

## **e.Catalog Product Acceptance Criteria**

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## **e.CATALOG PRODUCT ACCEPTANCE CRITERIA**

The following outlines the criteria that manufacturer's must meet in order for their products to be accepted into the BC Hydro e.Catalog:

- Products must meet local building codes and be approved by local electrical inspectors.
- Products must meet as a minimum Energy Star or the Federal Energy Management Program (FEMP) energy efficiency standard. For details on energy efficiency standards see the BC Hydro e.Catalog Energy Efficiency Criteria listed below.
- Where no standard exists or where data is unavailable BC Hydro applies its own criteria as determined by BC Hydro's Power Smart technical department. The product review process assesses each case individually and considers the following:
  - Products must be commercially available and both technically and economically feasible
  - Priority is given to products which consume electrical power to operate and meet high energy efficiency criteria
  - Resource constraints require BC Hydro to focus on the most obvious commercial electrical energy consuming products that have energy efficiency criteria
  - Products are rejected when technology is unproven. We rely on having criteria for e.Catalog approval because BC Hydro does not have resources to endorse or test vendor claims. Exceptions are made only when the Power Smart Technical department is comfortable with approving the product as is in the case where the technology is proven and product is clearly far more energy efficient than what is normally used.
  - Currently fuel substitution products are not accepted
- Manufacturers must have authorized distributors which are available and responsive regarding after sales service and warranty support as shown by:
  - local (British Columbia) contact information (phone and address),
  - demonstrated ability to follow up with customers on site, and
  - demonstrated ability to respond to customer issues within 48 hours.
- Manufacturers must not sell products exclusively online.
- Manufacturers must have been in business for a minimum of 3 years.
- Exceptions to these guidelines may be considered by BC Hydro on a case-by-case basis only.
- Manufacturer must be willing to invest the time and resources required to keep their product data current
- BC Hydro makes no representation, guarantee or warranty to any third party regarding the intellectual or other property rights of any person or party in any of the products listed on e.Catalog.”
- BC Hydro reserves the right to remove any products from e.Catalog at any time if, in BC Hydro's opinion, the product acceptance criteria are not met, or for any other reason as BC Hydro determines necessary for the proper administration of e.Catalog.

## **e.CATALOG ENERGY EFFICIENCY CRITERIA**

BC Hydro reviews manufacturer data to ensure it meets our energy efficiency standards. Through this process, we have adopted the higher standard for energy efficiency used by the US Department of Energy (DOE) known as Energy Star or the Federal Energy Management Program (FEMP). Where no standard exists or where data is unavailable Hydro has applied our own criteria as identified by BC Hydro's Power Smart technical department.

Note: Words underlined are defined in the glossary at the bottom of this document.

**Energy efficiency criteria are defined for the following products:**

Note: Products denoted below with \* are eligible technologies under the Product Incentive Program (PIP). Please consult the Product Performance Criteria to determine if products are eligible for PIP.

**Lamps**

- Compact Fluorescent Lamps (screw in\*, 2 pin, 4 pin)
- Cold Cathode\*
- T8 Fluorescent Lamps\*
- Electro Luminescent\*
- HID Lamps\* (select wattages eligible)
- Halogen HIR Lamps\*

**Luminaries**

- Compact Fluorescent\* (hardwired luminaires eligible only)
- Fluorescent\* (High bay fluorescent luminaire w/ T5, T5HO, T8 or CFL lamp eligible)
- Fiber Optic Luminaires
- HID Luminaires\* (high pressure sodium and pulse start metal halide)
- Outdoor Lighting
- Suspended Linear Fluorescent

**Ballasts**

- Compact Fluorescent
- Fluorescent Ballasts\*
- HID Ballasts

**Components**

- Retrofit Kits

**LED Lighting**

- LED Exit\*
- LED Lamps\*
- LED Exit Signs\*
- LED Exit Retrofit Kits\*
- LED Holiday Lights\*
- LED Signs\*
- LED Strips (for architectural area signage)\*

**HVAC**

- Chillers
- Unitary Air Conditioners
- Unitary Heat Pumps
- Split Air Conditioners
- Split Heat Pumps

**Controls**

- HID HI/Low Switching Systems\*
- HVAC Controls\*
- Vending Machine Sensor\*

**Ice Rink Technologies**

- Low-e Ceiling\*

**Computer Management**

- Power Management Software\*
- Energy Efficient UPS
- Energy Efficient Servers

## LAMPS

### Compact Fluorescent Lamps

Screw based CFL's must be Energy Star approved to be admitted to e.Catalog. 2 pin and 4 pin CFL's and CFL's greater than 42W are accepted without Energy Star approval since there is currently no Energy Star criteria for them. The table below outlines the energy efficiency sources and criteria applied. Note low wattage compact fluorescent lamps (< 9 Watts) with an efficacy greater than 45 are accepted into the e.Catalog based on Power Smart Technical Approval.

