

**Proposed Regulatory Area:
Evaluation of Energy Efficiency Regulations**

Target Market	Lighting Power Density for new buildings with a floor area greater than 600m ² , not including small residential and commercial buildings.
Test Standard	American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) ASHRAE 90.1-2004, Section 9.5
Current BC Regulation	City of Vancouver Building Bylaw (addendum G of ASHRAE 90.1 – 2001).
Proposed Energy Performance Standard	Lighting Power Densities Using the “Building Area Method” (Table 9.5.1 ASHRAE Standard) or the “Space-by-Space” Method (Table 9.6.1 of ASHRAE Standard) as attachment. This standard could be enacted as part of the Energy Efficiency Act, or as a provision in the BC Building Code.
Market segments	The Analysis focused on the Warehouse, Hotel/Motel, Multi-Unit, Retail, Office and Hospital Segments. These segments represent 66% of the existing stock of target market buildings. These segments were identified for Analysis in the 2002 BC Hydro Conservation Potential Review. These segments were selected based on data availability and the share of the existing commercial floor space stock these segments represent. New Schools and Universities were excluded from the analysis as they were found to be above the ASHRAE standard in the BC Hydro 2005 New Construction Program Baseline Study.
Effective Date	April 1, 2008
Certification	Certification By a Professional Engineer or Architect that the building design meets the Standard.
Need for the Regulation	New regulation supports <i>The BC Energy Plan</i> and its associated energy efficiency targets, along with the greenhouse gas emission reduction provisions in the 2007 Throne Speech.
Results Based Regulatory Design	Regulation is based on energy intensity, resulting in tangible electricity savings for all consumers.

<p>Transparent Regulation Development (Acceptability)</p>	<p>Development of regulation involved the following procedure:</p> <ul style="list-style-type: none"> • Identified a potential standard • Identified test procedure • Market analysis • Economic assessment • Regulatory assessment • Industry consultation – Illumination Engineers Society of North America • Stakeholder consultation
<p>Market Transformation Strategy</p>	<p>BC Hydro’s High Performance Building program provides financial and technical support to reduce electricity demand. The program supports a building design approach that integrates building envelope and heating, ventilation, and air conditioning system design.</p> <p>Fortis BC’s New Construction Program provides financial incentives and technical support for new energy efficient buildings (PowerSense).</p>

Assessment from a Consumer Perspective

Criteria	Evaluation
Capital / purchase costs	<p>Incremental capital cost per consumer is approximately:</p> <ul style="list-style-type: none"> • Warehouse: \$5.51/m² • Motel / Hotel: \$2.71/m² • Multi Unit: \$1.67/m² • Retail: \$2.50/m² • Office: \$4.98/m² • Hospital: \$6.59/m² <p>Incremental Capital Costs are based on BC Hydro: New Construction Program Baseline Study</p>
Cost-Benefit Analysis Energy savings for each consumer (Affordability)	<p>This is based on the following assumptions:</p> <ul style="list-style-type: none"> • Discount rate of 8%, net of inflation • Base electricity price of \$0.0627/kWh • Energy cost escalation rate of 2.5% over inflation • Useful life of the capital costs is 20 years. <p>Electricity Savings of:</p> <ul style="list-style-type: none"> • Warehouse: 14.7 kwh/m²/Year • Motel / Hotel: 17.7 kwh/m²/Year • Multi Unit: 15.7 kwh/m²/Year • Retail: 12 kwh/m²/Year • Office: 11.3 kwh/m²/Year • Hospital: 14.7 kwh/m²/Year <p>*the electricity savings result in a 20% to 30% reduction in electricity use for lighting.</p> <p>Based on aforementioned capital costs and above assumptions – results in a Net Present Value of:</p> <ul style="list-style-type: none"> • Warehouse: \$3.4/m² • Motel / Hotel: \$8.0/m² • Multi Unit: \$8.0/m² • Retail: \$4.8/m² • Office: \$1.9/m² • Hospital: \$2.3/m² <p>The electricity savings from adhering to the standard cover the incremental capital cost and provide cost savings to the customer under almost all scenarios.</p>

Sensitivity Analysis:	<ul style="list-style-type: none"> • 20 % +/- on all variables (including capital cost, below), positive NPV for all market segments. • -50%/ + 20% for electricity savings for retail sector (due to uncertainties regarding use patterns in segment), NPV remained positive <p>Stochastic Analysis:</p> <ul style="list-style-type: none"> • Stochastic Analysis running 10,000 trials based on +/- 20% on all variables (-50%/ +20% electricity savings for retail sector) positive NPV in greater than 90% of trails for all sectors.
Consumer choice / quality of service (Availability)	No impact on customer choice / quality of service.

Assessment from an Industry Perspective

Range of products affected	Design and construction of all commercial buildings in British Columbia.
Cost impacts	The additional costs are expected to be fully recovered through the price paid by owner / occupiers. The increased capital costs related to the standard are effectively a flow through cost that will be recovered by the developers in the Market.
Competitive Analysis	ASHRAE standard is already quite common within North America, and design and construction firms have been able to adapt. Vancouver design firms are already accustomed to this standard and provide services for other parts of the province.

