Yukon Electricity Conservation and Demand Management Potential Review (CPR 2011)

Commercial Sector - Appendices

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Yukon Energy, Yukon Electrical Company,
Government of Yukon

Submitted by:
ICF Marbek
300-222 Somerset Street West
Ottawa, Ontario K2P 2G3

Tel: +1 613 523-0784
Fax: +1 613 523-0717
info@marbek.ca
www.marbek.ca

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Appendix A Background-Section 3: Base Year Electricity Use

Introduction

Appendix A provides additional detailed information related to the generation of the Commercial sector Base Year profile. The appendix discusses the following:

- Sub sector descriptions
- Sales data analysis
- CEEAM archetype summaries – existing buildings.

A1 Sub Sector Descriptions

Exhibit A 1 presents brief descriptions of the Commercial sub sectors. Detailed building archetype profiles for each sub sector are provided in Appendix A 3 (Existing buildings) and Appendix C 3 (New buildings).

Exhibit A 1 Sub sector Descriptions

Sub Sector	Definition	Examples of Building Types
Office	Buildings used for office or public administration.	Municipal Office, Government Office Building, Private Office Buildings
Food Retail	Retail store that primarily sells food items and has a significant refrigeration load.	Supermarket
Non-Food Retail	Retail store which primarily sells non-food items	“Big box” store, strip mall, enclosed mall unit
Hotel/Motel	Hotel or motel building.	
Healthcare	Buildings used for providing multiple accommodations for short- or long-term care residents.	Hospital, Nursing Homes, Nursing Stations
Recreation Centre	Community centres, typically incorporating arenas or curling rink. May include support facilities such as a community hall.	Hockey Arena, curling rink
Education	Buildings whose primary function is education. Typically characterized by seasonably variable occupancy.	Elementary or secondary schools, Universities, Colleges.
Restaurant	Full service or quick service restaurant	
Warehouse / Wholesale	Typically metal-clad building with high ceilings and predominantly high-bay lighting.	
Other General Service Building	Commercial, institutional, manufacturing or light industrial buildings which do not fit the above categories	Service garages, religious buildings, theaters, prisons, light manufacturing, placer mines.
Non-Building	Structures for which electricity is primarily used by unique equipment.	Telephone exchange, microwave repeater station.

Sub Sector	Definition	Examples of Building Types
Street Lighting	Street lighting	n/a
Parking Lot Plug	Outdoor receptacles provided in parking lots for use with block heaters	n/a

A2 Sales Data Analysis

This section outlines the methodology for the allocation of the sales data provided by YEC and YECL to the Commercial sub sectors identified above.

Both YEC and YECL provided sales data to ICF Marbek. These data included monthly consumption for accounts grouped by Standard Industrial Classification (SIC) code, rate class and supply type. These sales data were sorted using these three categories, resulting in an aggregated sales data figure (and number of accounts) for each unique combination of sub sector (using SIC code data), region (using supply type data) and ownership (government/non-government, using rate class data). Because the three diesel regions have relatively few commercial accounts, it was agreed that instead of reporting at the sub sector level, data and results would be reported in the following aggregate categories: General Service Buildings, Non-buildings and Street Lighting. Government and non-government customers are tracked separately.

Exhibit A 2, below, describes how SIC codes were mapped to the sub sector definitions given above. The available SIC code information did not allow the Food Retail and Non-food Retail sub sectors to be distinguished from each other. Instead, YEC and YECL staff manually identified individual accounts associated with food retail buildings.

Exhibit A 2 Sales Data Subsector Assignments

SIC Code	SIC Sub Sector	Description	CPR Subsector Assignment
11010	Single Family/Row	Overhead	Residential
11020	Single Family/Row	Underground	Residential
11030	Detached Garage	Detached Garage	Residential
12010	Mobile	Overhead	Residential
12020	Mobile	Underground	Residential
13010	Apartment/Bulk	Overhead	Residential
13020	Apartment/Bulk	Underground	Residential
14010	Apartment Suite	Overhead	Residential
14020	Apartment Suite	Underground	Residential
21010	Hospital	General Hospitals	Healthcare
21020	Hospital	Nursing Homes, Seniors Homes	Healthcare
21090	Hospital	Other	Healthcare
22010	Education	Elementary Schools	Education
22020	Education	High Schools	Education
22030	Education	Post Secondary Schools	Education
22090	Education	Other	Education
23010	Retail Independent	Stores - independent	Retail

SIC Code	SIC Sub Sector	Description	CPR Subsector Assignment
23020	Retail Independent	Shopping Centre - common service meter	Retail
23090	Retail Independent	Shopping Centre - bulk meter	Retail
23110	Automotive	Service stations	Other General Service Buildings
23120	Automotive	Car dealerships	Other General Service Buildings
23130	Automotive	Parking lot plug ins	Parking Lot Plug
23190	Automotive	Other	Other General Service Buildings
24010	Wholesale	Farm implement and equipment	Warehouse / Wholesale
24020	Wholesale	Lumber and building materials	Warehouse / Wholesale
24090	Wholesale	Other	Warehouse / Wholesale
24110	Warehouse	Grain elevators, seed cleaning plants	Warehouse / Wholesale
24120	Warehouse	Transportation Vehicle Storage	Warehouse / Wholesale
24190	Warehouse	Other	Warehouse / Wholesale
25010	Office	Less than 3 storey	Office
25020	Office	More than 3 storey	Office
26010	Transportation/Communications	Transportation	Other General Service Buildings
26020	Transportation/Communications	Communications	Non-Buildings
26030	Utilities/Defense	Utilities	Non-Buildings
26040	Utilities/Defense	Defense	Non-Buildings
26090	Utilities/Defense	Other	Non-Buildings
27010	Accommodations and Food Services	Hotel	Hotel / Motel
27020	Accommodations and Food Services	Motel	Hotel / Motel
27030	Accommodations and Food Services	Restaurant	Restaurant
27090	Accommodations and Food Services	Other	Restaurant
28010	Community, Recreational, Social and Religious Centres	Curling rinks	Recreation Centres
28020	Community, Recreational, Social and Religious Centres	Arenas (Rec centres)	Recreation Centres
28030	Community, Recreational, Social and Religious Centres	Motion picture theatres	Other General Service Buildings
28040	Community, Recreational, Social and Religious Centres	Community Halls	Other General Service Buildings
28090	Community, Recreational, Social and Religious Centres	Other	Other General Service Buildings
29010	Miscellaneous	Cathodic protection and rectifiers	Non-Buildings
29030	Miscellaneous	Construction: apt/condo	Other General Service Buildings
29032	Miscellaneous	Common service apartment	Residential
29040	Miscellaneous	Construction: non-resid.	Other General Service Buildings
29041	Miscellaneous	Construction: non-resid. Temporary	Other General Service Buildings
29050	Miscellaneous	Construction trades	Other General Service Buildings

SIC Code	SIC Sub Sector	Description	CPR Subsector Assignment
29051	Miscellaneous	Welding shops	Other General Service Buildings
29060	Miscellaneous	Unoccupied space	Non-Buildings
29070	Miscellaneous	Small oilfield service	Other General Service Buildings
29080	Miscellaneous	Penitentiary/jail	Other General Service Buildings
29090	Miscellaneous	Other	Non-Buildings
29091	Miscellaneous	Large company farm	Other General Service Buildings
31010	Residential Street Lighting	Overhead	Street Lighting
31020	Residential Street Lighting	Underground	Street Lighting
32010	Highway Street Lighting	Overhead	Street Lighting
32020	Highway Street Lighting	Underground	Street Lighting
67010	Industrial	Sawmills	Other General Service Buildings
67510	Industrial	Cement	Other General Service Buildings
68090	Industrial	Other Mining	Other General Service Buildings
69090	Industrial	Other Manufacturing	Other General Service Buildings
81010	Sentinel Lighting	Overhead	Street Lighting
81020	Sentinel Lighting	Underground	Street Lighting

A3 CEEAM Archetype Summaries – Existing Buildings

This section includes summary profiles of the nine new building archetypes constructed for this study. Exhibit C 12 presents a table of contents for the CEEAM building profiles that follow. A glossary of terms and acronyms used in the building profiles is included at the end of this appendix.

Exhibit A 3 Table of Contents - Existing CEEAM Building Profiles

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Office **< 40,000 ft2** **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.38	W/m².°C	0.07	Btu/hr.ft² .°F	Typical Building Size	1,394	m²	15,000	ft²
Roof U value (W/m².°C)	0.29	W/m².°C	0.05	Btu/hr.ft² .°F	Typical Footprint (m²)	697	m²	7,500	ft²
Glazing U value (W/m².°C)	3.30	W/m².°C	0.58	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	1			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	45%			
Window/Wall Ratio (WIWAR) (%)	0.35				Defined as Exterior Zone				
Shading Coefficient (SC)	0.58				Typical # Stories	2			
					Floor to Floor Height (m)	3.7	m	12.0	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	75%				25%				100%
Min. Air Flow (%)					60%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	26	m²/person	274	ft²/person	%OA	9.87%
Occupancy Schedule Occ. Period	90%					
Occupancy Schedule Unocc. Period						
Fresh Air Requirements or Outside Air	8	L/s.person	16	CFM/person		

Fresh Air Control Type *(enter a 1, 2 or 3) 1
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)
If Fresh Air Control Type = "2" enter % FA. to the right:
If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation L/s.m² CFM/ft² operation (%)

Sizing Factor 1
Total Air Circulation or Design Air Flow 2.98 L/s.m² 0.59 CFM/ft²

Separate Make-up air unit (100% OA) L/s.m² CFM/ft²
Operation occupied period 50%
Operation unoccupied period 50%

Infiltration Rate 0.70 L/s.m² 0.14 CFM/ft²
(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use			100%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters		
Peak Design Cooling Load	282,237	
Peak Zone Sensible Load	189,275	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	8,805	
Total air circulation or Design air	2.98	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic		
DDC/Pneumatic		
All DDC		
Total (should add-up to 100%)		

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	24	°C	75.2	°F	14	°C	57.2	°F
Summer Humidity (%)	50%				98%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	21	°C	69.8	°F	15	°C	59	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	21	°C	69.8	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning Changes/Year

Incidence of Annual Room Controls Maintenance

Incidence of Annual HVAC Controls Maintenance

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS:	SIZE:	VINTAGE:	REGION:
Office	< 40,000 ft2		Yukon
Baseline			

LIGHTING

GENERAL LIGHTING

Light Level	500	Lux	46.5	ft-candles
Floor Fraction (GLFF)	0.90			
Connected Load	14.2	W/m²	1.3	W/ft²

Occ. Period(Hrs./yr.)	3200
Unocc. Period(Hrs./yr.)	5560
Usage During Occupied Period	90%
Usage During Unoccupied Period	15%

Light Level (Lux)	450	500	650					Total
% Distribution		100%						100%
Weighted Average								**500**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)			50%		50%		0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:			
Incidence of Practice			
Interval		years	
Relamping Strategy & Incidence of Practice	Group	Spot	

EUI	kWh/ft².yr	4.4
	MJ/m².yr	171

ARCHITECTURAL LIGHTING

Light Level	350	Lux	32.5	ft-candles
Floor Fraction (ALFF)	0.10			
Connected Load	33.3	W/m²	3.1	W/ft²

Occ. Period(Hrs./yr.)	3200
Unocc. Period(Hrs./yr.)	5560
Usage During Occupied Period	95%
Usage During Unoccupied Period	30%

Light Level (Lux)	200	300	400	500				Total
% Distribution	10%	40%	40%	10%				100%
Weighted Average								**350**

	INC	CFL	T12	T8	MH	HPS	Other	TOTAL
System Present (%)	50%	50%						100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.55	0.55	0.55	
Efficacy (L/W)	15	50	72	84	65	90	90	

Fixture Cleaning:			
Incidence of Practice			
Interval		years	
Relamping Strategy & Incidence of Practice	Group	Spot	

EUI	kWh/ft².yr	1.5
	MJ/m².yr	56

EUI = Load X Hrs. X SF X GLFF

HIGH BAY LIGHTING

Light Level		Lux		ft-candles
Floor Fraction (HBLFF)				
Connected Load		W/m²		W/ft²

Floor fraction check: should = 1.00 | 1.00

Occ. Period(Hrs./yr.)	4000
Unocc. Period(Hrs./yr.)	4760
Usage During Occupied Period	0%
Usage During Unoccupied Period	100%

Light Level (Lux)	300	500	700	1000				Total
% Distribution								
Weighted Average								

	INC	CFL	T12	T8		MH	HPS	TOTAL
System Present (%)								
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:			
Incidence of Practice			
Interval		years	
Relamping Strategy & Incidence of Practice	Group	Spot	

EUI	kWh/ft².yr	
	MJ/m².yr	

TOTAL LIGHTING — Overall LP 16.09 W/m²

EUI TOTAL	kWh/ft².yr	5.9
	MJ/m².yr	227

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	55	51	100	200	217	
Density (device/occupant)	0.9	0.9	0.15	0.1	0.06	
Connected Load	1.9 W/m²	1.8 W/m²	0.6 W/m²	0.8 W/m²	0.5 W/m²	1.5 W/m²
	0.2 W/ft²	0.2 W/ft²	0.05 W/ft²	0.07 W/ft²	0.05 W/ft²	0.14 W/ft²
Diversity Occupied Period	80%	80%	80%	80%	100%	80%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	50%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2000	2500
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6760	6260

Total end-use load (occupied period)	5.8 W/m²	0.5 W/ft²
Total end-use load (unocc. period)	3.8 W/m²	0.4 W/ft²

Usage during occupied period	100%	Computer Equipment EUI	kWh/ft².yr 2.77
Usage during unoccupied period	66%		MJ/m².yr 107.44
		Plug Loads EUI	kWh/ft².yr 0.72
			MJ/m².yr 27.70

FOOD SERVICE EQUIPMENT

Provide description below: | Fossil Fuel Share: 5.0% | Electricity Fuel Share: 95.0%

	Fossil Fuel EUI		All Electric EUI	
Lunch room/cafeteria/restaurant	EUI kWh/ft².yr	0.1	EUI kWh/ft².yr	0.1
	MJ/m².yr	5.0	MJ/m².yr	4.0

REFRIGERATION

Provide description below:

Lunch room/cafeteria/restaurant	EUI kWh/ft².yr	0.1
	MJ/m².yr	4.0

MISCELLANEOUS

EUI	kWh/ft².yr	0.5
	MJ/m².yr	20

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS:	SIZE:	VINTAGE:	REGION:
Office	< 40,000 ft2		Yukon
Baseline			

SPACE HEATING

Heating Plant Type

	Fossil Fuel			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Unit					
System Present (%)	30%	30%	10%	10%	10%		10%	100%
Eff./COP	75%	80%	75%	1.70	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.25	1.33	0.59	0.33	0.22	1.00	

Peak Heating Load	96.7	W/m²	30.7	Btu/hr.ft²
Seasonal Heating Load	739	MJ/m².yr	19.1	kWh/ft².yr
(Tertiary Load)				
Sizing Factor	1.00			

Electric Fuel Share: 30.0% — Fossil Fuel Share: 70.0%

All Electric EUI	
kWh/ft².yr	13.8
MJ/m².yr	534

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

Fossil Fuel EUI	
kWh/ft².yr	24.7
MJ/m².yr	958

Market Composite EUI	
kWh/ft².yr	21.5
MJ/m².yr	831

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		WSHP	Recip. Chiller	Pkgd. DX	Absorption Chillers		Total
	Standard	HE				W. H.	CW	
System Present (%)		25.0%			75.0%			100.0%
COP	4.7	5.4	3.5	3.5	2.6	0.9	1	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.29	0.29	0.38	1.11	1.00	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water		
Condenser Water		

Setpoint

Chilled Water	7	°C	44.6	°F
Condenser Water	30	°C	86	°F
Supply Air	14.0	°C	57.2	°F

Peak Cooling Load	59	W/m²	19	Btu/hr.ft²	638 ft²/Ton
Seasonal Cooling Load	51.5	MJ/m².yr	1.3	kWh/ft².yr	
(Tertiary Load)					

Sizing Factor: 1.00 — Operation (occ. period): 3000 hrs/year — Note value cannot be less than 2,900 hrs/year)

A/C Saturation (Incidence of A/C): 75.0%

Electric Fuel Share: 100.0% — Gas Fuel Share:

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit		
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.6
MJ/m².yr	22

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.6
MJ/m².yr	22

DOMESTIC HOT WATER

Service Hot Water Plant Type

	Fossil Fuel SHW	Tank				Boiler
	System Present (%)	50%				
	Eff./COP	0.65				0.75

	Fossil		Elec. Res.
Fuel Share	50%		50%
Blended Efficiency	0.65		0.91

Service Hot Water load (MJ/m².yr): 22.8 (Tertiary Load)

Wetting Use Percentage: 90%

All Electric EUI	
kWh/ft².yr	0.6
MJ/m².yr	25

Fossil Fuel EUI	
kWh/ft².yr	0.9
MJ/m².yr	35

Market Composite EUI	
kWh/ft².yr	0.8
MJ/m².yr	30.0

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS:	SIZE:	VINTAGE:	REGION:
Office	< 40,000 ft2		Yukon
Baseline			

HVAC FANS & PUMPS

SUPPLY FANS

System Design Air Flow	3.0	L/s.m²	0.59	CFM/ft²	
System Static Pressure CAV	500	Pa	2.0	wg	
System Static Pressure VAV	500	Pa	2.0	wg	
Fan Efficiency	52%				
Fan Motor Efficiency	85%				
Sizing Factor	1.00				
Fan Design Load CAV	3.4	W/m²	0.31	W/ft²	
Fan Design Load VAV	3.4	W/m²	0.31	W/ft²	

Ventilation and Exhaust Fan Operation & Control

	Ventilation Fan		Exhaust Fan	
Control	Fixed	Variable Flow	Fixed	Variable Flow
Incidence of Use	75%	25%	100%	
Operation	Continuous	Scheduled	Continuous	Scheduled
Incidence of Use	50%	50%	50%	50%
Comments:				

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.3	L/s.m²	0.06	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.4	L/s.m²	0.08	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	40%			
Fan Motor Efficiency	80%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.3	W/m²	0.03	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.020	kW/kW	0.07	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	1.17	W/m²	0.11	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.003	L/s.m²	0.005	U.S. gpm/ft²
Pump Head Pressure	90	kPa	30	ft
Pump Efficiency	55%			
Pump Motor Efficiency	90%			
Sizing Factor	1.0			
Pump Connected Load	0.57	W/m²	0.05	W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.003	L/s.m²	0.0038	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure	150	kPa	50	ft		
Pump Efficiency	55%					
Pump Motor Efficiency	90%					
Sizing Factor	0.5					
Pump Connected Load	0.4	W/m²	0.04	W/ft²		

Supply Fan Occ. Period	3500	hrs./year
Supply Fan Unocc. Period	5260	hrs./year
Supply Fan Energy Consumption	17.0	kWh/m².yr
Exhaust Fan Occ. Period	3500	hrs./year
Exhaust Fan Unocc. Period	5260	hrs./year
Exhaust Fan Energy Consumption	1.9	kWh/m².yr
Condenser Pump Energy Consumption	0.2	kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.3	kWh/m².yr
Circulating Pump Yearly Operation	5000	hrs./year
Circulating Pump Energy Consumption	1.7	kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	2.0
	MJ/m².yr	76.1

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS:	SIZE:	VINTAGE:	REGION:
Office	< 40,000 ft2		Yukon
Baseline			

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **17.4** kWh/ft².yr **675.7** MJ/m².yr **Fossil Fue** **17.8** kWh/ft².yr **688.7** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr	END USE:	Electricity		Fossil Fuel	
				kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	4.4	170.6					
ARCHITECTURAL LIGHTING	1.5	56.5	SPACE HEATING	4.1	160.1	17.3	670.9
HIGH BAY LIGHTING			SPACE COOLING	0.4	16.2		
OTHER PLUG LOADS	0.7	27.7	DOMESTIC HOT WATER	0.3	12.5	0.5	17.5
HVAC FANS & PUMPS	2.0	76.1	FOOD SERVICE EQUIPMENT	0.1	3.8	0.0	0.3
REFRIGERATION	0.1	4.0					
MISCELLANEOUS	0.5	20.0					
COMPUTER EQUIPMENT	2.8	107.4					
ELEVATORS	0.1	3.9					
OUTDOOR LIGHTING	0.4	17.0					

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Food Retail **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.38	W/m².°C	0.07	Btu/hr.ft² .°F	Typical Building Size	2,788	m²	30,000	ft²
Roof U value (W/m².°C)	0.29	W/m².°C	0.05	Btu/hr.ft² .°F	Typical Footprint (m²)	2,788	m²	30,000	ft²
Glazing U value (W/m².°C)	3.30	W/m².°C	0.58	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	1			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	45%			
Window/Wall Ratio (WIWAR) (%)	0.06				Defined as Exterior Zone				
Shading Coefficient (SC)	0.69				Typical # Stories	1			
					Floor to Floor Height (m)	4.6	m	15.0	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	100%								100%
Min. Air Flow (%)					50%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	45	m²/person	484	ft²/person	%OA	27.28%	
Occupancy Schedule Occ. Period	90%						
Occupancy Schedule Unocc. Period							
Fresh Air Requirements or Outside Air	35	L/s.person	74	CFM/person			

Fresh Air Control Type *(enter a 1, 2 or 3)	1	If Fresh Air Control Type = "2" enter % FA. to the right:					
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)		If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation	0.5	L/s.m²	0.10	CFM/ft²	
			50%	operation (%)			
Sizing Factor	1.5						
Total Air Circulation or Design Air Flow	2.85	L/s.m²	0.56	CFM/ft²			
Infiltration Rate	0.70	L/s.m²	0.14	CFM/ft²			
(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)							

Separate Make-up air unit (100% OA) L/s.m² CFM/ft²
Operation occupied period 50%
Operation unoccupied period 50%

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use			100%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters		
Peak Design Cooling Load	680,897	
Peak Zone Sensible Load	241,371	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	11,229	
Total air circulation or Design air	2.85	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic		
DDC/Pneumatic		
All DDC		
Total (should add-up to 100%)		

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	22	°C	71.6	°F	14	°C	57.2	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	22	°C	71.6	°F	15	°C	59	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	21	°C	69.8	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning Changes/Year

Incidence of Annual Room Controls Maintenance

Incidence of Annual HVAC Controls Maintenance

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Food Retail **Yukon**
Baseline

LIGHTING

GENERAL LIGHTING

Light Level	500	Lux	46.5	ft-candles
Floor Fraction (GLFF)	0.45			
Connected Load	13.6	W/m²	1.3	W/ft²

Occ. Period(Hrs./yr.)	4400
Unocc. Period(Hrs./yr.)	4360
Usage During Occupied Period	100%
Usage During Unoccupied Period	20%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution		100%					100%
Weighted Average							**500**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)			50%		50%		0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.7	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	85	

EUI kWh/ft².yr 3.0
MJ/m².yr 116

ARCHITECTURAL LIGHTING

Light Level	500	Lux	46.5	ft-candles
Floor Fraction (ALFF)	0.10			
Connected Load	60.4	W/m²	5.6	W/ft²

Occ. Period(Hrs./yr.)	4400
Unocc. Period(Hrs./yr.)	4360
Usage During Occupied Period	100%
Usage During Unoccupied Period	20%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution		100%					100%
Weighted Average							**500**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)	75%	25%						100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	85	

EUI kWh/ft².yr 3.0
EUI = Load X Hrs. X SF X GLFF MJ/m².yr 115

HIGH BAY LIGHTING

Light Level	500.00	Lux	46.5	ft-candles
Floor Fraction (HBLFF)	0.45			
Connected Load	23.0	W/m²	2.1	W/ft²

Floor fraction check: should = 1.00 | 1.00

Occ. Period(Hrs./yr.)	4400
Unocc. Period(Hrs./yr.)	4360
Usage During Occupied Period	100%
Usage During Unoccupied Period	20%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution		100%					100%
Weighted Average							**500**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)						95%	5%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	85	

EUI kWh/ft².yr 5.1
MJ/m².yr 197

TOTAL LIGHTING Overall LP 22.55 W/m²
EUI TOTAL kWh/ft².yr 11
MJ/m².yr 428

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	55	51	100	200	217	
Density (device/occupant)	0.65	0.65	0.01	0.01	0.03	
Connected Load	0.8 W/m²	0.7 W/m²	0.0 W/m²	0.0 W/m²	0.1 W/m²	1.5 W/m²
	0.1 W/ft²	0.1 W/ft²	0.00 W/ft²	0.00 W/ft²	0.01 W/ft²	0.14 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	90%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	50%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2600	4100
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6160	4660
Total end-use load (occupied period)	2.9 W/m²	0.3 W/ft²	to see notes (cells with red indicator in upper right corner, type "SHIFT F2"			
Total end-use load (unocc. period)	1.7 W/m²	0.2 W/ft²				
Usage during occupied period	100%					
Usage during unoccupied period	58%					

Computer Equipment EUI kWh/ft².yr 0.88
MJ/m².yr 34.0
Plug Loads EUI kWh/ft².yr 0.84
MJ/m².yr 32.5

FOOD SERVICE EQUIPMENT

Provide description below: | Fossil Fuel Share: 60.0% | Electricity Fuel Share: 40.0%

Fossil Fuel EUI			All Electric EUI		
EUI	kWh/ft².yr	2.6	EUI	kWh/ft².yr	1.5
	MJ/m².yr	100.0		MJ/m².yr	60.0

REFRIGERATION

Provide description below:
Commercial refrigeration display cases

EUI kWh/ft².yr 31.0
MJ/m².yr 1200.0

MISCELLANEOUS

EUI kWh/ft².yr 0.3
MJ/m².yr 10

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Food Retail **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Fossil Fuel			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Units					
System Present (%)	15%	15%	50%		10%		10%	100%
Eff./COP	75%	80%	75%	1.70	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.25	1.33	0.59	0.33	0.22	1.00	

Peak Heating Load 58.3 W/m² 18.5 Btu/hr.ft²
Seasonal Heating Load 772 MJ/m².yr 19.9 kWh/ft².yr
(Tertiary Load)
Sizing Factor 1.00

Electric Fuel Share 20.0% Fossil Fuel Share 80.0% Other fuel Share

All Electric EUI	
kWh/ft².yr	14.0
MJ/m².yr	542

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

Fossil Fuel EUI	
kWh/ft².yr	26.3
MJ/m².yr	1017

Market Composite EUI	
kWh/ft².yr	23.8
MJ/m².yr	922

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Recip.	Pkgd. DX	Absorption Chillers		Total
	Standard	HE	Chillers	Chiller		W. H.	CW	
System Present (%)					100.0%			100.0%
COP	4.7	5.4	4.4	3.6	2.6	0.9	1	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.28	0.38	1.11	1.00	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water		
Condenser Water		

Setpoint

Chilled Water	7	°C	44.6	°F
Condenser Water	30	°C	86	°F
Supply Air	14.0	°C	57.2	°F

Peak Cooling Load 72 W/m² 23 Btu/hr.ft² 529 ft²/Ton
Seasonal Cooling Load 24.1 MJ/m².yr 0.6 kWh/ft².yr
(Tertiary Load)

Sizing Factor 1.00 Operation (occ. period 4000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation (Incidence of A/C) 65.0%

Electric Fuel Share 100.0% Gas Fuel Share

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit		
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.3
MJ/m².yr	11

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.3
MJ/m².yr	11

SERVICE HOT WATER

Service Hot Water Plant Type

Fossil Fuel SHW	Avg. Tank				Boiler
System Present (%)	55%				5%
Eff./COP	0.65				0.75

	Fossil		Elec. Res.
Fuel Share	60%		40%
Blended Efficiency	0.66		0.91

Service Hot Water load (MJ/m².yr) 45.5
(Tertiary Load)

Wetting Use Percentage 20%

All Electric EUI	
kWh/ft².yr	1.3
MJ/m².yr	50

Fossil Fuel EUI	
kWh/ft².yr	1.8
MJ/m².yr	69

Market Composite EUI	
kWh/ft².yr	1.6
MJ/m².yr	61.5

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Food Retail **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

System Design Air Flow	2.9	L/s.m²	0.56	CFM/ft²	
System Static Pressure CAV	500	Pa	2.0	wg	
System Static Pressure VAV	500	Pa	2.0	wg	
Fan Efficiency	60%				
Fan Motor Efficiency	80%				
Sizing Factor	1.00				
Fan Design Load CAV	3.0	W/m²	0.28	W/ft²	
Fan Design Load VAV	3.0	W/m²	0.28	W/ft²	

Ventilation and Exhaust Fan Operation & Control

	Ventilation Fan		Exhaust Fan	
Control	Fixed	Variable Flow	Fixed	Variable Flow
Incidence of Use	100%		100%	
Operation	Continuous	Scheduled	Continuous	Scheduled
Incidence of Use	50%	50%	50%	50%

Comments:

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.1	L/s.m²	0.01	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.2	L/s.m²	0.03	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	75%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.2	W/m²	0.02	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.020	kW/kW	0.07	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	1.43	W/m²	0.13	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.004	L/s.m²	0.006	U.S. gpm/ft²
Pump Head Pressure		kPa		ft
Pump Efficiency	50%			
Pump Motor Efficiency	80%			
Sizing Factor	1.0			
Pump Connected Load		W/m²		W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.003	L/s.m²	0.0045	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure	100	kPa	50	ft		
Pump Efficiency	50%					
Pump Motor Efficiency	80%					
Sizing Factor	0.8					
Pump Connected Load	0.6	W/m²	0.06	W/ft²		

Supply Fan Occ. Period	5000	hrs./year
Supply Fan Unocc. Period	3760	hrs./year
Supply Fan Energy Consumption	20.4	kWh/m².yr
Exhaust Fan Occ. Period	5000	hrs./year
Exhaust Fan Unocc. Period	3760	hrs./year
Exhaust Fan Energy Consumption	1.6	kWh/m².yr
Condenser Pump Energy Consumption		kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.1	kWh/m².yr
Circulating Pump Yearly Operation	7000	hrs./year
Circulating Pump Energy Consumption	3.9	kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	2.4
	MJ/m².yr	93.7

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Food Retail **Yukon**
Baseline

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **51.9** kWh/ft².yr **2,008.7** MJ/m².yr **Fossil Fue** **23.6** kWh/ft².yr **915.0** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	3.0	116.5
ARCHITECTURAL LIGHTING	3.0	114.7
HIGH BAY LIGHTING	5.1	196.7
OTHER PLUG LOADS	0.8	32.5
HVAC FANS & PUMPS	2.4	93.7
REFRIGERATION	31.0	1,200.0
MISCELLANEOUS	0.3	10.0
COMPUTER EQUIPMENT	0.9	34.0
ELEVATORS		
OUTDOOR LIGHTING	1.3	50.9

END USE:	Electricity		Fossil Fuel	
	kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
SPACE HEATING	2.8	108.3	21.0	813.5
SPACE COOLING	0.2	7.4		
SERVICE HOT WATER	0.5	20.0	1.1	41.5
FOOD SERVICE EQUIPMENT	0.6	24.0	1.5	60.0

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Non Food Retail **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.38	W/m².°C	0.07	Btu/hr.ft² .°F	Typical Building Size	929	m²	10,000	ft²
Roof U value (W/m².°C)	0.29	W/m².°C	0.05	Btu/hr.ft² .°F	Typical Footprint (m²)	929	m²	10,000	ft²
Glazing U value (W/m².°C)	3.30	W/m².°C	0.58	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	5			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	45%			
Window/Wall Ratio (WIWAR) (%)	0.10				Defined as Exterior Zone				
Shading Coefficient (SC)	0.75				Typical # Stories	1			
					Floor to Floor Height (m)	4.5	m	14.8	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	100%								100%
Min. Air Flow (%)					50%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	25	m²/person	269	ft²/person	%OA	12.53%
Occupancy Schedule Occ. Period	90%					
Occupancy Schedule Unocc. Period						
Fresh Air Requirements or Outside Air	8	L/s.person	16	CFM/person		

Fresh Air Control Type *(enter a 1, 2 or 3)	1	If Fresh Air Control Type = "2" enter % FA. to the right:	34%			
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)		If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation	0.5	L/s.m²	0.10	CFM/ft²
			50%	operation (%)		
Sizing Factor	0.75					
Total Air Circulation or Design Air Flow	2.39	L/s.m²	0.47	CFM/ft²		
Infiltration Rate	0.42	L/s.m²	0.08	CFM/ft²		

(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)

Separate Make-up air unit (100% OA)		L/s.m²		CFM/ft²
Operation occupied period	50%			
Operation unoccupied period	50%			

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use			100%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters		
Peak Design Cooling Load	198,376	
Peak Zone Sensible Load	135,162	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	6,288	
Total air circulation or Design air	2.39	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic		
DDC/Pneumatic		
All DDC		
Total (should add-up to 100%)		

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	21	°C	69.8	°F	14	°C	57.2	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	21	°C	69.8	°F	15	°C	59	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	21	°C	69.8	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning — Changes/Year

Incidence of Annual Room Controls Maintenance

Incidence of Annual HVAC Controls Maintenance

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Non Food Retail **Yukon**
Baseline

LIGHTING

GENERAL LIGHTING

Light Level	500	Lux	46.5	ft-candles
Floor Fraction (GLFF)	0.80			
Connected Load	14.2	W/m²	1.3	W/ft²

Occ. Period(Hrs./yr.)	4400
Unocc. Period(Hrs./yr.)	4360
Usage During Occupied Period	95%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	400	500	600	1000			Total
% Distribution	25%	50%	25%				100%
Weighted Average							**500**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)			50%		50%			100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 5.1
MJ/m².yr 197

ARCHITECTURAL LIGHTING

Light Level	500	Lux	46.5	ft-candles
Floor Fraction (ALFF)	0.10			
Connected Load	60.4	W/m²	5.6	W/ft²

Occ. Period(Hrs./yr.)	4400
Unocc. Period(Hrs./yr.)	4360
Usage During Occupied Period	95%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution	30%	40%	30%				100%
Weighted Average							**500**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)	75%	25%					0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 2.7
MJ/m².yr 105

EUI = Load X Hrs. X SF X GLFF

HIGH BAY LIGHTING

Light Level	500.00	Lux	46.5	ft-candles
Floor Fraction (HBLFF)	0.10			
Connected Load	22.7	W/m²	2.1	W/ft²

Floor fraction check: should = 1.00 | 1.00

Occ. Period(Hrs./yr.)	4400
Unocc. Period(Hrs./yr.)	4360
Usage During Occupied Period	95%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution	30%	40%	30%				100%
Weighted Average							**500**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)						90%	10%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 1.0
MJ/m².yr 39

TOTAL LIGHTING Overall LP 17.38 W/m²

EUI TOTAL kWh/ft².yr 8.8
MJ/m².yr 342

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	55	51	100	200	217	
Density (device/occupant)	0.18	0.18	0.01	0.01	0.02	
Connected Load	0.4 W/m²	0.4 W/m²	0.0 W/m²	0.1 W/m²	0.1 W/m²	1.15 W/m²
	0.0 W/ft²	0.0 W/ft²	0.00 W/ft²	0.01 W/ft²	0.01 W/ft²	0.11 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	90%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	50%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2000	4100
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6760	4660

Total end-use load (occupied period) 2.0 W/m² 0.2 W/ft²
Total end-use load (unocc. period) 1.2 W/m² 0.1 W/ft²

to see notes (cells with red indicator in upper right corner, type "SHIFT F2"

Usage during occupied period 100%
Usage during unoccupied period 59%

Computer Equipment EUI kWh/ft².yr 0.54
MJ/m².yr 20.81

Plug Loads EUI kWh/ft².yr 0.64
MJ/m².yr 24.92

FOOD SERVICE EQUIPMENT

Provide description below: Fossil Fuel Share: Electricity Fuel Share: 100.0%

Small restaurants, food courts, kitchenettes

Fossil Fuel EUI: EUI kWh/ft².yr 0.4 / MJ/m².yr 15.0

All Electric EUI: EUI kWh/ft².yr 0.3 / MJ/m².yr 10.0

REFRIGERATION

Provide description below:

EUI kWh/ft².yr 0.4
MJ/m².yr 15.0

MISCELLANEOUS

EUI kWh/ft².yr 0.3
MJ/m².yr 10

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Non Food Retail **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Fossil Fuel			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Units					
System Present (%)	10%	5%	65%		10%		10%	100%
Eff./COP	75%	80%	75%	1.70	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.25	1.33	0.59	0.33	0.22	1.00	

Peak Heating Load	75.9	W/m²	24.1	Btu/hr.ft²
Seasonal Heating Load	577	MJ/m².yr	14.9	kWh/ft².yr
(Tertiary Load)				
Sizing Factor	1.00			

Electric Fuel Share: 20.0% Fossil Fuel Share: 80.0%

All Electric EUI	
kWh/ft².yr	10.6
MJ/m².yr	411

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

Fossil Fuel EUI	
kWh/ft².yr	19.8
MJ/m².yr	766

Market Composite EUI	
kWh/ft².yr	17.9
MJ/m².yr	695

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Recip.	Pkgd. DX	Absorption Chillers		Total
	Standard	HE	Chillers	Chiller		W. H.	CW	
System Present (%)					100.0%			100.0%
COP	4.8	5.4	4.4	3.7	2.6	0.9	1	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.27	0.38	1.11	1.00	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water		
Condenser Water		

Setpoint

Chilled Water	7	°C	44.6	°F
Condenser Water	30	°C	86	°F
Supply Air	14.0	°C	57.2	°F

Peak Cooling Load	63	W/m²	20	Btu/hr.ft²	605 ft²/Ton
Seasonal Cooling Load	42.6	MJ/m².yr	1.1	kWh/ft².yr	
(Tertiary Load)					
Sizing Factor	1.00				
A/C Saturation (Incidence of A/C)	65.0%				

Electric Fuel Share: 100.0% Gas Fuel Share:

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit		
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.3
MJ/m².yr	10

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.3
MJ/m².yr	10

DOMESTIC HOT WATER

Service Hot Water Plant Type

	Fossil Fuel SHW	Avg. Tank				Boiler
	System Present (%)	70%				
	Eff./COP	0.65				0.75

	Fossil		Elec. Res.
Fuel Share	70%		30%
Blended Efficiency	0.65		0.91

Service Hot Water load (MJ/m².yr) 17.3
(Tertiary Load)

Wetting Use Percentage: 90%

All Electric EUI	
kWh/ft².yr	0.5
MJ/m².yr	19

Fossil Fuel EUI	
kWh/ft².yr	0.7
MJ/m².yr	27

Market Composite EUI	
kWh/ft².yr	0.6
MJ/m².yr	24.3

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Non Food Retail **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

						Ventilation and Exhaust Fan Operation & Control			
						Ventilation Fan		Exhaust Fan	
System Design Air Flow	2.4	L/s.m²	0.47	CFM/ft²	Control	Fixed	Variable Flow	Fixed	Variable Flow
System Static Pressure CAV	400	Pa	1.6	wg					
System Static Pressure VAV	400	Pa	1.6	wg	Incidence of Use	100%		100%	
Fan Efficiency	60%				Operation	Continuous	Scheduled	Continuous	Scheduled
Fan Motor Efficiency	88%								
Sizing Factor	1.00				Incidence of Use	50%	50%	50%	50%
Fan Design Load CAV	1.8	W/m²	0.17	W/ft²					
Fan Design Load VAV	1.8	W/m²	0.17	W/ft²	Comments:				

EXHAUST FANS

Washroom Exhaust	50	L/s.washroom	106	CFM/washroom
Washroom Exhaust per gross unit area	0.1	L/s.m²	0.02	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.2	L/s.m²	0.04	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	75%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.3	W/m²	0.03	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.020	kW/kW	0.07	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	1.25	W/m²	0.12	W/ft²

Condenser Pump

Pump Design Flow		L/s.KW		U.S. gpm/Ton
Pump Design Flow per unit floor area		L/s.m²		U.S. gpm/ft²
Pump Head Pressure	45	kPa	15	ft
Pump Efficiency	50%			
Pump Motor Efficiency	80%			
Sizing Factor	1.0			
Pump Connected Load		W/m²		W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.003	L/s.m²	0.0040	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure		kPa		ft		
Pump Efficiency	50%					
Pump Motor Efficiency	80%					
Sizing Factor	0.8					
Pump Connected Load		W/m²		W/ft²		

Supply Fan Occ. Period	5500	hrs./year
Supply Fan Unocc. Period	3260	hrs./year
Supply Fan Energy Consumption	12.9	kWh/m².yr
Exhaust Fan Occ. Period	5500	hrs./year
Exhaust Fan Unocc. Period	3260	hrs./year
Exhaust Fan Energy Consumption	2.0	kWh/m².yr
Condenser Pump Energy Consumption		kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.1	kWh/m².yr
Circulating Pump Yearly Operation	7000	hrs./year
Circulating Pump Energy Consumption		kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	1.4
	MJ/m².yr	54.1

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Non Food Retail **Yukon**
Baseline

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **15.6** kWh/ft².yr **605.1** MJ/m².yr **Fossil Fue** **16.3** kWh/ft².yr **631.5** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr	**END USE:**	Electricity		Fossil Fuel	
				kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	5.1	197.3					
ARCHITECTURAL LIGHTING	2.7	105.2	SPACE HEATING	2.1	82.3	15.8	612.9
HIGH BAY LIGHTING	1.0	39.4	SPACE COOLING	0.2	6.5		
OTHER PLUG LOADS	0.6	24.9	DOMESTIC HOT WATER	0.1	5.7	0.5	18.6
HVAC FANS & PUMPS	1.4	54.1	FOOD SERVICE EQUIPMENT	0.3	10.0		
REFRIGERATION	0.4	15.0					
MISCELLANEOUS	0.3	10.0					
COMPUTER EQUIPMENT	0.5	20.8					
ELEVATORS/ESCALATORS							
OUTDOOR LIGHTING	0.9	33.9					

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS:	SIZE:	VINTAGE:	REGION:
Hotel/Motel	< 40,000 ft2		Yukon
Baseline			

CONSTRUCTION

Wall U value (W/m².°C)	0.38	W/m².°C	0.07	Btu/hr.ft² .°F	Typical Building Size	1,859	m²	20,000	ft²
Roof U value (W/m².°C)	0.29	W/m².°C	0.05	Btu/hr.ft² .°F	Typical Footprint (m²)	929	m²	10,000	ft²
Glazing U value (W/m².°C)	3.30	W/m².°C	0.58	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	4			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	45%			
Window/Wall Ratio (WIWAR) (%)	0.28				Defined as Exterior Zone				
Shading Coefficient (SC)	0.57				Typical # Stories	2			
					Floor to Floor Height (m)	3.2	m	10.5	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	90%				10%				100%
Min. Air Flow (%)					60%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	46	m²/person	495	ft²/person	%OA	7.93%	
Occupancy Schedule Occ. Period	50%						
Occupancy Schedule Unocc. Period	80%						
Fresh Air Requirements or Outside Air	8	L/s.person	16	CFM/person			

Fresh Air Control Type *(enter a 1, 2 or 3)	1	If Fresh Air Control Type = "2" enter % FA. to the right:	15%			
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)		If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation	0.5	L/s.m²	0.10	CFM/ft²
			50%	operation (%)		
Sizing Factor	1					
Total Air Circulation or Design Air Flow	2.06	L/s.m²	0.40	CFM/ft²		
Infiltration Rate	1.00	L/s.m²	0.20	CFM/ft²		
(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)						

Separate Make-up air unit (100% OA)		L/s.m²		CFM/ft²
Operation occupied period	50%			
Operation unoccupied period	50%			

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use			100%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters		
Peak Design Cooling Load	238,677	
Peak Zone Sensible Load	174,088	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	8,099	
Total air circulation or Design air	2.06	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic		
DDC/Pneumatic		
All DDC		
Total (should add-up to 100%)		

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	22	°C	71.6	°F	14	°C	57.2	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	21	°C	69.8	°F	15	°C	59	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	15	°C	59	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning — Changes/Year

Incidence of Annual Room Controls Maintenance

Incidence of Annual HVAC Controls Maintenance

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS:	SIZE:	VINTAGE:	REGION:
Hotel/Motel	< 40,000 ft2		Yukon
Baseline			

LIGHTING

GENERAL LIGHTING

Light Level	450	Lux	41.8	ft-candles
Floor Fraction (GLFF)	0.25			
Connected Load	12.8	W/m²	1.2	W/ft²

Occ. Period(Hrs./yr.)	4400
Unocc. Period(Hrs./yr.)	4360
Usage During Occupied Period	85%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	200	300	400	500			Total
% Distribution			50%	50%			100%
Weighted Average							**450**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)			50%		50%			100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI	kWh/ft².yr	1.3
	MJ/m².yr	50

ARCHITECTURAL LIGHTING

Light Level	125	Lux	11.6	ft-candles
Floor Fraction (ALFF)	0.75			
Connected Load	11.9	W/m²	1.1	W/ft²

Occ. Period(Hrs./yr.)	2500
Unocc. Period(Hrs./yr.)	6260
Usage During Occupied Period	50%
Usage During Unoccupied Period	25%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	100	125	150	300			Total
% Distribution	25%	50%	25%				100%
Weighted Average							**125**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)	50%	50%					0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI	kWh/ft².yr	2.3
	MJ/m².yr	90

EUI = Load X Hrs. X SF X GLFF

HIGH BAY LIGHTING

Light Level	300.00	Lux	27.9	ft-candles
Floor Fraction (HBLFF)				
Connected Load	14.0	W/m²	1.3	W/ft²

Floor fraction check: should = 1.00 | 1.00

Occ. Period(Hrs./yr.)	4000
Unocc. Period(Hrs./yr.)	4760
Usage During Occupied Period	0%
Usage During Unoccupied Period	100%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution	100%						100%
Weighted Average							**300**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)		0%				100%	0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI	kWh/ft².yr	
	MJ/m².yr	

TOTAL LIGHTING — Overall LP 12.12 W/m²

EUI TOTAL	kWh/ft².yr	3.6
	MJ/m².yr	141

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	55	51	100	200	217	
Density (device/occupant)	0.3	0.3	0.05	0.033	0.02	
Connected Load	0.4 W/m²	0.3 W/m²	0.1 W/m²	0.1 W/m²	0.1 W/m²	1.5 W/m²
	0.0 W/ft²	0.0 W/ft²	0.01 W/ft²	0.01 W/ft²	0.01 W/ft²	0.14 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	70%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	25%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2500	3000
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6260	5760

Total end-use load (occupied period)	2.0 W/m²	0.2 W/ft²	to see notes (cells with red indicator in upper right corner, type "SHIFT F2"
Total end-use load (unocc. period)	1.0 W/m²	0.1 W/ft²	
Usage during occupied period	100%		
Usage during unoccupied period	48%		

Computer Equipment	EUI	kWh/ft².yr	0.55
		MJ/m².yr	21.19
Plug Loads	EUI	kWh/ft².yr	0.49
		MJ/m².yr	19.12

FOOD SERVICE EQUIPMENT

Provide description below: | Fossil Fuel Share: 75.0% | Electricity Fuel Share: 25.0%

Kitchen services

Fossil Fuel EUI			All Electric EUI		
EUI	kWh/ft².yr	2.6	EUI	kWh/ft².yr	1.3
	MJ/m².yr	100.0		MJ/m².yr	50.0

REFRIGERATION

Provide description below:

Walk-in coolers/freezers, reach-in coolers/freezers, refrigerated buffet cases

EUI	kWh/ft².yr	0.8
	MJ/m².yr	30.0

MISCELLANEOUS

EUI	kWh/ft².yr	0.3
	MJ/m².yr	10

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Hotel/Motel **< 40,000 ft2** **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Fossil Fuel			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Unit					
System Present (%)	50%	10%	20%				20%	100%
Eff./COP	75%	80%	70%	1.70	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.25	1.43	0.59	0.33	0.22	1.00	

Peak Heating Load	90.4	W/m²	28.7	Btu/hr.ft²
Seasonal Heating Load	635	MJ/m².yr	16.4	kWh/ft².yr
(Tertiary Load)				
Sizing Factor	1.00			

Electric Fuel Share 20.0% Fossil Fuel Share 80.0%

All Electric EUI	
kWh/ft².yr	16.4
MJ/m².yr	635

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

Fossil Fuel EUI	
kWh/ft².yr	22.1
MJ/m².yr	855

Market Composite EUI	
kWh/ft².yr	20.9
MJ/m².yr	811

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Recip.	Pkgd. DX	Absorption Chillers		Total
	Standard	HE	Chillers	Chiller		W. H.	CW	
System Present (%)	20.0%				80.0%			100.0%
COP	4.7	5.4	4.4	3.6	2.6	0.9	1	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.28	0.38	1.11	1.00	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water		
Condenser Water		

Setpoint

Chilled Water	7	°C	44.6	°F
Condenser Water	30	°C	86	°F
Supply Air	14.0	°C	57.2	°F

Peak Cooling Load	38	W/m²	12	Btu/hr.ft²	1006	ft²/Ton
Seasonal Cooling Load	32.3	MJ/m².yr	0.8	kWh/ft².yr		
(Tertiary Load)						

Sizing Factor 1.00 Operation (occ. perio 3000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation (Incidence of A/C) 65.0%

Electric Fuel Share 100.0% Gas Fuel Share

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit		
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.3
MJ/m².yr	13

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.3
MJ/m².yr	13

DOMESTIC HOT WATER

Service Hot Water Plant Type

	Fossil Fuel SHW	Avg. Tank				Boiler
	System Present (%)	65%				20%
	Eff./COP	0.65				0.75

	Fossil		Elec. Res.
Fuel Share	85%		15%
Blended Efficiency	0.67		0.91

Service Hot Water load (MJ/m².yr) 236.6
(Tertiary Load)

All Electric EUI	
kWh/ft².yr	6.7
MJ/m².yr	260

Fossil Fuel EUI	
kWh/ft².yr	9.1
MJ/m².yr	351

Market Composite EUI	
kWh/ft².yr	8.7
MJ/m².yr	337.6

Wetting Use Percentage 80%

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS:	SIZE:	VINTAGE:	REGION:
Hotel/Motel	< 40,000 ft2		Yukon
Baseline			

HVAC FANS & PUMPS

SUPPLY FANS

System Design Air Flow	2.1	L/s.m²	0.40	CFM/ft²	
System Static Pressure CAV	338	Pa	1.4	wg	
System Static Pressure VAV	338	Pa	1.4	wg	
Fan Efficiency	45%				
Fan Motor Efficiency	80%				
Sizing Factor	1.00				
Fan Design Load CAV	1.9	W/m²	0.18	W/ft²	
Fan Design Load VAV	1.9	W/m²	0.18	W/ft²	

Ventilation and Exhaust Fan Operation & Control

	Ventilation Fan		Exhaust Fan	
Control	Fixed	Variable Flow	Fixed	Variable Flow
Incidence of Use	100%		100%	
Operation	Continuous	Scheduled	Continuous	Scheduled
Incidence of Use	50%	50%	50%	50%
Comments:				

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.2	L/s.m²	0.04	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.3	L/s.m²	0.06	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	75%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.4	W/m²	0.04	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.024	kW/kW	0.08	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	0.88	W/m²	0.08	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.002	L/s.m²	0.003	U.S. gpm/ft²
Pump Head Pressure		kPa		ft
Pump Efficiency	50%			
Pump Motor Efficiency	80%			
Sizing Factor	1.0			
Pump Connected Load		W/m²		W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.002	L/s.m²	0.0024	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure	100	kPa	33	ft		
Pump Efficiency	50%					
Pump Motor Efficiency	80%					
Sizing Factor	0.8					
Pump Connected Load	0.3	W/m²	0.03	W/ft²		

Supply Fan Occ. Period	3500	hrs./year
Supply Fan Unocc. Period	5260	hrs./year
Supply Fan Energy Consumption	11.8	kWh/m².yr
Exhaust Fan Occ. Period	3500	hrs./year
Exhaust Fan Unocc. Period	5260	hrs./year
Exhaust Fan Energy Consumption	2.6	kWh/m².yr
Condenser Pump Energy Consumption		kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.2	kWh/m².yr
Circulating Pump Yearly Operation	5000	hrs./year
Circulating Pump Energy Consumption	1.3	kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	1.5
	MJ/m².yr	57.2

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS:	SIZE:	VINTAGE:	REGION:
Hotel/Motel	< 40,000 ft2		Yukon
Baseline			

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **12.6** kWh/ft².yr **486.3** MJ/m².yr **Fossil Fue** **27.3** kWh/ft².yr **1,057.6** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	1.3	50.4
ARCHITECTURAL LIGHTING	2.3	90.5
HIGH BAY LIGHTING		
OTHER PLUG LOADS	0.5	19.1
HVAC FANS & PUMPS	1.5	57.2
REFRIGERATION	0.8	30.0
MISCELLANEOUS	0.3	10.0
COMPUTER EQUIPMENT	0.5	21.2
ELEVATORS	0.1	3.9
OUTDOOR LIGHTING	0.4	17.0

END USE:	Electricity		Fossil Fuel	
	kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
SPACE HEATING	3.3	127.0	17.7	684.0
SPACE COOLING	0.2	8.5		
DOMESTIC HOT WATER	1.0	39.0	7.7	298.6
FOOD SERVICE EQUIPMENT	0.3	12.5	1.9	75.0

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Healthcare **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.38	W/m².°C	0.07	Btu/hr.ft² .°F	Typical Building Size	8,829	m²	95,000	ft²
Roof U value (W/m².°C)	0.29	W/m².°C	0.05	Btu/hr.ft² .°F	Typical Footprint (m²)	1,750	m²	18,830	ft²
Glazing U value (W/m².°C)	3.30	W/m².°C	0.58	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	2			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	45%			
Window/Wall Ratio (WIWAR) (%)	0.15				Defined as Exterior Zone				
Shading Coefficient (SC)	0.65				Typical # Stories	3			
					Floor to Floor Height (m)	3.7	m	12.0	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	80%				20%				100%
Min. Air Flow (%)					50%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	30	m²/person	323	ft²/person	%OA	41.33%	
Occupancy Schedule Occ. Period	90%						
Occupancy Schedule Unocc. Period	75%						
Fresh Air Requirements or Outside Air	50	L/s.person	106	CFM/person			

Fresh Air Control Type *(enter a 1, 2 or 3)	1	If Fresh Air Control Type = "2" enter % FA. to the right:			15%		
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)		If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation			0.5	L/s.m²	0.10 CFM/ft²
					50%	operation (%)	
Sizing Factor	3						
Total Air Circulation or Design Air Flow	4.03	L/s.m²	0.79	CFM/ft²			
Infiltration Rate	0.70	L/s.m²	0.14	CFM/ft²			
(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)							

Separate Make-up air unit (100% OA) L/s.m² CFM/ft²
Operation occupied period 50%
Operation unoccupied period 50%

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use			100%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters

Peak Design Cooling Load	########	
Peak Zone Sensible Load	540,578	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R.H	13.2	ft³/lbm
Design CFM	25,148	
Total air circulation or Design air flo	4.03	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic		
DDC/Pneumatic		
All DDC		
Total (should add-up to 100%)		

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	24	°C	75.2	°F	14	°C	57.2	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	23	°C	73.4	°F	15	°C	59	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	23	°C	73.4	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning Changes/Year

Incidence of Annual Room Controls Maintenance

Incidence of Annual HVAC Controls Maintenance

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Healthcare **Yukon**
Baseline

LIGHTING

GENERAL LIGHTING

Light Level	450	Lux	41.8	ft-candles
Floor Fraction (GLFF)	0.90			
Connected Load	12.5	W/m²	1.2	W/ft²

Occ. Period(Hrs./yr.) 4500
Unocc. Period(Hrs./yr.) 4260
Usage During Occupied Period 90%
Usage During Unoccupied Period 30%

Light Level (Lux)	200	300	400	500			Total
% Distribution			50%	50%			100%
Weighted Average							**450**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)			40%		60%		0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval years

Relamping Strategy & Incidence of Practice: Group | Spot

EUI kWh/ft².yr 5.6
MJ/m².yr 216

ARCHITECTURAL LIGHTING

Light Level	350	Lux	32.5	ft-candles
Floor Fraction (ALFF)	0.10			
Connected Load	29.7	W/m²	2.8	W/ft²

Occ. Period(Hrs./yr.) 8760
Unocc. Period(Hrs./yr.)
Usage During Occupied Period 85%
Usage During Unoccupied Period

Light Level (Lux)	200	300	400	500			Total
% Distribution		50%	50%				100%
Weighted Average							**350**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)	40%	60%						100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval years

Relamping Strategy & Incidence of Practice: Group | Spot

EUI kWh/ft².yr 2.1
MJ/m².yr 80

EUI = Load X Hrs. X SF X GLFF

HIGH BAY LIGHTING

Light Level	250.00	Lux	23.2	ft-candles
Floor Fraction (HBLFF)				
Connected Load	11.9	W/m²	1.1	W/ft²

Floor fraction check: should = 1.00 | 1.00

Occ. Period(Hrs./yr.) 4000
Unocc. Period(Hrs./yr.) 4760
Usage During Occupied Period 100%
Usage During Unoccupied Period 100%

Light Level (Lux)	200	300	500	700			Total
% Distribution	50%	50%					100%
Weighted Average							**250**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)	15%	15%	20%		50%		0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval years

Relamping Strategy & Incidence of Practice: Group | Spot

EUI kWh/ft².yr
MJ/m².yr

TOTAL LIGHTING Overall LPD 14.25 W/m²

EUI TOTAL kWh/ft².yr 7.6
MJ/m².yr 296

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	54.55	51	100	200	217	
Density (device/occupant)	0.48	0.48	0.02	0.02	0.04	
Connected Load	0.9 W/m²	0.8 W/m²	0.1 W/m²	0.1 W/m²	0.3 W/m²	3.85 W/m²
	0.1 W/ft²	0.1 W/ft²	0.01 W/ft²	0.01 W/ft²	0.02 W/ft²	0.36 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	90%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	25%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2600	4100
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6160	4660

Total end-use load (occupied period) 5.4 W/m² 0.5 W/ft²
Total end-use load (unocc. period) 2.2 W/m² 0.2 W/ft²

to see notes (cells with red indicator in upper right corner, type "SHIFT F2"

Usage during occupied period 100%
Usage during unoccupied period 40%

Computer Equipment EUI kWh/ft².yr 1.1
MJ/m².yr 43.1

Plug Loads EUI kWh/ft².yr 1.7
MJ/m².yr 67.3

FOOD SERVICE EQUIPMENT

Provide description below: Fossil Fuel Share: 75.0% Electricity Fuel Share: 25.0%

Commercial food services

Fossil Fuel EUI: EUI kWh/ft².yr 3.1 / MJ/m².yr 120.0

All Electric EUI: EUI kWh/ft².yr 2.1 / MJ/m².yr 80.0

REFRIGERATION

Provide description below:
Walk-in coolers/freezers, reach-in coolers/freezers, refrigerated buffet cases

EUI kWh/ft².yr 0.4
MJ/m².yr 15.0

MISCELLANEOUS

EUI kWh/ft².yr 0.3
MJ/m².yr 10

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Healthcare **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Fossil Fuel			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Unit					
System Present (%)		80%	10%		5%		5%	100%
Eff./COP	75%	80%	75%	1.70	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.25	1.33	0.59	0.33	0.22	1.00	

Peak Heating Load 43.0 W/m² 13.6 Btu/hr.ft²
Seasonal Heating Load 1644 MJ/m².yr 42.4 kWh/ft².yr
(Tertiary Load)
Sizing Factor 1.00

Electric Fuel Share 10.0% Fossil Fuel Share 90.0%

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

All Electric EUI	
kWh/ft².yr	30.7
MJ/m².yr	1188

Fossil Fuel EUI	
kWh/ft².yr	53.4
MJ/m².yr	2070

Market Composite EUI	
kWh/ft².yr	51.2
MJ/m².yr	1982

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Recip.	Pkgd. DX	Absorption Chillers		Total
	Standard	HE	Chillers	Chiller		W. H.	CW	
System Present (%)		50.0%			50.0%			100.0%
COP	4.7	5.4	4.4	3.6	2.7	0.9	1	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.28	0.37	1.11	1.00	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water		
Condenser Water		

Setpoint

Chilled Water	7	°C	44.6	°F
Condenser Water	30	°C	86	°F
Supply Air	14.0	°C	57.2	°F

Peak Cooling Load 76 W/m² 24 Btu/hr.ft² 496 ft²/Ton
Seasonal Cooling Load 23.8 MJ/m².yr 0.6 kWh/ft².yr
(Tertiary Load)

Sizing Factor 1.00 Operation (occ. perio 3000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation 65.0%
(Incidence of A/C)

Electric Fuel Share 100.0% Gas Fuel Share

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit		
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.3
MJ/m².yr	12

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.3
MJ/m².yr	12

DOMESTIC HOT WATER

Service Hot Water Plant Type

Fossil Fuel SHW	Avg. Tank				Boiler
System Present (%)	20%				70%
Eff./COP	0.65				0.75

	Fossil		Elec. Res.
Fuel Share	90%		10%
Blended Efficiency	0.73		0.91

Service Hot Water load (MJ/m².yr) 118.3
(Tertiary Load)

Wetting Use Percentage 50%

All Electric EUI	
kWh/ft².yr	3.4
MJ/m².yr	130

Fossil Fuel EUI	
kWh/ft².yr	4.2
MJ/m².yr	163

Market Composite EUI	
kWh/ft².yr	4.1
MJ/m².yr	159.3

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Healthcare **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

					Ventilation and Exhaust Fan Operation & Control			
					Ventilation Fan		Exhaust Fan	
System Design Air Flow	4.0	L/s.m²	0.79	CFM/ft²	Control	Fixed	Variable Flow	Fixed	Variable Flow
System Static Pressure CAV	875	Pa	3.5	wg					
System Static Pressure VAV	875	Pa	3.5	wg	Incidence of Use	80%	20%	100%	
Fan Efficiency	52%				Operation	Continuous	Scheduled	Continuous	Scheduled
Fan Motor Efficiency	85%								
Sizing Factor	1.00				Incidence of Use	75%	25%	75%	25%
Fan Design Load CAV	8.0	W/m²	0.74	W/ft²					
Fan Design Load VAV	8.0	W/m²	0.74	W/ft²	Comments:				

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.1	L/s.m²	0.02	CFM/ft²
Other Exhaust (Smoking/Conference)	0.5	L/s.m²	0.10	CFM/ft²
Total Building Exhaust	0.6	L/s.m²	0.12	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	75%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.8	W/m²	0.08	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.024	kW/kW	0.09	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	1.84	W/m²	0.17	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.004	L/s.m²	0.006	U.S. gpm/ft²
Pump Head Pressure	100	kPa	33	ft
Pump Efficiency	50%			
Pump Motor Efficiency	80%			
Sizing Factor	1.0			
Pump Connected Load	1.01	W/m²	0.09	W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.003	L/s.m²	0.0048	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure	100	kPa	33	ft		
Pump Efficiency	50%					
Pump Motor Efficiency	80%					
Sizing Factor	0.8					
Pump Connected Load	0.7	W/m²	0.06	W/ft²		

Supply Fan Occ. Period	4000	hrs./year
Supply Fan Unocc. Period	4760	hrs./year
Supply Fan Energy Consumption	51.4	kWh/m².yr
Exhaust Fan Occ. Period	4000	hrs./year
Exhaust Fan Unocc. Period	4760	hrs./year
Exhaust Fan Energy Consumption	6.2	kWh/m².yr
Condenser Pump Energy Consumption	0.8	kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.2	kWh/m².yr
Circulating Pump Yearly Operation	7000	hrs./year
Circulating Pump Energy Consumption	4.4	kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	5.8
	MJ/m².yr	226.5

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Healthcare **Yukon**
Baseline

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **22.2** kWh/ft².yr **859.3** MJ/m².yr **Fossil Fue** **54.2** kWh/ft².yr **2,099.5** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr	**END USE:**	Electricity		Fossil Fuel	
				kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	5.6	216.3					
ARCHITECTURAL LIGHTING	2.1	79.7	SPACE HEATING	3.1	118.8	48.1	1,863.2
HIGH BAY LIGHTING			SPACE COOLING	0.2	7.9		
OTHER PLUG LOADS	1.7	67.3	DOMESTIC HOT WATER	0.3	13.0	3.8	146.3
HVAC FANS & PUMPS	5.8	226.5	FOOD SERVICE EQUIPMENT	0.5	20.0	2.3	90.0
REFRIGERATION	0.4	15.0					
MISCELLANEOUS	0.3	10.0					
COMPUTER EQUIPMENT	1.1	43.1					
ELEVATORS	0.2	7.7					
OUTDOOR LIGHTING	0.9	33.9					

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Education **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.38	W/m².°C	0.07	Btu/hr.ft² .°F	Typical Building Size	3,067	m²	33,000 ft²
Roof U value (W/m².°C)	0.30	W/m².°C	0.05	Btu/hr.ft² .°F	Typical Footprint (m²)	1,533	m²	16,500 ft²
Glazing U value (W/m².°C)	3.30	W/m².°C	0.58	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	2		
					Percent Conditioned Space	100%		
					Percent Conditioned Space	50%		
Window/Wall Ratio (WIWAR) (%)	0.28				Defined as Exterior Zone			
Shading Coefficient (SC)	0.68				Typical # Stories	2		
					Floor to Floor Height (m)	3.5	m	11.5 ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	100%								100%
Min. Air Flow (%)									

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	14	m²/person	151	ft²/person	%OA	23.59%
Occupancy Schedule Occ. Period	90%					
Occupancy Schedule Unocc. Period						
Fresh Air Requirements or Outside Air	7.5	L/s.person	16	CFM/person		

Fresh Air Control Type *(enter a 1, 2 or 3)	1	If Fresh Air Control Type = "2" enter % FA. to the right:		10%			
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)		If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation		0.5	L/s.m²	0.10	CFM/ft²
				50%	operation (%)		
Sizing Factor	1						
Total Air Circulation or Design Air Flow	2.27	L/s.m²	0.45	CFM/ft²			
					Separate Make-up air unit (100% OA)		L/s.m² CFM/ft²
Infiltration Rate	0.30	L/s.m²	0.06	CFM/ft²	Operation occupied period	50%	
(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)					Operation unoccupied period	50%	

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use	20%		80%		100%
Switchover Point		KJ/kg.	20	°C	
		Btu/lbm	68	°F	

Summary of Design Parameters		
Peak Design Cooling Load	689,754	
Peak Zone Sensible Load	317,244	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	14,758	
Total air circulation or Design air	2.27	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic	35%	90%
DDC/Pneumatic	55%	
All DDC	10%	10%
Total (should add-up to 100%)	100%	100%

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	24	°C	75.2	°F	14	°C	57.2	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	22	°C	71.6	°F	15	°C	59	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	19	°C	66.2	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning — Changes/Year: 4

Incidence of Annual Room Controls Maintenance: 100.0%

Incidence of Annual HVAC Controls Maintenance: 100%

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	100%
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	100%
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Education **Yukon**
Baseline

LIGHTING

GENERAL LIGHTING

Light Level	420	Lux	39.0	ft-candles
Floor Fraction (GLFF)	0.80			
Connected Load	11.2	W/m²	1.0	W/ft²

Occ. Period(Hrs./yr.)	2000
Unocc. Period(Hrs./yr.)	6760
Usage During Occupied Period	90%
Usage During Unoccupied Period	10%

Light Level (Lux)	300	500	700	1000			Total
% Distribution	40%	60%					100%
Weighted Average							**420**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)			40%		60%			100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	82	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval years

Relamping Strategy & Incidence of Practice: Group / Spot

EUI kWh/ft².yr 2.1
MJ/m².yr 80

ARCHITECTURAL LIGHTING

Light Level	370	Lux	34.4	ft-candles
Floor Fraction (ALFF)	0.10			
Connected Load	35.2	W/m²	3.3	W/ft²

Occ. Period(Hrs./yr.)	2000
Unocc. Period(Hrs./yr.)	6760
Usage During Occupied Period	90%
Usage During Unoccupied Period	10%

Light Level (Lux)	300	500	700	1000			Total
% Distribution	65%	35%					100%
Weighted Average							**370**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)	50%	50%						100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	82	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval years

Relamping Strategy & Incidence of Practice: Group / Spot

EUI kWh/ft².yr 0.8
MJ/m².yr 31

EUI = Load X Hrs. X SF X GLFF

HIGH BAY LIGHTING

Light Level	300.00	Lux	27.9	ft-candles
Floor Fraction (HBLFF)	0.10			
Connected Load	13.6	W/m²	1.3	W/ft²

Floor fraction check: should = 1.00 — 1.00

Occ. Period(Hrs./yr.)	2000
Unocc. Period(Hrs./yr.)	6760
Usage During Occupied Period	90%
Usage During Unoccupied Period	10%

Light Level (Lux)	300	500	700	1000			Total
% Distribution	100%						100%
Weighted Average							**300**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)						90%	10%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval years

Relamping Strategy & Incidence of Practice: Group / Spot

EUI kWh/ft².yr 0.3
MJ/m².yr 12

TOTAL LIGHTING

Overall LP 12.44 W/m²

EUI TOTAL kWh/ft².yr 3
MJ/m².yr 123

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers		Monitors		Printers		Copiers		Servers		Plug Loads	
Measured Power (W/device)	55		51		100		200		217			
Density (device/occupant)	0.16		0.16		0.02		0.02		0.01			
Connected Load	0.6	W/m²	0.6	W/m²	0.1	W/m²	0.3	W/m²	0.1	W/m²	1	W/m²
	0.1	W/ft²	0.1	W/ft²	0.01	W/ft²	0.03	W/ft²	0.01	W/ft²	0.09	W/ft²
Diversity Occupied Period	90%		90%		90%		90%		100%		100%	
Diversity Unoccupied Period	25%		25%		25%		25%		100%		50%	
Operation Occ. Period (hrs./year)	2000		2000		2000		2000		2000		2000	
Operation Unocc. Period (hrs./year)	6760		6760		6760		6760		6760		6760	

Total end-use load (occupied period) 2.6 W/m² 0.2 W/ft²
Total end-use load (unocc. period) 1.0 W/m² 0.1 W/ft²

to see notes (cells with red indicator in upper right corner, type "SHIFT F2"

Usage during occupied period 100%
Usage during unoccupied period 40%

Computer Equipment EUI kWh/ft².yr 0.61
MJ/m².yr 23.80

Plug Loads EUI kWh/ft².yr 0.50
MJ/m².yr 19.37

FOOD SERVICE EQUIPMENT

Provide description below: Fossil Fuel Share: 50.0% Electricity Fuel Share: 50.0%

	Fossil Fuel EUI		All Electric EUI	
Cooking	EUI kWh/ft².yr	0.8	EUI kWh/ft².yr	0.5
	MJ/m².yr	30.0	MJ/m².yr	20.0

REFRIGERATION

Provide description below:
Coolers, freezers, pop machines

50

EUI kWh/ft².yr 0.3
MJ/m².yr 10.0

MISCELLANEOUS

EUI kWh/ft².yr 0.1
MJ/m².yr 5

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Education **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Fossil Fuel			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Unit					
System Present (%)	40%	40%	10%		5%		5%	100%
Eff./COP	75%	80%	75%	1.70	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.25	1.33	0.59	0.33	0.22	1.00	

100%

Peak Heating Load 55.2 W/m² (17.5 Btu/hr.ft²)
Seasonal Heating Load 658 MJ/m².yr (17.0 kWh/ft².yr)
(Tertiary Load)
Sizing Factor 1.00

Electric Fuel Share 10.0% Fossil Fuel Share 90.0%

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

All Electric EUI	
kWh/ft².yr	17.0
MJ/m².yr	658

Fossil Fuel EUI	
kWh/ft².yr	21.2
MJ/m².yr	822

Market Composite EUI	
kWh/ft².yr	21.0
MJ/m².yr	814

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Recip.	Pkgd. DX	Gas Cooling		Total
	Standard	HE	Chillers	Chiller		Absorption	Engine	
System Present (%)	5.0%				95.0%			100.0%
COP	4.7	5.4	4.4	3.6	2.6	0.9	1.8	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.28	0.38	1.11	0.56	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water	100%	
Condenser Water	100%	

Setpoint

Chilled Water	6	°C	42.8	°F
Condenser Water	35	°C	95	°F
Supply Air	14.0	°C	57.2	°F

Peak Cooling Load 66 W/m² (21 Btu/hr.ft² 574 ft²/Ton)
Seasonal Cooling Load 46.1 MJ/m².yr (1.2 kWh/ft².yr)
(Tertiary Load)

Sizing Factor 1.00 Operation (occ. period) 3000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation 5.0%
(Incidence of A/C)

Electric Fuel Share 100.0% Gas Fuel Share

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit	100%	2
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.6
MJ/m².yr	21

Cooling Tower/Air Cooled Condenser Maintenanc

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.6
MJ/m².yr	21

DOMESTIC HOT WATER

Service Hot Water Plant Type

Fossil Fuel SHW	Standard Boiler	Tank Heater	Tank Heater	Cnd. Boiler	Cnd. Water		Fossil		Elec. Res.
System Present (%)			50%			Fuel Share	50%		50%
Eff./COP	75%		65%	90%	90%	Blended Efficiency	0.65		0.91

100%

Service Hot Water load (MJ/m².yr) 40.0
(Tertiary Load)

Wetting Use Percentage 80%

All Electric EUI	
kWh/ft².yr	1.1
MJ/m².yr	44

Fossil Fuel EUI	
kWh/ft².yr	1.6
MJ/m².yr	62

Market Composite EUI	
kWh/ft².yr	1.4
MJ/m².yr	52.7

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Education **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

					Ventilation Fan		Exhaust Fan	
System Design Air Flow	2.3	L/s.m²	0.45	CFM/ft²	Control	Fixed	Variable Flow	Fixed	Variable Flow
System Static Pressure CAV	250	Pa	1.0	wg					
System Static Pressure VAV	250	Pa	1.0	wg	Incidence of Use	100%		100%	
Fan Efficiency	55%				Operation	Continous	Scheduled	Continuous	Scheduled
Fan Motor Efficiency	85%								
Sizing Factor	1.00				Incidence of Use	50%	50%	50%	50%
Fan Design Load CAV	1.2	W/m²	0.11	W/ft²					
Fan Design Load VAV	1.2	W/m²	0.11	W/ft²	Comments:				

Ventilation and Exhaust Fan Operation & Control

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit are	0.1	L/s.m²	0.03	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.2	L/s.m²	0.05	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	75%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.3	W/m²	0.03	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.003	kW/kW	0.01	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	0.19	W/m²	0.02	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.003	L/s.m²	0.005	U.S. gpm/ft²
Pump Head Pressure		kPa		ft
Pump Efficiency	60%			
Pump Motor Efficiency	85%			
Sizing Factor	1.0			
Pump Connected Load		W/m²		W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.003	L/s.m²	0.0042	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure	30	kPa	10	ft		
Pump Efficiency	60%					
Pump Motor Efficiency	85%					
Sizing Factor	1.0					
Pump Connected Load	0.2	W/m²	0.02	W/ft²		

Supply Fan Occ. Period	2200	hrs./year
Supply Fan Unocc. Period	6560	hrs./year
Supply Fan Energy Consumption	6.7	kWh/m².yr
Exhaust Fan Occ. Period	2200	hrs./year
Exhaust Fan Unocc. Period	6560	hrs./year
Exhaust Fan Energy Consumption	1.7	kWh/m².yr
Condenser Pump Energy Consumption		kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.0	kWh/m².yr
Circulating Pump Yearly Operation	7000	hrs./year
Circulating Pump Energy Consumption	1.1	kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	0.9
	MJ/m².yr	34.2

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Education **Yukon**
Baseline

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **8.3** kWh/ft².yr **322.7** MJ/m².yr **Fossil Fue** **20.3** kWh/ft².yr **785.4** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr	**END USE:**	Electricity		Fossil Fuel	
				kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	2.1	79.5					
ARCHITECTURAL LIGHTING	0.8	31.4	SPACE HEATING	1.7	65.8	19.1	739.6
HIGH BAY LIGHTING	0.3	12.1	SPACE COOLING	0.03	1.1		
OTHER PLUG LOADS	0.5	19.4	DOMESTIC HOT WATER	0.6	22.0	0.8	30.8
HVAC FANS & PUMPS	0.9	34.2	FOOD SERVICE EQUIPMENT	0.3	10.0	0.4	15.0
REFRIGERATION	0.3	10.0					
MISCELLANEOUS	0.1	5.0					
COMPUTER EQUIPMENT	0.6	23.8					
ELEVATORS							
OUTDOOR LIGHTING	0.2	8.5					

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Restaurant **All** **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.38	W/m².°C	0.07	Btu/hr.ft² .°F	Typical Building Size	372	m²	4,000	ft²
Roof U value (W/m².°C)	0.29	W/m².°C	0.05	Btu/hr.ft² .°F	Typical Footprint (m²)	372	m²	4,000	ft²
Glazing U value (W/m².°C)	3.30	W/m².°C	0.58	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	1			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	40%			
Window/Wall Ratio (WIWAR) (%)	0.15				Defined as Exterior Zone				
Shading Coefficient (SC)	0.85				Typical # Stories	1			
					Floor to Floor Height (m)	4.5	m	14.8	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	60%							40%	60%
Min. Air Flow (%)					10%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	50	m²/person	538	ft²/person	%OA	7.24%
Occupancy Schedule Occ. Period	90%					
Occupancy Schedule Unocc. Period						
Fresh Air Requirements or Outside Air	17	L/s.person	36	CFM/person		

Fresh Air Control Type *(enter a 1, 2 or 3)	2	If Fresh Air Control Type = "2" enter % FA. to the right:	40%		
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)		If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation	0.5	L/s.m²	0.10 CFM/ft²
			50%	operation (%)	
Sizing Factor	1.2				
Total Air Circulation or Design Air Flow	4.70	L/s.m²	0.92	CFM/ft²	
Infiltration Rate	0.30	L/s.m²	0.06	CFM/ft²	

(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)

Separate Make-up air unit (100% OA) 2 L/s.m² 0.39 CFM/ft²
Operation occupied period 50%
Operation unoccupied period 50%

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use	50%		50%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters		
Peak Design Cooling Load	361,902	
Peak Zone Sensible Load	66,272	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	3,083	
Total air circulation or Design air	4.70	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic	60%	90%
DDC/Pneumatic	30%	
All DDC	10%	10%
Total (should add-up to 100%)	100%	100%

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	24	°C	75.2	°F	15	°C	59	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	22	°C	71.6	°F	20	°C	68	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	22	°C	71.6	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning — Changes/Year: 4

Incidence of Annual Room Controls Maintenance 100.0%

Incidence of Annual HVAC Controls Maintenance 100%

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	100%
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	100%
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Restaurant **All** **Yukon**
Baseline

LIGHTING

GENERAL LIGHTING

Light Level	400	Lux	37.2	ft-candles
Floor Fraction (GLFF)	0.50			
Connected Load	10.0	W/m²	0.9	W/ft²

Occ. Period(Hrs./yr.)	4300
Unocc. Period(Hrs./yr.)	4460
Usage During Occupied Period	100%
Usage During Unoccupied Period	10%

Light Level (Lux)	400	500	700	1000			Total
% Distribution	100%						100%
Weighted Average							**400**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)			20%		80%		0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	82	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval ____ years

Relamping Strategy & Incidence of Practice: Group ____ Spot ____

EUI kWh/ft².yr 2.2
MJ/m².yr 86

ARCHITECTURAL LIGHTING

Light Level	300	Lux	27.9	ft-candles
Floor Fraction (ALFF)	0.50			
Connected Load	36.3	W/m²	3.4	W/ft²

Occ. Period(Hrs./yr.)	4300
Unocc. Period(Hrs./yr.)	4460
Usage During Occupied Period	100%
Usage During Unoccupied Period	10%

Light Level (Lux)	300	500	700	1000			Total
% Distribution	100%						100%
Weighted Average							**300**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)	75%	25%					0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	82	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval ____ years

Relamping Strategy & Incidence of Practice: Group ____ Spot ____

EUI kWh/ft².yr 8.0
MJ/m².yr 310

EUI = Load X Hrs. X SF X GLFF

HIGH BAY LIGHTING

Light Level	300.00	Lux	27.9	ft-candles
Floor Fraction (HBLFF)				
Connected Load	0.0	W/m²	0.0	W/ft²

Floor fraction check: should = 1.00 — 1.00

Occ. Period(Hrs./yr.)	4000
Unocc. Period(Hrs./yr.)	4760
Usage During Occupied Period	0%
Usage During Unoccupied Period	100%

Light Level (Lux)	300	500	700	1000			Total
% Distribution	100%						100%
Weighted Average							**300**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)							0%	0.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval ____ years

Relamping Strategy & Incidence of Practice: Group ____ Spot ____

EUI kWh/ft².yr
MJ/m².yr

TOTAL LIGHTING Overall LP 23.16 W/m²

EUI TOTAL kWh/ft².yr 10
MJ/m².yr 396

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	55	51	100	200	217	
Density (device/occupant)	0.36	0.36	0.01		0.03	
Connected Load	0.4 W/m²	0.4 W/m²	0.0 W/m²	W/m²	0.1 W/m²	1.15 W/m²
	0.0 W/ft²	0.0 W/ft²	0.00 W/ft²	W/ft²	0.01 W/ft²	0.11 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	90%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	50%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2000	4100
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6760	4660

Total end-use load (occupied period) 1.9 W/m² 0.2 W/ft²
Total end-use load (unocc. period) 1.1 W/m² 0.1 W/ft²

to see notes (cells with red indicator in upper right corner, type "SHIFT F2"

Usage during occupied period 100%
Usage during unoccupied period 59%

Computer Equipment EUI kWh/ft².yr 0.49
MJ/m².yr 18.95

Plug Loads EUI kWh/ft².yr 0.64
MJ/m².yr 24.92

FOOD SERVICE EQUIPMENT

Provide description below: Fossil Fuel Share: 75.0% Electricity Fuel Share: 25.0%

Cooking

Fossil Fuel EUI: EUI kWh/ft².yr 23.2 / MJ/m².yr 900.0

All Electric EUI: EUI kWh/ft².yr 16.8 / MJ/m².yr 650.0

REFRIGERATION

Provide description below:

Walk-ins, reach ins, fridges etc

EUI kWh/ft².yr 9.0
MJ/m².yr 350.0

MISCELLANEOUS

EUI kWh/ft².yr 0.3
MJ/m².yr 10

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Restaurant **All** **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Fossil Fuel			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Unit					
System Present (%)	25%		60%		5%		10%	100%
Eff./COP	75%	80%	70%	90%	77%	80%	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.25	1.43	1.11	1.30	1.25	1.00	

100%

Peak Heating Load	91.0	W/m²	28.9	Btu/hr.ft²
Seasonal Heating Load	1973	MJ/m².yr	50.9	kWh/ft².yr
(Tertiary Load)				
Sizing Factor	1.00			

Electric Fuel Share 15.0% Oil Fuel Share 85.0%

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

All Electric EUI	
kWh/ft².yr	39.3
MJ/m².yr	1523

Fossil Fuel EUI	
kWh/ft².yr	71.3
MJ/m².yr	2763

Market Composite EUI	
kWh/ft².yr	70.3
MJ/m².yr	2722

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Recip.	Pkgd. DX	Gas Cooling		Total
	Standard	HE	Chillers	Chiller		Absorption	Engine	
System Present (%)					100.0%			100.0%
COP	4.7	5.4	4.4	3.6	2.6	0.9	1.8	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.28	0.38	1.11	0.56	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water	100%	
Condenser Water	100%	

Setpoint

Chilled Water	6	°C	42.8	°F
Condenser Water	35	°C	95	°F
Supply Air	15.0	°C	59	°F

Peak Cooling Load	285	W/m²	90	Btu/hr.ft²	133	ft²/Ton
Seasonal Cooling Load	40.4	MJ/m².yr	1.0	kWh/ft².yr		
(Tertiary Load)						

Sizing Factor 1.00 Operation (occ. period) 3000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation (Incidence of A/C) 65.0%

Electric Fuel Share 100.0% Gas Fuel Share

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit	100%	2
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.5
MJ/m².yr	19

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.5
MJ/m².yr	19

DOMESTIC HOT WATER

Service Hot Water Plant Type

	Standard		Tank	Cnd.	Water
Fossil Fuel SHW	Boiler	Tank Heater	Heater	Boiler	Heater
System Present (%)	10%		75%		
Eff./COP	75%	60%	65%	90%	90%

	Fossil	Elec. Res.
Fuel Share	85%	15%
Blended Efficiency	0.66	0.91

100%

Service Hot Water load (MJ/m².yr) 400.0
(Tertiary Load)

Wetting Use Percentage 10%

All Electric EUI	
kWh/ft².yr	11.3
MJ/m².yr	440

Fossil Fuel EUI	
kWh/ft².yr	15.6
MJ/m².yr	604

Market Composite EUI	
kWh/ft².yr	15.0
MJ/m².yr	579.7

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Restaurant **All** **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

System Design Air Flow	4.7	L/s.m²	0.92	CFM/ft²	
System Static Pressure CAV	400	Pa	1.6	wg	
System Static Pressure VAV	400	Pa	1.6	wg	
Fan Efficiency	52%				
Fan Motor Efficiency	80%				
Sizing Factor	1.00				
Fan Design Load CAV	4.5	W/m²	0.42	W/ft²	
Fan Design Load VAV	4.5	W/m²	0.42	W/ft²	

Ventilation and Exhaust Fan Operation & Control

	Ventilation Fan		Exhaust Fan	
Control	Fixed	Variable Flow	Fixed	Variable Flow
Incidence of Use	100%		100%	
Operation	Continous	Scheduled	Continuous	Scheduled
Incidence of Use	50%	50%	50%	50%
Comments:				

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.5	L/s.m²	0.11	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.6	L/s.m²	0.13	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	72%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.9	W/m²	0.08	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.022	kW/kW	0.08	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	6.30	W/m²	0.59	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.015	L/s.m²	0.022	U.S. gpm/ft²
Pump Head Pressure		kPa		ft
Pump Efficiency	60%			
Pump Motor Efficiency	85%			
Sizing Factor	1.0			
Pump Connected Load		W/m²		W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.012	L/s.m²	0.0181	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure		kPa		ft		
Pump Efficiency	60%					
Pump Motor Efficiency	85%					
Sizing Factor	1.0					
Pump Connected Load		W/m²		W/ft²		

Supply Fan Occ. Period	3900	hrs./year
Supply Fan Unocc. Period	4860	hrs./year
Supply Fan Energy Consumption	28.6	kWh/m².yr
Exhaust Fan Occ. Period	3900	hrs./year
Exhaust Fan Unocc. Period	4860	hrs./year
Exhaust Fan Energy Consumption	5.6	kWh/m².yr
Condenser Pump Energy Consumption		kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.2	kWh/m².yr
Circulating Pump Yearly Operation	7000	hrs./year
Circulating Pump Energy Consumption		kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	3.2
	MJ/m².yr	124.0

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS:	SIZE:	VINTAGE:	REGION:
Restaurant	All		Yukon
Baseline			

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **38.8** kWh/ft².yr **1,503.0** MJ/m².yr **Fossil Fue** **91.3** kWh/ft².yr **3,537.4** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	2.2	85.8
ARCHITECTURAL LIGHTING	8.0	309.8
HIGH BAY LIGHTING		
OTHER PLUG LOADS	0.6	24.9
HVAC FANS & PUMPS	3.2	124.0
REFRIGERATION	9.0	350.0
MISCELLANEOUS	0.3	10.0
COMPUTER EQUIPMENT	0.5	18.9
ELEVATORS		
OUTDOOR LIGHTING	2.8	110.3

END USE:	Electricity		Fossil Fuel	
	kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
SPACE HEATING	5.9	228.4	60.6	2,348.6
SPACE COOLING	0.3	12.4		
DOMESTIC HOT WATER	1.7	65.9	13.3	513.8
FOOD SERVICE EQUIPMENT	4.2	162.5	17.4	675.0

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** Existing **REGION:**
Rec Centre **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.38	W/m².°C	0.07	Btu/hr.ft² .°F	Typical Building Size	2,323	m²	25,000	ft²
Roof U value (W/m².°C)	0.29	W/m².°C	0.05	Btu/hr.ft² .°F	Typical Footprint (m²)	2,323	m²	25,000	ft²
Glazing U value (W/m².°C)	3.30	W/m².°C	0.58	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	1			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	50%			
Window/Wall Ratio (WIWAR) (%)	0.05				Defined as Exterior Zone				
Shading Coefficient (SC)	0.80				Typical # Stories	1			
					Floor to Floor Height (m)	6.1	m	19.9	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	100%								100%
Min. Air Flow (%)					50%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	50	m²/person	538	ft²/person	%OA	15.77%
Occupancy Schedule Occ. Period	90%					
Occupancy Schedule Unocc. Period						
Fresh Air Requirements or Outside Air	10	L/s.person	21	CFM/person		

Fresh Air Control Type *(enter a 1, 2 or 3)	1	If Fresh Air Control Type = "2" enter % FA. to the right:				
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)		If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation	0.5	L/s.m²	0.10	CFM/ft²
			50%	operation (%)		
Sizing Factor	1					
Total Air Circulation or Design Air Flow	1.27	L/s.m²	0.25	CFM/ft²		
Infiltration Rate	0.70	L/s.m²	0.14	CFM/ft²		
(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)						

Separate Make-up air unit (100% OA) L/s.m² CFM/ft²
Operation occupied period 50%
Operation unoccupied period 50%

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use			100%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters		
Peak Design Cooling Load	235,980	
Peak Zone Sensible Load	134,178	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	6,242	
Total air circulation or Design air	1.27	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic		
DDC/Pneumatic		
All DDC		
Total (should add-up to 100%)		

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	22	°C	71.6	°F	13	°C	55.4	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	16	°C	60.8	°F	16	°C	60.8	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	16	°C	60.8	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning Changes/Year

Incidence of Annual Room Controls Maintenance

Incidence of Annual HVAC Controls Maintenance

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:**Existing **REGION:**
Rec Centre **Yukon**
Baseline

LIGHTING

GENERAL LIGHTING

Light Level	500	Lux	46.5	ft-candles
Floor Fraction (GLFF)	0.20			
Connected Load	13.6	W/m²	1.3	W/ft²

Occ. Period(Hrs./yr.)	3300
Unocc. Period(Hrs./yr.)	5460
Usage During Occupied Period	90%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution		100%					100%
Weighted Average							**500**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)			50%		50%			100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.7	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 1.0
MJ/m².yr 37

ARCHITECTURAL LIGHTING

Light Level	300	Lux	27.9	ft-candles
Floor Fraction (ALFF)	0.05			
Connected Load	28.6	W/m²	2.7	W/ft²

Occ. Period(Hrs./yr.)	3000
Unocc. Period(Hrs./yr.)	5760
Usage During Occupied Period	100%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	300	700	1000			Total
% Distribution		100%					100%
Weighted Average							**300**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)	50%	50%						100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 0.5
MJ/m².yr 20

EUI = Load X Hrs. X SF X GLFF

HIGH BAY LIGHTING

Light Level	300.00	Lux	27.9	ft-candles
Floor Fraction (HBLFF)	0.75			
Connected Load	13.6	W/m²	1.3	W/ft²

Floor fraction check: should = 1.00 | 1.00

Occ. Period(Hrs./yr.)	3300
Unocc. Period(Hrs./yr.)	5460
Usage During Occupied Period	90%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	200	300	400				Total
% Distribution	25%	50%	25%				100%
Weighted Average							**300**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)						90%	10%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 3.6
MJ/m².yr 139

TOTAL LIGHTING Overall LP 4.16 W/m²

EUI TOTAL kWh/ft².yr 5.1
MJ/m².yr 196

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	54.55	51	100	200	217	
Density (device/occupant)	0.05	0.05				
Connected Load	0.1 W/m²	0.1 W/m²	W/m²	W/m²	W/m²	1 W/m²
	0.0 W/ft²	0.0 W/ft²	W/ft²	W/ft²	W/ft²	0.09 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	90%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	25%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2000	3500
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6760	5260

Total end-use load (occupied period) 1.0 W/m² 0.1 W/ft² to see notes (cells with red indicator in upper right corner, type "SHIFT F2"
Total end-use load (unocc. period) 0.3 W/m² 0.0 W/ft²

Usage during occupied period 100%
Usage during unoccupied period 30%

Computer Equipment EUI kWh/ft².yr 0.05
MJ/m².yr 1.96

Plug Loads EUI kWh/ft².yr 0.41
MJ/m².yr 16.07

FOOD SERVICE EQUIPMENT

Fossil Fuel Share: 10.0% Electricity Fuel Share: 90.0%

Fossil Fuel EUI
EUI kWh/ft².yr 0.6
MJ/m².yr 25.0

All Electric EUI
EUI kWh/ft².yr 0.6
MJ/m².yr 25.0

REFRIGERATION

Provide description below:
Ice plant and auxiliaries

Artificial Ice Saturation 60.0%

EUI kWh/ft².yr 8.0
MJ/m².yr 309.9

MISCELLANEOUS

EUI kWh/ft².yr 0.3
MJ/m².yr 10

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** Existing **REGION:**
Rec Centre **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Fossil Fuel			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Units					
System Present (%)	25%	22%	50%				3%	100%
Eff./COP	75%	90%	75%	1.70	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.11	1.33	0.59	0.33	0.22	1.00	

Peak Heating Load	60.0	W/m²	19.0	Btu/hr.ft²
Seasonal Heating Load	578	MJ/m².yr	14.9	kWh/ft².yr
(Tertiary Load)				
Sizing Factor	1.00			

Electric Fuel Share: 3.0% Oil Fuel Share: 97.0%

All Electric EUI	
kWh/ft².yr	14.9
MJ/m².yr	578

Space Heat Saturation (Incidence of SPC HT): 70.0%

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

Fossil Fuel EUI	
kWh/ft².yr	19.1
MJ/m².yr	741

Market Composite EUI	
kWh/ft².yr	19.0
MJ/m².yr	736

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Recip.	Pkgd. DX	Absorption Chillers		Total
	Standard	HE	Chillers	Chiller		W. H.	CW	
System Present (%)					100.0%			100.0%
COP	4.7	5.4	4.4	3.6	2.6	0.9	1	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.28	0.38	1.11	1.00	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water		
Condenser Water		

Setpoint

Chilled Water	7	°C	44.6	°F
Condenser Water	30	°C	86	°F
Supply Air	13.0	°C	55.4	°F