Lamp Power Watts & Configuration	Minimum Efficacy Initial Lumens/Watt	Criteria Source
<b>Bare Lamp:</b>		
Lamp power <9 watts	45	Power Smart Technical Approval
Lamp power 9 – 14 watts	45	Energy Star
Lamp power 15 – 19 watts	60	Energy Star
Lamp power 20 – 25 watts	60	Energy Star
Lamp power ≥29	60	Energy Star
<b>Covered lamp no reflector:</b>		
Lamp power <15	40	Energy Star
15 ≤ lamp power <19	48	Energy Star
19 ≤ lamp power <25	50	Energy Star
Lamp power ≥25	55	Energy Star
<b>Covered lamp with reflector:</b>		
Lamp power <20	33	Energy Star
Lamp power ≥25	40	Energy Star

### Screw-in Cold Cathode Lamps

Cold cathode lamps complete with ballast for low wattages (3 to 5W) are accepted into e.Catalog. The life rating of lamps shall be a minimum of 25,000 hours and the color-rendering index (CRI) must be a minimum of 75. Products shall be ULC or CSA listed and suitable for indoor and outdoor use.

Lamp Type	Criteria Source
Cold cathode screw-in lamps	Power Smart Technical Approval

### Fluorescent Lamps

The table below outlines the energy efficiency sources and criteria applied. Note since T5 fluorescent tube lamps are more energy efficient than T8 lamps, T5 lamps are automatically accepted by the Power Smart technical department as energy efficient products. In addition, T8 lamps less than 32 watts are accepted into the e.Catalog.

Lamp Type	Performance Specifications	Criteria Source
<b>2' Lamps</b>		
T8, 17 watts	1,394 lumens or more	Power Smart Technical Approval
<b>3' Lamps</b>		
T8, 25 watts	2,225 lumens or more	Power Smart Technical Approval
<b>4' Lamps</b>		
T8, 15 watts	950 initial lumens	Power Smart Technical Approval
T8, 30 watts	2700 initial lumens	Power Smart Technical Approval

T8, 32 watts	2,800 lumens or more	FEMP
8' Lamps		
T8, 59 watts	5,700 lumens or more	FEMP
U-Tube Lamps		
T8,U, 31-32 watts	2,600 lumens or more	FEMP
U, 34 watts	2,700 lumens or more	FEMP
<b>T5 fluorescent lamps</b>		
42.2", 28 watts	2,900 lumens or more	Power Smart Technical Approval
57", 35 watts	3,650 lumens or more	Power Smart Technical Approval

### High Intensity Discharge (HID) Lamps

HID lamps are accepted into the e.Catalog because replacing incandescent lamps with HID lamps offers significant energy savings. Criteria for HID bare lamps is not available and not required because HID lamps provide 3 to 5 times more lumens per watt than an incandescent lamp.

Lamp Type	Criteria Source
High Pressure Sodium	Power Smart Technical Approval
Metal Halide including Pulse Start and Ceramic	Power Smart Technical Approval

### Halogen HIR Lamps

100W or less HIR PAR halogen lamps are accepted into e.Catalog because in the right applications replacing standard incandescent lamps with them offers significant energy savings.

Lamp Type	Criteria Source
Halogen HIR PAR Lamps	Power Smart Technical Approval

## **LUMINAIRES**

### **Compact Fluorescent Luminaires**

Compact Fluorescent luminaires are currently accepted into the e.Catalog based on Power Smart technical approval because they are more energy efficient than incandescent luminaires. Compact Fluorescent luminaires should use a high power factor (HPF) ballast.

