 – Compliance

Standard 100 Revision Flow Chart



ASHRAE Std. 100 – Next Steps

Develop Target Values for Canada

- **Natural Resources Canada (NRCan)**
 - In communication with the Chair of SSPC 100 WG4 (International Target Table)
 - Has expressed interest in contributing information
 - Has data from the 2009 Survey on Commercial and Institutional Energy Use (SCIEU 2009)
 - Analogous to 2003 CBECS
- **Oak Ridge National Laboratory**
 - Chair of SSPC 100 WG4 in communication with person who created US targets regarding possibility of using the SCIEU 2009 data to create targets for Canada
 - Energy use per m² does not vary much by climate zone
 - Building type in SCIEU parallel categories in CBECS

2015 POWER SMART
FORUM
GETTING TO ZERO:
INNOVATING FOR THE FUTURE



Thank You!

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