Peak Cooling Load	30	W/m²	9	Btu/hr.ft²	1271	ft²/Ton
Seasonal Cooling Load	13.5	MJ/m².yr	0.3	kWh/ft².yr		
(Tertiary Load)						

Sizing Factor: 1.00 Operation (occ. perio): 3000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation (Incidence of A/C): 5.0%

Electric Fuel Share: 100.0% Gas Fuel Share:

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit		
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.1
MJ/m².yr	4

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.1
MJ/m².yr	4

DOMESTIC HOT WATER

Service Hot Water Plant Type

	Fossil Fuel SHW	Avg. Tank				Boiler
	System Present (%)	70%				20%
	Eff./COP	0.65				0.75

	Fossil		Elec. Res.
Fuel Share	90%		10%
Blended Efficiency	0.67		0.91

Service Hot Water load (MJ/m².yr): 90.0 (Tertiary Load)

Incidence of Heat recr'y: 20%
Heat recr'y load share: 50%

Wetting Use Percentage: 50%

All Electric EUI	
kWh/ft².yr	2.6
MJ/m².yr	99

Fossil Fuel EUI	
kWh/ft².yr	3.5
MJ/m².yr	134

Market Composite EUI	
kWh/ft².yr	3.4
MJ/m².yr	130.4

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:**Existing **REGION:**
Rec Centre **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

					Ventilation and Exhaust Fan Operation & Control			
					Ventilation Fan		Exhaust Fan	
System Design Air Flow	1.3 L/s.m²	0.25 CFM/ft²	Control		Fixed	Variable Flow	Fixed	Variable Flow
System Static Pressure CAV	300 Pa	1.2 wg						
System Static Pressure VAV	300 Pa	1.2 wg	Incidence of Use		100%		100%	
Fan Efficiency	60%		Operation		Continuous	Scheduled	Continuous	Scheduled
Fan Motor Efficiency	80%							
Sizing Factor	1.00		Incidence of Use		50%	50%	50%	50%
Fan Design Load CAV	0.8 W/m²	0.07 W/ft²						
Fan Design Load VAV	0.8 W/m²	0.07 W/ft²	Comments:					

EXHAUST FANS

Washroom Exhaust	100 L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.1 L/s.m²	0.02	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1 L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.2 L/s.m²	0.04	CFM/ft²
Exhaust System Static Pressure	250 Pa	1.0	wg
Fan Efficiency	25%		
Fan Motor Efficiency	75%		
Sizing Factor	1.0		
Exhaust Fan Connected Load	0.2 W/m²	0.02 W/ft²	

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.020	kW/kW	0.07	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	0.60	W/m²	0.06	W/ft²
Condenser Pump				
Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.002	L/s.m²	0.002	U.S. gpm/ft²
Pump Head Pressure		kPa		ft
Pump Efficiency	50%			
Pump Motor Efficiency	80%			
Sizing Factor	1.0			
Pump Connected Load		W/m²		W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.001	L/s.m²	0.0019	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure	50	kPa	17	ft		
Pump Efficiency	50%					
Pump Motor Efficiency	80%					
Sizing Factor	0.8					
Pump Connected Load	0.1	W/m²	0.01	W/ft²		

Supply Fan Occ. Period	3500	hrs./year
Supply Fan Unocc. Period	5260	hrs./year
Supply Fan Energy Consumption	4.9	kWh/m².yr
Exhaust Fan Occ. Period	3500	hrs./year
Exhaust Fan Unocc. Period	5260	hrs./year
Exhaust Fan Energy Consumption	1.5	kWh/m².yr
Condenser Pump Energy Consumption		kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.1	kWh/m².yr
Circulating Pump Yearly Operation	5000	hrs./year
Circulating Pump Energy Consumption	0.6	kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	0.7
	MJ/m².yr	25.4

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:**Existing **REGION:**
Rec Centre **Yukon**
Baseline

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **13.49** kWh/ft².yr **522.7** MJ/m².yr **Fossil Fue** **16.2** kWh/ft².yr **626.3** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	0.96	37.2
ARCHITECTURAL LIGHTING	0.51	19.9
HIGH BAY LIGHTING	3.59	139.1
OTHER PLUG LOADS	0.41	16.1
HVAC FANS & PUMPS	0.66	25.4
REFRIGERATION	4.80	185.9
MISCELLANEOUS	0.26	10.0
COMPUTER EQUIPMENT	0.05	2.0
ELEVATORS		
OUTDOOR LIGHTING	1.10	42.4

END USE:	Electricity		Fossil Fuel	
	kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
SPACE HEATING	0.31	12.1	13.0	503.3
SPACE COOLING	0.01	0.2		
DOMESTIC HOT WATER	0.26	9.9	3.1	120.5
FOOD SERVICE EQUIPMENT	0.58	22.5	0.1	2.5

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Warehouse/Wholesale **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.38	W/m².°C	0.07	Btu/hr.ft² .°F	Typical Building Size	2,788	m²	30,000	ft²
Roof U value (W/m².°C)	0.29	W/m².°C	0.05	Btu/hr.ft² .°F	Typical Footprint (m²)	2,788	m²	30,000	ft²
Glazing U value (W/m².°C)	3.30	W/m².°C	0.58	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	1			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	45%			
Window/Wall Ratio (WIWAR) (%)	0.05				Defined as Exterior Zone				
Shading Coefficient (SC)	0.80				Typical # Stories	1			
					Floor to Floor Height (m)	6.1	m	19.9	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	100%								100%
Min. Air Flow (%)					50%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	100	m²/person	1076	ft²/person	%OA	21.95%	
Occupancy Schedule Occ. Period	90%						
Occupancy Schedule Unocc. Period							
Fresh Air Requirements or Outside Air	25	L/s.person	53	CFM/person			

Fresh Air Control Type *(enter a 1, 2 or 3)	1	If Fresh Air Control Type = "2" enter % FA. to the right:				
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)		If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation	0.5	L/s.m²	0.10	CFM/ft²
			50%	operation (%)		
Sizing Factor	1					
Total Air Circulation or Design Air Flow	1.14	L/s.m²	0.22	CFM/ft²		
Infiltration Rate	0.70	L/s.m²	0.14	CFM/ft²		
(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)						

Separate Make-up air unit (100% OA) L/s.m² CFM/ft²
Operation occupied period 50%
Operation unoccupied period 50%

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use			100%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters		
Peak Design Cooling Load	287,734	
Peak Zone Sensible Load	144,629	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	6,728	
Total air circulation or Design air	1.14	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic		
DDC/Pneumatic		
All DDC		
Total (should add-up to 100%)		

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	22	°C	71.6	°F	13	°C	55.4	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	21	°C	69.8	°F	15	°C	59	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	21	°C	69.8	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning Changes/Year

Incidence of Annual Room Controls Maintenance

Incidence of Annual HVAC Controls Maintenance

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Warehouse/Wholesale **Yukon**
Baseline

LIGHTING

GENERAL LIGHTING

Light Level	400	Lux	37.2	ft-candles
Floor Fraction (GLFF)	0.15			
Connected Load	10.9	W/m²	1.0	W/ft²

Occ. Period(Hrs./yr.)	3300
Unocc. Period(Hrs./yr.)	5460
Usage During Occupied Period	90%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution	50%	50%					100%
Weighted Average							**400**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)			50%		50%			100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.7	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 0.6
MJ/m².yr 22

ARCHITECTURAL LIGHTING

Light Level	300	Lux	27.9	ft-candles
Floor Fraction (ALFF)	0.05			
Connected Load	28.6	W/m²	2.7	W/ft²

Occ. Period(Hrs./yr.)	3000
Unocc. Period(Hrs./yr.)	5760
Usage During Occupied Period	90%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	300	700	1000			Total
% Distribution		100%					100%
Weighted Average							**300**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)	50%	50%						100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 0.5
MJ/m².yr 18

EUI = Load X Hrs. X SF X GLFF

HIGH BAY LIGHTING

Light Level	300.00	Lux	27.9	ft-candles
Floor Fraction (HBLFF)	0.80			
Connected Load	13.6	W/m²	1.3	W/ft²

Floor fraction check: should = 1.00 | 1.00

Occ. Period(Hrs./yr.)	3300
Unocc. Period(Hrs./yr.)	5460
Usage During Occupied Period	100%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	200	300	400				Total
% Distribution	25%	50%	25%				100%
Weighted Average							**300**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)						90%	10%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 4.2
MJ/m².yr 161

TOTAL LIGHTING Overall LP 13.94 W/m²

EUI TOTAL kWh/ft².yr 5.2
MJ/m².yr 202

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	54.55	51	100	200	217	
Density (device/occupant)	0.59	0.59	0.03	0.03	0.06	
Connected Load	0.3 W/m²	0.3 W/m²	0.0 W/m²	0.1 W/m²	0.1 W/m²	1 W/m²
	0.0 W/ft²	0.0 W/ft²	0.00 W/ft²	0.01 W/ft²	0.01 W/ft²	0.09 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	90%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	25%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2000	3500
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6760	5260

Total end-use load (occupied period) 1.7 W/m² 0.2 W/ft²
Total end-use load (unocc. period) 0.7 W/m² 0.1 W/ft²

to see notes (cells with red indicator in upper right corner, type "SHIFT F2"

Usage during occupied period 100%
Usage during unoccupied period 44%

Computer Equipment EUI kWh/ft².yr 0.46
MJ/m².yr 17.72

Plug Loads EUI kWh/ft².yr 0.41
MJ/m².yr 16.07

FOOD SERVICE EQUIPMENT

Fossil Fuel Share: | Electricity Fuel Share: 100.0%

Fossil Fuel EUI: EUI kWh/ft².yr 0.1 / MJ/m².yr 5.0

All Electric EUI: EUI kWh/ft².yr 0.1 / MJ/m².yr 4.0

REFRIGERATION

Provide description below:
Process

EUI kWh/ft².yr 1.8
MJ/m².yr 70.0

MISCELLANEOUS

EUI kWh/ft².yr 0.3
MJ/m².yr 10

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Warehouse/Wholesale **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Fossil Fuel			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Unit					
System Present (%)	25%	20%	50%				5%	100%
Eff./COP	75%	70%	75%	1.70	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.43	1.33	0.59	0.33	0.22	1.00	

Peak Heating Load	62.6	W/m²	19.8	Btu/hr.ft²
Seasonal Heating Load	562	MJ/m².yr	14.5	kWh/ft².yr
(Tertiary Load)				
Sizing Factor	1.00			

Electric Fuel Share: 5.0% Fossil Fuel Share: 95.0%

All Electric EUI	
kWh/ft².yr	14.5
MJ/m².yr	562

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

Fossil Fuel EUI	
kWh/ft².yr	19.6
MJ/m².yr	760

Market Composite EUI	
kWh/ft².yr	19.4
MJ/m².yr	750

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Recip.	Pkgd. DX	Absorption Chillers		Total
	Standard	HE	Chillers	Chiller		W. H.	CW	
System Present (%)					100.0%			100.0%
COP	4.7	5.4	4.4	3.6	2.6	0.9	1	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.28	0.38	1.11	1.00	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water		
Condenser Water		

Setpoint

Chilled Water	7	°C	44.6	°F
Condenser Water	30	°C	86	°F
Supply Air	13.0	°C	55.4	°F

Peak Cooling Load	30	W/m²	10	Btu/hr.ft²	1251	ft²/Ton
Seasonal Cooling Load	9.6	MJ/m².yr	0.2	kWh/ft².yr		
(Tertiary Load)						

Sizing Factor: 1.00 Operation (occ. perio: 3000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation (Incidence of A/C): 5.0%

Electric Fuel Share: 100.0% Gas Fuel Share:

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit		
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.1
MJ/m².yr	3

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.1
MJ/m².yr	3

DOMESTIC HOT WATER

Service Hot Water Plant Type

	Fossil Fuel SHW	Avg. Tank				Boiler
	System Present (%)	85%				
	Eff./COP	0.65				0.75

	Fossil		Elec. Res.
Fuel Share	85%		15%
Blended Efficiency	0.65		0.91

Service Hot Water load (MJ/m².yr) (Tertiary Load): 18.2

Wetting Use Percentage: 90%

All Electric EUI	
kWh/ft².yr	0.5
MJ/m².yr	20

Fossil Fuel EUI	
kWh/ft².yr	0.7
MJ/m².yr	28

Market Composite EUI	
kWh/ft².yr	0.7
MJ/m².yr	26.8

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Warehouse/Wholesale **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

						Ventilation and Exhaust Fan Operation & Control			
						Ventilation Fan		Exhaust Fan	
System Design Air Flow	1.1	L/s.m²	0.22	CFM/ft²	Control	Fixed	Variable Flow	Fixed	Variable Flow
System Static Pressure CAV	300	Pa	1.2	wg					
System Static Pressure VAV	300	Pa	1.2	wg	Incidence of Use	100%		100%	
Fan Efficiency	60%				Operation	Continuous	Scheduled	Continuous	Scheduled
Fan Motor Efficiency	80%								
Sizing Factor	1.00				Incidence of Use	50%	50%	50%	50%
Fan Design Load CAV	0.7	W/m²	0.07	W/ft²					
Fan Design Load VAV	0.7	W/m²	0.07	W/ft²	Comments:				

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.1	L/s.m²	0.01	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.2	L/s.m²	0.03	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	75%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.2	W/m²	0.02	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.020	kW/kW	0.07	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	0.60	W/m²	0.06	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.002	L/s.m²	0.002	U.S. gpm/ft²
Pump Head Pressure		kPa		ft
Pump Efficiency	50%			
Pump Motor Efficiency	80%			
Sizing Factor	1.0			
Pump Connected Load		W/m²		W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.001	L/s.m²	0.0019	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure	50	kPa	17	ft		
Pump Efficiency	50%					
Pump Motor Efficiency	80%					
Sizing Factor	0.8					
Pump Connected Load	0.1	W/m²	0.01	W/ft²		

Supply Fan Occ. Period	3500	hrs./year
Supply Fan Unocc. Period	5260	hrs./year
Supply Fan Energy Consumption	4.4	kWh/m².yr
Exhaust Fan Occ. Period	3500	hrs./year
Exhaust Fan Unocc. Period	5260	hrs./year
Exhaust Fan Energy Consumption	1.4	kWh/m².yr
Condenser Pump Energy Consumption		kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.0	kWh/m².yr
Circulating Pump Yearly Operation	5000	hrs./year
Circulating Pump Energy Consumption	0.6	kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	0.6
	MJ/m².yr	23.1

COMMERCIAL SECTOR BUILDING PROFILE

EXISTING BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Warehouse/Wholesale **Yukon**
Baseline

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **10.1** kWh/ft².yr **391.1** MJ/m².yr **Fossil Fue** **19.3** kWh/ft².yr **745.9** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	0.6	22.3
ARCHITECTURAL LIGHTING	0.5	18.3
HIGH BAY LIGHTING	4.2	161.3
OTHER PLUG LOADS	0.4	16.1
HVAC FANS & PUMPS	0.6	23.1
REFRIGERATION	1.8	70.0
MISCELLANEOUS	0.3	10.0
COMPUTER EQUIPMENT	0.5	17.7
ELEVATORS		
OUTDOOR LIGHTING	0.4	17.0

END USE:	Electricity		Fossil Fuel	
	kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
SPACE HEATING	0.7	28.1	18.6	722.1
SPACE COOLING	0.0	0.2		
DOMESTIC HOT WATER	0.1	3.0	0.6	23.8
FOOD SERVICE EQUIPMENT	0.1	4.0		

Terms Used in Building Profile Summaries

Profile Term	Explanation
Building envelope	Defines the thermal characteristics of a building's exterior components
U-value	The rate of heat loss, in Btu per hour per square foot per degree Fahrenheit (BTU/hr. $f^2.^oF$) through walls, roofs and windows. The U-value is the reciprocal of the R-value
Shading coefficient (SC)	Is a measure of the total amount of heat passing through the glazing compared with that through a single clear glass
Window-to-wall ratio	Defines the ratio of window to insulated exterior wall area
General lighting	Defines the lighting types that are used within the main areas of a building, e.g., for a School, the area is classrooms and the lighting type is fluorescent; for a Food Retail store, the main area is the retail floor.
LPD	Lighting power density expressed in terms of W/ft^2
Lux	The amount of visible light per square meter incident on a surface ($lumen/m^2$)
Inc	Incandescent lamps
CFL	Compact fluorescent lamps
T12	T12 fluorescent lamps with magnetic ballasts
T8	T8 fluorescent lamps with electronic ballasts
MH	Metal halide lamps
HPS	High-pressure sodium lamps
HID	High-intensity discharge lighting includes both MH and HPS
Secondary lighting	Defines the lighting types that are used within the secondary areas of a building, e.g., for a School, the secondary areas are corridors, lobbies, foyers, etc.,
Tertiary lighting	Defines the lighting types that are used within special purpose areas of a building, e.g., for a School, the tertiary area is a gymnasium.
Outdoor lighting	Defines the outdoor lighting including parking lot and façade
Overall LPD	The total floor weighted LPD that includes general, secondary, tertiary, and outdoor.
Fans	Defines mix of air handling systems
CAV	Constant air volume
VAV	Variable air volume
space heating	Defines the mix of heating equipment types found within the stock of buildings
ASHP	Air-source heat pump
WSHP	Water-source heat pump
Resistance	Electric resistance heating equipment including boilers and baseboard heaters
Natural gas	Natural gas heating equipment including packaged rooftop units and boilers
Space cooling	Defines the mix of cooling equipment types found within the stock of buildings
Centrifugal	Standard centrifugal chillers with a full load performance of 0.75 kW/ton
Centri HE	High-efficiency centrifugal chillers assumed to have a performance of <0.65 kW/ton
Recip open	Semi-hermetic reciprocating chillers
DX	Direct expansion cooling equipment that use small tonnage hermetic R-22 compressors

Appendix B Background-Section 4: Base Year Peak Load

Introduction

Appendix B provides additional detailed information related to each of the major steps employed in the generation of the Commercial sector Base Year peak loads. The discussion is organized as follows:

- Overview of peak load methodology
- Segmentation of commercial buildings
- Detailed results.

B1 Overview of Peak Load Profile Methodology

As noted in the main text, development of the electric peak load estimates employs four specific factors as outlined below:

- **Monthly Usage Allocation Factor**: This factor represents the percent of annual electric energy usage that is allocated to each month. This set of monthly fractions (percentages) reflects the seasonality of the load shape, whether a facility, process or end use, and is dictated by weather or other seasonal factors. In decreasing order of priority, this allocation factor can be obtained from either: (a) monthly consumption statistics from end-use load studies; (b) monthly seasonal sales (preferably weather normalized) obtained by subtracting a "base" month from winter and summer heating and cooling months; or (c) heating or cooling degree days on an appropriate base.

- **Weekend to Weekday Factor**: This factor is a ratio that describes the relationship between weekends and weekdays, reflecting the degree of weekend activity inherent in the facility or end use. This may vary by month or season. Based on this ratio, the average electric energy per day type can be computed from the corresponding monthly electric energy.

- **Peak Day Factor:** This factor reflects the degree of daily weather sensitivity associated with the load shape, particularly heating or cooling; it compares a peak (e.g., hottest or coldest) day to a typical weekday in that month.

- **Per Unit Hourly Factor**: The relationship of load among different hours of the day for each day type (weekday, weekend day, peak day) and for each month reflects the operating hours of the electric equipment or end use within commercial facilities by sub sector. For example, for lighting, this would be affected by time of day, season (affected by daylight), and room type, where applicable. For the Base Year, lighting is treated on an aggregate basis by total facility.

The four factors (sets of ratios) defined above provide the basis for converting annual energy to any hourly demand specified including the grouping of hours used in the three peak periods defined in this study. Exhibit B 1, below, illustrates how each of the above four factors is applied sequentially to a known annual energy value to produce a peak load value, defined as a specific peak period. In the example, Peak Period 1 (annual system peak hour) is used.

Exhibit B 1 Illustrative Application of Annual Energy to Peak Period Value Factors

Peak Period 1 (annual system peak hour) is computed based on the December peak day at 6 pm. The Yukon peak is assumed to occur in December, although the model allows for a January peak, as well.

The following steps are required:

- ***Step 1***: The monthly usage allocation factor for December is applied to the annual energy use to calculate December energy use.
- ***Step 2***: The average weekday in December is calculated based on the formula shown below, which adjusts the average day type use to reflect any difference in typical weekend use versus typical weekday use.
- 1/[Days in Month * (5/7 + 2/7 * Wkend Ratio)]
- ***Step 3:*** The peak day factor is then applied to the average weekday electric energy use to determine the peak day use (as defined by Yukon Energy).
- ***Step 4***: The peak hour is then calculated based on allocating the peak day use according to the per unit hourly load factor for a peak winter (December) day, using the percentage of use in that hour versus the daily usage for the December peak day.

It should be noted that the methodology shown in Exhibit B 1 produces aggregate diversified average loads for all customers or end uses in the defined sub sector.

Exhibit B 2 provides a specific numeric example for the calculation of peak hour demand (kW) under the Peak Period 1 definition. The example presented in Exhibit B 2 is for space heating use in Offices. The example shows how the annual consumption of 10,000 kWh can be converted to a peak demand value for Peak Period 1 by the calculation of a corresponding hours-use value.

Exhibit B 2 Sample Hours-Use Calculation for Office Electric Space Heating

Peak Period 1: 6 pm Winter Peak (December) =

Annual kWh * Mo. Allocation (Dec.) * 1/(Days in Month * (5/7 + 2/7 * Wkend Ratio)) * Peak Day Factor * Pk Hour % Daily kWh

6 pm Winter Peak = 10,000 [Annual kWh] * 14.75% [Mo. Allocation] * 1/(31 * (5/7 + 2/7 * 1.0 [Dec. Wkend Ratio Calc])) * 1.39 [Dec. Peak Day Factor] * 0.04105 [Pk Hour % Day kWh] = 3.098 kW

Hours-use Factor =10,000 [annual kWh] / 2.3755 [6pm Winter Peak] = 4,210 [Peak Period 1 Hours Use, in Red on Ex B5, LL Code 2022]

This means that any applicable Office annual space heating kWh can be converted to demand at winter peak hour (6 pm) by dividing by 4,210**.**

For other peak periods, different sets of hours are used, with calculations corresponding to the above steps. The resulting relationship between annual use and peak can be defined in terms of an hours-use factor, the ratio of the annual energy to the peak, for each of the three defined peak periods.

B2 Segmentation of Commercial Buildings

The Commercial sector segmentation used to generate the electric peak load profiles is the same as that used for electric energy use. That is, there is a load profile that corresponds to each combination of sub sector and end use.

Exhibit B 3 shows the Commercial sub sectors and end uses that were addressed.

Exhibit B 3 Commercial Segmentation Used for Electric Peak Load Calculations

Sub sectors (Office, Food Retail, Non-Food Retail, Hotel/Motel, Health, Education, Restaurant, Warehouse/Wholesale, Recreation Centres)

End uses (general lighting, outdoor lighting, architectural lighting, street lighting, space heating, space cooling, food service equipment, domestic hot water, refrigeration, computers/plug load)

Exhibit B 4 describes the assumptions and data sources for each of the four load profile factors that were used to develop the corresponding hours-use factors. To produce a demand for combination of sub sector and end use, the corresponding annual energy is divided by the hours-use factor for each of the three peak periods for the applicable load shape. For certain end uses that are assumed to have no usage during the winter months (e.g., cooling) the hours-use values are considered infinite (noted by 1E+15), resulting in virtually zero demand when divided into annual energy.

Exhibit B 4 Commercial End Use Load Shape Parameters

Load Shape #	End Use	Monthly Breakdown	Wkend / Wkday Ratio	Peak Day Factor	Hourly Profile
2001	General lighting – Office	RG&E Office lighting	App. 0.50 RG&E Office lighting	1.0 Assumed	Office lighting - RG&E 1991 Study[1]
2002	General lighting – Non-food Retail	RG&E Retail lighting	RG&E Retail lighting	1.0 Assumed	RG&E Retail lighting
2003	General lighting – Food Retail	RG&E Grocery lighting	RG&E Grocery lighting	1.0 Assumed	RG&E Grocery lighting
2004	General lighting – Hotel/Motel	RG&E Hotel/Motel lighting	RG&E Hotel/Motel lighting	1.0 Assumed	RG&E Hotel/Motel lighting
2005	General lighting – Health	RG&E Hospital/Long-term Care lighting	RG&E Hospital/Long-term Care lighting	1.0 Assumed	RG&E Hospital/Long-term Care lighting
2006	General lighting – Education	RG&E College lighting	RG&E College lighting	1.0 Assumed	RG&E College lighting

[1] Rochester Gas & Electric Company; 1991 DSM Evaluation Report Load Shape working papers.

Load Shape #	End Use	Monthly Breakdown	Wkend / Wkday Ratio	Peak Day Factor	Hourly Profile
2007	General lighting – Restaurant	RG&E Full-serve Restaurant lighting	RG&E Full-serve Restaurant lighting	1.0 Assumed	RG&E Full-serve Restaurant lighting
2008	General lighting – Warehouse	RG&E Warehouse lighting	RG&E Warehouse lighting	1.0 Assumed	RG&E Warehouse lighting
2009	General lighting – Small Office and Other Commercial	RG&E Office lighting	RG&E Office lighting (modified)[2]	1.0 Assumed	RG&E Office lighting (modified)
2010	General lighting – Small Non-food Retail	RG&E Small Non-food Retail lighting	RG&E Non-food Retail lighting (modified)	1.0 Assumed	RG&E Non-food Retail lighting (modified)
2011	Architectural lighting – Office & Education	Architectural lighting model	1.0 Assumed	1.0 Assumed	Architectural lighting model 6 am-6 pm 100%, 50% evening, 10% overnight
2012	Architectural lighting – Retail & Restaurant	Architectural lighting model	1.0 Assumed	1.0 Assumed	Architectural lighting model 6 am-10 pm 100%, 50% evening, 10% overnight
2013	Architectural lighting – Health & Warehouse	Architectural lighting model	1.0 Assumed	1.0 Assumed	Architectural lighting model 6 am-10 pm 100%, 80% evening, 50% overnight
2014	Architectural lighting – all other	Architectural lighting model	1.0 Assumed	1.0 Assumed	Architectural lighting model 6 am-6 pm 100%, 50% evening, 10% overnight
2015	Refrigeration – Restaurant, Hotel, Health	RG&E Restaurant refrigeration	RG&E total Restaurant refrigeration	RG&E total Restaurant refrigeration	RG&E total Restaurant refrigeration
2016	Refrigeration – Food Retail	RG&E Grocery refrigeration	RG&E Grocery refrigeration	RG&E Grocery refrigeration	RG&E Grocery refrigeration
2017	Refrigeration – Warehouse / Wholesale	RG&E Warehouse refrigeration	RG&E Warehouse refrigeration	RG&E Warehouse refrigeration	RG&E Warehouse refrigeration
2018	Refrigeration – Education	RG&E School refrigeration	RG&E School refrigeration	RG&E School refrigeration	RG&E School refrigeration
2019	Refrigeration – all Other Commercial	RG&E total Commercial refrigeration	RG&E total Commercial refrigeration	RG&E total Commercial refrigeration	RG&E total Commercial refrigeration
2020	Streetlighting	Based on dusk-to-dawn lighting model	1.0 Assumed	1.0 Assumed	Dusk-to-dawn model, average Whitehorse sunrise/ sunset
2021	Outdoor lighting	Based on outdoor lighting model	1.0 Assumed	1.0 Assumed	Outdoor lighting model, with RG&E 1991 study factors (0.55 overnight, 0.1 day, 1.0 eve.)

[2] Modifications for per-unit load shapes for Small Office and Small Non-food Retail reduced overnight loads by 50% after 6 pm (Office) and after 9 pm (Non-food Retail).

Load Shape #	End Use	Monthly Breakdown	Wkend / Wkday Ratio	Peak Day Factor	Hourly Profile
2022	Space heating – Office	10-year average Whitehorse HDD[3]	1.0 Assumed	10-year average ratio of peak/avg. HDD	RG&E 1991 Study for Office Space Heating
2023	Space heating – Retail Food/Non-Food	10-year average Whitehorse HDD	1.0 Assumed	10-year average ratio of peak/avg. HDD	RG&E 1991 study for Retail Space heating
2024	Space heating – Hotel/ Health	10-year average Whitehorse HDD	1.0 Assumed	10-year average ratio of peak/avg. HDD	RG&E 1991 study for Hospital/Long-term care space heating
2025	Space heating – School / University	10-year average Whitehorse HDD	1.0 Assumed	10-year average ratio of peak/avg. HDD	RG&E 1991 study for School space heating
2026	Space heating – Restaurant	10- year average Whitehorse HDD	1.0 Assumed	10-year average ratio of peak/avg. HDD	RG&E 1991 study for total Restaurant space heating
2027	Space heating – all Other Commercial	10-year average Whitehorse HDD	1.0 Assumed	10-year average ratio of peak/avg. HDD	RG&E 1991 study for Commercial space heating
2028	Food service equipment – Restaurant	RG&E total Restaurant cooking	RG&E total Restaurant cooking	RG&E total Restaurant cooking	RG&E total Restaurant cooking
2029	Food service equipment – Hotel / Health	RG&E total Hospital/Long-term Care cooking	RG&E total Hospital/Long-term Care Cooking	RG&E total Hospital/Long-term Care Cooking	RG&E total Hospital/Long-term Care cooking
2030	Food service equipment – Food Retail	RG&E Grocery cooking	RG&E Grocery cooking	RG&E Grocery cooking	RG&E Grocery cooking
2031	Food service equipment – School/University	RG&E School cooking	RG&E School cooking	RG&E School cooking	RG&E School cooking
2032	Food service equipment – all Other Commercial	RG&E School cooking	RG&E School cooking	RG&E School cooking	RG&E School cooking
2033	Domestic hot water (DHW) – Restaurant	RG&E Restaurant water heat	RG&E Restaurant water heat	RG&E Restaurant water heat	RG&E Restaurant water heat
2034	Domestic hot water (DHW) – Hotel / Health	RG&E total Commercial water heat	RG&E total Commercial water heat	RG&E total Commercial water heat	RG&E total Commercial water heat
2035	DHW – Food Retail and Non-Food Retail	RG&E Retail water heat	RG&E Retail water heat	RG&E Retail water heat	RG&E Retail water heat
2036	DHW – School / University	RG&E School water heat	RG&E School water heat	RG&E School water heat	RG&E School water heat
2037	DHW – all Other Commercial	RG&E water heat Commercial	RG&E water heat Commercial	RG&E water heat Commercial	RG&E water heat Commercial

[3] Heating degree days on an 18°C base for period 2001 - 2010 for the Whitehorse weather station.

Load Shape #	End Use	Monthly Breakdown	Wkend / Wkday Ratio	Peak Day Factor	Hourly Profile
2038	Space cooling – All Commercial	10-year average CDD	RG&E total Commercial (app. 0.74 – 0.82)	RG&E 1991 study for Commercial space cooling	RG&E 1991 study for Commercial space cooling
2039	Computer, plug load	RG&E Office lighting	RG&E Office lighting	1.0 Assumed	RG&E Office lighting
2040	Elevators	NYC subways	NYC subways (0.7881)	1.0 Assumed	NYC subways (6 am-6 pm), arch Office lighting (6 pm –6 am)
2041	Engine Block Heaters	10-yr average Whitehorse HDD	1.0 assumed	10-yr average Whitehorse HDD	Flat, average 7.9 hrs/day for 90 days[4]

Data Sources

As noted, class load profiles by rate class and end uses and, where applicable, valid sub sector segments of those rate classes and end uses, were the preferred source for load profile factors. For monthly breakdowns, sales data were available for many sub sectors and were used wherever possible, as indicated above. The principal sources used for other factors were:

- Rochester Gas & Electric 1991 load study – RG&E conducted a detailed end-use load and modeling study of residential and commercial end uses to support its DSM program portfolio and provided these results as backup in its regulatory filings for several years.
- Data from the Yukon can be used to substitute for the above sources as it becomes available. The LOADLIB model is designed to make the process of updating any load profile component straightforward. A sample (Office general lighting) of the tables and graphic outputs of the LOADLIB model, with 10,000 annual kWh used for illustrative purposes is provided at the end of this appendix.
- As indicated, class load profiles by rate class and, where applicable, valid subs segments of those rate classes (e.g., usage level strata), were to be used to calibrate class total hourly load profiles.

Exhibit B 5 shows the distinct hour-use values developed for each combination of peak period, sector, sub sector and end use employed in this study, as generated from the applicable load shape.

The hours-use value represents the divisor to convert annual energy (e.g., MWH) to that peak period demand. For example, dividing the annual electricity consumed for space heating in Offices (LL Code 2022), the hours-use value for Peak Period 1 (i.e., 4,210) will convert annual MWH to demand at the annual system peak hour (6 pm).

[4] Ontario Power Authority – OPA Measures and Assumptions List (prescriptive) as of January 31, 2010; 1,450 watts at 7.9 hours/day x 90 days.

Exhibit B 5 Commercial Sector Load Shape Hours-Use Values

LL Code	Sector Type	SubSector	Region	End Use	End Use Sub	Hours Use Values			
						Measure	Peak1	Peak2	Peak3
2001	Com	Large Office	All	General Lighting	All	Base	5,582	6,187	6,489
2002	Com	Non-Food Retail	All	General Lighting	All	Base	4,898	5,192	10,774
2003	Com	Food Retail	All	General Lighting	All	Base	6,590	6,761	7,802
2004	Com	Hotel/Motel	All	General Lighting	All	Base	6,618	6,918	7,065
2005	Com	Hospital/Long Term Care	All	General Lighting	All	Base	7,877	7,561	6,751
2006	Com	School/University	All	General Lighting	All	Base	5,672	5,681	7,575
2007	Com	Restaurant	All	General Lighting	All	Base	6,985	6,918	11,851
2008	Com	Warehouse/Wholesale	All	General Lighting	All	Base	5,112	5,706	4,747
2009	Com	Small Office/Other Comm.	All	General Lighting	All	Base	4,831	6,671	5,595
2010	Com	Small Non-Food Retail	All	General Lighting	All	Base	4,360	4,598	9,542
2011	Com	Office and School	All	Architectural Lighting	All	Base	6,053	8,070	6,053
2012	Com	Retail and Restaurant	All	Architectural Lighting	All	Base	6,778	6,778	6,778
2013	Com	Health and Warehouse	All	Architectural Lighting	All	Base	7,874	7,874	7,874
2014	Com	All Other	All	Architectural Lighting	All	Base	6,053	8,070	6,053
2015	Com	Restaurant/ Hotel/ Health	All	Refrigeration	All	Base	7,783	7,775	8,188
2016	Com	Food Retail	All	Refrigeration	All	Base	8,806	8,739	9,158
2017	Com	Warehouse/Wholesale	All	Refrigeration	All	Base	7,339	6,999	7,511
2018	Com	School/University	All	Refrigeration	All	Base	6,341	10,658	11,242
2019	Com	All Other	All	Refrigeration	All	Base	8,003	7,924	8,492
2020	Com	Streetlighting	All	Streetlighting	All	Base	3,901	4,792	3,674
2021	Com	All	All	Outdoor Lighting	All	Base	2,976	3,571	5,032
2022	Com	Office	All	Space Heating	All	Base	4,210	4,754	2,645
2023	Com	Retail Food and Non-Food	All	Space Heating	All	Base	3,165	3,183	2,354
2024	Com	Hotel, Hospital/Long Term Care	All	Space Heating	All	Base	3,464	3,880	3,161
2025	Com	School/University	All	Space Heating	All	Base	4,533	5,302	2,245
2026	Com	Restaurant	All	Space Heating	All	Base	3,639	4,353	2,697
2027	Com	All Other	All	Space Heating	All	Base	3,660	4,019	2,728
2028	Com	Restaurant	All	Food Service Equip.	All	Base	4,771	5,004	7,186
2029	Com	Hotel, Hospital/Long Term Care	All	Food Service Equip.	All	Base	5,067	6,134	4,521
2030	Com	Retail Food	All	Food Service Equip.	All	Base	11,361	12,159	5,951
2031	Com	School/University	All	Food Service Equip.	All	Base	165,008	61,915	2,211
2032	Com	All Other	All	Food Service Equip.	All	Base	165,008	61,915	2,211
2033	Com	Restaurant	All	Domestic Hot Water	All	Base	5,139	5,483	8,196
2034	Com	Hotel, Hospital/Long Term Care	All	Domestic Hot Water	All	Base	5,571	5,984	7,909
2035	Com	Retail Food and Non-Food	All	Domestic Hot Water	All	Base	13,538	8,120	21,754
2036	Com	School/University	All	Domestic Hot Water	All	Base	1.E+15	24,610	6,349
2037	Com	All Other	All	Domestic Hot Water	All	Base	5,571	5,984	7,909
2038	Com	All	All	Space Cooling	All	Base	1.E+15	1.E+15	1.E+15
2039	Com	All	All	Computer, Plug Load	All	Base	5,582	6,187	6,489
2040	Com	All	All	Elevators	All	Base	4,769	6,217	4,552
2041	Com	All	All	Engine Block Heaters	All	Base	1,493	1,194	1.E+15

Since YEC and YECL do not conduct regular class or end-use load analysis studies, there are no actual total (or sub sector) end-use load profiles upon which to calibrate the load profile models developed for this study. End-use data collection has not been performed. Summing all end use consumption would produce a total commercial daily load profile, but the Yukon class

load profile to which it would be compared would still only be a statistical estimate and not an actual, in the same way that the annual kWh energy sales would be for the calibration of total annual kWh. The best option for calibrating Yukon-specific load profile parameters is the weather-sensitive loads, since that is the most area-specific.

Since separately metered space heating end-use load data were not available, normal weather for the past 10 years was used to determine monthly allocations, and weekend/weekday ratios were developed from similar studies for another winter-peaking Canadian utility.

For peak day factors, the past 10 years of average versus peak weather conditions (in heating degree days) was analyzed for Whitehorse to determine typical peak day factors for normal weather. The resulting peak day factors ranged from about 1.2 to 1.5 for winter months. For non weather-sensitive end uses, a factor of 1.0 was assumed, absent specific load study data.

B4 Detailed Results

Exhibit B 6, Exhibit B 7 and Exhibit B 8 show hydro region peak demand by sub sector and end use for each of the three peak periods identified for this study.

Note:

- The results shown in the following exhibits are measured at the customer's point-of-use and do not include line losses. Any differences in totals are due to rounding.
- Zeros that appear in the following exhibits should be read as small but non-zero numbers. Actual values of zero are shown as a dash (-).

Exhibit B 6 Commercial Sector Base Year (2010) Hydro Region, Period 1 - Peak Hour Demand, by Sub Sector and End Use (MW)

Sub Sector	General Lighting	Architectural Lighting	High-bay Lighting	Outdoor Lighting	Space Heating	Space Cooling	HVAC Fans and Pumps	Water Heating	Computer Equipment	Other Plug Loads	Food Service Equipment	Refrigeration	Elevators	Miscellaneous	Street Lighting	Non Buildings	Block Heater	Grand Total
Office	1.1	0.3	-	0.2	1.3	0.0	0.5	0.1	0.7	0.2	0.0	0.0	0.0	0.1	-	-	-	4.6
Food Retail	0.1	0.1	0.2	0.1	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.7	-	0.0	-	-	-	1.4
Non-food Retail	0.9	0.4	0.2	0.3	0.6	0.0	0.3	0.0	0.1	0.1	0.0	0.0	-	0.0	-	-	-	3.0
Hotel / Motel	0.1	0.2	-	0.1	0.6	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	-	-	-	1.6
Healthcare	0.1	0.1	-	0.1	0.2	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-	-	-	0.8
Education	0.6	0.2	0.1	0.1	0.7	0.0	0.3	0.0	0.2	0.2	0.0	0.1	-	0.0	-	-	-	2.5
Recreation Centres	0.1	0.0	0.4	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3	-	0.0	-	-	-	1.2
Restaurant	0.1	0.2	-	0.2	0.3	0.0	0.1	0.1	0.0	0.0	0.2	0.2	-	0.0	-	-	-	1.4
Warehouse / Wholesale	0.2	0.1	1.2	0.2	0.3	0.0	0.2	0.0	0.1	0.1	0.0	0.4	-	0.1	-	-	-	2.8
Other General Service	1.5	0.6	0.2	0.4	1.3	0.0	0.5	0.1	0.5	0.3	0.0	0.1	0.0	0.1	-	-	-	5.6
Street lighting	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.9	-	-	0.9
Non-Buildings	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	-	2.2
Parking Lot Plug	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.2
Grand Total	4.8	2.3	2.1	1.8	5.5	0.0	2.2	0.4	1.8	1.1	0.3	1.8	0.1	0.6	0.9	2.2	0.2	28.2

Exhibit B 7 Commercial Sector Base Year (2010) Hydro Region, Period 2 - Annual System Peak, by Sub Sector and End Use (MW)

Sub Sector	General Lighting	Architectural Lighting	High-bay Lighting	Outdoor Lighting	Space Heating	Space Cooling	HVAC Fans and Pumps	Water Heating	Computer Equipment	Other Plug Loads	Food Service Equipment	Refrigeration	Elevators	Miscellaneous	Street Lighting	Non Buildings	Block Heater	Grand Total
Office	1.0	0.2	-	0.2	1.2	0.0	0.4	0.1	0.6	0.2	0.0	0.0	0.0	0.1	-	-	-	4.0
Food Retail	0.1	0.1	0.1	0.1	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.7	-	0.0	-	-	-	1.4
Non-food Retail	0.9	0.4	0.2	0.2	0.6	0.0	0.2	0.0	0.1	0.1	0.0	0.0	-	0.0	-	-	-	2.8
Hotel / Motel	0.1	0.2	-	0.1	0.5	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	-	-	-	1.4
Healthcare	0.2	0.1	-	0.1	0.2	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-	-	-	0.7
Education	0.6	0.2	0.1	0.1	0.6	0.0	0.3	0.0	0.2	0.1	0.0	0.0	-	0.0	-	-	-	2.3
Recreation Centres	0.1	0.0	0.3	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3	-	0.0	-	-	-	1.1
Restaurant	0.1	0.2	-	0.2	0.3	0.0	0.1	0.1	0.0	0.0	0.2	0.2	-	0.0	-	-	-	1.3
Warehouse / Wholesale	0.1	0.1	1.1	0.2	0.3	0.0	0.2	0.0	0.1	0.1	0.0	0.4	-	0.1	-	-	-	2.5
Other General Service	1.4	0.5	0.1	0.3	1.1	0.0	0.5	0.1	0.5	0.2	0.0	0.1	0.0	0.1	-	-	-	4.9
Street lighting	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7	-	-	0.7
Non-Buildings	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	-	2.2
Parking Lot Plug	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.3
Grand Total	4.5	1.9	1.9	1.5	4.9	0.0	2.1	0.4	1.6	0.9	0.3	1.9	0.1	0.4	0.7	2.2	0.3	25.6

Exhibit B 8 Base Year (2010) Hydro Region, Period 3, Annual Morning System Peak, by Sub Sector and End Use (MW)

Sub Sector	General Lighting	Architectural Lighting	High-bay Lighting	Outdoor Lighting	Space Heating	Space Cooling	HVAC Fans and Pumps	Water Heating	Computer Equipment	Other Plug Loads	Food Service Equipment	Refrigeration	Elevators	Miscellaneous	Street Lighting	Non Buildings	Block Heater	Grand Total
Office	0.9	0.3	-	0.1	2.1	0.0	0.4	0.1	0.6	0.2	0.1	0.0	0.0	0.2	-	-	-	5.0
Food Retail	0.1	0.1	0.1	0.1	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.7	-	0.0	-	-	-	1.4
Non-food Retail	0.4	0.4	0.1	0.2	0.8	0.0	0.1	0.0	0.1	0.1	0.0	0.0	-	0.1	-	-	-	2.3
Hotel / Motel	0.1	0.2	-	0.1	0.6	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	-	-	-	1.5
Healthcare	0.2	0.1	-	0.0	0.2	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-	-	-	0.8
Education	0.5	0.2	0.1	0.1	1.3	0.0	0.2	0.2	0.2	0.2	0.2	0.0	-	0.0	-	-	-	3.2
Recreation Centres	0.1	0.0	0.4	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.3	-	0.0	-	-	-	1.3
Restaurant	0.0	0.2	-	0.1	0.4	0.0	0.1	0.0	0.0	0.0	0.1	0.2	-	0.0	-	-	-	1.3
Warehouse / Wholesale	0.2	0.1	1.3	0.1	0.4	0.0	0.2	0.0	0.1	0.1	0.1	0.3	-	0.1	-	-	-	3.0
Other General Service	1.3	0.6	0.1	0.2	2.1	0.0	0.5	0.1	0.5	0.3	0.1	0.1	0.0	0.2	-	-	-	5.9
Street lighting	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	1.0
Non-Buildings	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	-	2.2
Parking Lot Plug	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0
Grand Total	3.8	2.3	2.1	1.1	8.3	0.0	1.9	0.4	1.5	1.2	0.8	1.8	0.1	0.6	1.0	2.2	0.0	28.9

B5 Sample LOADLIB Output

The following exhibits provide sample LOADLIB load shape library outputs, with Office space heating (LL Code 2022) as the example, assuming 10,000 annual kWh.