Lamp Type	Criteria Source
Compact Fluorescent Luminaire	Power Smart Technical Approval

### **Fluorescent Luminaires**

Fluorescent luminaires are currently accepted into the e.Catalog based on Power Smart technical approval because they are more energy efficient than incandescent luminaires.

Where possible in the future we plan to adopt the Luminaire Efficacy Rating (LER) shown in the table below. LER is a voluntary light-testing program implemented by the lighting industry. The LER represents the luminaire efficacy by dividing the luminaire's light output with the energy it consumes. It is difficult for manufacturers to specify LER with their luminaires because LER varies depending on what lamps and ballasts are installed and how the light is being distributed. Most fluorescent luminaires are not shipped with the lamps and ballasts.

Luminaire Type (NEMA designation)	# of Lamps	Recommended LER <sup>[2]</sup>	Best Available LER	Criteria Source
<b>2' x 4' Recessed</b>				
Lensed (FL)	2	62 or higher	77	FEMP
	3	61 or higher	77	FEMP
	4	61 or higher	77	FEMP
VDT <sup>[1]</sup> -preferred Louvered (FP)	2	50 or higher	62	FEMP
	3	51 or higher	68	FEMP
	4	54 or higher	68	FEMP
<b>Plastic Wraparound</b>				
Four-Foot (FW)	2	63 or higher	88	FEMP
	4	62 or higher	100	FEMP
<b>Strip Lights</b>				
Four-Foot (FS)	1	70 or higher	86	FEMP
	2	70 or higher	92	FEMP
<b>Industrial</b>				
Four-Foot (FI)	2	67 or higher	91	FEMP
Eight-Foot (FI)	2	68 or higher	86	FEMP
<b>2' x 2' Recessed, for U-Tube Lamps</b>				
VDT-preferred	2	41 or higher	63	FEMP
Lensed	2	49 or higher	78	FEMP

<sup>(1)</sup> Best lighting solution for VDTs (video display terminals/computer monitors) applications

### **HID Luminaires**

HID luminaires are currently accepted into the e.Catalog based on Power Smart technical approval because they are more energy efficient than incandescent luminaires.

Where possible in the future BC Hydro plans to adopt the Luminaire Efficacy Rating (LER) shown in the table below. The LER is not relevant for applications using HID lower than 150 watts.

HID Luminaire				
<u>Upward Efficiency</u>	Lamp Wattage	Closed Fixture (HC) LER	Open Fixture (HO) LER	Criteria
		Recommended	Recommended	
<b>Metal Halide Lamps</b>				
0%	150-399	41 or higher	(insuff. Data)	FEMP
	400-999	53 or higher	59 or higher	FEMP
	≥1000	77 or higher	(insuff. Data)	FEMP
1%-10%	150-399	56 or higher	(insuff. Data)	FEMP
	400-999	62 or higher	64 or higher	FEMP
	≥1000	insuff. Data	88 or higher	FEMP
11%-20%	150-399	57 or higher	(insuff. Data)	FEMP
	400-999	65 or higher	69 or higher	FEMP
	≥1000	insuff. Data	(insuff. Data)	FEMP
>20%	150-399	62 or higher	77 or higher	FEMP
	400-999	65 or higher	(insuff. Data)	FEMP
	≥1000	insuff. Data	(insuff. Data)	FEMP
<b>High Pressure Sodium Lamps</b>				
0%	150-399	58 or higher	68 or higher	FEMP
	400-999	63 or higher	84 or higher	FEMP
	≥1000	insuff. data	insuff. data	FEMP
1%-10%	150-399	64 or higher	63 or higher	FEMP
	400-999	82 or higher	89 or higher	FEMP
	≥1000	insuff. Data	109 or higher	FEMP
11%-20%	150-399	insuff. data	78 or higher	FEMP
	400-999	insuff. data	94 or higher	FEMP
	≥1000	insuff. data	insuff. Data	FEMP
>20%	150-399	75 or higher	77 or higher	FEMP
	400-999	insuff. Data	insuff. Data	FEMP
	≥1000	insuff. Data	insuff. Data	FEMP

### Fiber Optic Luminaires

Fiber optic luminaires are accepted into the e.Catalog for applications that replace another less energy efficient technology.