<p>Assessment from a Provincial Government Perspective Economic assessment from a provincial perspective</p> <p>(Aggregate energy, emission and net cost savings)</p>	<p>This is based on the following assumptions:</p> <ul style="list-style-type: none"> • Discount rate of 8%, net of inflation. • Annual floor space increase of 2.5 million metres per year. • A marginal electricity price of \$0.085/kWh, along with an annual 2.5% real price escalation. • \$15/tonne for greenhouse gas emission reductions, assuming 360 tonnes per Gigawatt-hour of electricity supply until 2016. <p>Electricity savings ranging from non-discounted savings of 32 GWh in the first year of the regulation to 663 GWh in year 20. The proposed change in the first full year would be equivalent to removing 320 houses from the grid and in the 20th year of the program, the output from a 50 mw thermal electricity plant operating at an 80% capacity factor.</p> <p>The net present value of energy savings related to the proposed regulation is \$215 million dollars.</p> <p>Total greenhouse gas emissions reductions, counted only through 2016, will be 511,457. Greenhouse Gasses are assumed to be 360 kg per GWh of electricity prior to 2016.</p>
<p>Regulatory Requirements Avoid or Eliminate Duplication with Other Jurisdictions</p>	<p>Currently the City of Vancouver Building Bylaw (addendum G of ASHRAE 90.1 – 2001) employs the proposed standard.</p> <p>British Columbia is currently examining integrating the ASHRAE 90.1-2004 into the Building Code.</p>
<p>Administrative Feasibility for Compliance and Enforcement</p>	<p>Compliance and enforcement plan to be developed.</p>

<p>Regulatory Assessment Completed by</p>	<p>Michael D’Antoni Senior Advisor Electricity & Alternative Energy Division BC Ministry of Energy, Mines & Petroleum Resources 5th Floor, 1810 Blanshard St. Victoria BC (250) 952-0308</p>
<p>Date</p>	<p>July 11, 2007</p>

Attachments

ASHRAE 90.1 (2004) Table 9.5.1 Lighting Power Densities Using the Building Area Method

Lighting Power Density	(W/m ²)
Automotive Facility	10
Convention Centre	13
Court House	13
Dining: Bar Lounge / leisure	14
Dining: Cafeteria/ Fast Food	15
Dining: Family	17
Dormitory	11
Exercise Center	11
Gymnasium	12
Healthcare-Clinic	11
Hospital	13
Hotel	11
Library	14
Manufacturing Facility	14
Motel	11
Motion Picture Theatre	13
Multi-Family	8
Museum	12
Office	11
Parking Garage	3
Penitentiary	11

Performing Arts Theatre	17
Police/Fire Station	11
Post Office	12
Religious Building	14
Retail	16
School / University	13
Sports Arena	12
Town Hall	12
Transportation	11
Warehouse	9
Workshop	15

ASHRAE 90.1 (2004) Table 9.6.1 Lighting Power Densities Using the Space-by-Space Method

Common Space Types	(W/m ²)	Building Specific Space Types (Continues)	(W/m ²)
Office-enclosed	12	Fire Stations	
Office-open plan	12	Fire Station Engine Room	9
Conference/ Meeting / Multipurpose	14	Sleeping Quarters	3
Classroom/lecture/Training	15	Post Office – Sorting Area	13
For Penitentiary	14	Convention Centre – Exhibit Space	14
Lobby	14	Library	
For Hotel	12	Card File & Cataloguing	12
For Performing Arts Theatre	36	Stacks	18
For Motion Picture Theatre	12	Reading Area	13
Audience/Seating Area	10	Hospital	
For Gymnasium	4	Emergency	29
For Exercise Centre	3	Recovery	9
For Convention Centre	8	Nurse Station	11
For Penitentiary	8	Exam / Treatment	16
For Religious Building	18	Pharmacy	13
For Sports Arena	4	Patient Room	8
For Performing Arts Theatre	28	Operating Room	24
For Motion Picture Theatre	13	Nursery	6
For Transportation	5	Medical Supply	15
Atrium-first three floors	6	Physical Therapy	10
Atrium-each additional floor	2	Radiology	4
Lounge/Recreation	13	Laundry – Washing	6
For Hospital	9	Automotive – Service / Repair	8
Dining Area	10	Manufacturing	
For Penitentiary	14	Low Bay	13
For Hotel	14	High Bay	18
For Motel	13	Detailed Manufacturing	23
For Bar/Lounge/Leisure Dining	15	Equipment Room	13
For Family Dining	23	Control Room	5
Food Preparation	13	Hotel / Motel Guest Rooms	12
Laboratory	15	Dormitory – Living Quarters	12
Restrooms	10	Museum	
Dressing/locker/fitting room	6	General Exhibition	11
Corridor/Transition	5	Restoration	18
For Hospital	11	Bank/Office – Banking Activity Area	16
For Manufacturing Facility	5	Religious Buildings	
Stairs – Active	6	Worship-pulpit, choir	26
Active Storage	9	Fellowship Hall	10
For Hospitals	10	Retail [for accent lighting see 9.3.1.2.1	
Inactive Storage	3	Sales Area	18
For Museum	9	Mall Concourse	18