Exhibit B 9 Commercial Sector LOADLIB Output – Summary Page

	OFFICE - HEATING-YE						
ENERGY PROFILE SUMMARY:				***SPHOFFRGE-BCLMYE***			2022
2022	ANNUAL USE:	**1000**	kWH	PEAK HR(s)	18	17	
		1000		PK MONTH(s)	12	7	
			AVERAGE	AVERAGE	NON-COIN	COIN	
	MONTHLY	PEAK DAY	WEEKDAY	WEEKEND	PEAK	PEAK	
	USAGE	USAGE	USAGE	USAGE	DEMAND	DEMAND	SEAS
JAN	156	7.2	5.0	5.0	0.4463	0.2180	W
FEB	126	6.4	4.5	4.5	0.3854	0.2130	W
MAR	118	5.9	3.8	3.8	0.3495	0.1868	W
APR	79	4.6	2.6	2.6	0.3023	0.1371	W
MAY	51	3.3	1.7	1.7	0.3577	0.0000	S
JUN	26	1.8	0.9	0.9	0.1898	0.0000	S
JUL	20	1.3	0.7	0.7	0.1411	0.0000	S
AUG	27	1.7	0.9	0.9	0.1664	0.0245	S
SEP	50	3.3	1.7	1.7	0.3222	0.0473	S
OCT	80	4.3	2.6	2.6	0.4149	0.0609	S
NOV	120	5.9	4.0	4.0	0.3630	0.1553	W
DEC	148	6.6	4.8	4.8	0.3723	0.2375	W
	OFFICE - HEATING-YE						
	ANNUAL STATISTICS:						
	AVERAGE DEMAND			**0.1142**	kW DEMAND		
	PEAK DEMAND			0.4463	kW	0.7439	kW
	NON-COIN LOAD FACTOR			25.58%			
	NON-COIN PEAK HOURS USE			2241		1344	hrs/yr
						3.68	hrs/day
	COINCIDENT PEAK STATISTICS:					Demand Factor	60.0%
	WINTER COINCIDENT PEAK			**0.2375**	kW		
	6	PM in DEC					
	ANNUAL COINCIDENCE FACTOR			53.22%			
	PEAK DAY COINCIDENCE FACTOR			49.32%			
	COIN PEAK LOAD FACTOR			48.06%			
	COIN PEAK HOURS USE			**4210**			
	SUMMER COINCIDENT PEAK			**0.0000**	kW		✂
	5	PM in JUL					✂
	COIN PEAK HOURS USE			**#N/A**			
	Annual Peak Hours	7a-10p Weekday / Non-Holidays		3731	hours	249	days
		Peak Energy		422	kWH		
		Percent Peak		42.2%			
		Peak 1	Peak 2	Peak 3			
OFFICE - HEATI	SPHOFFRGE-BCLMYE	4,210	4,754	2,645			HRS USE
		Winter Pk H18	Win Pk H17-20	Dec Pk Hr8-9			
		hours use	hours use	hours use			
	Average Demands	0.2375	0.2104	0.3780			
		kW	kW	kW			

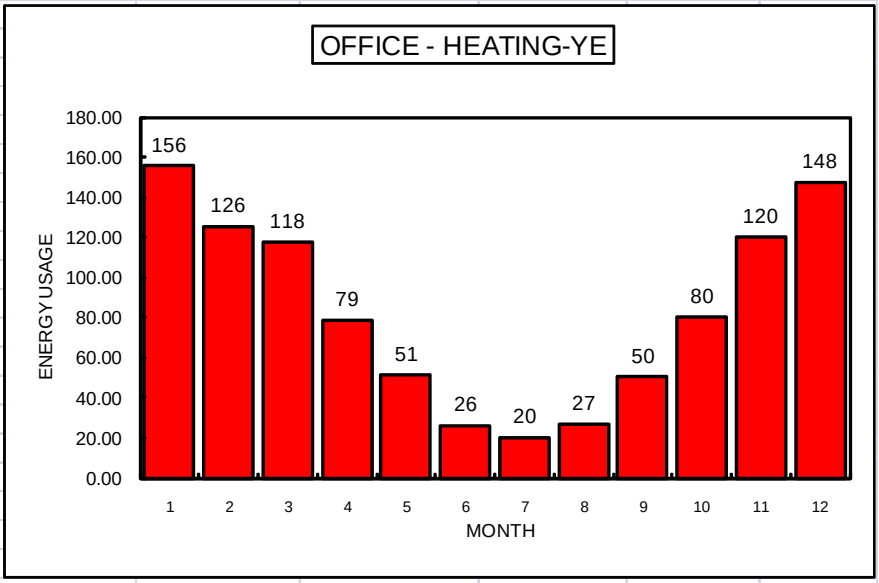
Exhibit B 10 Commercial Sector LOADLIB Output – Page 2

OFFICE - HEATING-YE

ENERGY PROFILE GRAPHIC SUMMARY — ***SPHOFFRGE-BCLMY*** 2022

MONTHLY USAGE BREAKDOWN: kWH

JANUARY	156
FEBRUARY	126
MARCH	118
APRIL	79
MAY	51
JUNE	26
JULY	20
AUGUST	27
SEPTEMBER	50
OCTOBER	80
NOVEMBER	120
DECEMBER	148
	1,000



JULY AVG WKDAY	JANUARY AVG WKDAY	Hr
0.03	0.18	1
0.03	0.18	2
0.05	0.19	3
0.06	0.19	4
0.07	0.19	5
0.10	0.27	6
0.06	0.34	7
0.06	0.31	8
0.00	0.27	9
0.00	0.26	10
0.00	0.25	11
0.00	0.24	12
0.00	0.23	13
0.00	0.22	14
0.00	0.22	15
0.00	0.21	16
0.00	0.13	17
0.00	0.14	18
0.01	0.16	19
0.02	0.16	20
0.04	0.16	21
0.03	0.17	22
0.03	0.17	23
0.03	0.17	24

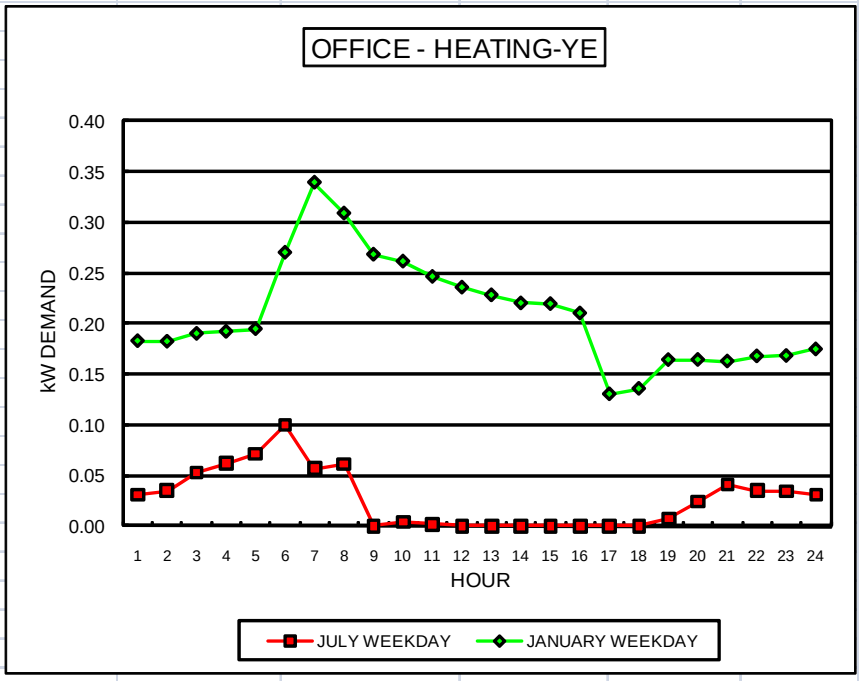


Exhibit B 11 Commercial Sector LOADLIB Output – Page 3

OFFICE - HEATING-YE

PEAK MONTH ENERGY PROFILE GRAPHIC SUMMARY — ***SPHOFFRGE-BCLMY*** 2022

PEAK MONTH OF: DEC

HOUR	PEAK DAY	WEEKDAY	WEEKEND		PEAK DAY	WEEKDAY	WEEKEND
1	0.18	0.17	0.16	13	0.33	0.22	0.23
2	0.21	0.17	0.16	14	0.31	0.21	0.22
3	0.22	0.17	0.17	15	0.31	0.21	0.22
4	0.23	0.17	0.16	16	0.30	0.20	0.22
5	0.25	0.18	0.17	17	0.23	0.13	0.17
6	0.31	0.23	0.21	18	0.24	0.14	0.17
7	0.36	0.27	0.25	19	0.27	0.18	0.18
8	0.34	0.26	0.27	20	0.27	0.17	0.19
9	0.33	0.26	0.25	21	0.23	0.17	0.17
10	0.36	0.26	0.24	22	0.22	0.17	0.16
11	0.37	0.25	0.23	23	0.19	0.16	0.17
12	0.35	0.23	0.23	24	0.20	0.17	0.17

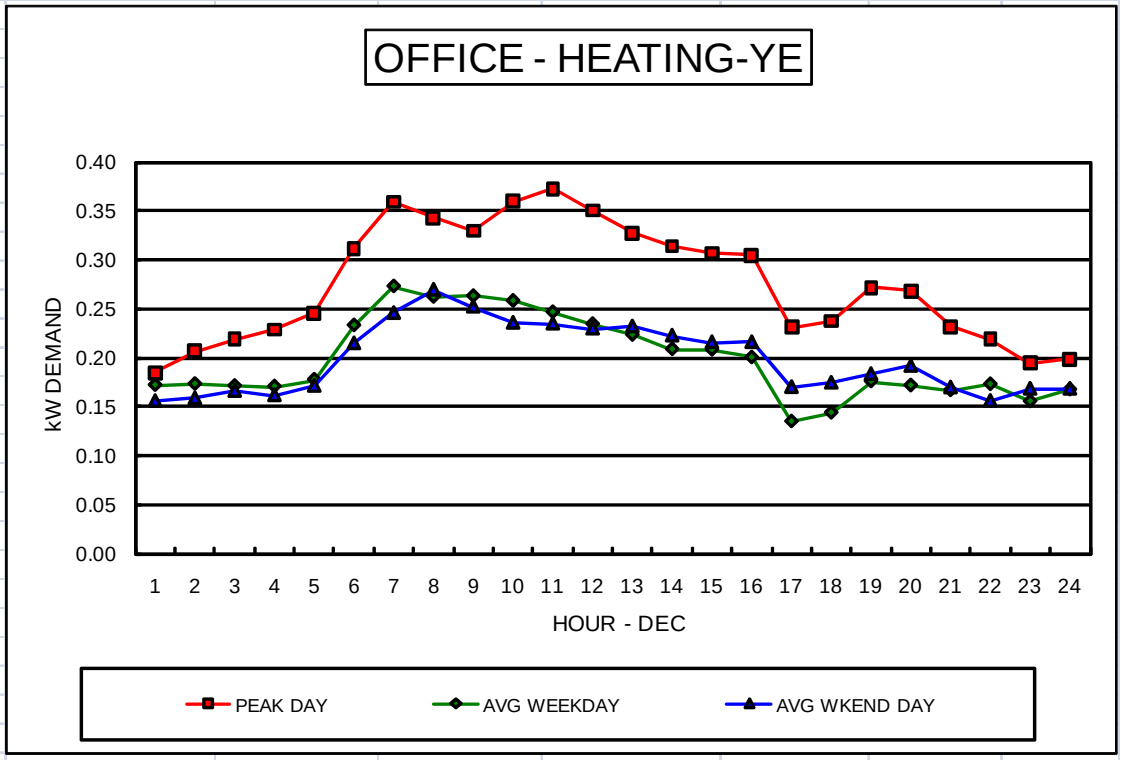


Exhibit B 12 Commercial Sector LOADLIB Output – Page 4

	OFFICE - HEATING-YE				SPHOFFRGE-BCLMYE		2022
	BILLING PARAMETERS ANALYSIS						
	kWH	kW	Monthly	Weekday	Hr End7a-10p Wkday Peak Period		
	Monthly kWh	Month Pk kW	Load Factor	Load Factor	Peak kWh	Off-Peak	Peak %
JAN	156	0.446	46.9%	61.6%	66	90	42.5%
FEB	126	0.385	48.5%	62.8%	53	73	42.2%
MAR	118	0.350	45.3%	51.3%	52	65	44.5%
APR	79	0.302	36.1%	40.8%	32	47	40.3%
MAY	51	0.358	19.2%	42.6%	22	29	42.5%
JUN	26	0.190	19.2%	27.1%	12	15	44.5%
JUL	20	0.141	19.2%	27.1%	9	12	42.5%
AUG	27	0.166	21.6%	21.6%	11	15	42.5%
SEP	50	0.322	21.6%	21.6%	21	29	42.4%
OCT	80	0.415	25.9%	42.2%	34	46	42.5%
NOV	120	0.363	46.0%	60.6%	51	69	42.4%
DEC	148	0.372	53.2%	72.7%	60	88	40.4%
Avg. Mo.	83	0.318	35.9%	44.3%	35	48	42.2%
Annual	1,000	0.446	25.6%		422	578	42.2%
Avg Hour	0.11				0.113	0.115	

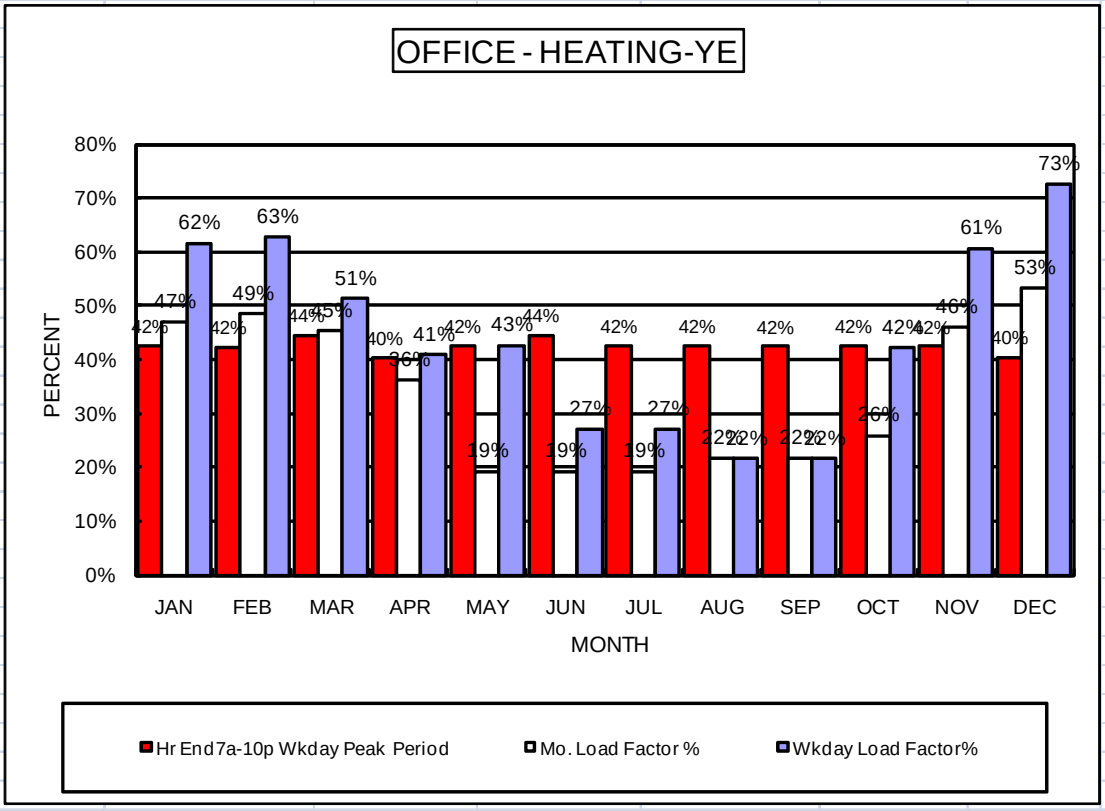
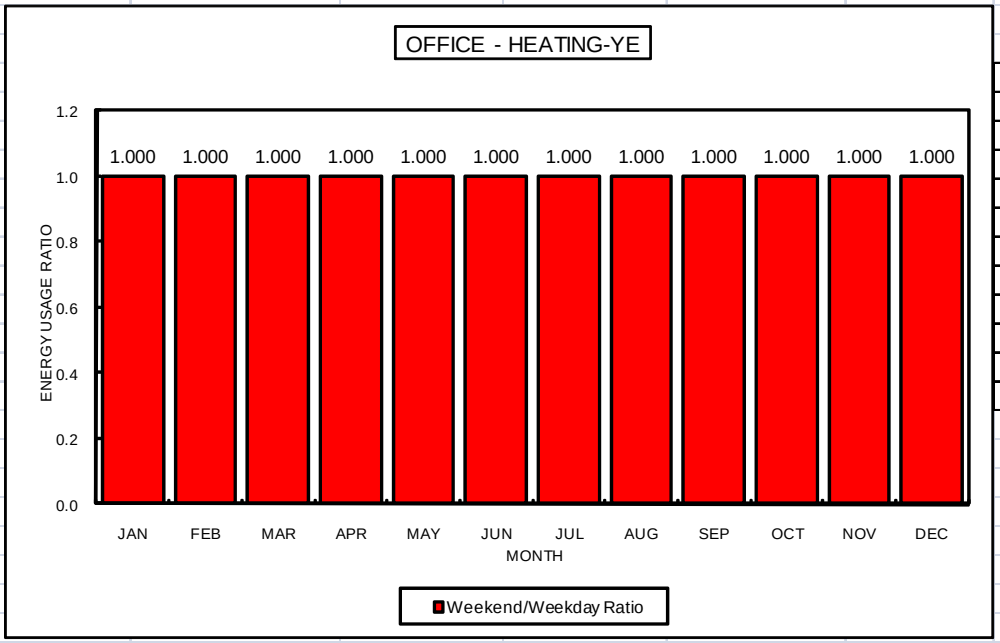


Exhibit B 13 Commercial Sector LOADLIB Output – Page 5

OFFICE - HEATING-YE

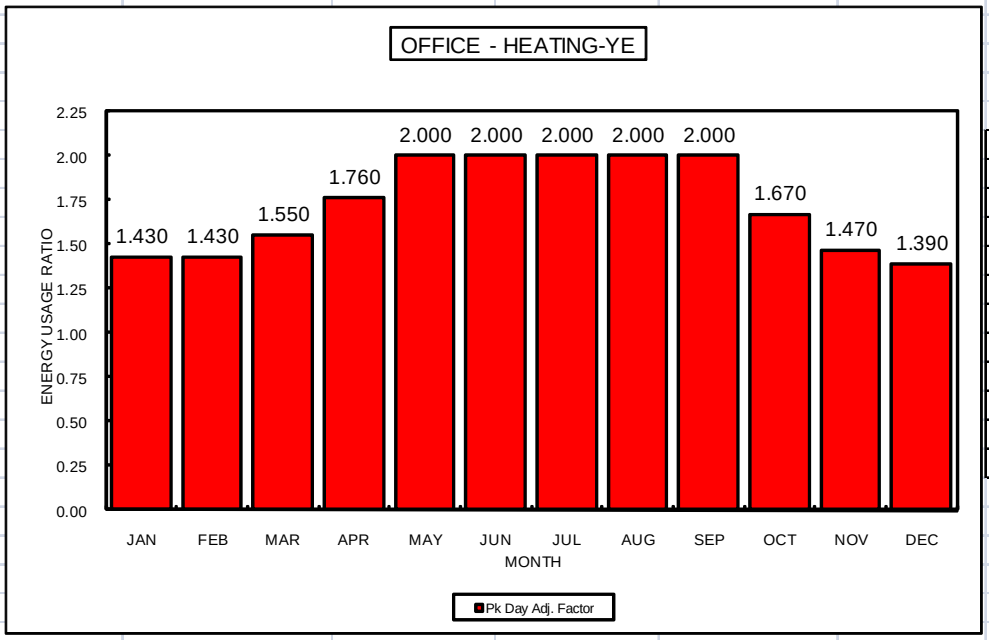
SPHOFFRGE-BCLMY 2022

Weekend/Weekday Ratio



	Wkend/ Wkday
JAN	1.000
FEB	1.000
MAR	1.000
APR	1.000
MAY	1.000
JUN	1.000
JUL	1.000
AUG	1.000
SEP	1.000
OCT	1.000
NOV	1.000
DEC	1.000

Peak Day Adjustment Factor



	PDAF
JAN	1.430
FEB	1.430
MAR	1.550
APR	1.760
MAY	2.000
JUN	2.000
JUL	2.000
AUG	2.000
SEP	2.000
OCT	1.670
NOV	1.470
DEC	1.390

Appendix C Background-Section 5: Reference Case Electricity Use

Introduction

Appendix C provides additional detailed information related to the construction of the Commercial sector Reference Case. The appendix discusses the following:

- Natural change assumptions
- Expected growth in building stock
- CEEAM archetype summaries – new buildings.

C 1 Natural Change Assumptions

For the purposes of this study, "natural" changes to electricity consumption are defined as those changes to electricity usage patterns that occur without incentive or other intervention. Expected natural changes in electricity consumption patterns over the study period take into account four major factors:

- Naturally-occurring improvements in equipment efficiency
- Expected stock penetration by more efficient equipment
- Changes in equipment density, e.g., computers and plug loads, etc.
- Changes in electric share in end uses for which fuel may vary, such as space heating and water heating.

Note that the first two factors will have the effect of reducing electricity consumption, while the third and fourth factor may result in either increased or decreased electricity demand. While all of these factors influence future electricity use within the Commercial sector, the fourth, specifically increased space heating penetration in new buildings, is the dominant driver of new Commercial sector load growth in the Reference Case.

Based on the assessment of current trends, the most significant natural changes are expected to involve the following end uses:

- Space cooling
- Lighting
- Computer equipment and other plug loads
- Water heating
- Space heating.

Further discussion of these changes follows and, in each case, the discussion identifies the technical change, the major driver(s) and the assumed electricity impact.

Space Cooling

As a result of natural conservation and efficiency gains, it is assumed that new space cooling equipment will provide improved electricity performance compared to existing equipment. Packaged rooftop units are available on the market with energy-efficiency ratios (EER) exceeding 12.0.[5] Similarly, new centrifugal chillers achieve performance efficiencies in the

[5] See http://www.energence.com/res/pdf/52W81_energence_58937_0709.pdf for example. Current federal energy-efficiency regulations require a minimum EER of 10.3 for rooftop air conditioning units with a capacity of 5.5 - 11 tons.

range of 0.49-0.60 kW per ton. The combined effects of natural conservation and efficiency gains are estimated to result in a decrease of 6% in space cooling EUI over the length of the study.

As illustrated in Exhibit C 1, the net effect of efficiency gains and increased space cooling saturation is expected to reduce energy consumption for space cooling in existing commercial buildings. Increases in overall space cooling energy use through time are expected to be due entirely to the construction of new building stock (Exhibit C 2).

Exhibit C 1 Reference Case Space Cooling Electricity Use in Existing Buildings by Sub Sector and Milestone Year – Hydro Region, Existing Buildings (MWh/yr.)

Sub Sector	2010	2015	2020	2025	2030
Office	569	560	552	543	535
Food Retail	38	37	36	36	35
Non-food Retail	152	150	148	146	143
Hotel / Motel	136	134	132	130	128
Healthcare	43	42	41	41	40
Education	48	47	47	46	45
Restaurant	62	61	60	59	58
Recreation Centres	3	3	3	3	3
Warehouse / Wholesale	6	6	6	6	6
Other General Service	507	499	492	484	477
Grand Total	1,564	1,540	1,517	1,493	1,470

Exhibit C 2 Reference Case Space Cooling Electricity Use in New Buildings by Sub Sector and Milestone Year – Hydro Region, New Buildings (MWh/yr.)

Sub Sector	2010	2015	2020	2025	2030
Office	-	171	361	571	805
Food Retail	-	11	22	35	50
Non-food Retail	-	52	110	174	246
Hotel / Motel	-	34	71	112	158
Healthcare	-	10	22	35	49
Education	-	11	24	37	53
Restaurant	-	18	37	60	85
Recreation Centres	-	0	1	1	1
Warehouse / Wholesale	-	1	3	4	6
Other General Service	-	-	-	-	-
Grand Total	-	308	650	1,030	1,452

Lighting

As a result of natural conservation, it is assumed that the replacement of existing T12 fluorescent lighting and electromagnetic ballasts with new T8 fluorescent lamps and electronic ballasts will continue. Similarly, CFLs will continue to increase their market share over incandescent lamps, particularly in sectors such as Hotel/Motel and Non-food Retail.

The continued growth of CFLs and T8 lighting/electronic ballasts is being driven by:

- Increased consumer recognition of the operating cost savings
- Energy regulations that are gradually removing electromagnetic fluorescent ballasts and incandescent lighting products from the market place.

Overall, the Reference Case assumes that by 2030 the energy intensity of general lighting in the existing building stock will decrease by 8%, while the energy intensity of architectural lighting will decrease by 1%.

Exhibit C 3 shows the impact of these EUI improvements on indoor lighting[6] energy consumption, while Exhibit C 4 shows indoor lighting energy use by sub sector and milestone year in new construction. Again, all increases in overall indoor lighting energy use through time are expected to be due entirely to the construction of new building stock

Exhibit C 3 Reference Case Lighting Electricity Use by Sub Sector and Milestone Year – Hydro Region, Existing Buildings (MWh/yr.)

Sub Sector	2010	2015	2020	2025	2030
Office	7,995	7,870	7,745	7,620	7,495
Food Retail	2,159	2,146	2,133	2,120	2,107
Non-food Retail	8,053	7,954	7,854	7,755	7,656
Hotel / Motel	2,248	2,228	2,208	2,189	2,169
Healthcare	1,595	1,571	1,546	1,522	1,497
Education	5,534	5,459	5,384	5,309	5,234
Restaurant	1,987	1,975	1,962	1,950	1,937
Recreation Centres	2,529	2,519	2,509	2,499	2,488
Warehouse / Wholesale	7,503	7,484	7,466	7,448	7,429
Other General Service	13,088	12,909	12,731	12,552	12,374
Grand Total	52,691	52,115	51,539	50,963	50,387

Exhibit C 4 Reference Case Lighting Electricity Use by Sub Sector and Milestone Year – Hydro Region, New Buildings (MWh/yr.)

Sub Sector	2010	2015	2020	2025	2030
Office	-	931	1,962	3,103	4,367
Food Retail	-	246	521	830	1,176
Non-food Retail	-	815	1,723	2,735	3,864
Hotel / Motel	-	229	483	767	1,083
Healthcare	-	161	339	534	750
Education	-	614	1,301	2,070	2,932
Restaurant	-	194	416	668	954
Recreation Centres	-	222	468	741	1,043
Warehouse / Wholesale	-	861	1,832	2,928	4,166
Other General Service	-	1,261	2,645	4,165	5,834
Grand Total	-	5,533	11,688	18,540	26,170

[6] Including general, architectural and high-bay lighting.

Computer Equipment and Other Plug Loads

Computer equipment and other plug loads will continue to grow as a result of increased density of computers and peripherals per occupant, increased use of server load, and growth in other peripherals, such as telephone network equipment. Increased penetration of laptops, more efficient server hardware and higher penetration of ENERGY STAR® rated computer equipment and other plug loads is expected to counterbalance the effect of increasing hardware density to some degree.

Overall, the Reference Case assumes that by 2030 the energy intensity of computer equipment and plug loads in the existing building stock will increase by 15%.[7] The impact on electricity use in existing buildings is shown in Exhibit C 5, below.

Exhibit C 5 Computer and Plug Load Energy Use in by Sub Sector and Milestone Year – Hydro Region, Existing Buildings (MWh/yr.)

Sub Sector	2010	2015	2020	2025	2030
Office	3,783	3,925	4,067	4,209	4,351
Food Retail	171	178	184	191	197
Non-food Retail	490	509	527	545	564
Hotel / Motel	338	351	363	376	389
Healthcare	232	241	250	258	267
Education	1,070	1,111	1,151	1,191	1,231
Restaurant	95	99	102	106	109
Recreation Centres	25	26	27	28	29
Warehouse / Wholesale	658	683	708	732	757
Other General Service	2,950	3,061	3,171	3,282	3,392
Grand Total	9,814	10,182	10,550	10,918	11,286

Water Heating

Electricity consumption for water heating is expected to stay constant within the existing building stock, but to grow rapidly within the new building stock, as electric water heating fuel shares are expected to be significantly higher in new buildings than in existing ones. This is largely driven by an expected increase in electric space heating in the new building stock (see below), and the fact that buildings rarely maintain oil or propane service for water heating alone.

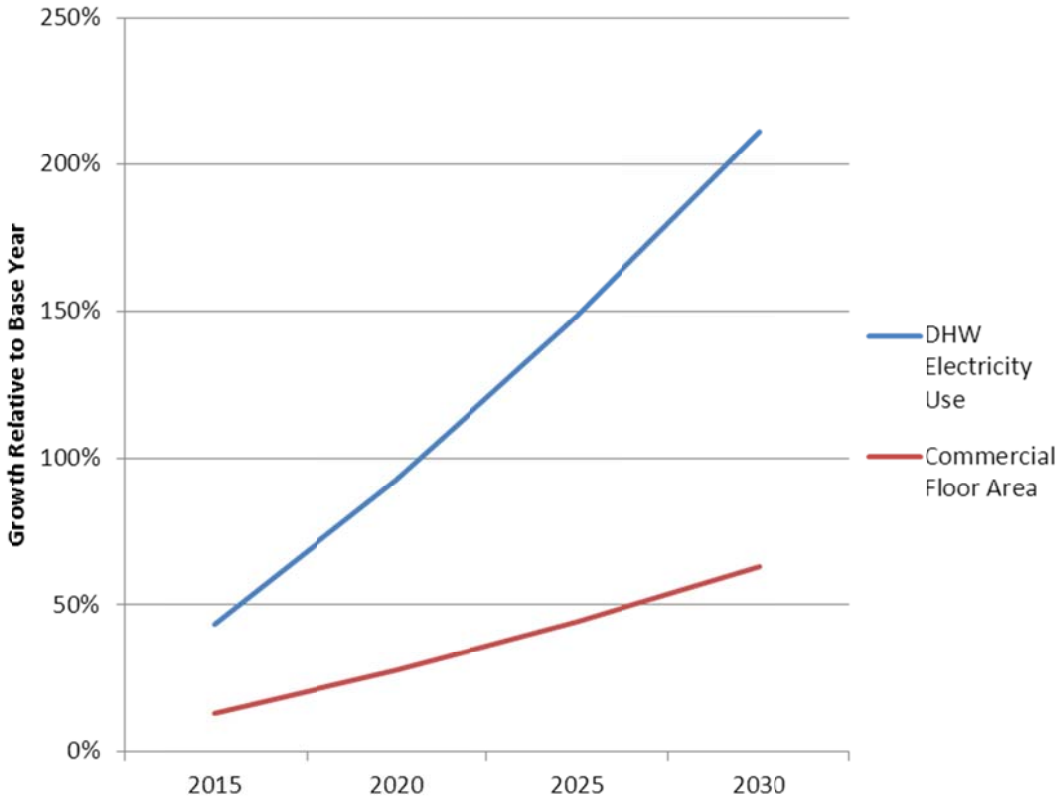
Exhibit C 6 illustrates the increased difference in electric water heating penetration between existing and new buildings. This leads to a growth in electricity use for water heating, which outpaces growth in floor area by a significant margin, as illustrated in Exhibit C 7.

[7] Estimates based on scenarios presented in Arthur D. Little, *Electricity Consumption by Office and Telecommunication Equipment in Commercial Buildings*. U.S. Department of Energy, 2002.

Exhibit C 6 Electric DHW Share by Sub Sector – Hydro Region, Existing and New Buildings (%)

Sub Sector	Existing Buildings	New Buildings
Office	50%	90%
Food Retail	40%	80%
Non-food Retail	30%	85%
Hotel / Motel	15%	95%
Healthcare	10%	60%
Education	50%	75%
Restaurant	15%	80%
Recreation Centres	10%	55%
Warehouse / Wholesale	15%	70%

Exhibit C 7 Electric DHW Electricity Consumption Growth Relative to Commercial Floor Area Growth – Hydro Region, Existing and New Buildings (%)



Space Heating

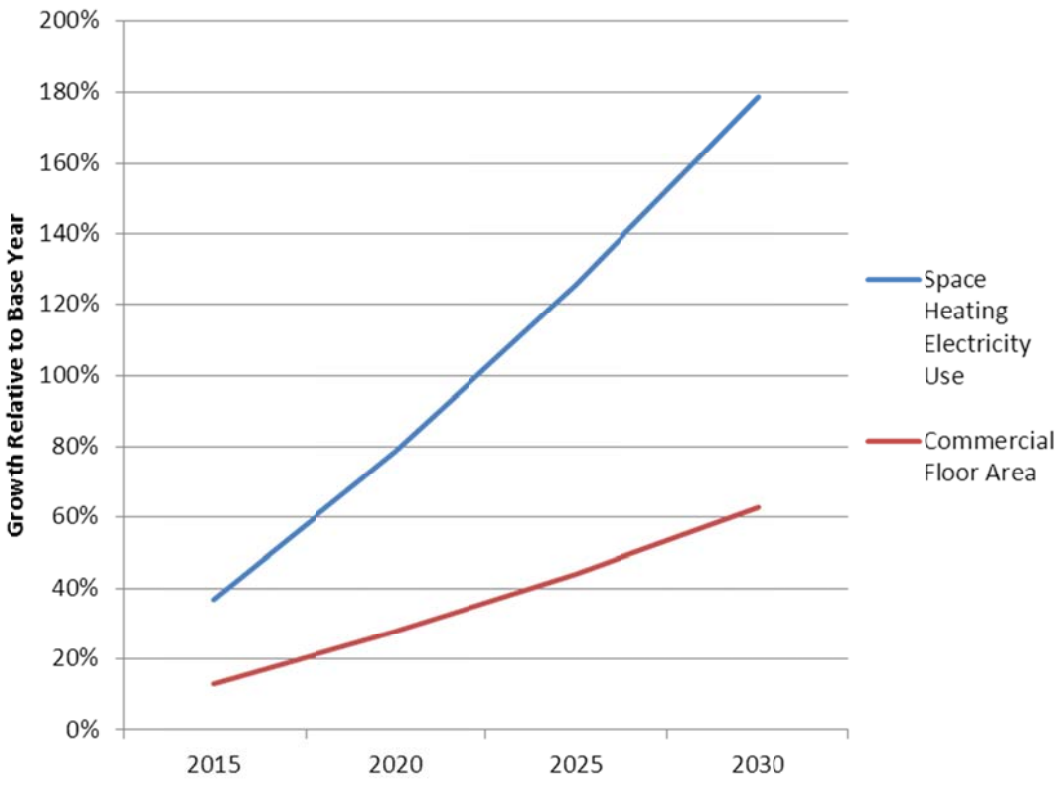
In recent years, electric space heating penetrations in new commercial construction have far exceeded the historical average, a trend that is presently expected to continue. Similar to the discussion of water heating energy above, electricity consumption for space heating is expected to stay constant within the existing building stock, but to grow rapidly within the new building stock. This is expected to be the major contributor to commercial load growth within the study period, accounting for approximately 35% of total commercial load growth.

Exhibit C 8 illustrates the increased difference in electric space heating penetration between existing and new buildings. This leads to a growth in electricity use for space heating, which outpaces growth in floor area by a significant margin, as illustrated in Exhibit C 9.

Exhibit C 8 Electric Space Heating Share by Sub Sector – Hydro Region, Existing and New Buildings (%)

Sub Sector	Existing Buildings	New Buildings
Office	50%	90%
Food Retail	40%	80%
Non-food Retail	30%	85%
Hotel / Motel	15%	95%
Healthcare	10%	60%
Education	50%	75%
Restaurant	15%	80%
Recreation Centres	10%	55%
Warehouse / Wholesale	15%	70%

Exhibit C 9 Electric Space Heating Electricity Consumption Growth Relative to Commercial Floor Area Growth – Hydro Region, Existing and New Buildings (%)



Overall Impact of Natural Changes

As illustrated in Exhibit C 10, the overall impact of the natural changes in energy usage patterns described above are very minimal, a decrease in existing building energy use of approximately 100 MWh, less than 0.1%, by 2030 relative to the Base Year (2010). This is consistent with the 2011 YEC 20-year load forecast, which assumes no per-customer electricity usage growth. Virtually all growth in electricity use through the study period occurs within the new building stock.

Exhibit C 10 Total Energy Use in by Sub Sector and Milestone Year – Hydro Region, Existing Buildings (MWh/yr.)

Sub Sector	2010	2015	2020	2025	2030
Office	23,792	23,837	23,882	23,927	23,972
Food Retail	10,137	10,136	10,135	10,134	10,132
Non-food Retail	14,252	14,191	14,130	14,069	14,007
Hotel / Motel	7,756	7,759	7,761	7,763	7,766
Healthcare	4,630	4,627	4,624	4,622	4,619
Education	14,514	14,511	14,508	14,505	14,502
Restaurant	7,549	7,544	7,539	7,534	7,528
Recreation Centres	6,739	6,738	6,736	6,735	6,733
Warehouse / Wholesale	14,529	14,558	14,586	14,615	14,644
Other General Service Buildings	29,290	29,260	29,230	29,200	29,170
Grand Total	133,189	133,160	133,131	133,102	133,073

C2 Expected Growth in Building Stock

The next step in developing the Reference Case involved the development and application of estimated levels of floor space growth in each building sub sector over the study period. The stock growth rates were derived from the sales forecast data provided by in the YEC 20-year Resource Plan - 2011. The derivation of floor space data in each of the milestone periods applied the following steps:

- As described above for the existing building stock, estimate and apply the expected impact of natural changes within the new building stock over the study period. Efficiency improvements are expected to be more moderate within the new building stock through time. Computer and other plug load growth are expected to be consistent in both existing and new buildings.
- Add floor space at a rate consistent with the YEC forecast of electricity consumption growth for each combination of sub sector and milestone year.

A summary of the total new commercial floor space at each milestone period is provided in Exhibit C 11.

Exhibit C 11 New Commercial Building Floor Space, by Sub Sector and Milestone Year – Hydro Region (ft^2)

Sub Sector	2015	2020	2025	2030
Office	177,356	377,774	604,251	860,177
Food Retail	25,449	54,212	86,719	123,458
Non-food Retail	121,260	258,639	414,279	590,606
Hotel / Motel	78,974	168,043	268,497	381,792
Healthcare	25,855	54,914	87,572	124,276
Education	245,057	524,585	843,434	1,207,135
Restaurant	29,049	62,434	100,804	144,902
Recreation Centres	56,705	119,848	190,160	268,456
Warehouse / Wholesale	189,815	404,667	647,859	923,127
Other General Service	210,674	446,254	709,685	1,004,261
Grand Total	1,160,195	2,471,370	3,953,260	5,628,190

C3 CEEAM Archetype Summaries – New Buildings

This section includes summary profiles of the nine new building archetypes constructed for this study. Exhibit C 12 presents a table of contents for the CEEAM building profiles that follow. A glossary of terms and acronyms used in the building profiles is included at the end of this appendix.

Exhibit C 12 Table of Contents - New CEEAM Building Profiles

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Office **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.20	W/m².°C	0.04	Btu/hr.ft² .°F	Typical Building Size	1,394	m²	15,000	ft²
Roof U value (W/m².°C)	0.11	W/m².°C	0.02	Btu/hr.ft² .°F	Typical Footprint (m²)	697	m²	7,500	ft²
Glazing U value (W/m².°C)	1.60	W/m².°C	0.28	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	2			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	45%			
Window/Wall Ratio (WIWAR) (%)	0.35				Defined as Exterior Zone				
Shading Coefficient (SC)	0.58				Typical # Stories	2			
					Floor to Floor Height (m)	3.7	m	12.0	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	50%				50%				100%
Min. Air Flow (%)					60%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	26	m²/person	274	ft²/person	%OA	9.08%
Occupancy Schedule Occ. Period	90%					
Occupancy Schedule Unocc. Period						
Fresh Air Requirements or Outside Air	8	L/s.person	16	CFM/person		

Fresh Air Control Type *(enter a 1, 2 or 3) 1
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)
If Fresh Air Control Type = "2" enter % FA. to the right:
If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation L/s.m² CFM/ft² operation (%)

Sizing Factor 1.1
Total Air Circulation or Design Air Flow 3.24 L/s.m² 0.64 CFM/ft²

Separate Make-up air unit (100% OA) L/s.m² CFM/ft²
Operation occupied period 50%
Operation unoccupied period 50%

Infiltration Rate 0.70 L/s.m² 0.14 CFM/ft²
(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use			100%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters		
Peak Design Cooling Load	279,953	
Peak Zone Sensible Load	186,991	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	8,699	
Total air circulation or Design air	3.24	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic		
DDC/Pneumatic		
All DDC		
Total (should add-up to 100%)		

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	24	°C	75.2	°F	14	°C	57.2	°F
Summer Humidity (%)	50%				98%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	23	°C	73.4	°F	15	°C	59	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	22	°C	71.6	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning Changes/Year

Incidence of Annual Room Controls Maintenance

Incidence of Annual HVAC Controls Maintenance

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Office **Yukon**
Baseline

LIGHTING

GENERAL LIGHTING

Light Level	500	Lux	46.5	ft-candles
Floor Fraction (GLFF)	0.90			
Connected Load	12.9	W/m²	1.2	W/ft²

Occ. Period(Hrs./yr.)	3200
Unocc. Period(Hrs./yr.)	5560
Usage During Occupied Period	95%
Usage During Unoccupied Period	15%

Light Level (Lux)	300	500	700	1000				Total
% Distribution		100%						100%
Weighted Average								**500**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)					100%			100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval years

Relamping Strategy & Incidence of Practice: Group | Spot

EUI kWh/ft².yr 4.2
MJ/m².yr 162

ARCHITECTURAL LIGHTING

Light Level	350	Lux	32.5	ft-candles
Floor Fraction (ALFF)	0.10			
Connected Load	24.4	W/m²	2.3	W/ft²

Occ. Period(Hrs./yr.)	3200
Unocc. Period(Hrs./yr.)	5560
Usage During Occupied Period	95%
Usage During Unoccupied Period	30%

Light Level (Lux)	200	300	400	500				Total
% Distribution	10%	40%	40%	10%				100%
Weighted Average								**350**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)	25%	75%						100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval years

Relamping Strategy & Incidence of Practice: Group | Spot

EUI kWh/ft².yr 1.1
MJ/m².yr 41

EUI = Load X Hrs. X SF X GLFF

SPECIAL PURPOSE LIGHTING

Light Level		Lux		ft-candles
Floor Fraction (HBLFF)				
Connected Load		W/m²		W/ft²

Floor fraction check: should = 1.00 | 1.00

Occ. Period(Hrs./yr.)	4000
Unocc. Period(Hrs./yr.)	4760
Usage During Occupied Period	0%
Usage During Unoccupied Period	100%

Light Level (Lux)	300	500	700	1000				Total
% Distribution								
Weighted Average								

	INC	CFL	T12	T8		MH	HPS	TOTAL
System Present (%)								
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval years

Relamping Strategy & Incidence of Practice: Group | Spot

EUI kWh/ft².yr
MJ/m².yr

TOTAL LIGHTING Overall LP 14.06 W/m²

EUI TOTAL kWh/ft².yr 5.3
MJ/m².yr 203

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	55	51	100	200	50	
Density (device/occupant)	0.9	0.9	0.15	0.1	0.26	
Connected Load	1.9 W/m²	1.8 W/m²	0.6 W/m²	0.8 W/m²	0.5 W/m²	1.5 W/m²
	0.2 W/ft²	0.2 W/ft²	0.05 W/ft²	0.07 W/ft²	0.05 W/ft²	0.14 W/ft²
Diversity Occupied Period	80%	80%	80%	80%	100%	80%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	50%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2000	2500
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6760	6260

Total end-use load (occupied period) 5.8 W/m² 0.5 W/ft²
Total end-use load (unocc. period) 3.8 W/m² 0.4 W/ft²

Usage during occupied period 100%
Usage during unoccupied period 66%

Computer Equipment EUI kWh/ft².yr 2.77
MJ/m².yr 107.44

Plug Loads EUI kWh/ft².yr 0.72
MJ/m².yr 27.70

FOOD SERVICE EQUIPMENT

Provide description below: Gas Fuel Share: 5.0% Electricity Fuel Share: 95.0%

	Natural Gas EUI		All Electric EUI	
Kitchen	EUI kWh/ft².yr	0.1	EUI kWh/ft².yr	0.10
	MJ/m².yr	5.0	MJ/m².yr	4.00

REFRIGERATION

Provide description below:

Lunch room/cafeteria/restaurant EUI kWh/ft².yr 0.10
MJ/m².yr 4.00

MISCELLANEOUS

EUI kWh/ft².yr 0.52
MJ/m².yr 20.00

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Office **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Natural Gas			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Unit					
System Present (%)	5%	5%	10%	10%	10%		60%	100%
Eff./COP	75%	85%	77%	1.70	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.18	1.30	0.59	0.33	0.22	1.00	

Peak Heating Load 63.3 W/m² (20.1 Btu/hr.ft²)
Seasonal Heating Load 424 MJ/m².yr (11.0 kWh/ft².yr)
(Tertiary Load)
Sizing Factor 1.00

Electric Fuel Share 80.0% Fossil Fuel Share 20.0%

All Electric EUI	
kWh/ft².yr	9.8
MJ/m².yr	380

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

Natural Gas EUI	
kWh/ft².yr	14.0
MJ/m².yr	542

Market Composite EUI	
kWh/ft².yr	10.6
MJ/m².yr	412

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		WSHP	Reciprocating Chillers		Absorption Chillers		Total
	Standard	HE		Open	DX	W. H.	CW	
System Present (%)		25.0%			75.0%			100.0%
COP	4.7	5.4	3.5	3.5	2.8	0.9	1	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.29	0.29	0.36	1.11	1.00	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water		
Condenser Water		

Setpoint

Chilled Water	7	°C	44.6	°F
Condenser Water	30	°C	86	°F
Supply Air	14.0	°C	57.2	°F

Peak Cooling Load 59 W/m² 19 Btu/hr.ft² 643 ft²/Ton
Seasonal Cooling Load 108.0 MJ/m².yr 2.8 kWh/ft².yr
(Tertiary Load)

Sizing Factor 1.00 Operation (occ. period) 3000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation (Incidence of A/C) 90.0%

Electric Fuel Share 100.0% Gas Fuel Share

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit		
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	1.1
MJ/m².yr	42

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	1.1
MJ/m².yr	42

DOMESTIC HOT WATER

Service Hot Water Plant Type

Fossil Fuel SHW	Std. Tank	HE Tank	Cond. Tnk	Std. Boiler	Cnd. Boil.
System Present (%)	10%				
Eff./COP	0.55	0.70	0.90	0.75	0.90

	Fossil		Elec. Res.
Fuel Share	10%		90%
Blended Efficiency	0.55		0.94

Service Hot Water load (MJ/m².yr) 22.8
(Tertiary Load)

Wetting Use Percentage 90%

All Electric EUI	
kWh/ft².yr	0.6
MJ/m².yr	24

Natural Gas EUI	
kWh/ft².yr	1.1
MJ/m².yr	41

Market Composite EUI	
kWh/ft².yr	0.7
MJ/m².yr	25.9

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Office **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

System Design Air Flow	3.2	L/s.m²	0.64	CFM/ft²	
System Static Pressure CAV	650	Pa	2.6	wg	
System Static Pressure VAV	650	Pa	2.6	wg	
Fan Efficiency	52%				
Fan Motor Efficiency	85%				
Sizing Factor	1.00				
Fan Design Load CAV	4.8	W/m²	0.44	W/ft²	
Fan Design Load VAV	4.8	W/m²	0.44	W/ft²	

Ventilation and Exhaust Fan Operation & Control

	Ventilation Fan		Exhaust Fan	
Control	Fixed	Variable Flow	Fixed	Variable Flow
Incidence of Use	50%	50%	100%	
Operation	Continuous	Scheduled	Continuous	Scheduled
Incidence of Use	50%	50%	50%	50%
Comments:				

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.3	L/s.m²	0.06	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.4	L/s.m²	0.08	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	40%			
Fan Motor Efficiency	80%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.3	W/m²	0.03	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.018	kW/kW	0.06	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	1.05	W/m²	0.10	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.003	L/s.m²	0.005	U.S. gpm/ft²
Pump Head Pressure	100	kPa	33.333333	ft
Pump Efficiency	55%			
Pump Motor Efficiency	90%			
Sizing Factor	1.0			
Pump Connected Load	0.63	W/m²	0.06	W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.003	L/s.m²	0.0037	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure	150	kPa	50	ft		
Pump Efficiency	55%					
Pump Motor Efficiency	90%					
Sizing Factor	0.5					
Pump Connected Load	0.4	W/m²	0.04	W/ft²		

Supply Fan Occ. Period	3500	hrs./year
Supply Fan Unocc. Period	5260	hrs./year
Supply Fan Energy Consumption	19.0	kWh/m².yr
Exhaust Fan Occ. Period	3500	hrs./year
Exhaust Fan Unocc. Period	5260	hrs./year
Exhaust Fan Energy Consumption	1.9	kWh/m².yr
Condenser Pump Energy Consumption	0.8	kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.5	kWh/m².yr
Circulating Pump Yearly Operation	5000	hrs./year
Circulating Pump Energy Consumption	0.8	kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	2.1
	MJ/m².yr	82.5