There are no technical criteria for the fiber optic elements and the illuminator, with the exception of the light sources. Light source for the fiber optics shall comply with the e.Catalog criteria for lamps. Hence, all HID and LED lamps are approved, and Halogen IR lamps 100W or less. Standard halogen/ quartz lamps are not acceptable as light sources, nor the illuminators designed around these sources.

Lamp Type	Criteria Source
Metal Halide including Pulse Start and Ceramic	Power Smart Technical Approval
Halogen HIR PAR Lamps 100W or less	Power Smart Technical Approval

## **BALLASTS**

### **Compact Fluorescent Ballasts**

Compact fluorescent ballasts are accepted into e.Catalog based on Power Smart technical approval because compact fluorescent products are more energy efficient than incandescent products.

### **Fluorescent Ballasts**

The table below outlines the energy efficiency source and criteria applied. Since T5 products are more energy efficient than T8 products, T5 ballasts are automatically accepted as energy efficient products.

Lamp Type	No. of Tubes	<u>B</u> <u>E</u> <u>F</u> - Ratio of <u>B</u> <u>a</u> <u>l</u> <u>l</u> <u>a</u> <u>s</u> <u>t</u> <u>F</u> <u>a</u> <u>c</u> <u>t</u> <u>o</u> <u>r</u> <u>t</u> <u>o</u> <u>I</u> <u>n</u> <u>p</u> <u>u</u> <u>t</u> <u>W</u> <u>a</u> <u>t</u> <u>t</u> s	Criteria Source
<b>2' Lamps</b>			
T8, 19 watts	1	4.50 or higher	Power Smart Technical Approval
	2	2.70 or higher	Power Smart Technical Approval
T8, 17 watts	3	1.85 or higher	Power Smart Technical Approval
T8, 17 watts	4	1.40 or higher	Power Smart Technical Approval
<b>3' Lamps</b>			
T8, 25 watts	1	3.35 or higher	Power Smart Technical Approval
	2	1.80 or higher	Power Smart Technical Approval
	3	1.25 or higher	Power Smart Technical Approval
	4	.90 or higher	Power Smart Technical Approval
<b>4' and U-Tube Lamps</b>			
T8, 32 watts	1	2.54 or higher	FEMP
	2	1.44 or higher	FEMP
	3	0.93 or higher	FEMP
	4	0.73 or higher	FEMP
<b>5' Lamps</b>			
T8, 55 watts	1	.014 or higher	Power Smart Technical Approval
	2	.007 or higher	Power Smart Technical Approval
<b>8' Lamps</b>			
T8, 32 watts	1	1.52 or higher	Power Smart Technical Approval
T8, 59 watts	2	0.80 or higher	FEMP

### **HID Ballasts**

There is no energy efficiency criteria currently available; only Pulse Start and HPS ballasts are accepted into the e.Catalog because using these ballasts provides significant energy saving.

Lamp Type	Criteria Source
Pulse Start Ballasts	Power Smart Technical Approval

High Pressure Sodium Ballasts	Power Smart Technical Approval
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**RETROFIT COMPONENTS**

**Retrofit Kits**

The Power Smart technical department approves the use of retrofit kits to convert existing systems to more energy efficient lighting.

**LED LIGHTING**

All LED lighting products are accepted into e.Catalog based on Power Smart Technical Approval.

**LED Lamps**

LED lamps are accepted into e.Catalog because they offer significant energy savings and have a long product life span.

Lamp Type	Criteria Source
LED lamps	Power Smart Technical Approval

**LED Exit Signs**

The Power Smart technical department recommends using LED exit signs because replacing incandescent or CFL exit signs with LED exit signs provides significant energy saving and longer product life span.

LED Exit Signs

Efficiency Characteristic	Performance Specifications	Criteria Source
Input Power demand	5 watts or less per face	Energy Star

LED Retrofit Kits - LED conversion kits comprising 2 screw-in lamps with diffuser or 1 bar with diffuser for existing signs.

Efficiency Characteristic	Performance Specifications	Criteria Source
Input Power demand	2 Watts for a bar	Power Smart Technical Approval
Input Power demand	1.4W for a lamp	Power Smart Technical Approval

**LED Exit Lamps**

LED exit lamps that are 1.4W or less are accepted into e.Catalog because LED exit signs are more efficient than incandescent or CFL exit lamps.