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Office **Yukon**
Baseline

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **21.5** kWh/ft².yr **832.7** MJ/m².yr **Gas:** **2.9** kWh/ft².yr **112.7** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr	**END USE:**	Electricity		Gas	
				kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	4.2	162.1					
ARCHITECTURAL LIGHTING	1.1	41.3	SPACE HEATING	7.8	304.0	2.8	108.3
SPECIAL PURPOSE LIGHTING			SPACE COOLING	1.0	37.4		
OTHER PLUG LOADS	0.7	27.7	DOMESTIC HOT WATER	0.6	21.8	0.1	4.1
HVAC FANS & PUMPS	2.1	82.5	FOOD SERVICE EQUIPMENT	0.1	3.8	0.0	0.3
REFRIGERATION	0.1	4.0					
MISCELLANEOUS	0.5	20.0					
COMPUTER EQUIPMENT	2.8	107.4					
ELEVATORS	0.1	3.9					
OUTDOOR LIGHTING	0.4	17.0					

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS:	SIZE:	VINTAGE:	REGION:
Food Retail		New	Yukon
Baseline			

CONSTRUCTION

Wall U value (W/m².°C)	0.20	W/m².°C	0.04	Btu/hr.ft² .°F	Typical Building Size	2,788	m²	30,000	ft²
Roof U value (W/m².°C)	0.11	W/m².°C	0.02	Btu/hr.ft² .°F	Typical Footprint (m²)	1,225	m²	13,181	ft²
Glazing U value (W/m².°C)	1.60	W/m².°C	0.28	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	1			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	40%			
Window/Wall Ratio (WIWAR) (%)	0.11				Defined as Exterior Zone				
Shading Coefficient (SC)	0.69				Typical # Stories	1			
					Floor to Floor Height (m)	6.0	m	19.7	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	100%								100%
Min. Air Flow (%)					50%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	45	m²/person	484	ft²/person	%OA	25.12%
Occupancy Schedule Occ. Period	90%					
Occupancy Schedule Unocc. Period						
Fresh Air Requirements or Outside Air	30	L/s.person	64	CFM/person		

Fresh Air Control Type *(enter a 1, 2 or 3)	1	If Fresh Air Control Type = "2" enter % FA. to the right:			
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)		If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation	0.5	L/s.m²	0.10 CFM/ft²
			50%	operation (%)	
Sizing Factor	3				
Total Air Circulation or Design Air Flow	2.65	L/s.m²	0.52	CFM/ft²	
Infiltration Rate	0.70	L/s.m²	0.14	CFM/ft²	

(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)

Separate Make-up air unit (100% OA)		L/s.m²	CFM/ft²
Operation occupied period	50%		
Operation unoccupied period	50%		

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use			100%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters		
Peak Design Cooling Load	278,751	
Peak Zone Sensible Load	112,333	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	5,226	
Total air circulation or Design air	2.65	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic		
DDC/Pneumatic		
All DDC		
Total (should add-up to 100%)		

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	22	°C	71.6	°F	13	°C	55.4	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	22	°C	71.6	°F	16	°C	60.8	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	21	°C	69.8	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning — Changes/Year

Incidence of Annual Room Controls Maintenance

Incidence of Annual HVAC Controls Maintenance

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS:	SIZE:	VINTAGE:	REGION:
Food Retail		New	Yukon
Baseline			

LIGHTING

GENERAL LIGHTING

Light Level	500	Lux	46.5	ft-candles
Floor Fraction (GLFF)	0.45			
Connected Load	11.8	W/m²	1.1	W/ft²

Occ. Period(Hrs./yr.)	5000
Unocc. Period(Hrs./yr.)	3760
Usage During Occupied Period	100%
Usage During Unoccupied Period	20%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	400	500	600	1000			Total
% Distribution		100%					100%
Weighted Average							**500**

	INC	CFL	T12	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)					100%		0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.7	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	85	

EUI	kWh/ft².yr	2.8
	MJ/m².yr	110

SECONDARY LIGHTING

Light Level	500	Lux	46.5	ft-candles
Floor Fraction (ALFF)	0.10			
Connected Load	47.6	W/m²	4.4	W/ft²

Occ. Period(Hrs./yr.)	5000
Unocc. Period(Hrs./yr.)	3760
Usage During Occupied Period	100%
Usage During Unoccupied Period	20%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution		100%					100%
Weighted Average							**500**

	INC	CFL	T12	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)	50%	50%					0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	85	

EUI	kWh/ft².yr	2.5
	MJ/m².yr	99

EUI = Load X Hrs. X SF X GLFF

TERTIARY LIGHTING

Light Level	500.00	Lux	46.5	ft-candles
Floor Fraction (HBLFF)	0.45			
Connected Load	20.6	W/m²	1.9	W/ft²

Floor fraction check: should = 1.00 | 1.00

Occ. Period(Hrs./yr.)	4000
Unocc. Period(Hrs./yr.)	4760
Usage During Occupied Period	100%
Usage During Unoccupied Period	20%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution							
Weighted Average							**500**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)						50%	50%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	85	

EUI	kWh/ft².yr	4.3
	MJ/m².yr	165

TOTAL LIGHTING — Overall LP 10.09 W/m²

EUI TOTAL	kWh/ft².yr	10
	MJ/m².yr	374

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	55	51	100	200	217	
Density (device/occupant)	0.65	0.65	0.01	0.01	0.03	
Connected Load	0.8 W/m²	0.7 W/m²	0.0 W/m²	0.0 W/m²	0.1 W/m²	1.5 W/m²
	0.1 W/ft²	0.1 W/ft²	0.00 W/ft²	0.00 W/ft²	0.01 W/ft²	0.14 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	90%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	50%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2600	4100
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6160	4660
Total end-use load (occupied period)	2.9 W/m²	0.3 W/ft²	to see notes (cells with red indicator in upper right corner, type "SHIFT F2"			
Total end-use load (unocc. period)	1.7 W/m²	0.2 W/ft²				
Usage during occupied period	100%					
Usage during unoccupied period	58%					

Computer Equipment	EUI	kWh/ft².yr	0.88
		MJ/m².yr	33.97
Plug Loads	EUI	kWh/ft².yr	0.84
		MJ/m².yr	32.51

FOOD SERVICE EQUIPMENT

Provide description below: | Gas Fuel Share: 60.0% | Electricity Fuel Share: 40.0%

Natural Gas EUI			All Electric EUI		
EUI	kWh/ft².yr	2.6	EUI	kWh/ft².yr	1.5
	MJ/m².yr	100.0		MJ/m².yr	60.0

REFRIGERATION

Provide description below:

Commercial refrigeration display cases

EUI	kWh/ft².yr	29.0
	MJ/m².yr	1125.0

MISCELLANEOUS

EUI	kWh/ft².yr	0.3
	MJ/m².yr	10

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Food Retail **New** **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Natural Gas			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Units					
System Present (%)	3%	2%	15%		5%		75%	100%
Eff./COP	80%	85%	78%	3.20	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.25	1.18	1.28	0.31	0.33	0.22	1.00	

Peak Heating Load 20.9 W/m² 6.6 Btu/hr.ft²
Seasonal Heating Load 405 MJ/m².yr 10.5 kWh/ft².yr
(Tertiary Load)
Sizing Factor 1.00

Electric Fuel Share 80.0% Fossil Fuel Share 20.0% Other Fuel Share

All Electric EUI	
kWh/ft².yr	10.1
MJ/m².yr	392

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

Natural Gas EUI	
kWh/ft².yr	13.3
MJ/m².yr	513

Market Composite EUI	
kWh/ft².yr	10.7
MJ/m².yr	416

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Reciprocating Chillers		Absorption Chillers		Total
	Standard	HE	Chillers	Open	DX	W. H.	CW	
System Present (%)					100.0%			100.0%
COP	4.7	5.2	4.4	3.2	2.7	0.9	1	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.31	0.37	1.11	1.00	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water		
Condenser Water		

Setpoint

Chilled Water	7	°C	44.6	°F
Condenser Water	30	°C	86	°F
Supply Air	13.0	°C	55.4	°F

Peak Cooling Load 29 W/m² 9 Btu/hr.ft² 1291 ft²/Ton
Seasonal Cooling Load 49.6 MJ/m².yr 1.3 kWh/ft².yr
(Tertiary Load)

Sizing Factor 1.00 Operation (occ. period 4000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation (Incidence of A/C) 75.0%

Electric Fuel Share 100.0% Gas Fuel Share

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit		
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.6
MJ/m².yr	21

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.6
MJ/m².yr	21

DOMESTIC HOT WATER

Service Hot Water Plant Type

Fossil Fuel SHW	Std. Tank	HE Tank	Cond. Tnk	Std. Boiler	Cnd. Boil.
System Present (%)	15%			5%	
Eff./COP	60%	70%	90%	75%	90%

	Fossil		Elec. Res.
Fuel Share	20%		80%
Blended Efficiency	0.64		0.91

Service Hot Water load (MJ/m².yr) 45.5
(Tertiary Load)

Wetting Use Percentage 20%

All Electric EUI	
kWh/ft².yr	1.3
MJ/m².yr	50

Natural Gas EUI	
kWh/ft².yr	1.8
MJ/m².yr	71

Market Composite EUI	
kWh/ft².yr	1.4
MJ/m².yr	54.3

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Food Retail **New** **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

System Design Air Flow	2.7	L/s.m²	0.52	CFM/ft²	
System Static Pressure CAV	600	Pa	2.4	wg	
System Static Pressure VAV	600	Pa	2.4	wg	
Fan Efficiency	60%				
Fan Motor Efficiency	80%				
Sizing Factor	1.00				
Fan Design Load CAV	3.3	W/m²	0.31	W/ft²	
Fan Design Load VAV	3.3	W/m²	0.31	W/ft²	

Ventilation and Exhaust Fan Operation & Control

	Ventilation Fan		Exhaust Fan	
Control	Fixed	Variable Flow	Fixed	Variable Flow
Incidence of Use	100%		100%	
Operation	Continuous	Scheduled	Continuous	Scheduled
Incidence of Use	100%		100%	
Comments:				

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.2	L/s.m²	0.03	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.3	L/s.m²	0.05	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	75%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.4	W/m²	0.03	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.020	kW/kW	0.07	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	0.59	W/m²	0.05	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.002	L/s.m²	0.002	U.S. gpm/ft²
Pump Head Pressure		kPa		ft
Pump Efficiency	50%			
Pump Motor Efficiency	80%			
Sizing Factor	1.0			
Pump Connected Load		W/m²		W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.001	L/s.m²	0.0019	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure		kPa	50	ft		
Pump Efficiency	50%					
Pump Motor Efficiency	80%					
Sizing Factor	0.8					
Pump Connected Load		W/m²		W/ft²		

Supply Fan Occ. Period	5000	hrs./year
Supply Fan Unocc. Period	3760	hrs./year
Supply Fan Energy Consumption	29.1	kWh/m².yr
Exhaust Fan Occ. Period	5000	hrs./year
Exhaust Fan Unocc. Period	3760	hrs./year
Exhaust Fan Energy Consumption	3.1	kWh/m².yr
Condenser Pump Energy Consumption		kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.3	kWh/m².yr
Circulating Pump Yearly Operation	7000	hrs./year
Circulating Pump Energy Consumption		kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	3.0
	MJ/m².yr	116.7

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS:	SIZE:	VINTAGE:	REGION:
Food Retail		New	Yukon
Baseline			

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **54.9** kWh/ft².yr **2,127.9** MJ/m².yr **Gas:** **4.6** kWh/ft².yr **177.0** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	2.8	110.3
SECONDARY LIGHTING	2.5	98.6
TERTIARY LIGHTING	4.3	165.0
OTHER PLUG LOADS	0.8	32.5
HVAC FANS & PUMPS	3.0	116.7
REFRIGERATION	29.0	1,125.0
MISCELLANEOUS	0.3	10.0
COMPUTER EQUIPMENT	0.9	34.0
ELEVATORS		
OUTDOOR LIGHTING	1.1	42.4

END USE:	Electricity		Gas	
	kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
SPACE HEATING	8.1	313.3	2.7	102.7
SPACE COOLING	0.4	16.1		
DOMESTIC HOT WATER	1.0	40.0	0.4	14.3
FOOD SERVICE EQUIPMENT	0.6	24.0	1.5	60.0

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Non-Food Retail **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.20	W/m².°C	0.04	Btu/hr.ft² .°F	Typical Building Size	1,859	m²	20,000	ft²
Roof U value (W/m².°C)	0.11	W/m².°C	0.02	Btu/hr.ft² .°F	Typical Footprint (m²)	1,859	m²	20,000	ft²
Glazing U value (W/m².°C)	1.60	W/m².°C	0.28	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	5			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	45%			
Window/Wall Ratio (WIWAR) (%)	0.10				Defined as Exterior Zone				
Shading Coefficient (SC)	0.78				Typical # Stories	1			
					Floor to Floor Height (m)	6.0	m	19.7	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	100%								100%
Min. Air Flow (%)					50%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	25	m²/person	269	ft²/person	%OA	18.39%	
Occupancy Schedule Occ. Period	90%						
Occupancy Schedule Unocc. Period							
Fresh Air Requirements or Outside Air	15	L/s.person	32	CFM/person			

Fresh Air Control Type *(enter a 1, 2 or 3)	1	If Fresh Air Control Type = "2" enter % FA. to the right:	34%			
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)		If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation	0.5	L/s.m²	0.10	CFM/ft²
			50%	operation (%)		
Sizing Factor	1.4					
Total Air Circulation or Design Air Flow	3.26	L/s.m²	0.64	CFM/ft²		
Infiltration Rate	0.42	L/s.m²	0.08	CFM/ft²		
(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)						

Separate Make-up air unit (100% OA) L/s.m² CFM/ft²
Operation occupied period 50%
Operation unoccupied period 50%

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use			100%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters		
Peak Design Cooling Load	433,075	
Peak Zone Sensible Load	197,282	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	9,178	
Total air circulation or Design air	3.26	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic		
DDC/Pneumatic		
All DDC		
Total (should add-up to 100%)		

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	21	°C	69.8	°F	14	°C	57.2	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	21	°C	69.8	°F	15	°C	59	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	21	°C	69.8	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning Changes/Year

Incidence of Annual Room Controls Maintenance

Incidence of Annual HVAC Controls Maintenance

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Non-Food Retail **Yukon**
Baseline

LIGHTING

GENERAL LIGHTING

Light Level	500	Lux	46.5	ft-candles
Floor Fraction (GLFF)	0.80			
Connected Load	11.8	W/m²	1.1	W/ft²

Occ. Period(Hrs./yr.)	4400
Unocc. Period(Hrs./yr.)	4360
Usage During Occupied Period	95%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	400	500	600	1000			Total
% Distribution	25%	50%	25%				100%
Weighted Average							**500**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)					100%		0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.7	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 4.3
MJ/m².yr 165

ARCHITECTURAL LIGHTING

Light Level	500	Lux	46.5	ft-candles
Floor Fraction (ALFF)	0.10			
Connected Load	34.8	W/m²	3.2	W/ft²

Occ. Period(Hrs./yr.)	4400
Unocc. Period(Hrs./yr.)	4360
Usage During Occupied Period	95%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution	30%	40%	30%				100%
Weighted Average							**500**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)	25%	75%						100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 1.6
MJ/m².yr 61

EUI = Load X Hrs. X SF X GLFF

SPECIAL PURPOSE LIGHTING

Light Level	500.00	Lux	46.5	ft-candles
Floor Fraction (HBLFF)	0.10			
Connected Load	20.1	W/m²	1.9	W/ft²

Floor fraction check: should = 1.00 | 1.00

Occ. Period(Hrs./yr.)	4400
Unocc. Period(Hrs./yr.)	4360
Usage During Occupied Period	95%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution	30%	40%	30%				100%
Weighted Average							**500**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)						50%	50%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 0.9
MJ/m².yr 35

TOTAL LIGHTING Overall LP 12.95 W/m²

EUI TOTAL kWh/ft².yr 6.7
MJ/m².yr 260

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	55	51	100	200	217	
Density (device/occupant)	0.18	0.18	0.01	0.01	0.02	
Connected Load	0.4 W/m²	0.4 W/m²	0.0 W/m²	0.1 W/m²	0.1 W/m²	1.15 W/m²
	0.0 W/ft²	0.0 W/ft²	0.00 W/ft²	0.01 W/ft²	0.01 W/ft²	0.11 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	90%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	50%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2000	4100
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6760	4660

Total end-use load (occupied period) 2.0 W/m² 0.2 W/ft²
Total end-use load (unocc. period) 1.2 W/m² 0.1 W/ft²

to see notes (cells with red indicator in upper right corner, type "SHIFT F2"

Usage during occupied period 100%
Usage during unoccupied period 59%

Computer Equipment EUI kWh/ft².yr 0.54
MJ/m².yr 20.81

Plug Loads EUI kWh/ft².yr 0.64
MJ/m².yr 24.92

FOOD SERVICE EQUIPMENT

Provide description below: Gas Fuel Share: Electricity Fuel Share: 100.0%

Small restaurants, food courts, kitchenettes

Natural Gas EUI: EUI kWh/ft².yr 0.4 / MJ/m².yr 15.0

All Electric EUI: EUI kWh/ft².yr 0.3 / MJ/m².yr 10.0

REFRIGERATION

Provide description below:

EUI kWh/ft².yr 0.4
MJ/m².yr 15.0

MISCELLANEOUS

EUI kWh/ft².yr 0.3
MJ/m².yr 10

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Non-Food Retail **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Natural Gas			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Rooftop					
System Present (%)	3%	2%	15%		10%		70%	100%
Eff./COP	75%	85%	77%	3.20	3.50	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.18	1.30	0.31	0.29	0.22	1.00	

Peak Heating Load	33.6	W/m²	10.7	Btu/hr.ft²
Seasonal Heating Load	358	MJ/m².yr	9.3	kWh/ft².yr
(Tertiary Load)				
Sizing Factor	1.00			

Electric Fuel Share: 80.0% Fossil Fuel Share: 20.0%

All Electric EUI	
kWh/ft².yr	8.5
MJ/m².yr	330

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

Natural Gas EUI	
kWh/ft².yr	12.0
MJ/m².yr	463

Market Composite EUI	
kWh/ft².yr	9.2
MJ/m².yr	357

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Recprocting Chillers		Absorption Chillers		Total
	Standard	HE	Chillers	Open	DX	W. H.	CW	
System Present (%)					100.0%			100.0%
COP	4.8	5.4	4.4	3.7	2.8	0.9	1	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.27	0.36	1.11	1.00	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water		
Condenser Water		

Setpoint

Chilled Water	7	°C	44.6	°F
Condenser Water	30	°C	86	°F
Supply Air	14.0	°C	57.2	°F

Peak Cooling Load	68	W/m²	22	Btu/hr.ft²	554	ft²/Ton
Seasonal Cooling Load	64.1	MJ/m².yr	1.7	kWh/ft².yr		
(Tertiary Load)						

Sizing Factor: 1.00

A/C Saturation (Incidence of A/C): 80.0%

Electric Fuel Share: 100.0% Gas Fuel Share:

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit		
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.5
MJ/m².yr	21

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.5
MJ/m².yr	21

DOMESTIC HOT WATER

Service Hot Water Plant Type

Fossil Fuel SHW	Std. Tank	HE Tank	Cond. Tnk	Std. Boiler	Cnd. Boil.
System Present (%)	10.00%	5.00%			
Eff./COP	0.550	0.700	0.900	0.800	0.900

	Fossil		Elec. Res.
Fuel Share	15%		85%
Blended Efficiency	0.60		0.91

Service Hot Water load (MJ/m².yr) (Tertiary Load): 17.3

Wetting Use Percentage: 90%

All Electric EUI	
kWh/ft².yr	0.5
MJ/m².yr	19

Natural Gas EUI	
kWh/ft².yr	0.7
MJ/m².yr	29

Market Composite EUI	
kWh/ft².yr	0.5
MJ/m².yr	20.5

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Non-Food Retail **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

System Design Air Flow	3.3	L/s.m²	0.64	CFM/ft²	
System Static Pressure CAV	400	Pa	1.6	wg	
System Static Pressure VAV	400	Pa	1.6	wg	
Fan Efficiency	60%				
Fan Motor Efficiency	88%				
Sizing Factor	1.00				
Fan Design Load CAV	2.5	W/m²	0.23	W/ft²	
Fan Design Load VAV	2.5	W/m²	0.23	W/ft²	

Ventilation and Exhaust Fan Operation & Control

	Ventilation Fan		Exhaust Fan	
Control	Fixed	Variable Flow	Fixed	Variable Flow
Incidence of Use	100%		100%	
Operation	Continuous	Scheduled	Continuous	Scheduled
Incidence of Use	75%	25%	50%	50%
Comments:				

EXHAUST FANS

Washroom Exhaust	50	L/s.washroom	106	CFM/washroom
Washroom Exhaust per gross unit area	0.1	L/s.m²	0.01	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.2	L/s.m²	0.03	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	75%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.2	W/m²	0.02	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.020	kW/kW	0.07	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	1.37	W/m²	0.13	W/ft²

Condenser Pump

Pump Design Flow		L/s.KW		U.S. gpm/Ton
Pump Design Flow per unit floor area		L/s.m²		U.S. gpm/ft²
Pump Head Pressure	45	kPa	15	ft
Pump Efficiency	50%			
Pump Motor Efficiency	80%			
Sizing Factor	1.0			
Pump Connected Load		W/m²		W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.003	L/s.m²	0.0043	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure		kPa		ft		
Pump Efficiency	50%					
Pump Motor Efficiency	80%					
Sizing Factor	0.8					
Pump Connected Load		W/m²		W/ft²		

Supply Fan Occ. Period	5500	hrs./year
Supply Fan Unocc. Period	3260	hrs./year
Supply Fan Energy Consumption	19.6	kWh/m².yr
Exhaust Fan Occ. Period	5500	hrs./year
Exhaust Fan Unocc. Period	3260	hrs./year
Exhaust Fan Energy Consumption	1.5	kWh/m².yr
Condenser Pump Energy Consumption		kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.3	kWh/m².yr
Circulating Pump Yearly Operation	7000	hrs./year
Circulating Pump Energy Consumption		kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	2.0
	MJ/m².yr	76.9

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Non-Food Retail **Yukon**
Baseline

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **19.8** kWh/ft².yr **765.6** MJ/m².yr **Gas:** **2.5** kWh/ft².yr **96.9** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	4.3	164.8
ARCHITECTURAL LIGHTING	1.6	60.6
SPECIAL PURPOSE LIGHTING	0.9	34.9
OTHER PLUG LOADS	0.6	24.9
HVAC FANS & PUMPS	2.0	76.9
REFRIGERATION	0.4	15.0
MISCELLANEOUS	0.3	10.0
COMPUTER EQUIPMENT	0.5	20.8
ELEVATORS/ESCALATORS		
OUTDOOR LIGHTING	1.3	50.9

END USE:	Electricity		Gas	
	kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
SPACE HEATING	6.8	264.0	2.4	92.6
SPACE COOLING	0.4	16.6		
DOMESTIC HOT WATER	0.4	16.2	0.1	4.3
FOOD SERVICE EQUIPMENT	0.3	10.0		

Fuel Specific EUIs for Heating Cooling & DHW

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Hotel/Motel **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.20	W/m².°C	0.04	Btu/hr.ft² .°F	Typical Building Size	1,859	m²	20,000	ft²
Roof U value (W/m².°C)	0.11	W/m².°C	0.02	Btu/hr.ft² .°F	Typical Footprint (m²)	1,859	m²	20,000	ft²
Glazing U value (W/m².°C)	1.60	W/m².°C	0.28	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	4			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	45%			
Window/Wall Ratio (WIWAR) (%)	0.30				Defined as Exterior Zone				
Shading Coefficient (SC)	0.65				Typical # Stories	1			
					Floor to Floor Height (m)	3.7	m	12.0	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	FCoils	IU	100% O.A	TOTAL
System Present (%)	90%				10%				100%
Min. Air Flow (%)					60%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	50	m²/person	538	ft²/person	%OA	9.77%	
Occupancy Schedule Occ. Period	50%						
Occupancy Schedule Unocc. Period	80%						
Fresh Air Requirements or Outside Air	10	L/s.person	21	CFM/person			

Fresh Air Control Type *(enter a 1, 2 or 3)	1	If Fresh Air Control Type = "2" enter % FA. to the right:	15%			
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)		If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation	0.5	L/s.m²	0.10	CFM/ft²
			50%	operation (%)		
Sizing Factor	1.2					
Total Air Circulation or Design Air Flow	2.05	L/s.m²	0.40	CFM/ft²		
Infiltration Rate	0.70	L/s.m²	0.14	CFM/ft²		
(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)						

Separate Make-up air unit (100% OA) L/s.m² CFM/ft²
Operation occupied period 50%
Operation unoccupied period 50%

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use			100%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters		
Peak Design Cooling Load	222,133	
Peak Zone Sensible Load	144,483	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	6,721	
Total air circulation or Design air	2.05	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic		
DDC/Pneumatic		
All DDC		
Total (should add-up to 100%)		

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	22	°C	71.6	°F	13	°C	55.4	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	21	°C	69.8	°F	15	°C	59	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	21	°C	69.8	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning Changes/Year

Incidence of Annual Room Controls Maintenance

Incidence of Annual HVAC Controls Maintenance

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Hotel/Motel **Yukon**
Baseline

LIGHTING

GENERAL LIGHTING

Light Level	450	Lux	41.8	ft-candles
Floor Fraction (GLFF)	0.25			
Connected Load	11.6	W/m²	1.1	W/ft²

Occ. Period(Hrs./yr.)	4400
Unocc. Period(Hrs./yr.)	4360
Usage During Occupied Period	85%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	200	300	400	500			Total
% Distribution			50%	50%			100%
Weighted Average							**450**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)					100%		0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 1.2
MJ/m².yr 46

SECONDARY LIGHTING

Light Level	125	Lux	11.6	ft-candles
Floor Fraction (ALFF)	0.75			
Connected Load	8.7	W/m²	0.8	W/ft²

Occ. Period(Hrs./yr.)	2500
Unocc. Period(Hrs./yr.)	6260
Usage During Occupied Period	50%
Usage During Unoccupied Period	25%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	100	125	150	300			Total
% Distribution	25%	50%	25%				100%
Weighted Average							**125**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)	25%	75%					0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 1.7
MJ/m².yr 66

EUI = Load X Hrs. X SF X GLFF

TERTIARY LIGHTING

Light Level		Lux		ft-candles
Floor Fraction (HBLFF)				
Connected Load		W/m²		W/ft²

Floor fraction check: should = 1.00 — 1.00

Occ. Period(Hrs./yr.)	4000
Unocc. Period(Hrs./yr.)	4760
Usage During Occupied Period	0%
Usage During Unoccupied Period	100%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)							Total
% Distribution							
Weighted Average							

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)		0%				100%	0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr
MJ/m².yr

TOTAL LIGHTING Overall LP 9.43 W/m² EUI TOTAL kWh/ft².yr 2.9
MJ/m².yr 112

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	55	51	100	200	217	
Density (device/occupant)	0.3	0.3	0.05	0.033	0.02	
Connected Load	0.3 W/m²	0.3 W/m²	0.1 W/m²	0.1 W/m²	0.1 W/m²	1.5 W/m²
	0.0 W/ft²	0.0 W/ft²	0.01 W/ft²	0.01 W/ft²	0.01 W/ft²	0.14 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	70%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	25%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2500	3000
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6260	5760

Total end-use load (occupied period) 1.9 W/m² 0.2 W/ft² to see notes (cells with red indicator in upper right corner, type "SHIFT F2"
Total end-use load (unocc. period) 0.9 W/m² 0.1 W/ft²

Usage during occupied period 100%
Usage during unoccupied period 48%

Computer Equipment EUI kWh/ft².yr 0.51
MJ/m².yr 19.79

Plug Loads EUI kWh/ft².yr 0.49
MJ/m².yr 19.12

FOOD SERVICE EQUIPMENT

Provide description below: Gas Fuel Share: 75.0% Electricity Fuel Share: 25.0%

	Natural Gas EUI		All Electric EUI	
Kitchen services	EUI kWh/ft².yr	2.6	EUI kWh/ft².yr	1.3
	MJ/m².yr	100.0	MJ/m².yr	50.0

REFRIGERATION

Provide description below:
Walk-in coolers/freezers, reach-in coolers/freezers, refrigerated buffet cases

EUI kWh/ft².yr 0.8
MJ/m².yr 30.0

MISCELLANEOUS

EUI kWh/ft².yr 0.5
MJ/m².yr 20

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Hotel/Motel **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Natural Gas			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Units					
System Present (%)		3%	2%				95%	100%
Eff./COP	75%	85%	75%	3.20	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.18	1.33	0.31	0.33	0.22	1.00	

Peak Heating Load	50.1	W/m²	15.9	Btu/hr.ft²
Seasonal Heating Load	338	MJ/m².yr	8.7	kWh/ft².yr
(Tertiary Load)				
Sizing Factor	1.00			

Electric Fuel Share: 95.0% Fossil Fuel Share: 5.0%

All Electric EUI	
kWh/ft².yr	8.7
MJ/m².yr	338

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

Natural Gas EUI	
kWh/ft².yr	10.8
MJ/m².yr	419

Market Composite EUI	
kWh/ft².yr	8.8
MJ/m².yr	342

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Reciprocating Chillers		Absorption Chillers		Total
	Standard	HE	Chillers	Open	DX	W. H.	CW	
System Present (%)		20.0%			80.0%			100.0%
COP	4.7	5.4	4.4	3.5	2.9	0.9	1	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.29	0.34	1.11	1.00	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water		
Condenser Water		

Setpoint

Chilled Water	7	°C	44.6	°F
Condenser Water	30	°C	86	°F
Supply Air	13.0	°C	55.4	°F

Peak Cooling Load	35	W/m²	11	Btu/hr.ft²	1080	ft²/Ton
Seasonal Cooling Load	52.3	MJ/m².yr	1.3	kWh/ft².yr		
(Tertiary Load)						

Sizing Factor: 1.00 Operation (occ. perio: 4000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation (Incidence of A/C): 75.0%

Electric Fuel Share: 100.0% Gas Fuel Share:

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit		
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.6
MJ/m².yr	22

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.6
MJ/m².yr	22

DOMESTIC HOT WATER

Service Hot Water Plant Type

Fossil Fuel SHW	Std. Tank	HE Tank	Cond. Tnk	Std. Boiler	Cnd. Boil.
System Present (%)		5%			
Eff./COP	55%	70%	90%	75%	90%

	Fossil		Elec. Res.
Fuel Share	5%		95%
Blended Efficiency	0.70		0.91

Service Hot Water load (MJ/m².yr) (Tertiary Load): 236.6

Wetting Use Percentage: 90%

All Electric EUI	
kWh/ft².yr	6.7
MJ/m².yr	260

Natural Gas EUI	
kWh/ft².yr	8.7
MJ/m².yr	338

Market Composite EUI	
kWh/ft².yr	6.8
MJ/m².yr	263.9

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Hotel/Motel **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

System Design Air Flow	2.0	L/s.m²	0.40	CFM/ft²	
System Static Pressure CAV	300	Pa	1.2	wg	
System Static Pressure VAV	300	Pa	1.2	wg	
Fan Efficiency	45%				
Fan Motor Efficiency	70%				
Sizing Factor	1.00				
Fan Design Load CAV	2.0	W/m²	0.18	W/ft²	
Fan Design Load VAV	2.0	W/m²	0.18	W/ft²	

Ventilation and Exhaust Fan Operation & Control

	Ventilation Fan		Exhaust Fan	
Control	Fixed	Variable Flow	Fixed	Variable Flow
Incidence of Use	100%		100%	
Operation	Continuous	Scheduled	Continuous	Scheduled
Incidence of Use	60%	40%	100%	
Comments:				

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.1	L/s.m²	0.02	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.2	L/s.m²	0.04	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	75%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.3	W/m²	0.03	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.022	kW/kW	0.08	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	0.76	W/m²	0.07	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.002	L/s.m²	0.003	U.S. gpm/ft²
Pump Head Pressure		kPa		ft
Pump Efficiency	50%			
Pump Motor Efficiency	80%			
Sizing Factor	1.0			
Pump Connected Load		W/m²		W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.002	L/s.m²	0.0022	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure	100	kPa	33	ft		
Pump Efficiency	50%					
Pump Motor Efficiency	80%					
Sizing Factor	0.8					
Pump Connected Load	0.3	W/m²	0.03	W/ft²		

Supply Fan Occ. Period	3500	hrs./year
Supply Fan Unocc. Period	5260	hrs./year
Supply Fan Energy Consumption	13.0	kWh/m².yr
Exhaust Fan Occ. Period	3500	hrs./year
Exhaust Fan Unocc. Period	5260	hrs./year
Exhaust Fan Energy Consumption	2.4	kWh/m².yr
Condenser Pump Energy Consumption		kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.4	kWh/m².yr
Circulating Pump Yearly Operation	7000	hrs./year
Circulating Pump Energy Consumption	0.1	kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	1.5
	MJ/m².yr	57.1

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Hotel/Motel **Yukon**
Baseline

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **22.6** kWh/ft².yr **876.0** MJ/m².yr **Gas:** **2.9** kWh/ft².yr **112.8** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	1.2	46.0
SECONDARY LIGHTING	1.7	66.1
TERTIARY LIGHTING		
OTHER PLUG LOADS	0.5	19.1
HVAC FANS & PUMPS	1.5	57.1
REFRIGERATION	0.8	30.0
MISCELLANEOUS	0.5	20.0
COMPUTER EQUIPMENT	0.5	19.8
ELEVATORS	0.1	3.9
OUTDOOR LIGHTING	0.4	17.0

END USE:	Electricity		Gas	
	kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
SPACE HEATING	8.3	321.0	0.5	20.9
SPACE COOLING	0.4	16.5		
DOMESTIC HOT WATER	6.4	247.0	0.4	16.9
FOOD SERVICE EQUIPMENT	0.3	12.5	1.9	75.0

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Health Care **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.20	W/m².°C	0.04	Btu/hr.ft² .°F	Typical Building Size	8,829	m²	95,000	ft²
Roof U value (W/m².°C)	0.11	W/m².°C	0.02	Btu/hr.ft² .°F	Typical Footprint (m²)	1,400	m²	15,064	ft²
Glazing U value (W/m².°C)	1.60	W/m².°C	0.28	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	2			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	45%			
Window/Wall Ratio (WIWAR) (%)	0.20				Defined as Exterior Zone				
Shading Coefficient (SC)	0.65				Typical # Stories	3			
					Floor to Floor Height (m)	4.3	m	14.0	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	FCoils	IU	100% O.A	TOTAL
System Present (%)	50%				50%				100%
Min. Air Flow (%)					60%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	30	m²/person	323	ft²/person	%OA	26.86%	
Occupancy Schedule Occ. Period	90%						
Occupancy Schedule Unocc. Period	75%						
Fresh Air Requirements or Outside Air	55	L/s.person	117	CFM/person			

Fresh Air Control Type *(enter a 1, 2 or 3) 1
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)
If Fresh Air Control Type = "2" enter % FA. to the right: 15%
If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation 0.5 L/s.m² 0.10 CFM/ft²
50% operation (%)

Sizing Factor 6
Total Air Circulation or Design Air Flow 6.82 L/s.m² 1.34 CFM/ft²

Separate Make-up air unit (100% OA) L/s.m² CFM/ft²

Infiltration Rate 0.70 L/s.m² 0.14 CFM/ft²
(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)

Operation occupied period 50%
Operation unoccupied period 50%

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use			100%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters

Peak Design Cooling Load	########	
Peak Zone Sensible Load	457,402	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R.H	13.2	ft³/lbm
Design CFM	21,278	
Total air circulation or Design air flo	6.82	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic		
DDC/Pneumatic		
All DDC		
Total (should add-up to 100%)		

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	24	°C	75.2	°F	14	°C	57.2	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	24	°C	75.2	°F	16.5	°C	61.7	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	24	°C	75.2	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning Changes/Year

Incidence of Annual Room Controls Maintenance

Incidence of Annual HVAC Controls Maintenance

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Health Care **Yukon**
Baseline

LIGHTING

GENERAL LIGHTING

Light Level	450	Lux	41.8	ft-candles
Floor Fraction (GLFF)	0.90			
Connected Load	11.6	W/m²	1.1	W/ft²

Occ. Period(Hrs./yr.)	4500
Unocc. Period(Hrs./yr.)	4260
Usage During Occupied Period	90%
Usage During Unoccupied Period	30%

Light Level (Lux)	200	300	400	500				Total
% Distribution			50%	50%				100%
Weighted Average								**450**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)					100%		0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval years

Relamping Strategy & Incidence of Practice: Group | Spot

EUI kWh/ft².yr 5.2
MJ/m².yr 201

SECONDARY LIGHTING

Light Level	350	Lux	32.5	ft-candles
Floor Fraction (ALFF)	0.10			
Connected Load	15.4	W/m²	1.4	W/ft²

Occ. Period(Hrs./yr.)	8760
Unocc. Period(Hrs./yr.)	
Usage During Occupied Period	85%
Usage During Unoccupied Period	

Light Level (Lux)	200	300	400	500				Total
% Distribution		50%	50%					100%
Weighted Average								**350**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)		100%					0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval years

Relamping Strategy & Incidence of Practice: Group | Spot

EUI kWh/ft².yr 1.1
MJ/m².yr 41

EUI = Load X Hrs. X SF X GLFF

TERTIARY LIGHTING

Light Level	250.00	Lux	23.2	ft-candles
Floor Fraction (HBLFF)				
Connected Load	8.2	W/m²	0.8	W/ft²

Floor fraction check: should = 1.00 | 1.00

Occ. Period(Hrs./yr.)	4000
Unocc. Period(Hrs./yr.)	4760
Usage During Occupied Period	100%
Usage During Unoccupied Period	100%

Light Level (Lux)	200	300	500	700				Total
% Distribution	50%	50%						100%
Weighted Average								**250**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)	5%	5%			90%		0%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval years

Relamping Strategy & Incidence of Practice: Group | Spot

EUI kWh/ft².yr
MJ/m².yr

TOTAL LIGHTING Overall LPD 12.00 W/m²

EUI TOTAL kWh/ft².yr 6.2
MJ/m².yr 242

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	54.55	51	100	200	217	
Density (device/occupant)	0.48	0.48	0.02	0.02	0.04	
Connected Load	0.9 W/m²	0.8 W/m²	0.1 W/m²	0.1 W/m²	0.3 W/m²	3.85 W/m²
	0.1 W/ft²	0.1 W/ft²	0.01 W/ft²	0.01 W/ft²	0.02 W/ft²	0.36 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	90%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	25%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2600	4100
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6160	4660

Total end-use load (occupied period) 5.4 W/m² 0.5 W/ft²
Total end-use load (unocc. period) 2.2 W/m² 0.2 W/ft²

to see notes (cells with red indicator in upper right corner, type "SHIFT F2"

Usage during occupied period 100%
Usage during unoccupied period 40%

Computer Equipment EUI kWh/ft².yr 1.11
MJ/m².yr 43.10

Plug Loads EUI kWh/ft².yr 1.74
MJ/m².yr 67.29

FOOD SERVICE EQUIPMENT

Provide description below: Gas Fuel Share: 75.0% Electricity Fuel Share: 25.0%

	Natural Gas EUI		All Electric EUI	
Commercial food services	EUI kWh/ft².yr	3.1	EUI kWh/ft².yr	2.1
	MJ/m².yr	120.0	MJ/m².yr	80.0

REFRIGERATION

Provide description below:
Walk-in coolers/freezers, reach-in coolers/freezers, refrigerated buffet cases

EUI kWh/ft².yr 0.4
MJ/m².yr 15.0

MISCELLANEOUS

EUI kWh/ft².yr 0.3
MJ/m².yr 10

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Health Care **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Natural Gas			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Unit					
System Present (%)	5%	20%	15%		5%		55%	100%
Eff./COP	75%	85%	78%	1.70	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.18	1.28	0.59	0.33	0.22	1.00	

Peak Heating Load 33.7 W/m² 10.7 Btu/hr.ft²
Seasonal Heating Load 920 MJ/m².yr 23.7 kWh/ft².yr
(Tertiary Load)
Sizing Factor 1.00

Electric Fuel Share 60.0% Fossil Fuel Share 40.0%

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

All Electric EUI	
kWh/ft².yr	22.9
MJ/m².yr	887

Natural Gas EUI	
kWh/ft².yr	29.3
MJ/m².yr	1136

Market Composite EUI	
kWh/ft².yr	25.5
MJ/m².yr	987

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Reciprocating Chillers		Absorption Chillers		Total
	Standard	HE	Chillers	Open	DX	W. H.	CW	
System Present (%)		75.0%			25.0%			100.0%
COP	4.7	6.1	4.4	3.6	2.7	0.9	1	
Performance (1 / COP) (kW/kW)	0.21	0.16	0.23	0.28	0.37	1.11	1.00	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water		
Condenser Water		

Setpoint

Chilled Water	7	°C	44.6	°F
Condenser Water	30	°C	86	°F
Supply Air	14.0	°C	57.2	°F

Peak Cooling Load 66 W/m² 21 Btu/hr.ft² 570 ft²/Ton
Seasonal Cooling Load 56.2 MJ/m².yr 1.5 kWh/ft².yr
(Tertiary Load)

Sizing Factor 1.00 Operation (occ. perio 3000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation 75.0%
(Incidence of A/C)

Electric Fuel Share 100.0% Gas Fuel Share

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit		
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.5
MJ/m².yr	21

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.5
MJ/m².yr	21

DOMESTIC HOT WATER

Service Hot Water Plant Type

	Fossil Fuel SHW	Std. Tank	HE Tank	Cond. Tnk	Std. Boiler	Cnd. Boil.
System Present (%)			5.00%		25.00%	10.00%
Eff./COP	60%	75%	90%	85%	90%	

	Fossil		Elec. Res.
Fuel Share	40%		60%
Blended Efficiency	0.85		0.91

Service Hot Water load (MJ/m².yr) 118.3
(Tertiary Load)

Wetting Use Percentage 90%

All Electric EUI	
kWh/ft².yr	3.4
MJ/m².yr	130

Natural Gas EUI	
kWh/ft².yr	3.6
MJ/m².yr	139

Market Composite EUI	
kWh/ft².yr	3.5
MJ/m².yr	133.7

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Health Care **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

System Design Air Flow	6.8	L/s.m²	1.34	CFM/ft²	
System Static Pressure CAV	750	Pa	3.0	wg	
System Static Pressure VAV	750	Pa	3.0	wg	
Fan Efficiency	55%				
Fan Motor Efficiency	89%				
Sizing Factor	1.00				
Fan Design Load CAV	10.5	W/m²	0.97	W/ft²	
Fan Design Load VAV	10.5	W/m²	0.97	W/ft²	

Ventilation and Exhaust Fan Operation & Control

	Ventilation Fan		Exhaust Fan	
Control	Fixed	Variable Flow	Fixed	Variable Flow
Incidence of Use	80%	20%	100%	
Operation	Continuous	Scheduled	Continuous	Scheduled
Incidence of Use	75%	25%	75%	25%

Comments:

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.1	L/s.m²	0.03	CFM/ft²
Other Exhaust (Smoking/Conference)	0.5	L/s.m²	0.10	CFM/ft²
Total Building Exhaust	0.6	L/s.m²	0.13	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	75%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.9	W/m²	0.08	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.017	kW/kW	0.06	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	1.09	W/m²	0.10	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.004	L/s.m²	0.005	U.S. gpm/ft²
Pump Head Pressure	100	kPa	33	ft
Pump Efficiency	60%			
Pump Motor Efficiency	88%			
Sizing Factor	1.0			
Pump Connected Load	0.67	W/m²	0.06	W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.003	L/s.m²	0.0042	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure	100	kPa	33	ft		
Pump Efficiency	60%					
Pump Motor Efficiency	88%					
Sizing Factor	0.8					
Pump Connected Load	0.4	W/m²	0.04	W/ft²		

Supply Fan Occ. Period	4000	hrs./year
Supply Fan Unocc. Period	4760	hrs./year
Supply Fan Energy Consumption	68.0	kWh/m².yr
Exhaust Fan Occ. Period	4000	hrs./year
Exhaust Fan Unocc. Period	4760	hrs./year
Exhaust Fan Energy Consumption	6.5	kWh/m².yr
Condenser Pump Energy Consumption	0.7	kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.3	kWh/m².yr
Circulating Pump Yearly Operation	7000	hrs./year
Circulating Pump Energy Consumption	1.4	kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	7.1
	MJ/m².yr	276.6

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Health Care **Yukon**
Baseline

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **34.6** kWh/ft².yr **1,339.4** MJ/m².yr **Gas:** **15.5** kWh/ft².yr **600.3** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	5.2	200.7
SECONDARY LIGHTING	1.1	41.2
TERTIARY LIGHTING		
OTHER PLUG LOADS	1.7	67.3
HVAC FANS & PUMPS	7.1	276.6
REFRIGERATION	0.4	15.0
MISCELLANEOUS	0.3	10.0
COMPUTER EQUIPMENT	1.1	43.1
ELEVATORS	0.2	7.7
OUTDOOR LIGHTING	0.8	32.2

END USE:	Electricity		Gas	
	kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
SPACE HEATING	13.7	532.0	11.7	454.6
SPACE COOLING	0.4	15.6		
DOMESTIC HOT WATER	2.0	78.0	1.4	55.7
FOOD SERVICE EQUIPMENT	0.5	20.0	2.3	90.0

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Education **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.20	W/m².°C	0.04	Btu/hr.ft² .°F	Typical Building Size	4,000	m²	43,040	ft²
Roof U value (W/m².°C)	0.11	W/m².°C	0.02	Btu/hr.ft² .°F	Typical Footprint (m²)	2,000	m²	21,520	ft²
Glazing U value (W/m².°C)	1.60	W/m².°C	0.28	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	2			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	50%			
Window/Wall Ratio (WIWAR) (%)	0.28				Defined as Exterior Zone				
Shading Coefficient (SC)	0.68				Typical # Stories	2			
					Floor to Floor Height (m)	3.5	m	11.5	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	100%								100%
Min. Air Flow (%)									

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	14	m²/person	151	ft²/person	%OA	20.36%
Occupancy Schedule Occ. Period	90%					
Occupancy Schedule Unocc. Period						
Fresh Air Requirements or Outside Air	6	L/s.person	13	CFM/person		

Fresh Air Control Type *(enter a 1, 2 or 3) 1
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)

If Fresh Air Control Type = "2" enter % FA. to the right: 10%
If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation 0.5 L/s.m² 0.10 CFM/ft²
50% operation (%)

Sizing Factor 1.1
Total Air Circulation or Design Air Flow 2.10 L/s.m² 0.41 CFM/ft²

Separate Make-up air unit (100% OA) L/s.m² CFM/ft²
Operation occupied period 50%
Operation unoccupied period 50%

Infiltration Rate 0.30 L/s.m² 0.06 CFM/ft²
(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use	20%		80%		100%
Switchover Point		KJ/kg.	20	°C	
		Btu/lbm	68	°F	