Lamp Type	Maximum Wattage Allowed	Criteria Source
LED Exit Lamps	1.4W	Power Smart Technical Approval

**LED Holiday Lights**

LED Holiday Lights are accepted into e.Catalog because LED light strings consume a lower wattage and last longer than incandescent light strings.

## LED Signs

LED signs are accepted into e.Catalog because they are more efficient than fluorescent, neon and incandescent signs.

## LED Strips

LED strips used in architectural area lighting or illuminated channel letters are accepted into e.Catalog because they are more efficient than neon or fluorescent.

## HVAC

### Residential Ventilating Fans (ex. ceiling fans)

Criteria for Energy Star Qualified Residential Ventilating Fans Minimum Efficacy Levels	
Airflow (cfm)	Minimum Efficacy Level (cfm/W)*
Range Hoods – up to 500 cfm (max)	2.8
Bathroom and Utility Rooms Fans – 10 to 80 cfm	1.4
Bathroom and Utility Room Fans – 90 to 130 cfm	2.8
Bathroom and Utility Room Fans – 140 to 500 cfm max	2.8
In-Line (single-port & multi-port) Ventilating Fans	2.8

\* Based on static pressure reference measurement as specified in Section 4D of this specification

Criteria for Energy Star Qualified Residential Ventilating Fans Maximum Allowable Sound Levels	
Airflow (cfm)	Maximum Allowable Sound Level (Sones)*
Range Hoods – up to 500 cfm (max)	2.0
Bathroom and Utility Rooms Fans – 10 to 80 cfm	2.0
Bathroom and Utility Room Fans – 90 to 130 cfm	2.0
Bathroom and Utility Room Fans – 140 to 500 cfm max	3.0

\* Based on static pressure reference measurement as specified in Section 4D of this specification

### Air-Cooled Electric Chillers

The table below outlines the energy efficiency source and criteria applied.

Compressor Type and Capacity	Full Load (kW/Ton)	IPLV (kW/Ton)	Criteria Source
Scroll 30-60 Tons	1.23 or less	0.86 or less	FEMP
Reciprocating 30-150 Tons	1.23 or less	0.90 or less	FEMP
Screw 70-200 Tons	1.23 or less	0.98 or less	FEMP

### Chiller Efficiency Criteria

The table below outlines the energy efficiency source and criteria applied.

Product Type	Full Load (kW/Ton)	IPLV (kW/Ton)	Criteria Source
Centrifical 150-299 Tons	0.59 or less	0.52 or less	FEMP
Centrifical 300-2,000 Tons	0.56 or less	0.45 or less	FEMP
Rotary Screw $\geq$ 150 Tons	0.64 or less	0.49 or less	FEMP

### Unitary Air-Conditioners and Condensing Units

The table below outlines the energy efficiency source and criteria applied. Note this criteria also applies to split air conditioning systems.

Equipment Type	Size Category	Specification	Criteria Source
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Air-Source Conditioners (3 phase)	<65,000 Btu/h	≥ 13 <u>SEER</u>	Energy Star
Air-Source Conditioners	≥65,000 Btu/h - ≤135,000 Btu/h	≥ 11.0 EER; 11.4 IPLV	Energy Star
Air-Source Conditioners	≥135,000 Btu/h - ≤250,000 Btu/h	≥ 10.8 EER; 11.2 IPLV	Energy Star
Air-Source Conditioners	>250,000 Btu/h	≥ 10.0 <u>EER</u>	Energy Star
Water Source	<65,000 Btu/h	≥ 12.0 EER	Energy Star
Water Source	≥65,000 Btu/h - ≤135,000 Btu/h	≥ 11.5 EER	Energy Star
Water Source**	>135,000 Btu/h	≥ 11.0 EER	Energy Star
Condensing units, water or evaporative cooled	–	≥ 12.9 IPLV	Energy Star

\*\* Includes Evaporative Condenser and Evaporative Pre-Cooled Condenser

### Geothermal Heat Pumps

The table below outlines the energy efficiency source and criteria applied.

Product Type	EER	<u>COP</u>	Water Heating	Criteria Source
<u>Closed Loop</u>	14.1	3.3	Yes	Energy Star
With integrated WH	14.1	3.3	N/A	Energy Star
<u>Open Loop</u>	16.2	3.6	Yes	Energy Star
With integrated WH	16.2	3.6	N/A	Energy Star
<u>DX</u>	15	3.5	Yes	Energy Star
With integrated WH	15	3.5	N/A	Energy Star

### Heat Pumps Equipment & Systems

The table below outlines the energy efficiency source and criteria applied. Note this criteria also applies to split heat pumps.