Summary of Design Parameters		
Peak Design Cooling Load	750,400	
Peak Zone Sensible Load	348,610	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	16,217	
Total air circulation or Design air	2.10	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic	35%	90%
DDC/Pneumatic	55%	
All DDC	10%	10%
Total (should add-up to 100%)	100%	100%

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	24	°C	75.2	°F	14	°C	57.2	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	22	°C	71.6	°F	17	°C	62.6	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	22	°C	71.6	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning Changes/Year 4

Incidence of Annual Room Controls Maintenance 100.0%

Incidence of Annual HVAC Controls Maintenance 100%

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	100%
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	100%
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Education **Yukon**
Baseline

LIGHTING

GENERAL (CLASSROOM) LIGHTING

Light Level	420	Lux	39.0	ft-candles
Floor Fraction (GLFF)	0.80			
Connected Load	9.9	W/m²	0.9	W/ft²

Occ. Period(Hrs./yr.)	2000
Unocc. Period(Hrs./yr.)	6760
Usage During Occupied Period	90%
Usage During Unoccupied Period	10%

Light Level (Lux)	300	500	700	1000			Total
% Distribution	40%	60%					100%
Weighted Average							**420**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)					100%			100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	82	88	65	90	

Fixture Cleaning:		
Incidence of Practice		
Interval		years

Relamping Strategy & Incidence of Practice	Group	Spot

EUI kWh/ft².yr 1.8
MJ/m².yr 71

ARCHITECTURAL LIGHTING

Light Level	370	Lux	34.4	ft-candles
Floor Fraction (ALFF)	0.10			
Connected Load	16.3	W/m²	1.5	W/ft²

Occ. Period(Hrs./yr.)	2000
Unocc. Period(Hrs./yr.)	6760
Usage During Occupied Period	90%
Usage During Unoccupied Period	10%

Light Level (Lux)	300	500	700	1000			Total
% Distribution	65%	35%					100%
Weighted Average							**370**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)		100%						100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	82	88	65	90	

Fixture Cleaning:		
Incidence of Practice		
Interval		years

Relamping Strategy & Incidence of Practice	Group	Spot

EUI kWh/ft².yr 0.4
MJ/m².yr 14

EUI = Load X Hrs. X SF X GLFF

HIGH BAY (GYMNASIUM) LIGHTING

Light Level	300.00	Lux	27.9	ft-candles
Floor Fraction (HBLFF)	0.10			
Connected Load	13.0	W/m²	1.2	W/ft²

Floor fraction check: should = 1.00 | 1.00

Occ. Period(Hrs./yr.)	2000
Unocc. Period(Hrs./yr.)	6760
Usage During Occupied Period	90%
Usage During Unoccupied Period	10%

Light Level (Lux)	300	500	700	1000			Total
% Distribution	100%						100%
Weighted Average							**300**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)						75%	25%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:		
Incidence of Practice		
Interval		years

Relamping Strategy & Incidence of Practice	Group	Spot

EUI kWh/ft².yr 0.3
MJ/m².yr 12

TOTAL LIGHTING Overall LP 9.58 W/m²

EUI TOTAL kWh/ft².yr 3
MJ/m².yr 97

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	55	51	100	200	217	
Density (device/occupant)	0.16	0.16	0.02	0.02	0.01	
Connected Load	0.6 W/m²	0.6 W/m²	0.1 W/m²	0.3 W/m²	0.1 W/m²	1 W/m²
	0.1 W/ft²	0.1 W/ft²	0.01 W/ft²	0.03 W/ft²	0.01 W/ft²	0.09 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	100%
Diversity Unoccupied Period	25%	25%	25%	25%	100%	50%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2000	2000
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6760	6760

Total end-use load (occupied period)	2.6 W/m²	0.2 W/ft²
Total end-use load (unocc. period)	1.0 W/m²	0.1 W/ft²

Usage during occupied period	100%
Usage during unoccupied period	40%

Computer Equipment EUI kWh/ft².yr 0.61
MJ/m².yr 23.80

Plug Loads EUI kWh/ft².yr 0.50
MJ/m².yr 19.37

FOOD SERVICE EQUIPMENT

Provide description below: Gas Fuel Share: 50.0% Electricity Fuel Share: 50.0%

	Natural Gas EUI		All Electric EUI	
Cooking	EUI kWh/ft².yr	0.8	EUI kWh/ft².yr	0.5
	MJ/m².yr	30.0	MJ/m².yr	20.0

REFRIGERATION

Provide description below:

Coolers, freezers, pop machines — EUI kWh/ft².yr 0.1
MJ/m².yr 5.0

MISCELLANEOUS

EUI kWh/ft².yr 0.1
MJ/m².yr 5

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Education **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Fossil Fuel			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Unit					
System Present (%)		35%			25%		40%	100%
Eff./COP	75%	85%	75%	1.70	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.18	1.33	0.59	0.33	0.22	1.00	

100%

Peak Heating Load	38.7	W/m²	12.3	Btu/hr.ft²
Seasonal Heating Load	386	MJ/m².yr	10.0	kWh/ft².yr
(Tertiary Load)				
Sizing Factor	1.00			

Electric Fuel Share 65.0% Gas Fuel Share 35.0%

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

All Electric EUI	
kWh/ft².yr	10.0
MJ/m².yr	386

Natural Gas EUI	
kWh/ft².yr	8.5
MJ/m².yr	329

Market Composite EUI	
kWh/ft².yr	9.1
MJ/m².yr	352

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Recprocting Chillers		Gas Cooling		Total
	Standard	HE	Chillers	Open	DX	Absorption	Engine	
System Present (%)	10.0%			15.0%	75.0%			100.0%
COP	4.7	5.4	4.4	3.6	2.6	0.9	1.8	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.28	0.38	1.11	0.56	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water	100%	
Condenser Water	100%	

Setpoint

Chilled Water	6	°C	42.8	°F
Condenser Water	35	°C	95	°F
Supply Air	14.0	°C	57.2	°F

Peak Cooling Load	55	W/m²	17	Btu/hr.ft²	688 ft²/Ton
Seasonal Cooling Load	77.5	MJ/m².yr	2.0	kWh/ft².yr	
(Tertiary Load)					

Sizing Factor 1.00 Operation (occ. period) 3000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation (Incidence of A/C) 5.0%

Electric Fuel Share 100.0% Gas Fuel Share

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit	100%	2
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.9
MJ/m².yr	35

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.9
MJ/m².yr	35

DOMESTIC HOT WATER

Service Hot Water Plant Type

	Standard Boiler	Tank Heater	Tank Heater	Cnd. Boiler	Water Heater
Fossil Fuel SHW					
System Present (%)	5%		20%		
Eff./COP	75%		70%	90%	90%

	Fossil	Elec. Res.
Fuel Share	25%	75%
Blended Efficiency	0.71	0.91

100%

Service Hot Water load (MJ/m².yr) 40.0
(Tertiary Load)

Wetting Use Percentage 80%

All Electric EUI	
kWh/ft².yr	1.1
MJ/m².yr	44

All Natural Gas EUI	
kWh/ft².yr	1.5
MJ/m².yr	56

Market Composite EUI	
kWh/ft².yr	1.2
MJ/m².yr	47.1

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Education **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

System Design Air Flow	2.1	L/s.m²	0.41	CFM/ft²	
System Static Pressure CAV	500	Pa	2.0	wg	
System Static Pressure VAV	500	Pa	2.0	wg	
Fan Efficiency	55%				
Fan Motor Efficiency	85%				
Sizing Factor	1.00				
Fan Design Load CAV	2.3	W/m²	0.21	W/ft²	
Fan Design Load VAV	2.3	W/m²	0.21	W/ft²	

Ventilation and Exhaust Fan Operation & Control

	Ventilation Fan		Exhaust Fan	
Control	Fixed	Variable Flow	Fixed	Variable Flow
Incidence of Use	100%		100%	
Operation	Continous	Scheduled	Continuous	Scheduled
Incidence of Use	20%	80%	20%	80%
Comments:				

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.1	L/s.m²	0.02	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.2	L/s.m²	0.04	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	75%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.3	W/m²	0.02	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.003	kW/kW	0.01	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	0.16	W/m²	0.02	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.003	L/s.m²	0.004	U.S. gpm/ft²
Pump Head Pressure		kPa		ft
Pump Efficiency	60%			
Pump Motor Efficiency	85%			
Sizing Factor	1.0			
Pump Connected Load		W/m²		W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.002	L/s.m²	0.0035	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure	30	kPa	10	ft		
Pump Efficiency	60%					
Pump Motor Efficiency	85%					
Sizing Factor	1.0					
Pump Connected Load	0.1	W/m²	0.01	W/ft²		

Supply Fan Occ. Period	2200	hrs./year
Supply Fan Unocc. Period	6560	hrs./year
Supply Fan Energy Consumption	7.9	kWh/m².yr
Exhaust Fan Occ. Period	2200	hrs./year
Exhaust Fan Unocc. Period	6560	hrs./year
Exhaust Fan Energy Consumption	0.9	kWh/m².yr
Condenser Pump Energy Consumption		kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.1	kWh/m².yr
Circulating Pump Yearly Operation	7000	hrs./year
Circulating Pump Energy Consumption	0.6	kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	0.9
	MJ/m².yr	34.2

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Education **Yukon**
Baseline

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **12.7** kWh/ft².yr **493.6** MJ/m².yr **Gas:** **3.7** kWh/ft².yr **144.1** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr
GENERAL (CLASSROOM) LIGHTIN(	1.8	70.9
ARCHITECTURAL LIGHTING	0.4	14.5
HIGH BAY (GYMNASIUM) LIGHTINC	0.3	11.6
OTHER PLUG LOADS	0.5	19.4
HVAC FANS & PUMPS	0.9	34.2
REFRIGERATION	0.1	5.0
MISCELLANEOUS	0.1	5.0
COMPUTER EQUIPMENT	0.6	23.8
ELEVATORS		
OUTDOOR LIGHTING	0.2	8.5

END USE:	Electricity		Gas	
	kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
SPACE HEATING	6.5	251.1	3.0	115.0
SPACE COOLING	0.05	1.8		
DOMESTIC HOT WATER	0.9	33.0	0.4	14.1
FOOD SERVICE EQUIPMENT	0.3	10.0	0.4	15.0
MISCELLANEOUS	0.1	5.0		

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS:	SIZE:	VINTAGE:	REGION:
Restaurant	All		Yukon
Baseline			

CONSTRUCTION

Wall U value (W/m².°C)	0.20	W/m².°C	0.04	Btu/hr.ft² .°F	Typical Building Size	500	m²	5,380	ft²
Roof U value (W/m².°C)	0.11	W/m².°C	0.02	Btu/hr.ft² .°F	Typical Footprint (m²)	500	m²	5,380	ft²
Glazing U value (W/m².°C)	1.60	W/m².°C	0.28	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	1			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	40%			
Window/Wall Ratio (WIWAR) (%)	0.15				Defined as Exterior Zone				
Shading Coefficient (SC)	0.85				Typical # Stories	1			
					Floor to Floor Height (m)	4.5	m	14.8	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	60%							40%	60%
Min. Air Flow (%)					10%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	50	m²/person	538	ft²/person	%OA	13.90%
Occupancy Schedule Occ. Period	90%					
Occupancy Schedule Unocc. Period						
Fresh Air Requirements or Outside Air	19	L/s.person	40	CFM/person		

Fresh Air Control Type *(enter a 1, 2 or 3)	2	If Fresh Air Control Type = "2" enter % FA. to the right:	40%		
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)		If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation	0.5	L/s.m²	0.10 CFM/ft²
			50%	operation (%)	
Sizing Factor	1				
Total Air Circulation or Design Air Flow	2.73	L/s.m²	0.54	CFM/ft²	
Infiltration Rate	0.30	L/s.m²	0.06	CFM/ft²	

(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)

Separate Make-up air unit (100% OA)		L/s.m²	CFM/ft²
Operation occupied period	50%		
Operation unoccupied period	50%		

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use	50%		50%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters		
Peak Design Cooling Load	263,743	
Peak Zone Sensible Load	62,254	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	2,896	
Total air circulation or Design air	2.73	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic	60%	90%
DDC/Pneumatic	30%	
All DDC	10%	10%
Total (should add-up to 100%)	100%	100%

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	24	°C	75.2	°F	15	°C	59	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	22	°C	71.6	°F	15	°C	59	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	22	°C	71.6	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning — Changes/Year: 4

Incidence of Annual Room Controls Maintenance: 100.0%

Incidence of Annual HVAC Controls Maintenance: 100%

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	100%
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	100%
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Restaurant **All** **Yukon**
Baseline

LIGHTING

GENERAL LIGHTING

Light Level	400	Lux	37.2	ft-candles
Floor Fraction (GLFF)	0.50			
Connected Load	9.5	W/m²	0.9	W/ft²

Occ. Period(Hrs./yr.)	4300
Unocc. Period(Hrs./yr.)	4460
Usage During Occupied Period	100%
Usage During Unoccupied Period	10%

Light Level (Lux)	400	500	700	1000			Total
% Distribution	100%						100%
Weighted Average							**400**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)					100%			100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	82	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval ____ years

Relamping Strategy & Incidence of Practice: Group ____ Spot ____

EUI kWh/ft².yr 2.1
MJ/m².yr 81

ARCHITECTURAL LIGHTING

Light Level	300	Lux	27.9	ft-candles
Floor Fraction (ALFF)	0.50			
Connected Load	20.9	W/m²	1.9	W/ft²

Occ. Period(Hrs./yr.)	4300
Unocc. Period(Hrs./yr.)	4460
Usage During Occupied Period	100%
Usage During Unoccupied Period	10%

Light Level (Lux)	300	500	700	1000			Total
% Distribution	100%						100%
Weighted Average							**300**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)	25%	75%						100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	82	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval ____ years

Relamping Strategy & Incidence of Practice: Group ____ Spot ____

EUI kWh/ft².yr 4.6
MJ/m².yr 178

EUI = Load X Hrs. X SF X GLFF

OTHER (HIGH BAY) LIGHTING

Light Level		Lux		ft-candles
Floor Fraction (HBLFF)				
Connected Load		W/m²		W/ft²

Floor fraction check: should = 1.00 — 1.00

Occ. Period(Hrs./yr.)	4000
Unocc. Period(Hrs./yr.)	4760
Usage During Occupied Period	0%
Usage During Unoccupied Period	100%

Light Level (Lux)	300	500	700	1000			Total
% Distribution							
Weighted Average							

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	HPS	TOTAL
System Present (%)							0%	0.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

Fixture Cleaning:
Incidence of Practice
Interval ____ years

Relamping Strategy & Incidence of Practice: Group ____ Spot ____

EUI kWh/ft².yr
MJ/m².yr

TOTAL LIGHTING Overall LP 15.17 W/m²

EUI TOTAL kWh/ft².yr 6.7
MJ/m².yr 259

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	55	51	100	200	217	
Density (device/occupant)	0.36	0.36	0.01		0.03	
Connected Load	0.4 W/m²	0.4 W/m²	0.0 W/m²	W/m²	0.1 W/m²	1.15 W/m²
	0.0 W/ft²	0.0 W/ft²	0.00 W/ft²	W/ft²	0.01 W/ft²	0.11 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	90%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	50%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2000	4100
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6760	4660

Total end-use load (occupied period) 1.9 W/m² 0.2 W/ft²
Total end-use load (unocc. period) 1.1 W/m² 0.1 W/ft²

Usage during occupied period 100%
Usage during unoccupied period 59%

Computer Equipment EUI kWh/ft².yr 0.49
MJ/m².yr 18.95

Plug Loads EUI kWh/ft².yr 0.64
MJ/m².yr 24.92

FOOD SERVICE EQUIPMENT

Provide description below: Gas Fuel Share: 75.0% Electricity Fuel Share: 25.0%

Cooking

Natural Gas EUI: EUI kWh/ft².yr 23.2 / MJ/m².yr 900.0

All Electric EUI: EUI kWh/ft².yr 16.8 / MJ/m².yr 650.0

REFRIGERATION

Provide description below:
Walk-ins, reach ins, fridges etc

EUI kWh/ft².yr 9.0
MJ/m².yr 350.0

MISCELLANEOUS

EUI kWh/ft².yr 0.3
MJ/m².yr 10

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Restaurant **All** **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Fossil Fuel			Electric				
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Unit					
System Present (%)	3%	2%	15%		10%		70%	100%
Eff./COP	80%	85%	77%	250%	350%	80%	1.00	
Performance (1 / Eff.) (kW/kW)	1.25	1.18	1.30	0.40	0.29	1.25	1.00	

100%

Peak Heating Load 35.3 W/m² (11.2 Btu/hr.ft²)
Seasonal Heating Load 393 MJ/m².yr (10.2 kWh/ft².yr)
(Tertiary Load)
Sizing Factor 1.00

Electric Fuel Share 80.0% Fossil Fuel Share 20.0%

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

All Electric EUI	
kWh/ft².yr	10.2
MJ/m².yr	393

Natural Gas EUI	
kWh/ft².yr	10.0
MJ/m².yr	387

Market Composite EUI	
kWh/ft².yr	10.1
MJ/m².yr	392

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Recprocting Chillers		Gas Cooling		Total
	Standard	HE	Chillers	Open	DX	Absorption	Engine	
System Present (%)					100.0%			100.0%
COP	4.7	5.4	4.4	3.6	3	0.9	1.8	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.28	0.33	1.11	0.56	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water	100%	
Condenser Water	100%	

Setpoint

		°C		°F
Chilled Water	6	°C	42.8	°F
Condenser Water	35	°C	95	°F
Supply Air	15.0	°C	59	°F

Peak Cooling Load 155 W/m² (49 Btu/hr.ft²) 245 ft²/Ton
Seasonal Cooling Load 71.7 MJ/m².yr (1.9 kWh/ft².yr)
(Tertiary Load)

Sizing Factor 1.00 Operation (occ. period) 3000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation (Incidence of A/C) 80.0%

Electric Fuel Share 100.0% Gas Fuel Share

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit	100%	2
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.8
MJ/m².yr	29

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.8
MJ/m².yr	29

DOMESTIC HOT WATER

Service Hot Water Plant Type

Fossil Fuel SHW	Standard Boiler	Tank Heater	Tank Heater	Cnd. Boiler	Water Heater
System Present (%)			20%		
Eff./COP	75%	60%	70%	90%	90%

	Fossil	Elec. Res.
Fuel Share	20%	80%
Blended Efficiency	0.70	0.91

100%

Service Hot Water load (MJ/m².yr) 400.0
(Tertiary Load)

Wetting Use Percentage 10%

All Electric EUI	
kWh/ft².yr	11.3
MJ/m².yr	440

All Natural Gas EUI	
kWh/ft².yr	14.8
MJ/m².yr	571

Market Composite EUI	
kWh/ft².yr	12.0
MJ/m².yr	465.9

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Restaurant **All** **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

System Design Air Flow	2.7	L/s.m²	0.54	CFM/ft²	
System Static Pressure CAV	500	Pa	2.0	wg	
System Static Pressure VAV	625	Pa	2.5	wg	
Fan Efficiency	52%				
Fan Motor Efficiency	80%				
Sizing Factor	1.00				
Fan Design Load CAV	3.3	W/m²	0.31	W/ft²	
Fan Design Load VAV	4.1	W/m²	0.38	W/ft²	

Ventilation and Exhaust Fan Operation & Control

	Ventilation Fan		Exhaust Fan	
Control	Fixed	Variable Flow	Fixed	Variable Flow
Incidence of Use	100%		100%	
Operation	Continous	Scheduled	Continuous	Scheduled
Incidence of Use	90%	10%	100%	
Comments:				

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.4	L/s.m²	0.08	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.5	L/s.m²	0.10	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	72%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.7	W/m²	0.06	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.022	kW/kW	0.08	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	3.42	W/m²	0.32	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.008	L/s.m²	0.012	U.S. gpm/ft²
Pump Head Pressure		kPa		ft
Pump Efficiency	60%			
Pump Motor Efficiency	85%			
Sizing Factor	1.0			
Pump Connected Load		W/m²		W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.007	L/s.m²	0.0098	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure		kPa		ft		
Pump Efficiency	60%					
Pump Motor Efficiency	85%					
Sizing Factor	1.0					
Pump Connected Load		W/m²		W/ft²		

Supply Fan Occ. Period	3900	hrs./year
Supply Fan Unocc. Period	4860	hrs./year
Supply Fan Energy Consumption	27.2	kWh/m².yr
Exhaust Fan Occ. Period	3900	hrs./year
Exhaust Fan Unocc. Period	4860	hrs./year
Exhaust Fan Energy Consumption	6.1	kWh/m².yr
Condenser Pump Energy Consumption		kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.4	kWh/m².yr
Circulating Pump Yearly Operation	7000	hrs./year
Circulating Pump Energy Consumption		kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	3.1
	MJ/m².yr	121.4

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS:	**SIZE:**	**VINTAGE:**	**REGION:**
Restaurant	**All**		**Yukon**
Baseline			

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **44.7** kWh/ft².yr **1,731.6** MJ/m².yr **Gas:** **22.4** kWh/ft².yr **866.8** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	2.1	80.9
ARCHITECTURAL LIGHTING	4.6	178.4
OTHER (HIGH BAY) LIGHTING		
OTHER PLUG LOADS	0.6	24.9
HVAC FANS & PUMPS	3.1	121.4
REFRIGERATION	9.0	350.0
MISCELLANEOUS	0.3	10.0
COMPUTER EQUIPMENT	0.5	18.9
ELEVATORS		
OUTDOOR LIGHTING	2.2	84.8

END USE:	Electricity		Gas	
	kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
SPACE HEATING	8.1	314.8	2.0	77.5
SPACE COOLING	0.6	23.4		
DOMESTIC HOT WATER	9.1	351.6	3.0	114.3
FOOD SERVICE EQUIPMENT	4.2	162.5	17.4	675.0
MISC.	0.3	10.0		
			20.4	

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:**New **REGION:**
Rec Centre **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.20	W/m².°C	0.04	Btu/hr.ft² .°F	Typical Building Size	1,859	m²	20,000	ft²
Roof U value (W/m².°C)	0.11	W/m².°C	0.02	Btu/hr.ft² .°F	Typical Footprint (m²)	1,859	m²	20,000	ft²
Glazing U value (W/m².°C)	1.60	W/m².°C	0.28	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	1			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	50%			
Window/Wall Ratio (WIWAR) (%)	0.05				Defined as Exterior Zone				
Shading Coefficient (SC)	0.80				Typical # Stories	1			
					Floor to Floor Height (m)	6.1	m	19.9	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	100%								100%
Min. Air Flow (%)					50%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	50	m²/person	538	ft²/person	%OA	21.47%
Occupancy Schedule Occ. Period	90%					
Occupancy Schedule Unocc. Period						
Fresh Air Requirements or Outside Air	10	L/s.person	21	CFM/person		

Fresh Air Control Type *(enter a 1, 2 or 3) 1
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)

If Fresh Air Control Type = "2" enter % FA. to the right:
If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation 0.5 L/s.m² 0.10 CFM/ft²
50% operation (%)

Sizing Factor 1
Total Air Circulation or Design Air Flow 0.93 L/s.m² 0.18 CFM/ft²

Separate Make-up air unit (100% OA) L/s.m² CFM/ft²

Infiltration Rate 0.40 L/s.m² 0.08 CFM/ft²
(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)

Operation occupied period 50%
Operation unoccupied period 50%

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use			100%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters		
Peak Design Cooling Load	160,296	
Peak Zone Sensible Load	78,854	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	3,668	
Total air circulation or Design air	0.93	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic		
DDC/Pneumatic		
All DDC		
Total (should add-up to 100%)		

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	22	°C	71.6	°F	13	°C	55.4	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	16	°C	60.8	°F	16	°C	60.8	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	16	°C	60.8	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning Changes/Year

Incidence of Annual Room Controls Maintenance

Incidence of Annual HVAC Controls Maintenance

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:**New **REGION:**
Rec Centre **Yukon**
Baseline

LIGHTING

GENERAL LIGHTING

Light Level	400	Lux	37.2	ft-candles
Floor Fraction (GLFF)	0.20			
Connected Load	9.5	W/m²	0.9	W/ft²

Occ. Period(Hrs./yr.)	3500
Unocc. Period(Hrs./yr.)	5260
Usage During Occupied Period	100%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution	50%	50%					100%
Weighted Average							**400**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)					100%			100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.7	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 0.8
MJ/m².yr 29

SECONDARY LIGHTING

Light Level	300	Lux	27.9	ft-candles
Floor Fraction (ALFF)	0.05			
Connected Load	13.2	W/m²	1.2	W/ft²

Occ. Period(Hrs./yr.)	3000
Unocc. Period(Hrs./yr.)	5760
Usage During Occupied Period	100%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution	100%						100%
Weighted Average							**300**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)		100%						100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 0.2
MJ/m².yr 9

EUI = Load X Hrs. X SF X GLFF

TERTIARY LIGHTING

Light Level	300.00	Lux	27.9	ft-candles
Floor Fraction (HBLFF)	0.75			
Connected Load	11.1	W/m²	1.0	W/ft²

Floor fraction check: should = 1.00 — 1.00

Occ. Period(Hrs./yr.)	3300
Unocc. Period(Hrs./yr.)	5460
Usage During Occupied Period	90%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	200	300	400	1000			Total
% Distribution	25%	50%	25%				100%
Weighted Average							**300**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)						25%	75%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 2.9
MJ/m².yr 113

TOTAL LIGHTING Overall LP 2.55 W/m²

EUI TOTAL kWh/ft².yr 3.9
MJ/m².yr 152

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	54.55	51	100	200	217	
Density (device/occupant)	0.05	0.05				
Connected Load	0.1 W/m²	0.1 W/m²	W/m²	W/m²	W/m²	1 W/m²
	0.0 W/ft²	0.0 W/ft²	W/ft²	W/ft²	W/ft²	0.09 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	90%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	25%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2000	3500
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6760	5260

Total end-use load (occupied period) 1.0 W/m² 0.1 W/ft²
Total end-use load (unocc. period) 0.3 W/m² 0.0 W/ft²

to see notes (cells with red indicator in upper right corner, type "SHIFT F2"

Usage during occupied period 100%
Usage during unoccupied period 30%

Computer Equipment EUI kWh/ft².yr 0.05
MJ/m².yr 1.96

Plug Loads EUI kWh/ft².yr 0.41
MJ/m².yr 16.07

FOOD SERVICE EQUIPMENT

Provide description below: Gas Fuel Share: 10.0% Electricity Fuel Share: 90.0%

Natural Gas EUI: EUI kWh/ft².yr 0.6 / MJ/m².yr 25.0

All Electric EUI: EUI kWh/ft².yr 0.6 / MJ/m².yr 25.0

REFRIGERATION

Provide description below: Artificial Ice Saturation 100.0%

Refrigeration Plant and Auxiliaries

EUI kWh/ft².yr 7.0
MJ/m².yr 271.2

MISCELLANEOUS

EUI kWh/ft².yr 0.3
MJ/m².yr 10

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:**New **REGION:**
Rec Centre **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Fossil Fuel						Electric	
	Boilers		Packaged	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
	Stan.	High	Units					
System Present (%)	10%	10%	30%				50%	100%
Eff./COP	80%	85%	78%	1.70	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.25	1.18	1.28	0.59	0.33	0.22	1.00	

Peak Heating Load 29.7 W/m² 9.4 Btu/hr.ft²
Seasonal Heating Load 336 MJ/m².yr 8.7 kWh/ft².yr
(Tertiary Load)
Sizing Factor 1.00

Electric Fuel Share 50.0% Gas Fuel Share 50.0%

Space Heat Saturation 70.0%
(Incidence of SPC HT)

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

All Electric EUI	
kWh/ft².yr	8.7
MJ/m².yr	336

Natural Gas EUI	
kWh/ft².yr	10.9
MJ/m².yr	421

Market Composite EUI	
kWh/ft².yr	9.8
MJ/m².yr	378

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw	Reciprocating Chillers		Absorption Chillers		Total
	Standard	HE	Chillers	Open	DX	W. H.	CW	
System Present (%)					100.0%			100.0%
COP	4.7	5.4	4.4	3.6	2.9	0.9	1	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.28	0.34	1.11	1.00	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water		
Condenser Water		

Setpoint

Chilled Water	7	°C	44.6	°F
Condenser Water	30	°C	86	°F
Supply Air	13.0	°C	55.4	°F

Peak Cooling Load 25 W/m² 8 Btu/hr.ft² 1497 ft²/Ton
Seasonal Cooling Load 14.3 MJ/m².yr 0.4 kWh/ft².yr
(Tertiary Load)

Sizing Factor 1.00 Operation (occ. perio 3000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation 5.0%
(Incidence of A/C)

Electric Fuel Share 100.0% Gas Fuel Share

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit		
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.1
MJ/m².yr	4

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.1
MJ/m².yr	4

DOMESTIC HOT WATER

Service Hot Water Plant Type

Fossil Fuel SHW	Std. Tank	HE Tank	Cond. Tnk	Std. Boiler	Cnd. Boil.
System Present (%)		30%	5%	10%	
Eff./COP	0.55	0.70	0.90	0.80	0.90

	Fossil		Elec. Res.
Fuel Share	45%		55%
Blended Efficiency	0.74		0.91

Service Hot Water load (MJ/m².yr) 80.0
(Tertiary Load)
Incidence of Heat recr'y 40%
Heat recr'y load share 50%

Wetting Use Percentage 50%

All Electric EUI	
kWh/ft².yr	2.3
MJ/m².yr	88

Natural Gas EUI	
kWh/ft².yr	2.8
MJ/m².yr	107

Market Composite EUI	
kWh/ft².yr	2.5
MJ/m².yr	96.7

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:**New **REGION:**
Rec Centre **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

						Ventilation and Exhaust Fan Operation & Control			
						Ventilation Fan		Exhaust Fan	
System Design Air Flow	0.9	L/s.m²	0.18	CFM/ft²	Control	Fixed	Variable Flow	Fixed	Variable Flow
System Static Pressure CAV	300	Pa	1.2	wg					
System Static Pressure VAV	300	Pa	1.2	wg	Incidence of Use	100%		100%	
Fan Efficiency	60%				Operation	Continuous	Scheduled	Continuous	Scheduled
Fan Motor Efficiency	80%								
Sizing Factor	1.00				Incidence of Use	50%	50%	50%	50%
Fan Design Load CAV	0.6	W/m²	0.05	W/ft²					
Fan Design Load VAV	0.6	W/m²	0.05	W/ft²	Comments:				

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.1	L/s.m²	0.02	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.2	L/s.m²	0.04	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	75%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.3	W/m²	0.03	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.020	kW/kW	0.07	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	0.51	W/m²	0.05	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.001	L/s.m²	0.002	U.S. gpm/ft²
Pump Head Pressure		kPa		ft
Pump Efficiency	50%			
Pump Motor Efficiency	80%			
Sizing Factor	1.0			
Pump Connected Load		W/m²		W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.001	L/s.m²	0.0016	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure		kPa		ft		
Pump Efficiency	50%					
Pump Motor Efficiency	80%					
Sizing Factor	0.8					
Pump Connected Load		W/m²		W/ft²		

Supply Fan Occ. Period	3500	hrs./year
Supply Fan Unocc. Period	5260	hrs./year
Supply Fan Energy Consumption	3.6	kWh/m².yr
Exhaust Fan Occ. Period	3500	hrs./year
Exhaust Fan Unocc. Period	5260	hrs./year
Exhaust Fan Energy Consumption	1.7	kWh/m².yr
Condenser Pump Energy Consumption		kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.1	kWh/m².yr
Circulating Pump Yearly Operation	7000	hrs./year
Circulating Pump Energy Consumption		kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	0.5
	MJ/m².yr	19.2

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:**New **REGION:**
Rec Centre **Yukon**
Baseline

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **18.1** kWh/ft².yr **701.0** MJ/m².yr **Gas:** **5.1** kWh/ft².yr **198.2** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	0.8	29.2
SECONDARY LIGHTING	0.2	9.2
TERTIARY LIGHTING	2.9	113.3
OTHER PLUG LOADS	0.4	16.1
HVAC FANS & PUMPS	0.5	19.2
REFRIGERATION	7.0	271.2
MISCELLANEOUS	0.3	10.0
COMPUTER EQUIPMENT	0.1	2.0
ELEVATORS		
OUTDOOR LIGHTING	1.1	42.4

END USE:	Electricity		Gas	
	kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
SPACE HEATING	3.0	117.4	3.8	147.3
SPACE COOLING	0.0	0.2		
DOMESTIC HOT WATER	1.2	48.4	1.2	48.4
FOOD SERVICE EQUIPMENT	0.6	22.5	0.1	2.5

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Warehouse/Wholesale **Yukon**
Baseline

CONSTRUCTION

Wall U value (W/m².°C)	0.20	W/m².°C	0.04	Btu/hr.ft² .°F	Typical Building Size	3,253	m²	35,000	ft²
Roof U value (W/m².°C)	0.11	W/m².°C	0.02	Btu/hr.ft² .°F	Typical Footprint (m²)	3,253	m²	35,000	ft²
Glazing U value (W/m².°C)	1.60	W/m².°C	0.28	Btu/hr.ft² .°F	Footprint Aspect Ratio (L:W)	1			
					Percent Conditioned Space	100%			
					Percent Conditioned Space	40%			
Window/Wall Ratio (WIWAR) (%)	0.05				Defined as Exterior Zone				
Shading Coefficient (SC)	0.80				Typical # Stories	1			
					Floor to Floor Height (m)	6.1	m	19.9	ft

VENTILATION SYSTEM, BUILDING CONTROLS & INDOOR CONDITIONS

Ventilation System Type

	CAV	CAVR	DDMZ	DDMZVV	VAV	VAVR	IU	100% O.A	TOTAL
System Present (%)	100%								100%
Min. Air Flow (%)					50%				

(Minimum Throttled Air Volume as Percent of Full Flow)

Occupancy or People Density	100	m²/person	1076	ft²/person	%OA	30.70%	
Occupancy Schedule Occ. Period	90%						
Occupancy Schedule Unocc. Period							
Fresh Air Requirements or Outside Air	25	L/s.person	53	CFM/person			

Fresh Air Control Type *(enter a 1, 2 or 3)	1	If Fresh Air Control Type = "2" enter % FA. to the right:					
(1 = mixed air control, 2 = Fixed fresh air, 3 100% fresh air)		If Fresh Air Control Type = "3" enter Make-up Air Ventilation and operation	0.5	L/s.m²	0.10	CFM/ft²	
			50%	operation (%)			
Sizing Factor	1						
Total Air Circulation or Design Air Flow	0.81	L/s.m²	0.16	CFM/ft²			
Infiltration Rate	0.40	L/s.m²	0.08	CFM/ft²			
(air infiltration is assumed to occur during unoccupied hours only if the ventilation system shuts down)							

Separate Make-up air unit (100% OA) L/s.m² CFM/ft²
Operation occupied period 50%
Operation unoccupied period 50%

Economizer

	Enthalpy Based		Dry-Bulb Based		Total
Incidence of Use			100%		100%
Switchover Point		KJ/kg.	18	°C	
		Btu/lbm	64.4	°F	

Summary of Design Parameters		
Peak Design Cooling Load	287,602	
Peak Zone Sensible Load	120,647	
Room air enthalpy	28.2	Btu/lbm
Discharge air enthalpy	23.4	Btu/lbm
Specific volume of air at 55F & 100% R	13.2	ft³/lbm
Design CFM	5,612	
Total air circulation or Design air	0.81	l/s.m²

Controls Type

System Present (%)	HVAC Equipment	Room Controls
All Pneumatic		
DDC/Pneumatic		
All DDC		
Total (should add-up to 100%)		

Control mode

	Proportional	PI / PID	Total
Control Mode			
	Fixed Discharge	Reset	
Control Strategy			

Indoor Design Conditions

	Room				Supply Air			
Summer Temperature	22	°C	71.6	°F	13	°C	55.4	°F
Summer Humidity (%)	50%				100%			
Enthalpy	65.5	KJ/kg.	28.2	Btu/lbm	54.5	KJ/kg.	23.4	Btu/lbm
Winter Occ. Temperature	21	°C	69.8	°F	16	°C	60.8	°F
Winter Occ. Humidity	30%				45%			
Enthalpy	53	KJ/kg.	22.8	Btu/lbm	45.5	KJ/kg.	19.6	Btu/lbm
Winter Unocc. Temperature	21	°C	69.8	°F				
Winter Unocc. Humidity	30%							
Enthalpy	50	KJ/kg.	21.5	Btu/lbm				

Damper Maintenance

	Incidence (%)	Frequency (years)
Control Arm Adjustment		
Lubrication		
Blade Seal Replacement		

Air Filter Cleaning Changes/Year

Incidence of Annual Room Controls Maintenance

Incidence of Annual HVAC Controls Maintenance

Annual Maintenance Tasks	Incidence (%)
Calibration of Transmitters	
Calibration of Panel Gauges	
Inspection of Auxiliary Devices	
Inspection of Control Devices	

Annual Maintenance Tasks	Incidence (%)
Inspection/Calibration of Room Thermostat	
Inspection of PE Switches	
Inspection of Auxiliary Devices	
Inspection of Control Devices (Valves, (Dampers, VAV Boxes)	

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Warehouse/Wholesale **Yukon**
Baseline

LIGHTING

GENERAL LIGHTING

Light Level	400	Lux	37.2	ft-candles
Floor Fraction (GLFF)	0.15			
Connected Load	9.5	W/m²	0.9	W/ft²

Occ. Period(Hrs./yr.)	3300
Unocc. Period(Hrs./yr.)	5460
Usage During Occupied Period	90%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution	50%	50%					100%
Weighted Average							**400**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)					100%			100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.7	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 0.5
MJ/m².yr 19

SECONDARY LIGHTING

Light Level	300	Lux	27.9	ft-candles
Floor Fraction (ALFF)	0.05			
Connected Load	20.9	W/m²	1.9	W/ft²

Occ. Period(Hrs./yr.)	3000
Unocc. Period(Hrs./yr.)	5760
Usage During Occupied Period	90%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	300	500	700	1000			Total
% Distribution	100%						100%
Weighted Average							**300**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)	25%	75%						100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 0.3
MJ/m².yr 13

EUI = Load X Hrs. X SF X GLFF

TERTIARY LIGHTING

Light Level	300.00	Lux	27.9	ft-candles
Floor Fraction (HBLFF)	0.80			
Connected Load	12.0	W/m²	1.1	W/ft²

Floor fraction check: should = 1.00 | 1.00

Occ. Period(Hrs./yr.)	3300
Unocc. Period(Hrs./yr.)	5460
Usage During Occupied Period	100%
Usage During Unoccupied Period	15%
Fixture Cleaning:	
Incidence of Practice	
Interval	years
Relamping Strategy & Incidence of Practice	Group / Spot

Light Level (Lux)	200	300	400	1000			Total
% Distribution	25%	50%	25%				100%
Weighted Average							**300**

	INC	CFL	T12 ES	T8 Mag	T8 Elec	MH	T5 HO	TOTAL
System Present (%)						50%	50%	100.0%
CU	0.7	0.7	0.6	0.6	0.6	0.6	0.6	
LLF	0.65	0.65	0.75	0.80	0.80	0.55	0.55	
Efficacy (L/W)	15	50	72	84	88	65	90	

EUI kWh/ft².yr 3.7
MJ/m².yr 143

TOTAL LIGHTING Overall LP 12.10 W/m² EUI TOTAL kWh/ft².yr 4.5
MJ/m².yr 176

OFFICE EQUIPMENT & PLUG LOADS

Equipment Type	Computers	Monitors	Printers	Copiers	Servers	Plug Loads
Measured Power (W/device)	54.55	51	100	200	217	
Density (device/occupant)	0.59	0.59	0.03	0.03	0.06	
Connected Load	0.3 W/m²	0.3 W/m²	0.0 W/m²	0.1 W/m²	0.1 W/m²	1 W/m²
	0.0 W/ft²	0.0 W/ft²	0.00 W/ft²	0.01 W/ft²	0.01 W/ft²	0.09 W/ft²
Diversity Occupied Period	90%	90%	90%	90%	100%	90%
Diversity Unoccupied Period	50%	50%	50%	50%	100%	25%
Operation Occ. Period (hrs./year)	2000	2000	2000	2000	2000	3500
Operation Unocc. Period (hrs./year)	6760	6760	6760	6760	6760	5260

Total end-use load (occupied period) 1.7 W/m² 0.2 W/ft²
Total end-use load (unocc. period) 0.7 W/m² 0.1 W/ft²

to see notes (cells with red indicator in upper right corner, type "SHIFT F2"

Usage during occupied period 100%
Usage during unoccupied period 44%

Computer Equipment EUI kWh/ft².yr 0.46
MJ/m².yr 17.72

Plug Loads EUI kWh/ft².yr 0.41
MJ/m².yr 16.07

FOOD SERVICE EQUIPMENT

Provide description below: | Gas Fuel Share: | Electricity Fuel Share: 100.0%

Natural Gas EUI		All Electric EUI	
EUI kWh/ft².yr	0.1	EUI kWh/ft².yr	0.1
MJ/m².yr	5.0	MJ/m².yr	4.0

REFRIGERATION

Provide description below:
Large refrigeration storage

EUI kWh/ft².yr 1.8
MJ/m².yr 70.0

MISCELLANEOUS

EUI kWh/ft².yr 0.3
MJ/m².yr 10

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Warehouse/Wholesale **Yukon**
Baseline

SPACE HEATING

Heating Plant Type

	Hot Water System						Electric	
	Boiler	Unit Heater	Packaged Units	A/A HP	W. S. HP	H/R Chiller	Resistance	Total
System Present (%)	15%		35%				50%	100%
Eff./COP	75%	75%	77%	1.70	3.00	4.50	1.00	
Performance (1 / Eff.) (kW/kW)	1.33	1.33	1.30	0.59	0.33	0.22	1.00	

Peak Heating Load 29.2 W/m² 9.3 Btu/hr.ft²
Seasonal Heating Load 393 MJ/m².yr 10.1 kWh/ft².yr
(Tertiary Load)
Sizing Factor 1.00

Electric Fuel Share 50.0% Fossil Fuel Share 50.0%

All Electric EUI	
kWh/ft².yr	10.1
MJ/m².yr	393

Boiler Maintenance

Annual Maintenance Tasks	Incidence (%)
Fire Side Inspection	75%
Water Side Inspection for Scale Buildup	100%
Inspection of Controls & Safeties	100%
Inspection of Burner	100%
Flue Gas Analysis & Burner Set-up	90%

Natural Gas EUI	
kWh/ft².yr	13.3
MJ/m².yr	514

Market Composite EUI	
kWh/ft².yr	11.7
MJ/m².yr	454

SPACE COOLING

A/C Plant Type

	Centrifugal Chillers		Screw Chillers	Reciprocating Chillers		Absorption Chillers		Total
	Standard	HE		Open	DX	W. H.	CW	
System Present (%)					100.0%			100.0%
COP	4.7	5.4	4.4	3.6	2.9	0.9	1	
Performance (1 / COP) (kW/kW)	0.21	0.19	0.23	0.28	0.34	1.11	1.00	
Additional Refrigerant Related Information								

Control Mode

Incidence of Use	Fixed Setpoint	Reset
Chilled Water		
Condenser Water		

Setpoint

Chilled Water	7	°C	44.6	°F
Condenser Water	30	°C	86	°F
Supply Air	13.0	°C	55.4	°F

Peak Cooling Load 26 W/m² 8 Btu/hr.ft² 1460 ft²/Ton
Seasonal Cooling Load 13.8 MJ/m².yr 0.4 kWh/ft².yr
(Tertiary Load)

Sizing Factor 1.00 Operation (occ. perio 4000 hrs/year Note value cannot be less than 2,900 hrs/year)

A/C Saturation 5.0%
(Incidence of A/C)

Electric Fuel Share 100.0% Gas Fuel Share

Chiller Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect Control, Safeties & Purge Unit		
Inspect Coupling, Shaft Sealing and Bearings		
Megger Motors		
Condenser Tube Cleaning		
Vibration Analysis		
Eddy Current Testing		
Spectrochemical Oil Analysis		

All Electric EUI	
kWh/ft².yr	0.1
MJ/m².yr	5

Cooling Tower/Air Cooled Condenser Maintenan

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspection/Clean Spray Nozzles		
Inspect/Service Fan/Fan Motors		
Megger Motors		
Inspect/Verify Operation of Controls		

Natural Gas EUI	
kWh/ft².yr	
MJ/m².yr	

Market Composite EUI	
kWh/ft².yr	0.1
MJ/m².yr	5

DOMESTIC HOT WATER

Service Hot Water Plant Type

Fossil Fuel SHW	Std. Tank	HE Tank	Cond. Tnk	Std. Boiler	Cnd. Boil.
System Present (%)	25%	5%			
Eff./COP	55%	70%	90%	75%	90%

	Fossil		Elec. Res.
Fuel Share	30%		70%
Blended Efficiency	0.58		0.91

Service Hot Water load (MJ/m².yr) 18.2
(Tertiary Load)

Wetting Use Percentage 90%

All Electric EUI	
kWh/ft².yr	0.5
MJ/m².yr	20

Natural Gas EUI	
kWh/ft².yr	0.8
MJ/m².yr	32

Market Composite EUI	
kWh/ft².yr	0.6
MJ/m².yr	23.5

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Warehouse/Wholesale **Yukon**
Baseline

HVAC FANS & PUMPS

SUPPLY FANS

						Ventilation and Exhaust Fan Operation & Control			
						Ventilation Fan		Exhaust Fan	
System Design Air Flow	0.8	L/s.m²	0.16	CFM/ft²	Control	Fixed	Variable Flow	Fixed	Variable Flow
System Static Pressure CAV	300	Pa	1.2	wg					
System Static Pressure VAV	300	Pa	1.2	wg	Incidence of Use	100%		100%	
Fan Efficiency	60%				Operation	Continuous	Scheduled	Continuous	Scheduled
Fan Motor Efficiency	80%								
Sizing Factor	1.00				Incidence of Use	50%	50%	50%	50%
Fan Design Load CAV	0.5	W/m²	0.05	W/ft²					
Fan Design Load VAV	0.5	W/m²	0.05	W/ft²	Comments:				

EXHAUST FANS

Washroom Exhaust	100	L/s.washroom	212	CFM/washroom
Washroom Exhaust per gross unit area	0.1	L/s.m²	0.01	CFM/ft²
Other Exhaust (Smoking/Conference)	0.1	L/s.m²	0.02	CFM/ft²
Total Building Exhaust	0.2	L/s.m²	0.03	CFM/ft²
Exhaust System Static Pressure	250	Pa	1.0	wg
Fan Efficiency	25%			
Fan Motor Efficiency	75%			
Sizing Factor	1.0			
Exhaust Fan Connected Load	0.2	W/m²	0.02	W/ft²

AUXILIARY COOLING EQUIPMENT (Condenser Pump and Cooling Tower/Condenser Fans)

Average Condenser Fan Power Draw	0.020	kW/kW	0.07	kW/Ton
(Cooling Tower/Evap. Condenser/ Air Cooled Condenser)	0.52	W/m²	0.05	W/ft²

Condenser Pump

Pump Design Flow	0.053	L/s.KW	3.0	U.S. gpm/Ton
Pump Design Flow per unit floor area	0.001	L/s.m²	0.002	U.S. gpm/ft²
Pump Head Pressure		kPa		ft
Pump Efficiency	50%			
Pump Motor Efficiency	80%			
Sizing Factor	1.0			
Pump Connected Load		W/m²		W/ft²

CIRCULATING PUMP (Heating & Cooling)

Pump Design Flow @ 5 °C (10 °F) delta T	0.001	L/s.m²	0.0016	U.S. gpm/ft²	2.4	U.S. gpm/Ton
Pump Head Pressure		kPa		ft		
Pump Efficiency	50%					
Pump Motor Efficiency	80%					
Sizing Factor	0.8					
Pump Connected Load		W/m²		W/ft²		

Supply Fan Occ. Period	3500	hrs./year
Supply Fan Unocc. Period	5260	hrs./year
Supply Fan Energy Consumption	3.1	kWh/m².yr
Exhaust Fan Occ. Period	3500	hrs./year
Exhaust Fan Unocc. Period	5260	hrs./year
Exhaust Fan Energy Consumption	1.3	kWh/m².yr
Condenser Pump Energy Consumption		kWh/m².yr
Cooling Tower /Condenser Fans Energy Consumption	0.1	kWh/m².yr
Circulating Pump Yearly Operation	7000	hrs./year
Circulating Pump Energy Consumption		kWh/m².yr

Fans and Pumps Maintenance

Annual Maintenance Tasks	Incidence (%)	Frequency (years)
Inspect/Service Fans & Motors		
Inspect/Adjust Belt Tension on Fan Belts		
Inspect/Service Pump & Motors		

EUI	kWh/ft².yr	0.4
	MJ/m².yr	16.2

COMMERCIAL SECTOR BUILDING PROFILE

NEW BUILDINGS: **SIZE:** **VINTAGE:** **REGION:**
Warehouse/Wholesale **Yukon**
Baseline

EUI SUMMARY

TOTAL ALL END-USES: **Electricity:** **13.9** kWh/ft².yr **537.3** MJ/m².yr **Gas:** **6.9** kWh/ft².yr **266.6** MJ/m².yr

END USE:	kWh/ft².yr	MJ/m².yr
GENERAL LIGHTING	0.5	19.4
SECONDARY LIGHTING	0.3	13.4
TERTIARY LIGHTING	3.7	142.9
OTHER PLUG LOADS	0.4	16.1
HVAC FANS & PUMPS	0.4	16.2
REFRIGERATION	1.8	70.0
MISCELLANEOUS	0.3	10.0
COMPUTER EQUIPMENT	0.5	17.7
ELEVATORS		
OUTDOOR LIGHTING	0.4	17.0

END USE:	Electricity		Gas	
	kWh/ft².yr	MJ/m².yr	kWh/ft².yr	MJ/m².yr
SPACE HEATING	5.1	196.4	6.6	257.1
SPACE COOLING	0.0	0.3		
DOMESTIC HOT WATER	0.4	14.0	0.2	9.5
FOOD SERVICE EQUIPMENT	0.1	4.0		

Terms Used in Building Profile Summaries

Profile Term	Explanation
Building envelope	Defines the thermal characteristics of a building's exterior components
U-value	The rate of heat loss, in Btu per hour per square foot per degree Fahrenheit (BTU/hr. $f^2.^oF$) through walls, roofs and windows. The U-value is the reciprocal of the R-value
Shading coefficient (SC)	Is a measure of the total amount of heat passing through the glazing compared with that through a single clear glass
Window-to-wall ratio	Defines the ratio of window to insulated exterior wall area
General lighting	Defines the lighting types that are used within the main areas of a building, e.g., for a School, the area is classrooms and the lighting type is fluorescent; for a Food Retail store, the main area is the retail floor.
LPD	Lighting power density expressed in terms of W/ft^2
Lux	The amount of visible light per square meter incident on a surface ($lumen/m^2$)
Inc	Incandescent lamps
CFL	Compact fluorescent lamps
T12	T12 fluorescent lamps with magnetic ballasts
T8	T8 fluorescent lamps with electronic ballasts
MH	Metal halide lamps
HPS	High-pressure sodium lamps
HID	High-intensity discharge lighting includes both MH and HPS
Secondary lighting	Defines the lighting types that are used within the secondary areas of a building, e.g., for a School, the secondary areas are corridors, lobbies, foyers, etc.,
Tertiary lighting	Defines the lighting types that are used within special purpose areas of a building, e.g., for a School, the tertiary area is a gymnasium.
Outdoor lighting	Defines the outdoor lighting including parking lot and façade
Overall LPD	The total floor weighted LPD that includes general, secondary, tertiary, and outdoor.
Fans	Defines mix of air handling systems
CAV	Constant air volume
VAV	Variable air volume
space heating	Defines the mix of heating equipment types found within the stock of buildings
ASHP	Air-source heat pump
WSHP	Water-source heat pump
Resistance	Electric resistance heating equipment including boilers and baseboard heaters
Natural gas	Natural gas heating equipment including packaged rooftop units and boilers
Space cooling	Defines the mix of cooling equipment types found within the stock of buildings
Centrifugal	Standard centrifugal chillers with a full load performance of 0.75 kW/ton
Centri HE	High-efficiency centrifugal chillers assumed to have a performance of <0.65 kW/ton
Recip open	Semi-hermetic reciprocating chillers
DX	Direct expansion cooling equipment that use small tonnage hermetic R-22 compressors

Appendix D Background-Section 6: Reference Case Peak Load

No additional data. As noted in the main text, the same method and hours-use factors that were used for the Base Year calculation were applied to the Reference Case electricity values.

Appendix E Background-Section 7: Technology Assessment - Energy-efficiency Measures

Introduction

Exhibit E 1 provides an example of part of the worksheet that calculates the CCE for T8 fluorescent lamps, one of the analyzed measures. For more detail on this and all the other measures, refer to the measure TRC model Excel workbooks submitted with this report.

Exhibit E 1 Sample Measure CCE Calculation Worksheet

YUKON ELECTRIC: COMMERCIAL SECTOR ELECTRIC EFFICIENCY MEASURES

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T8 Fluorescent Lamps (T12 Baseline)

		References/Notes
Description:	While code changes have eliminated T12 lighting as a new purchase, many fixtures still remain installed in the building stock and standard T8 lighting presents neaarly 30% savings with no decrease in light levels. Due to T12 lighting being unavailable on the market at large, this is considered only at full cost.	
Baseline:	Standard 2-lamp F34T12 fixture consuming 81 W and producing 4,779 lumens.	OPA 2010 Quasi-Prescriptive Measures and Assumptions, Page 98
Upgrade:	Upgrade is a 2-lamp F32T8 fixture consuming 58W and producing 5,120 lumens.	OPA 2010 Quasi-Prescriptive Measures and Assumptions, Page 98

Inter.Eff.Mode:	Electricity
Primary End-Use	General Lighting
Measure Type:	Baseload
Discount Rate:	5.25%
GHG Adder Incl.?	No

= User Input	= User Input
= Calculation	= Calculation

Resource Costs:

	Avoided Cost (NPV)	Customer Cost
Elec. ($/kWh)	$3.922	$0.132
Elec. ($/kW)	$0.000	$7.394
Nat. Gas ($/m^3)	$3.165	$0.232
Oil ($/L)	$0.000	$1.250
Water ($/1000L)	$0.000	$1.500

Sub-sector		Low Use	Medium Use	High Use	References/Notes
Baseline Consumption	**Elec. (kWh/yr.)**	200.6	345.1	431.6	The hours of use is based on the building archetypes for General Lighting as noted in the description.
	Oil (L/yr.)				
Upgrade Consumption	**Elec. (kWh/yr.)**	143.6	247.1	309.0	
	Oil (L/yr.)				
Winter Peak Hours-Use Factor					
Annual Resource Savings	**Elec. (kWh/yr.)**	56.9	98.0	122.5	
	Elec. (kW peak)	-	-	-	
	Oil (L/yr.)	-	-	-	
Cost Parameters	**Upgrade, Material ($)**	$31.28	$31.28	$31.28	OPA Quasi-Prescriptive Measures and Assumptions, Page 100
	Upgrade, Installation ($)	$17.25	$17.25	$17.25	Estimated Installation Cost
	Baseline, Material ($)				Evaluated at full cost
	Baseline, Installation ($)				
	Total Measure Cost ($)	$48.53	$48.53	$48.53	
	Basis (Full/Incr.)	Full	Full	Full	
Incremental O&M ($/yr.)		$0	$0	$0	
Lifetimes	**Upgrade (yrs.)**	16.00	16.00	16.00	16 years - BC Hydro QA Standard
	Baseline (yrs.)	16.00	16.00	16.00	16 years - BC Hydro QA Standard
Cost Savings ($/yr.)		$ 7.54	$ 12.97	$ 16.22	
Simple Payback (yrs.)		6.4	3.7	3.0	
NPV of O&M Costs ($)		$0	$0	$0	
Total Benefits ($)	**Electric Energy**	223.36	384.32	480.65	
	Electric Demand	0.00	0.00	0.00	
	Natural Gas	0.00	0.00	0.00	
	Oil	0.00	0.00	0.00	
	Water	0.00	0.00	0.00	
Measure TRC ($)		174.83	335.79	432.12	
Benefit/Cost Ratio		4.60	7.92	9.90	
Cost of Conserved Electricity (CCE) (¢/kWh)		8.00	4.65	3.72	

Savings over Baseline	**Raw**	28.4%	28.4%	28.4%
	w/ Elec.Htg. Penalty	28.4%	28.4%	28.4%

Appendix F Background-Section 8: Economic Potential - Electric Energy Forecast

Introduction

Exhibit F 1 provides the detailed Economic Potential results for the hydro grid.

Exhibit F 1-1 Total Economic Potential Electricity Savings by End Use, Sub Sector and Milestone Year (MWh/yr.) – Hydro Grid

Sub Sector / Milestone Year	General Lighting	Architectural Lighting	High-bay Lighting	Outdoor Lighting	Space Heating	Space Cooling	HVAC Fans and Pumps	Water Heating	Computer Equipment	Other Plug Loads	Cooking Equipment	Refrigeration	Elevators	Miscellaneous	Non Buildings	Street Lighting	Block Heater	Grand Total
Office																		
2015	3,420	1,306	-	423	3,367	187	895	316	1,428	55	-	16	-	-	-	-	-	11,415
2020	3,633	1,431	-	476	4,491	299	1,151	384	1,671	65	-	36	-	-	-	-	-	13,637
2025	3,880	1,572	-	536	5,730	424	1,440	460	1,957	76	-	41	-	-	-	-	-	16,116
2030	4,272	1,731	-	603	7,101	563	1,767	546	2,294	89	-	46	-	-	-	-	-	19,012
Food Retail																		
2015	335	386	397	179	332	12	164	73	78	-	6	2,468	-	-	-	-	-	4,429
2020	355	429	470	198	491	19	216	91	92	-	13	3,586	-	-	-	-	-	5,959
2025	379	477	553	219	667	27	275	111	108	-	14	4,763	-	-	-	-	-	7,593
2030	418	532	647	243	863	35	341	133	126	-	16	5,527	-	-	-	-	-	8,882
Non-food Retail																		
2015	2,611	1,599	376	600	1,298	54	462	118	203	-	-	40	-	-	-	-	-	7,362
2020	2,738	1,724	450	708	1,942	88	626	152	239	-	-	91	-	-	-	-	-	8,758
2025	2,889	1,865	534	831	2,656	126	811	191	280	-	-	103	-	-	-	-	-	10,287
2030	3,149	2,025	630	970	3,450	169	1,021	235	329	-	-	116	-	-	-	-	-	12,095
Hotel / Motel																		
2015	455	946	-	191	1,215	40	298	676	126	9	-	54	-	-	-	-	-	4,010
2020	479	1,035	-	215	1,728	62	376	1,017	146	10	-	122	-	-	-	-	-	5,191
2025	508	1,135	-	241	2,294	87	465	1,401	170	12	-	137	-	-	-	-	-	6,451
2030	556	1,248	-	271	2,922	114	565	1,835	198	14	-	155	-	-	-	-	-	7,876
Healthcare																		
2015	636	274	-	128	481	13	415	75	99	10	5	9	-	-	-	-	-	2,145
2020	677	292	-	143	735	19	540	110	115	12	11	20	-	-	-	-	-	2,674
2025	725	312	-	159	1,018	27	680	150	134	14	12	23	-	-	-	-	-	3,254
2030	797	335	-	177	1,334	35	837	194	156	16	14	26	-	-	-	-	-	3,921

Sub Sector / Milestone Year	General Lighting	Architectural Lighting	High-bay Lighting	Outdoor Lighting	Space Heating	Space Cooling	HVAC Fans and Pumps	Water Heating	Computer Equipment	Other Plug Loads	Cooking Equipment	Refrigeration	Elevators	Miscellaneous	Non Buildings	Street Lighting	Block Heater	Grand Total
Education																		
2015	1,974	902	224	273	2,264	14	513	754	408	25	21	48	-	-	-	-	-	7,419
2020	2,130	963	276	310	3,426	21	661	897	482	29	47	103	-	-	-	-	-	9,345
2025	2,315	1,032	334	351	4,739	29	830	1,059	570	35	54	112	-	-	-	-	-	11,459
2030	2,582	1,110	399	399	6,224	39	1,022	1,245	675	41	62	121	-	-	-	-	-	13,918
Recreation Centres																		
2015	263	162	703	382	151	0	84	118	12	-	-	1,567	-	-	-	-	-	3,443
2020	269	170	813	424	273	1	103	165	14	-	-	1,729	-	-	-	-	-	3,962
2025	276	180	937	470	408	1	124	218	17	-	-	1,907	-	-	-	-	-	4,537
2030	292	190	1,074	521	558	1	147	277	19	-	-	2,105	-	-	-	-	-	5,185
Restaurant																		
2015	224	1,013	-	388	620	17	182	334	43	-	38	669	-	-	-	-	-	3,529
2020	254	1,103	-	431	831	28	245	516	51	-	87	1,043	-	-	-	-	-	4,590
2025	289	1,206	-	482	1,063	42	317	725	61	-	100	1,407	-	-	-	-	-	5,692
2030	332	1,324	-	540	1,321	57	400	965	73	-	115	1,690	-	-	-	-	-	6,818
Warehouse / Wholesale																		
2015	468	448	2,421	447	1,050	1	224	112	272	17	-	3	-	-	-	-	-	5,464
2020	492	491	2,897	504	1,744	2	278	159	319	20	-	6	-	-	-	-	-	6,912
2025	521	540	3,435	568	2,521	3	339	211	374	23	-	7	-	-	-	-	-	8,543
2030	569	596	4,044	640	3,394	4	409	271	439	27	-	8	-	-	-	-	-	10,402
Other General Service																		
2015	3,650	1,686	273	664	2,110	37	658	230	852	-	11	36	-	-	-	-	-	10,207
2020	3,779	1,821	324	757	3,005	37	876	281	986	-	24	81	-	-	-	-	-	11,971
2025	3,939	1,972	377	861	3,990	36	1,120	339	1,143	-	27	90	-	-	-	-	-	13,894
2030	4,242	2,140	437	977	5,075	36	1,393	404	1,325	-	30	101	-	-	-	-	-	16,160

Sub Sector / Milestone Year	General Lighting	Architectural Lighting	High-bay Lighting	Outdoor Lighting	Space Heating	Space Cooling	HVAC Fans and Pumps	Water Heating	Computer Equipment	Other Plug Loads	Cooking Equipment	Refrigeration	Elevators	Miscellaneous	Non Buildings	Street Lighting	Block Heater	Grand Total
Non-Buildings																		
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Street lighting																		
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,016	-	2,016
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,113	-	2,113
2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,304	-	2,304
2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,620	-	2,620
Parking Lot Plug																		
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	88	88
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	92	92
2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	101	101
2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	114	114
Grand Total																		
2015	14,036	8,722	4,394	3,676	12,889	375	3,896	2,806	3,522	116	80	4,910	-	-	-	2,016	88	61,526
2020	14,808	9,459	5,230	4,165	18,665	577	5,073	3,772	4,114	136	182	6,817	-	-	-	2,113	92	75,204
2025	15,721	10,291	6,170	4,718	25,087	802	6,401	4,866	4,813	159	208	8,589	-	-	-	2,304	101	90,229
2030	17,209	11,233	7,231	5,342	32,242	1,053	7,903	6,106	5,633	187	237	9,894	-	-	-	2,620	114	107,004

Appendix G Background-Section 9: Technology Assessment - Peak Load Measures

Introduction

Appendix G provides additional detailed information related to peak load reduction measures. The appendix discusses the following:

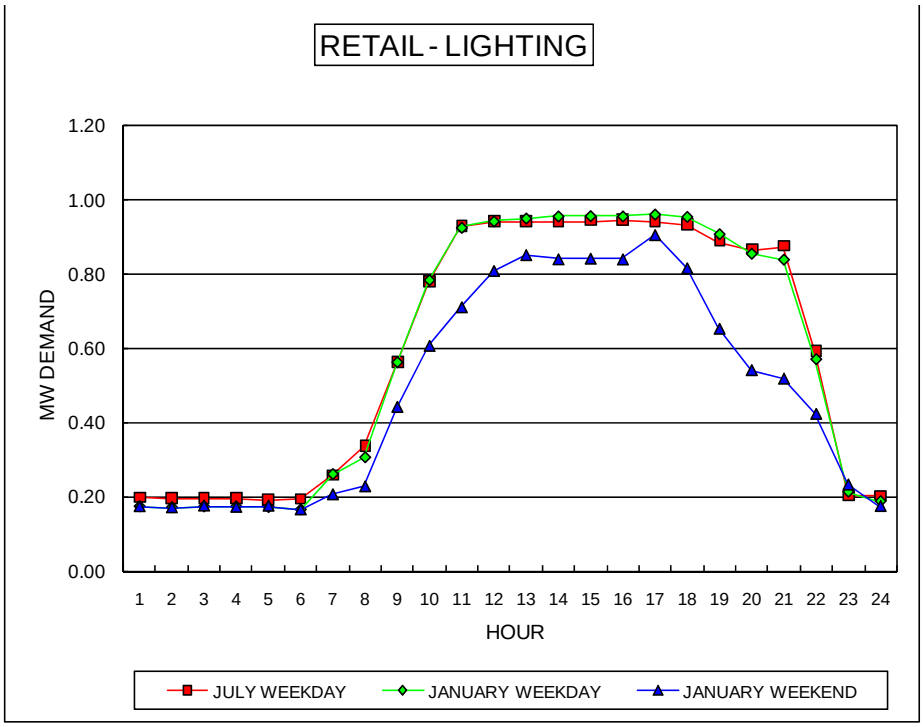
- Overview
- Description of electric peak reduction measures
- Measure lifecycle costing worksheets.

G1 Overview

Electric peak load measures are typically implemented by utilities to avoid or defer the costs of capacity expansion. Capacity costs refer to all levels of capital-based investments, including generating stations (new and upgraded), transmission and distribution lines, along with substations, transformers and other infrastructure required to deliver power, primarily related to peak capacity driven requirements.

Exhibit G 1 illustrates the base case Non-food Retail general lighting load profile on a cold December day (base case 4,647 MWH from Exhibit 10 in the body of the report). As shown, the daytime aggregate annual peak for these customers is estimated at about 0.93 MW, with about 0.95 MW for Peak Period 1 (6 pm) for this sub sector, and 0.90 MW for Peak Period 2 (4-8 pm).

Exhibit G 1 Baseline Commercial Non-Food Retail Lighting



Supply capacity can be purchased, but infrastructure must still be available to deliver the supply to customers. DSM measures that reduce peak requirements avoid and/or defer these capital-intensive investments.

From the customer's side, adoption of electric peak reduction strategies is typically dependent on the overall benefits to them, including direct incentive payments or rate benefits. Under most current rates for all but the smallest commercial customers, customers are billed both for peak demand (kW) and also for electric energy (kWh). Consequently, electric peak load measures that do not also reduce overall energy consumption do provide some financial benefits to customers if they coincide with their billing peaks. The industry trend is towards more specific pricing, including time-of-use and even hourly pricing, or peak incentives that pass along some of the utility benefits to customers on a performance basis. These new pricing structures provide incentive for commercial customers to implement measures or to participate in utility peak load reduction programs, as long as the differential between peak and off-peak prices are sufficient to provide a noticeable bill saving potential. These options are only limited by the availability and cost of suitable metering technology, remote facility data communications and by energy measurement storage options that would enable remote and/or automated measurement and control of devices.

G2 Description of Electric Peak Reduction Measures

The following sub sections provide a description of each of the measures listed in Section 9 of the main report. The discussion is organized by major end use and is presented in the following sub sections:

- Water heating
- Block heater timers and storage
- Lighting
- Whole facility misc. equipment
- Thermal energy storage for room and supplemental heating.

The discussion of each measure is organized as follows.

- Description
- Assumptions on applicability (dwelling type, unit types, vintage)
- Typical costs – one-time incremental, operating costs
- Typical electric peak reductions
- Other benefits
- Useful life
- Barriers and constraints for Economic and Achievable implementation
- Program issues.

Water Heating

Switch-based Water Heating Unit Load Control
Assumptions used for Analysis

Applicable facility type(s)	▪ Small-Medium Commercial Buildings – all with individual unit control/circuits
Applicable equipment type	▪ Water heater with at least a 40-gallon tank.
Vintage	▪ Existing and new
Costs	▪ $200 incremental cost in existing and new homes; $125 incremental cost as a add on to existing control system ▪ Approximately $10/site/year maintenance/evaluation
Electric peak reduction	▪ 80% reduction in water heating end use evening peaks ▪ About 80% of non-standby water heating energy reduction during curtailment is recovered
Useful life	▪ 10 years

Description

Switch-based water heating load control is accomplished by the installation of a remote control switch on either the water heater itself or on the circuits controlling the water heater. In older systems, this type of control has been accomplished via radio frequency (RF) control, which allows remote shut off of the water heater under specific capacity-constrained conditions during a limited number of pre-specified hours during winter peak months. In the systems that are currently offered, pager-based communications is used. An even more economic solution is to "piggyback" on an existing communications system. For example, if space heat control already exists, water heat control can be added via a hard-wired or wireless connection. This can significantly reduce the total cost of the water heat control.

Depending upon the length of the control, when the control is operated, and the size of the water heater tank, units can be shut off for the entire control period or cycled to limit their on time to a predetermined number of minutes per control cycle. Water heat control is commercially available and implemented in hundreds of thousands of sites in the U.S., thus demonstrating the viability of the technology, success of the programs, customer acceptance and utility satisfaction.

Applicability

Applicable dwelling types are any commercial buildings with an electric water heater that has at least a 40-gallon tank. The size of the tank is important because it provides hot water during times when the control is in effect. The larger the water heater tank, the longer the control can be in place without disrupting the customer's requirements.

Costs

Switches cost about $100 per unit, plus $100 for installation, plus maintenance. Costs are reduced to $125 (i.e., $25 incremental installation) if the control switch can be added to an existing control system at the same time, including any remote system, which may include thermostat control, engine block heater control, lighting or other. There are no savings in installation costs for a new facility.

Electric Peak Reduction

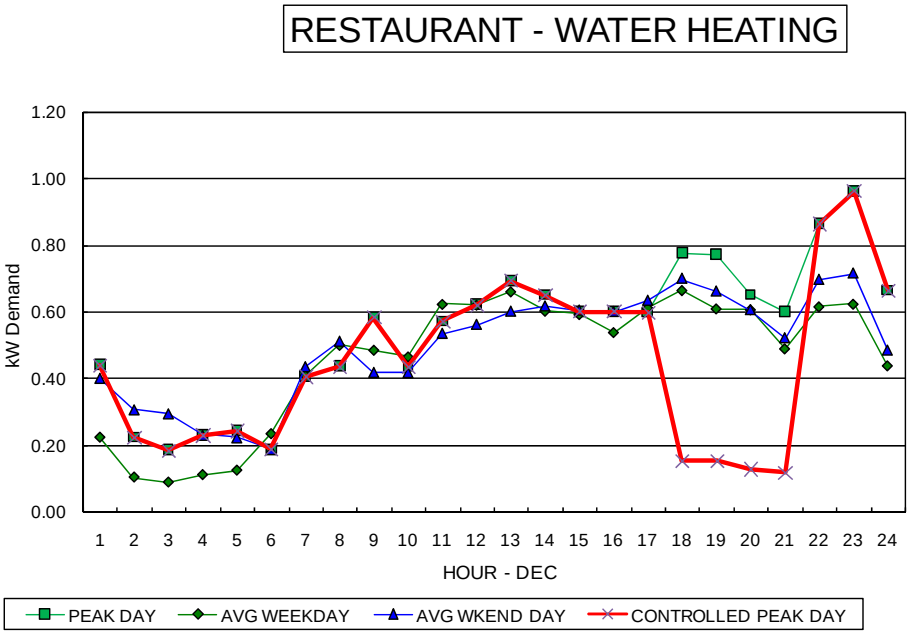
Assuming systems comparable to residential and primarily used for kitchen, washing and laundry usage, and annual energy consumption per participant (with 100% electric fuel use) of 4,000 kWh, the table below provides estimated impacts, assuming 80% reduction in load (i.e., 20% overrides, communications and switch failures):

Exhibit G 2 Commercial Sub Sector Load Shape Impact (kW)

Sub sector	Load Shape Code	Winter Peak Hour 18 (Peak period 1) impact	Winter Peak eve 4-8 pm (Peak Period 2) Impact	Winter Weekday morning 7-9 am (Peak Period 3) impact
Restaurant	2033	0.62	0.58	0.39
Hotel/Motel and Healthcare	2034	0.57	0.53	0.40
Retail	2035	0.24	0.39	0.15
Commercial All Other	2037	0.57	0.53	0.40

For the selected sub sectors and building size indicated, the range of Peak Period 2 impacts for this measure is 0.50 kW to 0.57 kW, assuming +/- 5% reduction percentage (from 20% average). Education is excluded because there is no significant water heater load expected during Peak Periods 1 or 2. Exhibit G 3 below illustrates an 80% reduction for Restaurant peak day water heating, compared to peak, weekday and weekend day load profiles.

Exhibit G 3 Commercial Water Heater Baseline vs. Controlled Load



Other Benefits

The water heater control switch would not provide customers with any ancillary benefits and thus the only incentive for participation would be monetary in nature, likely on a per annum or per control event basis.

Useful Life

This technology has a long history, going back at least 30 years on various types of equipment, including central air conditioners, water heaters and pool pumps. For the costing analysis, a 10-year life has been assumed, although there are programs which have had switches in place for longer.

Cost-Effectiveness Summary

Based on a one-time cost of approximately $200, ongoing maintenance of 5% (about $10/yr.) and estimated annual impacts of 0.50 kW – 0.57 kW, a preliminary estimate of the CEPR is $48 - $55 per kW. As an incremental option to other load control options within facilities, the installation costs would be reduced by $75 and the resulting CEPR would be $35 - $40 per kW.

Barriers and Constraints

Contractors are often the cause for lack of participation or dropouts, since they may incorrectly blame the switches for system performance problems, dissuading participation or resulting in removals. New tenants or their contractors may not know what the switches are and have them removed. With one-way communications, there is no way to verify whether the switch is even in place and an accurate count of actual switches in place cannot be reliably made without a systematic site verification plan.

Program Issues

Because there are no customer benefits inherent in the technology, a cash incentive would typically be expected for each season that the measure was needed, payable either by season or by event (or both). Additional work would be required to maintain, verify and evaluate the system performance to the same degree of accuracy as two-way systems due to the lack of confirmation and higher incidence of removals and failures.

Block Heater Timers and Storage

Engine Block Heater Load Control
Assumptions used for Analysis

Applicable facility type(s)	▪ For commercial fleets and maintenance vehicles often plugged in at the end of the work day
Applicable equipment type	▪ Block heaters and warmers
Vintage	▪ Existing and new
Costs	▪ $25 cost per vehicle for fleets of 10 or more ▪ $10 installation cost per vehicle ▪ Approximately $5/site/year maintenance/evaluation
Electric peak reduction	▪ 95% reduction in evening peaks ▪ 100% of energy reduction during curtailment is recovered
Useful life	▪ 10 years

Description

Engine block heater timers and/or control are accomplished by the installation of a timer that could be monitored and/or controlled by the utility to ensure that it is not overridden. The critical component in this application is to defer any operation until after the 5-8 pm peak period, especially in December, but including weekends as well. While timers can be used to reduce unnecessary energy consumption, reducing the heat cycle from 8-12 hours per day to the two to three hours per day that is required to ensure that engines are at warm enough temperatures to start, the timing of the operation is particularly key to the capacity control aspect. Ideally, operation should be both deferred until after 8 pm and staggered to prevent a local distribution peak (if the fleet operation was sizable enough), as well as billing demands for the fleet facility account, likely a separate parking garage or lot, to relieve the overall system peak associated with the 5-8 pm period.

Applicability

Applicable facility types are any business operation with a fleet of vehicles, such as post offices, taxis and utilities (electric, gas, cable, delivery services, taxi, hotel shuttle, etc.) where plug-in heaters are required for the vehicle fleet.

Costs

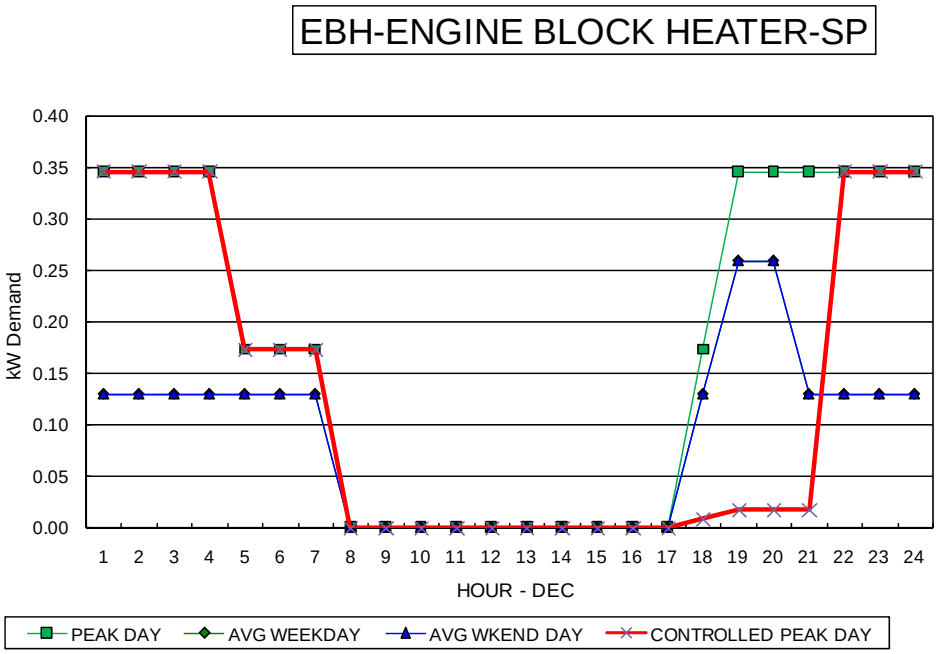
Given that a fleet operation is involved, economies of scale can be applied to reduce the costs of switch installation. Assuming at least 10 vehicles are involved, switches are assumed to cost about $25 per unit, plus $10 for installation, plus maintenance. There is no assumed incremental option.

Electric Peak Reduction

As with residential applications, assuming annual energy consumption per participant of 258 kWh, which would likely have been included in the outdoor lighting end-use category, baseline electric peak period loads are estimated as 0.173 kW for Peak Period 1 (system peak hour 6 pm), and 0.216 kW for Peak Period 2 (winter peak weekday 4-8 pm). Assuming 100% load control for evening peak hours, Exhibit G 4 below illustrates the baseline vs. control load profiles on the system peak day. This results in an estimated average of 0.173 kW per unit peak reduction for Peak Period 1 (at 6 pm) and an average of 0.216 kW per unit peak reduction for Peak Period 2 (4-8 pm), assuming no overrides or switch failures. These estimates may erode over time due to a number of factors, disabling of switches (by customers and contractors) and malfunctioning timers, so some maintenance and ongoing monitoring should be expected.

In Exhibit G 4 below, the red line represents the timer control option (controlled peak day) while the green line (peak day) represents the baseline. None of these load profiles assume use of timers used solely to reduce energy, which would not necessarily reduce evening peak demand unless specifically programmed to do so. The degree to which timers are set to defer usage and also lock out operation during 4-8 pm would be considered duplicated savings.

Exhibit G 4 Commercial Fleet Block Heater Baseline vs. Controlled Load



Other Benefits

The timers would also provide energy savings and, depending on the applicable rate in effect, could be operated to maximize bill savings as well.

Useful Life

Timers are an established technology. For the costing analysis, a 10-year life has been assumed, although timers can be expected to last longer than that if maintained in clean working condition, which would presumably be more feasible in a fleet facility environment.

Cost-Effectiveness Summary

Based on a one-time cost of approximately $25, ongoing maintenance of 10% (about $5/yr.) and estimated annual impacts of 0.173 kW – 0.216 kW per switch, a preliminary estimate of the CEPR is $33 - $42 per kW when applied to fleet facilities.

Barriers and Constraints

In a fleet operation, it is unlikely that contractors or operators would disconnect timers. Some switches may not maintain the correct time without some type of battery backup.

Program Issues

Without time-of-use rates, customers have no particular incentive to maintain the lock-out feature or timer operation to exclude the 4-8 pm period, so some monitoring may be necessary to ensure that block heater operation avoids system peaks. Additional monitoring and sampling would be required to maintain, verify and evaluate the system performance, which would be facilitated if the applicable facility were separately metered.

Lighting Load Control

Switch-based Lighting Load Control
Assumptions used for Analysis

Applicable facility type(s)	▪ All building types
Applicable equipment type	▪ Non-essential lighting
Vintage	▪ Existing and new
Costs	▪ $50 incremental cost in existing and new facilities; approximately $5/site/yr. maintenance/evaluation
Electric peak reduction	▪ 100% of non-essential lighting, assumed as 10% of baseline lighting usage, or 0.234 kW. ▪ No recovery energy is assumed
Useful life	▪ 8 years

Description

General and architectural lighting represent approximately 27% of Base Year (2010) energy consumption in Commercial sector buildings. In virtually every building and facility, there are expected to be a number of non-essential lighting loads that could be controlled for limited periods, such as during system peak critical hours.

Switch-based lighting load control is accomplished by the installation of a remote control switch on non-essential lighting circuits, wall switches and plug-in lamps or decorative lighting. Existing automation systems currently utilize plug-in modules with communication via power line carrier or short-run radio signals. These systems can also interface with PCs and through telephone interfaces so that remote control can be accomplished as well. In terms of technical capability, the improvements to these existing systems that will facilitate their use in utility electric peak load control would require some reduced cost and more standardized and reliable remote interfaces.

Typical commercial EMS systems have some capability for remote programming for on-demand control use, but this capability may need to be enhanced. Most likely, this would be achieved as part of an add-on wireless communications control switch linked to the outside through a remote load control system already in place to maximize or even enable cost effectiveness. What is required is a gateway via broadband (e.g., broadband over power lines) or through the meter that would accept outside signals (such as from the utility) and convert them to short-run wireless (or wired) signals that would trigger switches placed on selected lights and appliances. This section describes the lighting applications only, in order to determine effect on lighting load profiles. The next section addresses aspects of non-lighting loads, although lighting and non-lighting plug loads are not expected to require separate systems, but rather a single gateway that controls switches for any plug load or, for lighting, wall switch. This technology would be applicable for any commercial facility, which could make effective use of total building communications through building wiring or a building wi-fi system, as is common for electrical sub metering applications today.

Applicability

This measure is applicable to all building and business types, but would be most applicable to Offices, Non-food Retail, Hotel/Motel, Education and Warehouses, and especially where occupancy varies and occupancy sensors are not viable.

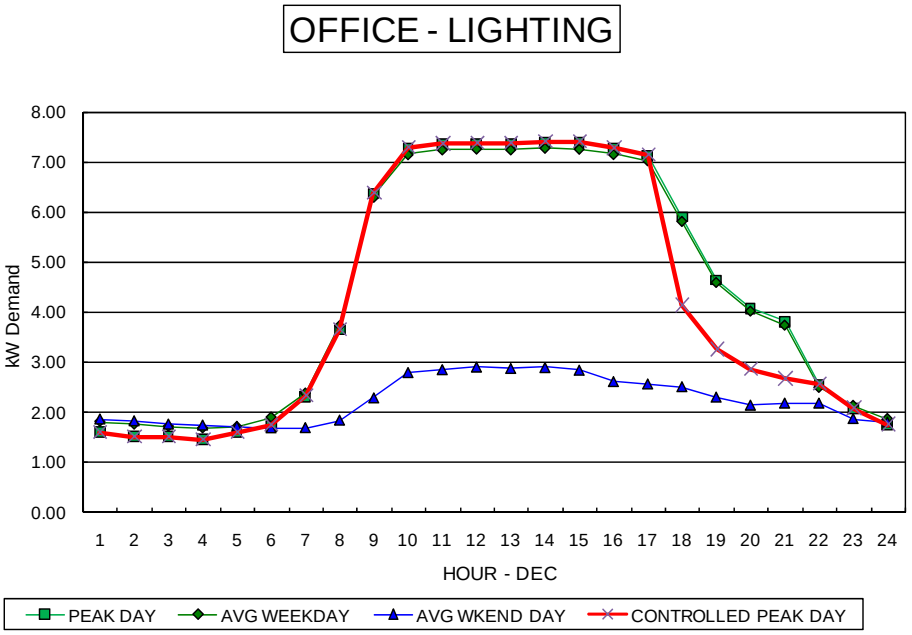
Costs

Gateway systems are estimated at $100 - $300 per site installed, although they would be expected to serve multiple purposes. For example, a programmable communicating thermostat or electric meter already installed in a commercial building for other applications could include a relay board that would relay signals from a remote host over broadband, building wiring or via wi-fi to individual devices in commercial spaces from one or more distinct customers within a single building. Switches are assumed to cost about $10 per unit (assume 10 for this example), which could control multiple lights and plug loads, and $100 installation. There is no savings assumed for installation costs for a new building.

Electric Peak Reduction

Based on annual general and architectural lighting loads per facility, using an Office suite of 5,000 square feet as an example, estimated base lighting consumption would be approximately 33,000 kWh (assuming 6.6 kWh/ft^2). Based on this, and using the general lighting load shape and assuming 30% of the average lighting load is controllable during the 4-8 pm Peak Period 2, impacts would be approximately 1.60 – 1.77 kW/site. In the figure below, the red line represents the timer control option (controlled peak day) while the green line (peak day) represents the baseline, assuming 30% lighting reduction from 4-8 pm.

Exhibit G 5 Commercial Office Lighting Baseline vs. 30% Controlled Load



Other Benefits

The gateway systems and switches would provide customers with many ancillary benefits, such as remote shut off of lights and appliances for security, convenience and energy saving, although no energy savings has been assumed for this analysis.

Useful Life

This technology has a fairly long history, going back at least 20 years for various protocols of home automation devices, including X-10 protocol units, which have been available through

electronics stores under various brand names. For the costing analysis, an eight-year life has been assumed, although the units typically last 10-15 years.

Cost-Effectiveness Summary

Based on the inclusion of a modest ($100) gateway system installation and 10 switches (at $10 each), installation cost of approximately $100, ongoing maintenance/support of 10% (about $10/yr,) and estimated annual impacts of 1.60 – 1.77 kW, the estimated CEPR is $26 - $28 per kW/yr. when applied to an Office. Business types with more coincident lighting during 4-8 pm, such as Retail, Healthcare and Hotel/Motel would be better options. For practical and economic purposes, this type of system may be incremental to an existing EMS or other facility control system, which would reduce the installation cost further.

Barriers and Constraints

The technology for this application, while existing, is not quite ready for general use and would be greatly enhanced by the introduction of gateways that are only now being pilot tested. In addition, without some type of time-based rate, there would be little incentive for customers to purchase these devices, even as timers, without cash incentives.

Program Issues

In the short term, the utility could work with building owners, building managers, electronics distributors and ESCOs to pilot test and demonstrate the benefits of these types of systems for remote shutdown of lights during the defined peak periods on system-critical days. This would be facilitated by adoption of time-of-use rates that would be consistent with the peak periods, with critical peak pricing periods on a handful of system peak days providing the additional incentive for customers to utilize their systems during system peak critical periods. Typical switches can be overridden easily so programming them as a default to shut certain lights for the peak winter months with the option to turn them back on if needed would be feasible.

Multiple (Miscellaneous Plug Loads)

See the discussion on lighting for description, applicability and costs, which are the same.

Electric Peak Reduction

Assuming a typical medium commercial Office suite of 5,000 ft^2, assume average computer and plug loads would be about 20,000 kWh/yr. at 3.96 kWh/ ft^2/yr. for miscellaneous plug loads. This would translate to about 3.23 kW of system-coincident computer and plug loads (under the Peak Period 2 definition). There are numerous devices to which this measure could be applied, including phantom loads; principal among these would be copiers, printers, monitors and electronic device chargers (many of which could be ganged on one power strip with a single switch). For the purposes of this analysis, it is assumed that 717 - 920 watts of devices could be controlled by five switches controlling “smart” power strips. Some equipment may have built-in features that place them in standby or sleep mode but this has not been assumed. This would consist of either standby (or sleep mode) power on units not being used, or full active standby power on units considered temporarily non-essential, as designated through cooperative agreement among utility, building management and occupants. The table below lists the best

candidates, based on a 1999 standby study by LBNL,[8] as well as other sources and project team experience.

Exhibit G 6 Commercial Office Appliance Power Consumption Ranges (W)

Appliance	Range of Power Consumption (Watts)
Small office copier	20 (standby) - 250 W
Ink jet printer	4 – 6 W
Laser printer	20 – 40 W
Hot/cold water cooler	70 W
LCD monitor	10 – 28 W
CRT monitor	50 -150 W
Instant/one-cup coffee-makers	30 – 50 W
Set-top boxes	5 – 25 W
Large screen TVs/monitors	5 – 22 W

For example, in offices with two or more copiers, at least one could be designated as interruptible, and either turned off or placed in sleep mode (standby) during utility system-critical days, reducing electric load by the active standby power level or active standby less standby. Initially, this function could be done through O&M measures, but ultimately are assumed to be implemented by remote utility control, either directly or through building management, as well as integrated into energy management systems (EMS). Copiers, laser printers, one-cup coffee makers and hot/cold water coolers would be ideal for these applications since they have heating elements that consume significant power and can be shut down for several hours without significant effect on business operations.

Cost-Effectiveness Summary

Based on the 100% incremental scenario, five switches ($50) and $20 for incremental installation costs, $10/yr. for maintenance, and estimated annual impacts of 200 watts on demand, encompassing a mix of the above devices being controlled, the estimated CEPR is $17 - $23 per kW/yr. vs. stand alone ($100 gateway) of $30 - $41 per kW/yr. For practical purposes, this type of system would not be used in stand-alone cases, only as an increment to an existing gateway system with lighting switches already in place.

Multiple Facility – Remote Circuit Control

Switch-based Interruptible Circuit Load Control
Assumptions used for Analysis

Applicable facility type(s)	▪ Office, Hotel/Motel building elevators ▪ Retail, Food, Hotel, Restaurant and Education refrigeration
Applicable equipment type	▪ Elevators, selected refrigeration/lighting units, HVAC systems and pumps
Vintage	▪ Existing and new
Costs	▪ $200 incremental cost in existing and new buildings; $100 incremental cost as a add on to an existing control system ▪ Approximately $20/site/yr. maintenance/evaluation
Electric peak reduction	▪ Assume 75% reduction in baseline loads of circuits for selected elevator and refrigeration/lighting equipment, 50% for HVAC systems and pumps; minimal recovery energy
Useful life	▪ 10 years

[8] Standby Power. http:/standby.lbl.gov – Lawrence Berkeley National Labs.

Description

Switch-based load controls on interruptible equipment is accomplished by the installation of remote control switches on selected equipment that is redundant (e.g., multiple elevator banks) or considered temporarily non-essential (e.g., refrigeration and lighting on beverage cases where spoilage is not an issue, HVAC systems and pumps in large facilities). In older systems, this type of control has been accomplished via radio frequency (RF) or power line carrier ("PLC" – through building wiring) control, which allows remote shut off of circuits under specific capacity-constrained conditions during a limited number of pre-specified hours during winter peak months. In newer systems and those projected for the future, other communications systems are expected, including wireless and wi-fi. An even more economic solution is to "piggyback" on an existing communications system or EMS. Most controlled loads anticipated under this measure would be capable of 100% shutdown for the several hours of critical peak periods. Units could also be cycled to limit their on time to a predetermined number of minutes per control cycle, but this may not be feasible for control of large circuits. In elevators, linking into local lock-out circuitry may be feasible, which would eliminate the need (and cost) of installing switches on circuits. For HVAC systems and pumps, existing EMS or demand-control systems could be accessed.

Applicability

Applicable facility types are any commercial buildings with types of loads that can be shut down for several hours without adverse effects on business operations or customer service. For example, elevators in multiple elevator buildings, refrigeration in empty cases or lighting in selected refrigeration cases, and HVAC fans and pumps could all be controlled. This would have some limits since Peak Period 2 (4-8 pm) generally corresponds to times when they may be in active use for some facility types (e.g., elevators in offices, refrigerator cases for grocery stores or restaurants). Another example is beverage cases for soft drinks or alcohol in grocery stores or supermarkets that would be minimally affected by being shut off for several hours.

Costs

Control system costs are assumed to be $200 for new installations. Switch costs are assumed at about $50 per unit, plus $100 for installation, plus $50/yr. maintenance. Costs are reduced to $150 (i.e., $150 incremental installation) if the control switch can be added to an existing control system at the same time. There is no savings in installation costs for a new facility.

Electric Peak Reduction

Elevator loads are approximately 2% of medium-large Office buildings, where this option is most applicable. For a typical large Office building it is assumed that Peak Period 2 demand would be approximately 15 kW. Assuming 25% of elevator consumption would be deferrable (shut down one of four elevators), that would result in 3.75 kW load reduction potential.

HVAC system fans and pumps comprise approximately 10% of commercial energy consumption. This option would be considered applicable only in larger facilities where there is central control and would exclude the Restaurant sub sector. We have assumed an average of about 3 kW per circuit. Assuming that 50% of HVAC system fans and pumps would be deferrable through use of alternate shutdowns and cycling, the result would be an estimated 1.5 kW per unit of peak reduction.

For refrigeration units (with lighting), this would apply primarily to Food Retail applications, including cafeterias in the Education, Hotel/Motel and Restaurant sub sectors. Refrigeration for a 5,000-ft^2 food store would contribute about 17.5 kW in the baseline scenario (3.5 kW per 1,000 ft^2). Control of 10% of that load would be 1.75 kW, which should be controllable with five switches (350 watts/switch).

Other Benefits

None.

Useful Life

Control switch technology has a long history. For the costing analysis, an eight-year life has been assumed.

Cost-Effectiveness Summary

For elevator controls and HVAC system fans and pumps, we have assumed a capital cost of $300, installation of $250, plus $100 for switches. Based on a stand-alone scenario and estimated electric peak load reduction totaling 5.25 kW for applicable building types (large Office buildings for elevators, most building types for fans and pumps), the estimated CEPR is $38 per kW/yr. for stand-alone systems. For elevators, most likely, this system would be used in stand-alone cases because of the difficulty in integrating it with other building systems. For HVAC system fans and pumps, while it is assumed that this would be a stand-alone system, it could also be integrated with other building systems. Removing the capital cost of a gateway, but leaving installation, switch and maintenance would reduce the CEPR to $31/kW/yr.