Equipment Type	Size Category	Specification	Criteria Source
Air-Source Heat Pump	<65,000 Btu/h	> 13 SEER 7.7 <u>HSPF</u>	Energy Star
Air-Source Heat Pump	≥65,000 Btu/h - ≤135,000 Btu/h	≥ 10.1 EER 10.4 IPLV 3.2 COP	FEMP
Air-Source Heat Pump	≥135,000 Btu/h - <240,000 Btu/h	≥ 9.3 EER 9.5 IPLV 3.1 <u>COP</u>	FEMP
Water Source	65,000 – 138,000 Btu/h	≥ 12.8 EER 4.5 COP	FEMP

## CONTROLS

### HID Hi/Low Switching Systems

HID hi/low switching systems are accepted into e.Catalog based on Power Smart Technical Approval providing they meet the criteria outlined below.

- High / Low switching system shall be a complete system to allow the controller switching of High Intensity Discharge (HID) luminaires, including Metal Halide, Pulse Start Metal Halide and High Pressure Sodium, from full ballast power input in High mode to 50% or less ballast power input in Low mode.
- Input for lighting control shall be accomplished by manual or automated controls, light level photosensor or occupancy sensor control.

- High / Low switching system shall start all lamps in high mode during initial start-up and shall restrict system from switching modes during initial lamp warm-up cycle.
- High / Low switching shall be accomplished with zero or no lamp strobing or drop out.
- Where photosensor control is used to initiate High / Low switching system, controls shall have adjustable sensitivity.
- Where occupancy sensor control is used to initiate High / Low switching system, sensors shall be a Passive Infrared (PIR) type, designed for narrow pattern detection zone and oriented downward toward the floor or target area.
- High / Low switching systems shall be a complete system ready for wiring and installation. System shall include mounting and come with all components including any; contractors, low voltage relays, isolated relay contacts, power packs, interfaces, control mounting boxes, manual switches and photosensors as required to interface with high / low switching ballasts to provide fully functional control of HID luminaires.
- Sensors shall have advanced signal-processing, integrated circuitry to provide high immunity to RFI and EMI influences. Low voltage photosensors shall be powered by a self contained low-voltage power pack.
- High / Low control systems shall be manufactured by luminaire manufacturer or system approved by ballast and luminaire manufacture for interface with luminaire ballast.
- High / Low control systems and all components shall have a minimum five year manufacturers warranty from the date of installation

### **HVAC Controls**

These criteria take key features for Energy Star approved thermostats and ACEEE standards for HVAC controls at Ref: [http://www.aceee.org/ogeece/ch3\\_controls.htm](http://www.aceee.org/ogeece/ch3_controls.htm)

#### Essential:

- The HVAC controls need third party verification such as from a laboratory that they reduce specifically electrical energy consumption by at least 5%.
- The HVAC controls save electrical energy. If they additionally save other forms of energy such as natural gas in addition to electricity this is acceptable providing the electrical energy savings are considered to be significant and from these electrical savings alone offer a less than 10 year payback.

#### Optional:

- The HVAC controls need be shipped with a default energy saving program that is capable of maintaining two separate programs (to address the different comfort needs of weekdays and weekends) and four temperature settings or more for each day.
- The HVAC controls provide Night Setback: This turns off the fans, closes the ventilation dampers, and shuts down the heating and cooling equipment, except as needed to keep the building warm enough or cool enough to return to operating conditions in the morning.
- The HVAC controls may provide Seven Day Programming: This keeps track of the day of the week and allows the night setback to continue on Saturdays and Sundays, and offers holiday overrides.

### **HVAC Occupancy Sensors**

HVAC occupancy sensors for packaged terminal air conditioning units or a heat pump unit with built in electric resistance heater are accepted into e.Catalog

### **Vending Machine Sensor**

Vending machine sensors are accepted into e.Catalog based on Power Smart technical approval because they reduce electrical consumption while maintaining temperature requirements when the vending machine is not in use.

### **Efficient Power Bar**

Power bars which automatically switch off plug load either by; (a) current sensors in conjunction with either computer operating system Power Management or e.Catalog approved computer energy management software, or (b) digital timer control.

### **Voltage Optimization**

By reducing voltage levels towards the lower limits of the CSA standard CAN3-C235-83, the energy consumption for certain types of end uses can be reduced. Voltage can be reduced within a customer's facility by conducting transformer tap changes (if available) and/or installing voltage optimization devices.

All Voltage Optimizations projects will be evaluated on an individual basis by Power Smart Engineering. Energy Savings and appropriate product selection will be reviewed at application stage.

## **ICE RINK TECHNOLOGIES**

### **Low-e Ceiling**

Low-e ceilings are accepted into e.Catalog based on Power Smart technical approval. The emissivity rating for low-e ceilings must be between 0.03-0.05 (tested to ASTM #E408) with a temperature rating from 60°F to 180°F and has the approved Building Code flame rating.

## **COMPUTER MANAGEMENT**

### **Energy Efficient UPS**

UPS systems in e.Catalog should offer an electrical energy efficiency of  $\geq 92\%$  at 30% load factor. This means the UPS systems will be either Delta-Conversion or Flywheel with only a few Double-Conversion UPS systems qualified.

### **Power Management Software**

Power management software is accepted into e.Catalog due to significant energy savings by installing and implementing such software. Power management software accepted into e.Catalog must:

- Reduce the on-time of computers and their monitors or screens
- Be deployed by means of a LAN network and/or by individual workstation installation
- Not have the power save features altered by end users
- Not be free
- Be proven to work as confirmed by third-party or BC Hydro pilots, and at BC Hydro's discretion.

### **Energy Efficient network Traffic Anomaly Monitoring/Detection Sensors**

- The product must be commercially available and used in the marketplace.
- The product must replace network hardware with electrical demand  $\geq 40W$ .
- The product must have an electrical demand  $\leq 20W$ .
- The product must be CSA, CSA/UL or UL approved.

### Energy Efficient High Volume Colour Printer

- Only high volume colour and black and white printers qualify for e.Catalog which capable of printing typical workloads of 100,000 printed pages per month per printer
- Maximum printing speeds need be  $\geq 100$  ppm (printed pages per minute)
- The electrical energy consumption for printers conforming to 1. and 2. above must be  $\leq 90$  kWh/month/printer

Optional:

- Printers need conform to the above essential high volume colour or black and white printer criteria but use heatless printing process's.
- Printers need conform to the above essential high volume colour or black and white printer criteria but include organic printer inks

### Energy Efficient Server

- Server OEM's (Original Equipment Manufacturer) need clearly specify that their servers are energy efficient.
- The server OEM needs show that the **overall ssj\_ops/watt** (server side Java operations per second per watt) as measured by SPEC is at least **300 overall ssj\_ops/watt**.
- If the server OEM fails to provide BC Hydro Power Smart Alliance with the **overall ssj\_ops/watt** the IT Advisor needs be informed and at his discretion he will recommend whether the vendor has supplied enough information to add their server to e.Catalog.

Optional Criteria\*

- The server needs have a power supply  $\geq 80\%$  Electrical Efficiency
- The server comes with idle base power requirements conforming to the proposed new Energy Star Standard for servers which is copied below.

Base Idle Power Requirements:

System Type	Idle Power Limit
Single Installed Processor (1P – All systems)	60 Watts
Two or Three Installed Processors (2P & 3P)	
Standard Availability Systems	151 Watts
High Availability, Low Installed Memory (<16GB) Systems	169 Watts
High Availability, High Installed Memory ( $\geq 16$ GB) Systems	221 Watts
Four Installed Processors (4P)	271 Watts

Additional Power Allowances for Extra Components:

System Characteristic	Additional Idle Power Allowance
Second Hard Drive	15 Watts
Additional Hard Drives Over Two	8 Watts per Drive
Additional Memory over 32 Gigabytes	2 Watts / GB

Optional Criteria\*Optional server criteria do not determine whether or not the server will be added to e.Catalog; however, if the OEM does offer servers which comply with this optional criteria PSE suggests this be noted in e.Catalog.

## GLOSSARY

### **Lighting**

**BEF (Ballast Efficacy Factor)** is the ratio of the ballast factor (BF) to input watts; it measures the efficiency of the lamp/ballast system relative to others using the same type and number of lamps.

**BF (Ballast Factor)** also called the Relative Light Output (RLO), is the ratio of the light output of a lamp(s) operated by a ballast, to the light output of the same lamp(s) operated by a reference ballast at rated current and voltage.

**Efficacy** is a measure of energy efficiency for compact fluorescent lamps. It is calculated from the initial lumens of the lamp divided by the lamp wattage.

**Federal Energy Management Program** is the US Department of Energy's criteria for improving the energy efficiency of US federal buildings.

**Lumen** is a measure of light output

**Luminaire** is a complete lighting unit consisting of a fixture along with one or more ballasts and lamps

**Luminaire Efficacy Rating (LER)** describes the efficiency of a luminaire in terms of rated light output in (lumens) per watt of electricity use. It is a voluntary light testing program that is relatively new to the lighting industry. LER will vary among luminaires depending on the application, lamp and ballast used.

**Upward efficiency** is the portion of light directed up. Both high-bay and low-bay luminaires are available with opaque reflectors, which direct all or most of the light downward, and with transparent refractors, which direct some light up.

### **HVAC**

**Airflow Rating (cfm):** The airflow of a residential ventilating fan shall be measured in cubic feet per minute (cfm). The cfm values shall be certified by HVI and measured by the method described in HVI Standard 916.

**Closed Loop System:** A ground heat exchanger in which the heat transfer fluid is permanently contained in a closed system.

**COP: Coefficient of Performance** — A measure of efficiency in the heating mode that represents the ratio of total heating capacity to electrical energy input.

**COP(COEFFICIENT OF PERFORMANCE)** — COOLING. The COP for electrically operated HVAC equipment - ratio of the rate of net heat removal to the rate of total energy input expressed in consistent units and under designated rating conditions.

**Direct Expansion (DX):** A geothermal heat pump system in which the refrigerant is circulated in pipes buried in the ground, rather than using a heat transfer fluid, such as water or antifreeze solution in a separate closed loop, and fluid to refrigerant heat exchanger. A DX system includes all equipment both inside and outside the building. DX systems may be single or multi-speed.

**EER - ENERGY EFFICIENCY RATIO**, is the cooling capacity (in BTU/hour) of the unit divided by its electrical input (in watts) at standard (ARI) conditions of 95 degrees F. for air-cooled equipment, and 85 degrees F. entering water for water-cooled models.

**Efficacy (cfm/W):** The efficacy of residential ventilating fan shall be expressed in cubic feet per minute per watt (cfm/W). Manufacturers shall calculate efficacy by using the airflow and fan motor electrical power values certified by HVI and described in HVI Standard 916. Fan motor electrical usage will be the only energy consumption considered for the efficacy calculation. Energy used for other fan auxiliaries, such as lights, is not included in the determination of fan efficacy.

**HSPF (HEATING SEASONAL PERFORMANCE FACTOR)** - total heating output of a heat pump during its normal annual efficiency for air conditioning and heat pump equipment on the basis of weighted operation at various load capacities for the equipment.

**Integrated Demand Water Heating:** This term is used to describe geothermal heat pumps that include a water heating function in the refrigeration cycle. Integrated demand water heating differs from desuperheater in that the integrated demand water heating model provides all or nearly all hot water needs and provides hot water even when space conditioning is not required. This includes systems that employ a separate water heating compressor unit or that use the same compressor for space conditioning and water heating. Also sometimes referred to as full-demand or demand water heating.

**Open Loop System:** A ground heat exchanger in which the heat transfer fluid is part of a larger environment.

**SEER - SEASONAL ENERGY EFFICIENCY RATIO** - percentage of cooling output to space versus amount of power that is consumed.

**Sound Rating (sone):** The sound output of a residential ventilating fan is measured in sones. The sound rating shall be certified by HVI and measured by the method described in the HVI Standards 915.

**Static Pressure Reference Measurements:** Ventilating fan performance characteristics such as motor wattage, cfm, and sones must be reported to EPA at specific static pressures. These reference measurements vary depending upon the fan type and follow HVI 920 rating points. Reference measurements shall be certified by HVI and conducted in accordance with HVI Standard 920. The static pressure reference measurements are listed for each qualifying fan type.