For refrigeration control, we have assumed stand-alone control system costs of $200 for devices, $100 for installation and $125 for five switches in a 5,000-ft^2 facility, with $50 annual maintenance, all over eight-year equipment life. This would result in an estimated CEPR of $53 per kW/yr. For an incremental installation (no capital equipment), this would reduce the CEPR to $39 per kW/yr.

Barriers and Constraints

The technology for this application is already utilized in limited applications, but would be greatly enhanced by the introduction of gateways, which are only now being pilot tested, that would link outside utility control to internal building control systems. Financial incentives would provide a significant incentive for customers to invest in these systems themselves, in the absence of utility incentives for the initial investment or pay-for-performance incentives for peak demand response.

Program Issues

In the short term, the utility could work with building owners, building managers and customers with applicable interruptible refrigeration systems, including ESCOs, to pilot test and demonstrate the benefits of these types of systems for remote shutdown of elevator, HVAC fans, pumps and refrigeration units during the defined peak periods on system-critical days. This would be facilitated by adoption of time-of-use rates that would be consistent with the peak periods, with critical peak pricing periods on a handful of system peak days providing the additional incentive for customers to utilize their systems during system peak critical periods. Typical switches can be overridden.

In addition, the effect of current and potential incoming federal regulations for reduced standby power levels should be taken into account when estimating potential program impact.

Electric Thermal Storage (ETS) Room Units

Electric Thermal Storage (ETS) Room Units
Assumptions used for Analysis

Applicable facility type(s)	▪ Hotel/Motel, Restaurant and Office, where individual room unit control is feasible and can take advantage of variable occupancy – requires off-peak rate structure
Applicable equipment type	▪ Baseboard systems compatible with replacement by stand-alone room unit ETS systems
Vintage	▪ Existing and new
Costs	▪ Assuming 15-hour operation (nine hour overnight charge time): ▪ $1,200 - $1,600 for room ETS units, vs. $400 for standard room baseboard system ▪ Assume $200 incremental installation costs; approximately $100/site/yr. incremental maintenance
Electric peak reduction	▪ Assume 95% of current full electric loads (assuming 5% override), operating 100% off peak otherwise, with only residual fan (same as baseline) during 15 daytime hours. Estimated 0.73 kW peak reduction for 2,500 annual kWh ▪ Approximately 5% increase in space heating energy for losses
Useful life	▪ 15 years (comparable to heat pump)

Description

ETS is a technology that has been widely used in Europe and selectively used in North America for more than 40 years. The basic premise of the systems is to convert electricity into heat and store it in specially designed high-density ceramic bricks, capable of holding heat up to 1,650°C. Combined with a utility off-peak rate, operation in charging mode during low-cost off-peak hours can provide heat all day, if properly sized, by thermostat-controlled release of heat from the bricks through either forced air or hydronic systems. Units come in various sizes, from whole-house units to individual room units. Control systems to ensure proper heat distribution are typically included and systems can be retrofitted or installed in new construction applications. The principal manufacturer in North America is Steffes Corp.[9], and marketing is principally accomplished through electric co-ops, as well as many northern U.S. and Canadian utilities, including Nova Scotia Power and Hydro-Quebec, where a sufficient differential between peak and off-peak prices during winter months makes it economical for residents. Many winter-peaking generation, transmission and distribution co-ops market the units in order to minimize their capacity requirements during peak winter.

Applicability

With the various size units available, ETS can be installed in any room, as a replacement or as a supplement to electric baseboard systems. For the Hotel/Motel and Healthcare sub sectors, and some Offices where occupancy varies, ETS can be used to replace comparable electric baseboard units. Often, a separate meter is used to measure only the central heating systems

[9] http://www.steffes.com.

to best take advantage of the off-peak rate but a separate meter would not be viable for room units. Systems would be configured to take advantage of rates, ideally a time-of-use rate, with charging periods designed to virtually eliminate any operation during peak periods. For Yukon, a 15-hour peak rate period (7 am – 10 pm) and nine-hour off-peak rate (10 pm – 7 am) would be used by the utility.

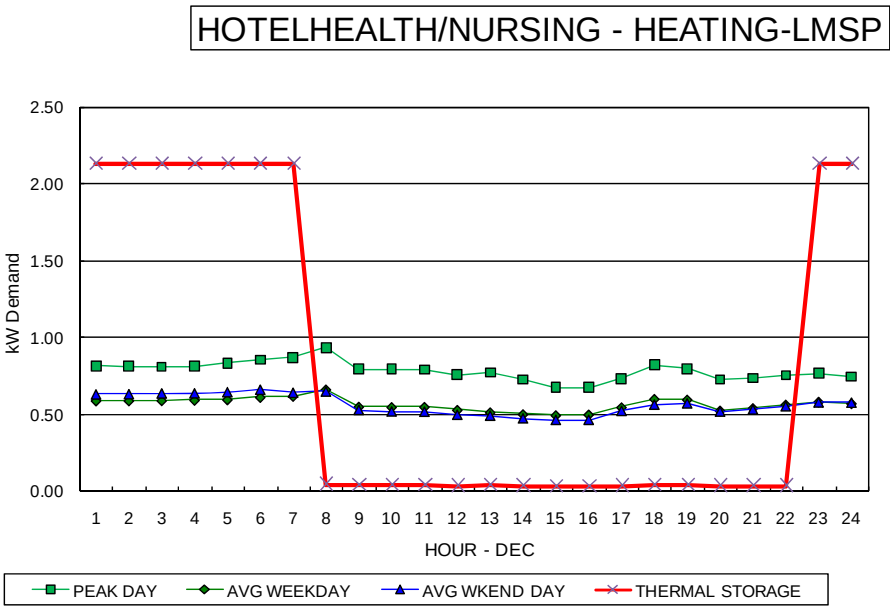
Costs

Initial costs for ETS systems are significantly higher than standard heating systems. For the economics to work for the customer, the rate differential must be significant, at least two or three to one for peak to off-peak. Initial costs are roughly proportional to the unit sizing, with an ETS system requiring two to three times the size of a standard system, and somewhat higher installation and maintenance costs. In addition, additional control equipment and sometimes wiring upgrades are necessary, as well as placement in the home (requires sufficient support for additional weight), making the specification of a system critical in terms of applicability. In general, larger facilities work best. For the purpose of this study, preliminary costs have been developed based on literature search and an interview with a representative of Steffes Corp.

Electric Peak Reduction

Electric peak load reduction would be theoretically 100% of the peak heating requirements of a standard electric space heater for the applicable room. Off-peak loads would be more than twice the levels so it would be critical to size the systems properly for the expected charging period. For example, for a large room with 3,000 annual kWh requirements for space heating, Peak Period 1 loads would be about 0.87 kW, and Peak Period 2 loads would average 0.77 kW. For the costing analysis, it is assumed that 5% of the usage would still be on peak to account for minimal overrides or where units do not provide all heating requirements through off-peak charging (even though theoretically designed to do so). For a room ETS unit, the comparable overnight (charging) on a peak day would be as illustrated below. Peak load reduction would therefore be about 0.82 kW at the hour ending 6 pm system Peak Period 1 and average 0.74 kW during the 4-8 pm peak period.

Exhibit G 7 Electric Thermal Storage Heating – Room Unit



Other Benefits

None.

Useful Life

This technology has a long history in Europe and the bricks are virtually indestructible, so the useful life is considered the same as comparable room heating systems, 15 years. Electronic control systems are required, which involve some maintenance.

Cost-Effectiveness Summary

For central systems, analysis is based on a one-time incremental cost of approximately $1,000 for the unit plus $150 installation, plus $50 annual maintenance. Estimated annual impacts of 0.73 – 0.76 kW were used, based on 95% of Peak Period 1 and 2 loads. Under those assumptions, a preliminary estimate of the CEPR is $132 - $147 per kW/yr.

Barriers and Constraints

The existence of an off-peak rate with significant differential is a major consideration, although additional metering and infrastructure (priced at $150 per site) would not be justified solely for this purpose. Numerous logistical and wiring issues would also need to be addressed. Space requirements and sufficient weight-bearing floors for installation of the units, which are much heavier than standard heating equipment, would be potential constraining factors to feasible installations.

Program Issues

While many co-ops and several major Canadian utilities have programs for this application, which could be consulted to assist in designing the program and identifying barriers experienced in real implementation (not just pilot programs), the programming infrastructure required would involve a significant commitment.

Electric Heat Switch Controls for Hotel/Motel

Electric Heat Switch Controls for Hotels
Assumptions used for Analysis

Applicable facility type(s)	▪ Hotel/Motel, where 10% of space heating is electric, where individual room control is feasible and can take advantage of variable occupancy
Applicable equipment type	▪ Electric room heating systems compatible with switch control
Vintage	▪ Existing and new
Costs	▪ $1,250 system cost with installation plus $50/switch for 10 room installation, plus $200 annual maintenance ▪ Assume $200 incremental installation costs, with all other costs the same
Electric peak reduction	▪ Assume 50% reduction in base loads, including overrides, estimated 6.2 – 6.4 kW reduction for 10 rooms for 5-9 pm period, approximately 5% increase in space heating energy for losses
Useful life	▪ 10 years (comparable to heat pump)

Description

Electric heating in the Hotel/Motel sub sector is subject to occupancy variables. Existing switch technology is available to enable remote central control of individual room units via thermostat or switch control. For rooms that are temporarily unoccupied (not reserved at all or the occupants are out of their rooms) during the 4-8 pm period, heating could be reduced significantly. It is estimated that 50% reduction could be achieved via temporary curtailment.

Applicability

Hotels or motels with at least 10 rooms would be expected to be large enough to accommodate the central control systems required.

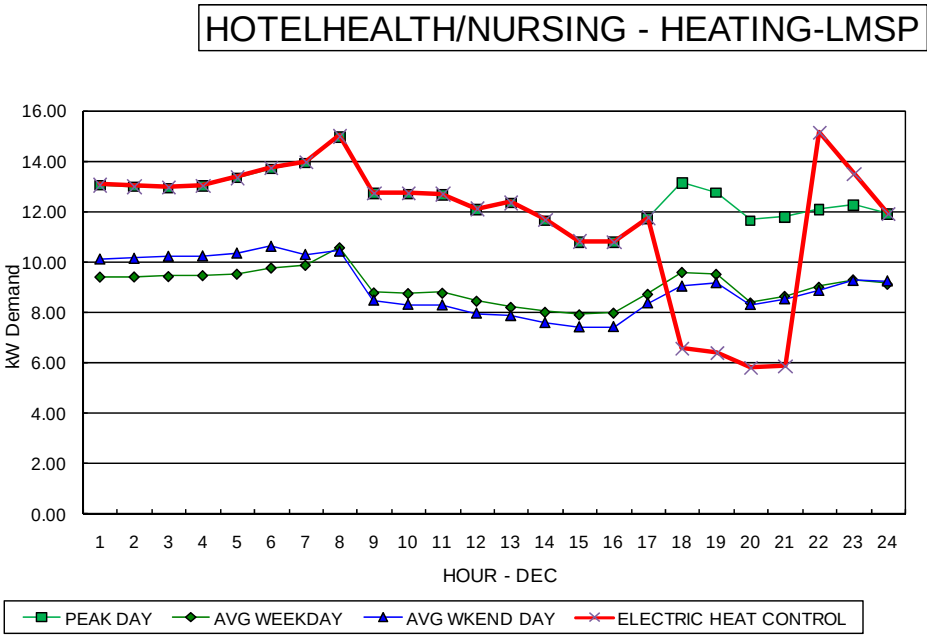
Costs

Initial costs for a central control system are estimated at $1,000 for a 10-room system, with $200 annual maintenance and $250 installation. Switches are estimated at $50 each, so a 10-switch system would cost $500.

Electric Peak Reduction

Electric peak load reduction would be theoretically 50% of the peak heating requirements of a standard electric space heater for the applicable room. Based on a 400-ft^2 room, 10 rooms and 10 kWh/ ft^2 annual heating requirement, total base annual consumption for 10 rooms would be 40,000 kWh. This translates to a 4-8 pm peak of about 10.31 kW and 11.55 kW at 6 pm for the 10 rooms. A 50% peak load reduction would therefore be about 5.2 – 5.8 kW, as illustrated below.

Exhibit G 8 Electric Heat Switch Controls for Hotel/Motel



Other Benefits

Hotels and motels could use this at other times to remotely reduce heating when rooms are unoccupied in order to save energy and also reduce their own billing peak.

Useful Life

Switches have a typical lifetime of 10 years, with maintenance.

Cost-Effectiveness Summary

Assuming systems costs as outlined above, a 10-room system would have a CEPR of $56 - $63 per kW/yr. An incremental system installation, assuming that there is already a system in place that would be capable of the type of control and could be retrofitted to the required curtailment scheduling, would have a CEPR of $42 - $47 per kW/yr.

Barriers and Constraints

Concerns about guest comfort would need to be addressed and some heating systems would not be compatible with the type of equipment and systems required. Some type of override (remotely by hotel manager or by guest) may need to be tuned to enable easy access.

Program Issues

None.

G3 Measure Lifecycle Costing Worksheets

The following worksheets detail the calculation of CEPR for each of the electric peak measures listed.

LIFE-CYCLE COSTING WORKSHEET

One-Way Switch - Water Heating

1	**One-time Costs - Retrofit**		2	**Recurring Costs ($/yr)**	
	Capital/Device	$100.00		Maintenance	$10.00
	Installation	$100.00		Support	$0.00
	Other	$0.00		Other	$0.00
	Total	$200.00		Total	$10.00
3	**Net present Value Cost (1)**	$273.79			
		Low	High		
4	**Peak Reduction (kw/yr)**	0.41	0.56		
5	**Life-Cycle Peak reduction**	4.10	5.60		
6	**Cost of Electric Peak Reduction (CEPR)**				
	(Rounded to $)	**$67.00**	**$49.00**		

(1) Discount Rate/yr 7.5%
Device Lifetime (yrs) 10

LIFE-CYCLE COSTING WORKSHEET

One-Way Switch - Water Heating (incremental)

1	**One-time Costs - Retrofit**		2	**Recurring Costs ($/yr)**	
	Capital/Device	$100.00		Maintenance	$10.00
	Installation	$25.00		Support	$0.00
	Other	$0.00		Other	$0.00
	Total	$125.00		Total	$10.00
3	**Net present Value Cost (1)**	$198.79			
		Low	High		
4	**Peak Reduction (kw/yr)**	0.41	0.56		
5	**Life-Cycle Peak reduction**	4.10	5.60		
6	**Cost of Electric Peak Reduction (CEPR)**				
	(Rounded to $)	**$48.00**	**$35.00**		

(1) Discount Rate/yr 7.5%
Device Lifetime (yrs) 10

LIFE-CYCLE COSTING WORKSHEET

One-Way Switch - Engine Block Heater

1	**One-time Costs - Retrofit**		2	**Recurring Costs ($/yr)**	
	Capital/Device	$25.00		Maintenance	$5.00
	Installation	$10.00		Support	$0.00
	Other	$0.00		Other	$0.00
	Total	$35.00		Total	$5.00
3	**Net present Value Cost (1)**	$71.89			
		Low	High		
4	**Peak Reduction (kw/yr)**	0.259	0.329		
5	**Life-Cycle Peak reduction**	2.59	3.29		
6	**Cost of Electric Peak Reduction (CEPR)**				
	(Rounded to $)	**$28.00**	**$22.00**		

(1) Discount Rate/yr 7.5%
Device Lifetime (yrs) 10

LIFE-CYCLE COSTING WORKSHEET

One-Way Switch - Engine Block Heater (incremental)

1	**One-time Costs - Retrofit**		2	**Recurring Costs ($/yr)**	
	Capital/Device	$25.00		Maintenance	$5.00
	Installation	$10.00		Support	$0.00
	Other	$0.00		Other	$0.00
	Total	$35.00		Total	$5.00
3	**Net present Value Cost (1)**	$71.89			
		Low	High		
4	**Peak Reduction (kw/yr)**	0.259	0.329		
5	**Life-Cycle Peak reduction**	2.59	3.29		
6	**Cost of Electric Peak Reduction (CEPR)**				
	(Rounded to $)	**$28.00**	**$22.00**		

(1) Discount Rate/yr 7.5%
Device Lifetime (yrs) 10

LIFE-CYCLE COSTING WORKSHEET

One-Way Switch - Lighting (stand-alone)

1	**One-time Costs - Retrofit**		2	**Recurring Costs ($/yr)**	
	Capital/Device	$100.00		Maintenance	$5.00
	Installation	$100.00		Support	$5.00
	Switches (10)	$100.00		Other	$0.00
	Total	$300.00		Total	$10.00

3	**Net present Value Cost (1)**	$362.97	
		Low	High
4	**Peak Reduction (kw/yr)**	0.92	1.38
5	**Life-Cycle Peak reduction**	7.36	11.04
6	**Cost of Electric Peak Reduction (CEPR)**		
	(Rounded to $)	**$49.00**	**$33.00**

(1)	Discount Rate/yr	7.5%
	Device Lifetime (yrs)	8

LIFE-CYCLE COSTING WORKSHEET

One-Way Switch - Commercial Plug Loads

1	**One-time Costs - Retrofit**		2	**Recurring Costs ($/yr)**	
	Capital/Device	$100.00		Maintenance	$10.00
	Installation	$20.00		Support	$0.00
	Switches (5)	$50.00		Other	$0.00
	Total	$170.00		Total	$10.00
3	**Net present Value Cost (1)**	$232.97			
		Low	High		
4	**Peak Reduction (kw/yr)**	0.300	0.300		
5	**Life-Cycle Peak reduction**	2.40	2.40		
6	**Cost of Electric Peak Reduction (CEPR)**				
	(Rounded to $)	**$97.00**	**$97.00**		

(1) Discount Rate/yr 7.5%
Device Lifetime (yrs) 8

LIFE-CYCLE COSTING WORKSHEET

One-Way Switch - Commercial Plug Loads (incremental)

1	**One-time Costs - Retrofit**		2	**Recurring Costs ($/yr)**	
	Capital/Device	$0.00		Maintenance	$10.00
	Installation	$20.00		Support	$0.00
	Switches (10)	$50.00		Other	$0.00
	Total	$70.00		Total	$10.00
3	**Net present Value Cost (1)**	$132.97			
		Low	High		
4	**Peak Reduction (kw/yr)**	0.300	0.300		
5	**Life-Cycle Peak reduction**	2.40	2.40		
6	**Cost of Electric Peak Reduction (CEPR)**				
	(Rounded to $)	**$55.00**	**$55.00**		

(1) Discount Rate/yr 7.5%
Device Lifetime (yrs) 8

LIFE-CYCLE COSTING WORKSHEET

One-Way Switch - Commercial Elevators, HVAC Fans and Pumps (Stand-alone)

1	**One-time Costs - Retrofit**		2	**Recurring Costs ($/yr)**	
	Capital/Device	$300.00		Maintenance	$100.00
	Installation	$250.00		Support	$50.00
	Switches	$100.00		Other	$0.00
	Total	$650.00		Total	$150.00
3	**Net present Value Cost (1)**	$1,594.49			
		Low	High		
4	**Peak Reduction (kw/yr)**	5.250	5.250		
5	**Life-Cycle Peak reduction**	42.00	42.00		
6	**Cost of Electric Peak Reduction (CEPR)**				
	(Rounded to $)	**$38.00**	**$38.00**		

(1) Discount Rate/yr 7.5%
Device Lifetime (yrs) 8

LIFE-CYCLE COSTING WORKSHEET

One-Way Switch - Commercial Elevators, HVAC Fans and Pumps (incremental)

1	**One-time Costs - Retrofit**		2	**Recurring Costs ($/yr)**	
	Capital/Device	$0.00		Maintenance	$100.00
	Installation	$250.00		Support	$50.00
	Switches	$100.00		Other	$0.00
	Total	$350.00		Total	$150.00
3	**Net present Value Cost (1)**	$1,294.49			
		Low	High		
4	**Peak Reduction (kw/yr)**	5.250	5.250		
5	**Life-Cycle Peak reduction**	42.00	42.00		
6	**Cost of Electric Peak Reduction (CEPR)**				
	(Rounded to $)	**$31.00**	**$31.00**		

(1) Discount Rate/yr 7.5%
Device Lifetime (yrs) 8

LIFE-CYCLE COSTING WORKSHEET

One-Way Switch - Commercial Interruptible Loads - Refrigeration

1	**One-time Costs - Retrofit**		2	**Recurring Costs ($/yr)**	
	Capital/Device	$200.00		Maintenance	$50.00
	Installation	$100.00		Support	$0.00
	Switches (5)	$125.00		Other	$0.00
	Total	$425.00		Total	$50.00
3	**Net present Value Cost (1)**	$739.83			
		Low	High		
4	**Peak Reduction (kw/yr)**	1.750	1.750	(10% of peak for 5000 sf)	
5	**Life-Cycle Peak reduction**	14.00	14.00		
6	**Cost of Electric Peak Reduction (CEPR)**				
	(Rounded to $)	**$53.00**	**$53.00**		

(1) Discount Rate/yr 7.5%
Device Lifetime (yrs) 8

LIFE-CYCLE COSTING WORKSHEET

One-Way Switch - Commercial Interruptible Loads - Refrigeration (incremental)

1	**One-time Costs - Retrofit**		2	**Recurring Costs ($/yr)**	
	Capital/Device	$0.00		Maintenance	$50.00
	Installation	$100.00		Support	$0.00
	Switches (5)	$125.00		Other	$0.00
	Total	$225.00		Total	$50.00
3	**Net present Value Cost (1)**	$539.83			
		Low	High		
4	**Peak Reduction (kw/yr)**	1.750	1.750	(10% of peak for 5000 sf)	
5	**Life-Cycle Peak reduction**	14.00	14.00		
6	**Cost of Electric Peak Reduction (CEPR)**				
	(Rounded to $)	**$39.00**	**$39.00**		

(1) Discount Rate/yr 7.5%
Device Lifetime (yrs) 8

LIFE-CYCLE COSTING WORKSHEET

Electric Thermal Storage - Room Unit Heating System - Commercial

1	**One-time Costs**		2	**Recurring Costs ($/yr)**	
	Capital/Device	$1,000.00		Maintenance	$50.00
	Installation	$150.00		Support	$0.00
	Other (Meter)	$0.00		Other	$0.00
	Total	$1,150.00		Total	$50.00
3	**Net present Value Cost (1)**	$1,624			
		Low	High		
4	**Peak Reduction (kw/yr)**	0.73	0.76	(95% of Peak period 2)	
5	**Life-Cycle Peak reduction**	10.95	11.40		
6	**Cost of Electric Peak Reduction (CEPR)**				
	(Rounded to $)	**$148**	**$142**		

(1) Discount Rate/yr 7.5%
Device Lifetime (yrs) 15

LIFE-CYCLE COSTING WORKSHEET

One-Way Switch - Hotel Electric Heating

1	**One-time Costs - Retrofit**		2	**Recurring Costs ($/yr)**	
	Capital/Device	$1,000.00		Maintenance	$200.00
	Installation	$250.00		Support	$0.00
	Switches (10)	$500.00		Other	$0.00
	Total	$1,750.00		Total	$200.00
3	**Net present Value Cost (1)**	$3,225.78			

		Low	High	
4	**Peak Reduction (kw/yr)**	6.20	6.40	10 rooms @50% Cycling
5	**Life-Cycle Peak reduction**	62.00	64.00	
6	**Cost of Electric Peak Reduction (CEPR)**			
	(Rounded to $)	**$52.00**	**$50.00**	

(1) Discount Rate/yr 7.5%
Device Lifetime (yrs) 10

LIFE-CYCLE COSTING WORKSHEET

One-Way Switch - Hotel Electric Heating (incremental)

1	**One-time Costs - Retrofit**		2	**Recurring Costs ($/yr)**	
	Capital/Device	$200.00		Maintenance	$200.00
	Installation	$250.00		Support	$0.00
	Switches (10)	$500.00		Other	$0.00
	Total	$950.00		Total	$200.00
3	**Net present Value Cost (1)**	$2,425.78			

		Low	High	
4	**Peak Reduction (kw/yr)**	6.20	6.40	10 rooms @50% Cycling
5	**Life-Cycle Peak reduction**	62.00	64.00	
6	**Cost of Electric Peak Reduction (CEPR)**			
	(Rounded to $)	**$39.00**	**$38.00**	

(1) Discount Rate/yr 7.5%
Device Lifetime (yrs) 10

The following worksheets calculate the counts by end use for per-unit cost calculations and supply curve development.

Water Heat Load Control

Segments:		kW Totals	
	restaurant	383	
	Small/Med Hotel	495	
	Health	42	
	Long-term Care	337	
	Other Hotel/Motel	495	
	Total	1,752	
		80%	reduction
		1,402	kW
		0.41	kW/reduction (from life cycle analysis)
		3,418	units reduced

Lighting Control

Segments:		kW Totals	
	General Lighting	81,621	
	Arch Lighting	26,122	
	Total	107,743	
		10%	reduction
		10,774	kW
		0.234	kW/reduction (from life cycle analysis)
		46,044	units reduced

Plug Load Control

Segments:		kW Totals	
	All Plugs	19,142	
	Total	19,142	
		25%	reduction
		4,785	kW
		0.3	kW/reduction (from life cycle analysis)
		15,951	units reduced

Refrigeration

Segments:		kW Totals	
	Retail Food	13,086	
	Total	13,086	
		10%	reduction
		1,309	kW
		1.75	kW/reduction (from life cycle analysis)
		748	units reduced

HVAC Fans & Elevators

Segments:		kW Totals	
	Large Office Elevators	736	
	Large Office HVAC	12,016	
	Total	12,752	
		25%	reduction
		3,188	kW
		5.25	kW/reduction (from life cycle analysis)
		607	units reduced

Hotel Switch Control

Segments:		kW Totals	
	Large Hotel Space Heat	835	
	Other Hotel Sp Heat	1,073	
	Total	1,908	
		50%	reduction
		954	kW
		6.3	kW/reduction (from life cycle analysis)
		151	units reduced

Hotel & 10% Restaurant/Ofice Thermal Storage

Segments:			kW Totals	
	Large Hotel Space Heat		835	
	Other Hotel Sp Heat		1,073	
	Restaurant	10%	131	
	Other Office	10%	492	
	Total		2,531	
			95%	reduction
			2,404	kW
			0.745	kW/reduction (from life cycle analysis)
			3,227	units reduced

Appendix H Background-Section 10: Achievable Potential - Electric Energy Forecast

Introduction

Appendix H provides additional detailed information related to the generation of the Commercial sector Achievable Potential forecasts, including background material provided to achievable workshop participants. The appendix includes the following:

- Commercial achievable workshop action profile slides
- Commercial achievable workshop measure worksheets
- Detailed upper and lower achievable potential results.

H1 Achievable Workshop Action Profile Slides

CPR Yukon

Commercial Opportunity 1: HP T8 Fixtures - Related Technologies

Measures	Economic Potential Savings (MWh/yr.)	% of Total Economic Potential	Weighted Average CCE (c/kWh)
Occupancy Controls	629	0.6%	6.4
HPT8 (T8 Retrofit)	4,212	3.9%	13.8
HP to redesign increment	135	0.1%	-1.6
Dimming Controls (Daylighting)	1,163	1.1%	24.1
Total	6,139	5.7%	

CPR Yukon

Commercial Opportunity 1: HP T8

- Technology Description
  - Reduced wattage or high performance T8 lamps and ballasts
  - For example, 2-lamp F28T8 fixture drawing 48 W replaces 2-lamp F32T8 fixture drawing 58W. Also applicable to T12 baseline (in early milestone years) 2-lamp F34T12 drawing 81 W.
- Discussion sub sector: applies to all, but start with Non-government offices on the hydro grid
- Typical application
  - Cost: full cost of $50 per 2 lamp fixture. (Incr. cost ~$7)
  - Useful life: 16 years
  - Savings: 17% vs. standard T8, 41% vs. T12.

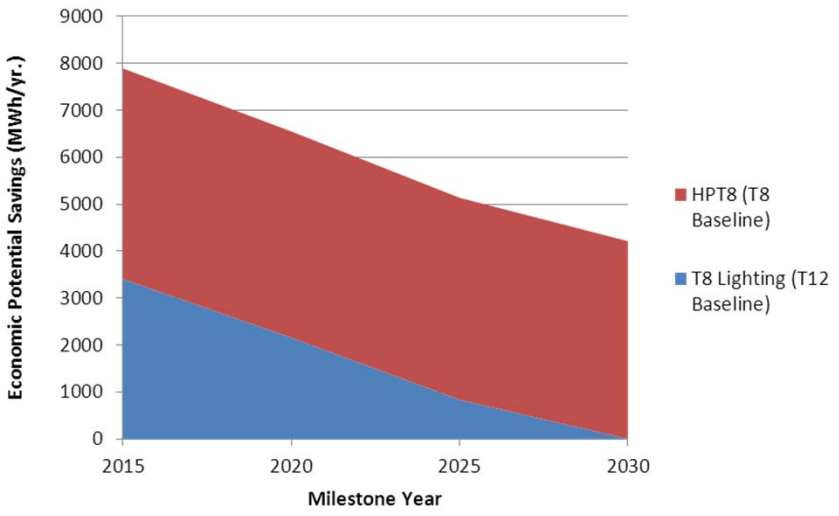
CPR Yukon

Commercial Opportunity 1: HP T8

- Financial and Economic Indicators
  - 1.2 year simple payback
  - CCE of 1.5 cents/kWh
  - Basis of assessment: incremental cost
- Eligible Participants
  - Approximately 90 Office buildings by 2030.
  - Approximately 5 buildings eligible per year.

Yukon CPR

Commercial Opportunity 1: HP T8



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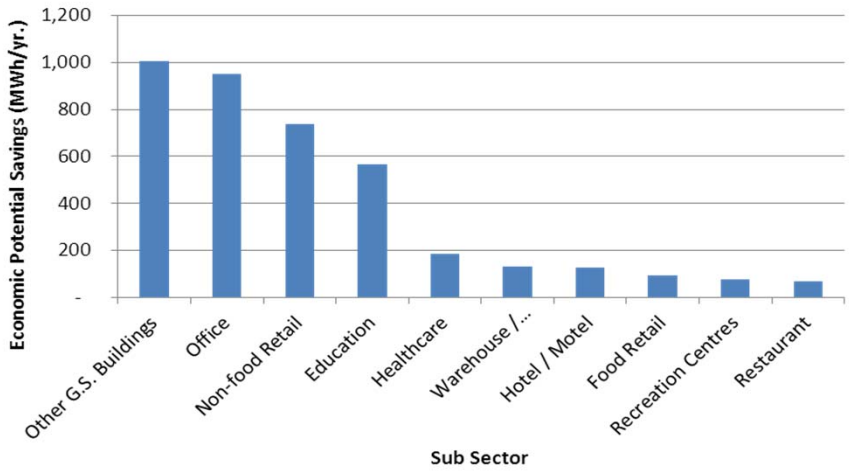
Commercial Opportunity 1: HP T8



CPR Yukon

Commercial Opportunity 2: White LED Lighting – Related Technologies

Measures	Economic Potential Savings (MWh/yr.)	% of Total Economic Potential	Weighted Average CCE (c/kWh)
CFL Lamps (Indoor)	7,061	6.6%	4.0
CFL to LED increment	447	0.4%	2.4
CFL Lamps (Outdoor)	579	0.5%	3.9
Total	8,086	7.5%	

CPR Yukon

Commercial Opportunity 2: White LED Lighting

- Technology Description
  - Solid-state lighting, using light emitting diodes (LEDs)
  - For example, 4 W LED replaces 20 W incandescent MR16 lamp
- Discussion sub sector: applies to all, but start with Non-government, Non-food Retail on the hydro grid
- Typical application
  - Cost: installed cost estimated at $32 each
  - Useful life: 10 years
  - Savings: 80% v. incandescent

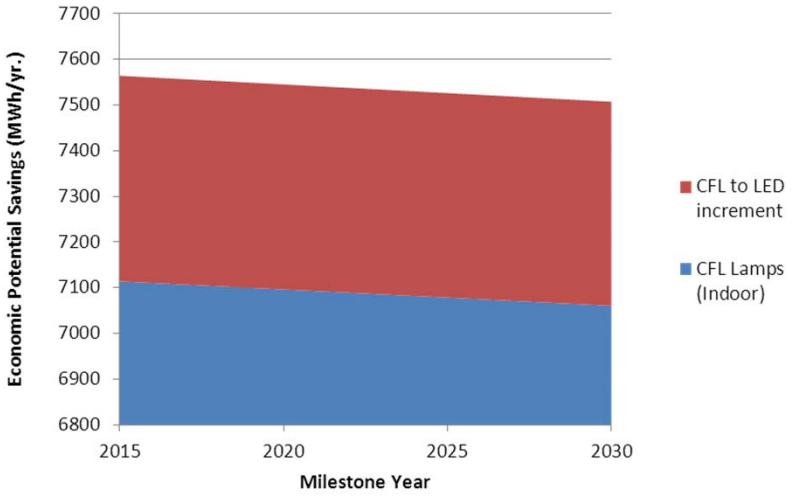
CPR Yukon

Commercial Opportunity 2: White LED Lighting

- Financial and Economic Indicators
  - 3.4 year simple payback
  - CCE of 5.9 cents/kWh
  - Basis of assessment: full cost
- Eligible Participants
  - Approximately 40 Non-food Retail buildings, all eligible immediately

Yukon CPR

Commercial Opportunity 2: White LED Lighting



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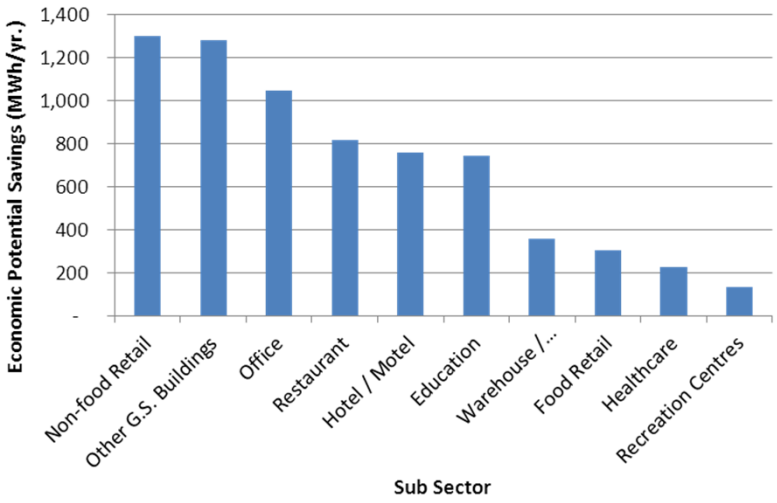
Commercial Opportunity 2: White LED Lighting



CPR Yukon

Commercial Opportunity 3: High Performance Glazing - Related Technologies

Measures	Economic Potential Savings (MWh/yr.)	% of Total Economic Potential	Weighted Average CCE (c/kWh)
Roof Insulation	859	0.8%	6.0
Wall Insulation	1,306	1.2%	7.2
HP Glazing	1,505	1.4%	6.5
HP to SHP Glazing increment	420	0.4%	6.0
Total	4,090	3.8%	

CPR Yukon

Commercial Opportunity 3: High Performance Glazing

- Technology Description
  - High Performance Glazing – U 0.29 (R 3.5), which may include low emissivity glass, argon fill, low thermal conductivity spacers, double glazing
  - Super High Performance Glazing - U 0.20 (R 5.0), which may include low emissivity glass, argon fill, low thermal conductivity spacers, triple glazing
- Discussion sub sector: applies to all, but start with Non-government offices on the hydro grid
- Typical application
  - Cost: HP: ~ \$6/ft^2, SHP: ~\$14/ft^2
  - Useful life: 30 years
  - Savings: HP: ~ \$6/ft^2, SHP: ~\$14/ft^2

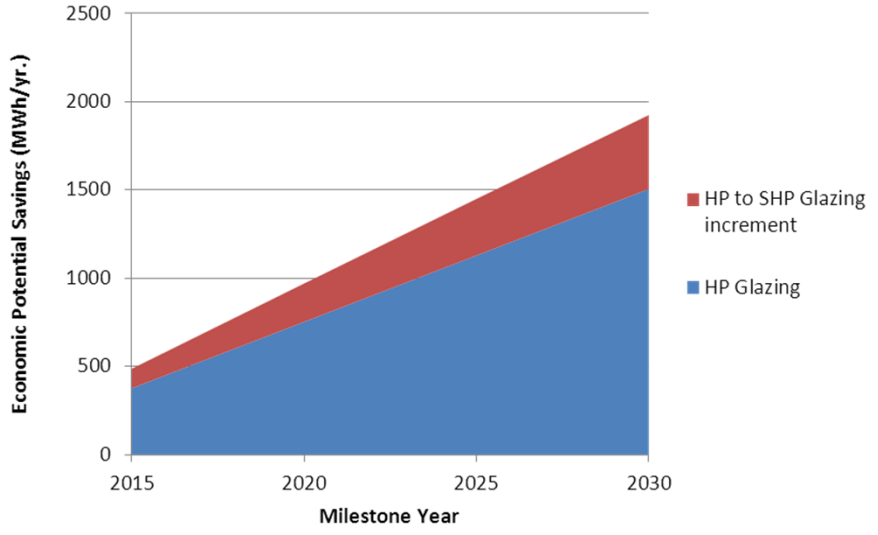
CPR Yukon

Commercial Opportunity 3: High Performance Glazing

- Financial and Economic Indicators
  - Simple payback: HP: 7.3 year, SHP: 14.1
  - CCE: HP: 6.5 cents/kWh, SHP: 12.5 cents/kWh
  - Basis of assessment: Incremental cost
- Eligible Participants
  - An estimated 70 Office buildings by 2030.
  - Approximately 2 buildings eligible per year

Yukon CPR

Commercial Opportunity 3: High Performance Glazing



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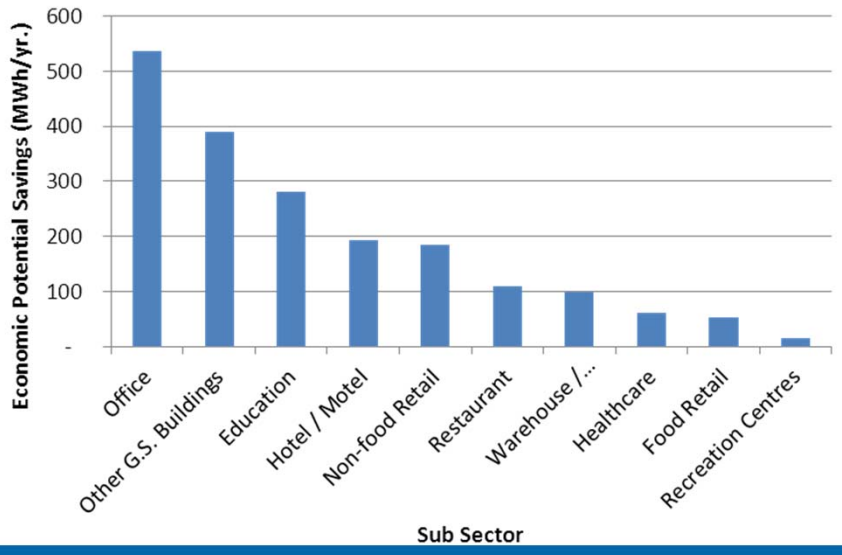
Commercial Opportunity 3: High Performance Glazing



CPR Yukon

Commercial Opportunity 4: ENERGY STAR Computers - Related Technologies

Measures	Economic Potential Savings (MWh/yr.)	% of Total Economic Potential	Weighted Average CCE (c/kWh)
ES Computers	3,042	2.8%	4.8
ES Office Equipment	376	0.4%	8.2
ES Servers	454	0.4%	6.7
ES Fridges, Freezers	759	0.7%	7.5
Total	4,631	4.3%	

CPR Yukon

Commercial Opportunity 4: ENERGY STAR Computers

- Technology Description
  - Measure involves upgrading a computer to an ENERGY STAR desktop or laptop. Savings are achieved through higher equipment efficiency and improved power management
  - Measure passes at incremental cost
- Discussion sub sector: applies to most sub sectors, but start with Non-government offices on the hydro grid
- Typical application
  - Cost: 15% incremental cost
  - Useful life: 5 years
  - Savings: 50% over non-ENERGY STAR baseline

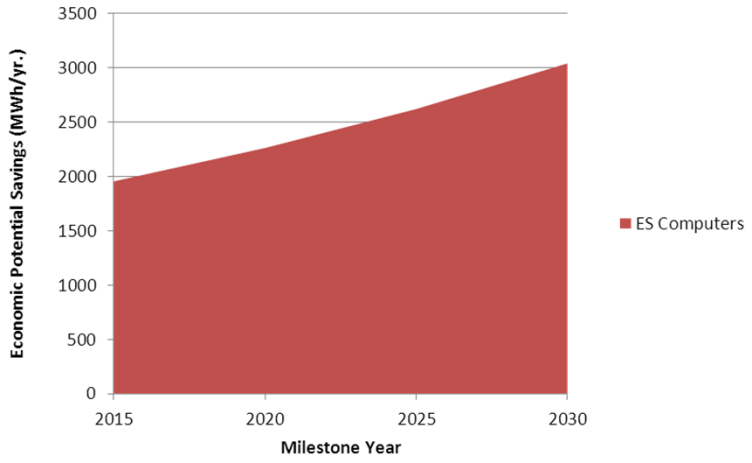
CPR Yukon

Commercial Opportunity 4: ENERGY STAR Computers

- Financial and Economic Indicators
  - 1.6 year simple payback
  - CCE of 4.8 cents/kWh
  - Basis of assessment: incremental cost
- Eligible Participants
  - An estimated 70 Office buildings by 2030.
  - Approximately 15 buildings eligible per year (on the order of 1000 computers/year)

Yukon CPR

Commercial Opportunity 4: ENERGY STAR Computers



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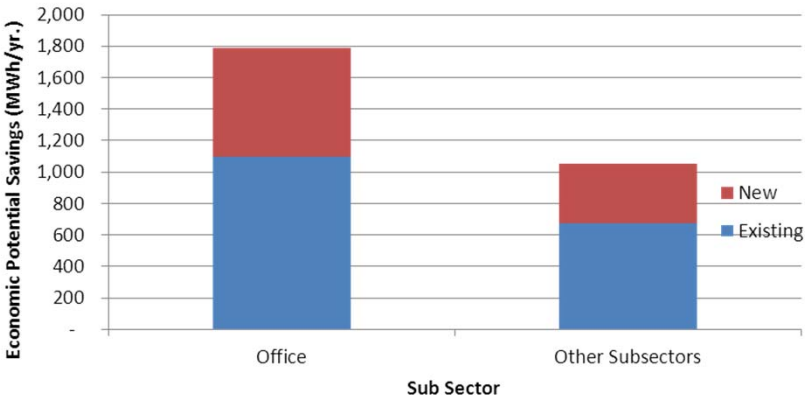
Commercial Opportunity 4: ENERGY STAR Computers



CPR Yukon

Commercial Opportunity 5: High Efficiency Refrigeration

Measures	Economic Potential Savings (MWh/yr.)	% of Total Economic Potential	Weighted Average CCE (c/kWh)
HE Refrigeration - Full Cost	1,846	1.7%	5.0
HE Refrigeration - Incr. Cost	2,553	2.4%	6.2
Ref. Plant Ctrls	58	0.1%	9.4
Total	4,457	4.2%	

CPR Yukon

Commercial Opportunity 5: High Efficiency Refrigeration

- Technology Description
  - Typical package of low-cost refrigeration measures for built-up refrigeration systems including night covers & smart defrost controls
- Discussion sub sector: Non-government Food Retail on the hydro grid. Also applicable to restaurants
- Typical application
  - Cost: estimated at $1.75/ft^2
  - Useful life: 10 years
  - Savings: 23.5% of refrigeration energy

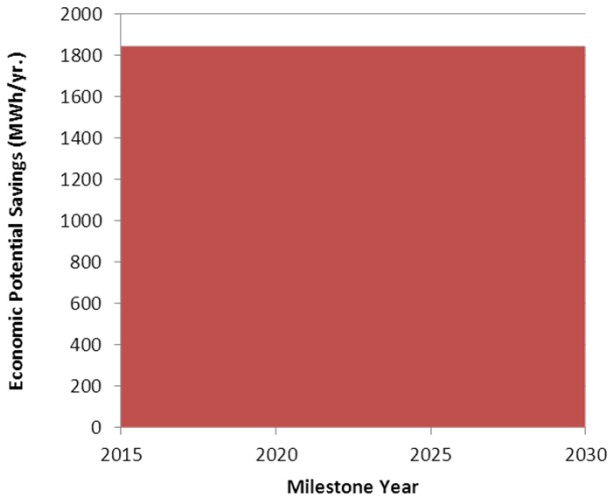
CPR Yukon

Commercial Opportunity 5: High Efficiency Refrigeration

- Financial and Economic Indicators
  - 2.0 year simple payback
  - CCE of 3.5 cents/kWh
  - Basis of assessment: full cost
- Eligible Participants
  - An estimated 5 (equivalent 30,000 ft^2) Food Retail Buildings, eligible immediately.

Yukon CPR

Commercial Opportunity 5: High Efficiency Refrigeration



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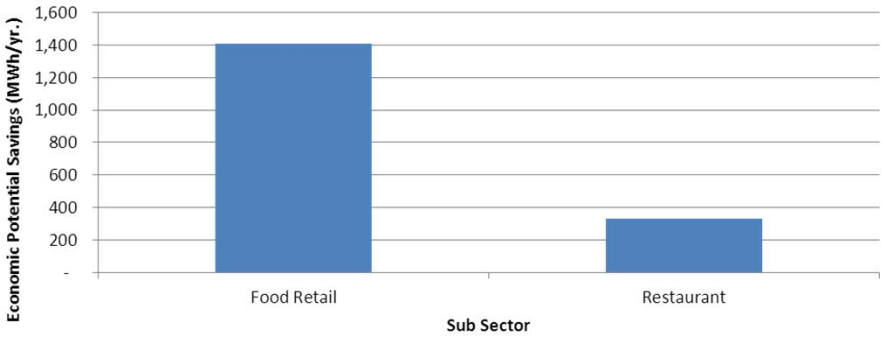
Commercial Opportunity 5: High Efficiency Refrigeration



CPR Yukon

Commercial Opportunity 6: LED Street Lighting

Measures	Economic Potential Savings (MWh/yr.)	% of Total Economic Potential	Weighted Average CCE (c/kWh)
DHID Streetlighting	2,238	2.1%	10.1
Pulse-start MH (Outdoor)	788	0.7%	3.9
Induction (Outdoor)	60	0.1%	25.2
DHID to LED Streetlighting increment	267	0.2%	5.5
Total	3,353	3.1%	

CPR Yukon

Commercial Opportunity 6: LED Street Lighting

- Technology Description
  - LED streetlights drawing 38 W LED lamp replacing 106 W high pressure sodium lamps
- Discussion sub sector: Street Lighting
- Typical application
  - Cost: estimated at $700/fixture (installed)
  - Useful life: 34 years
  - Savings: 64% of street lighting energy

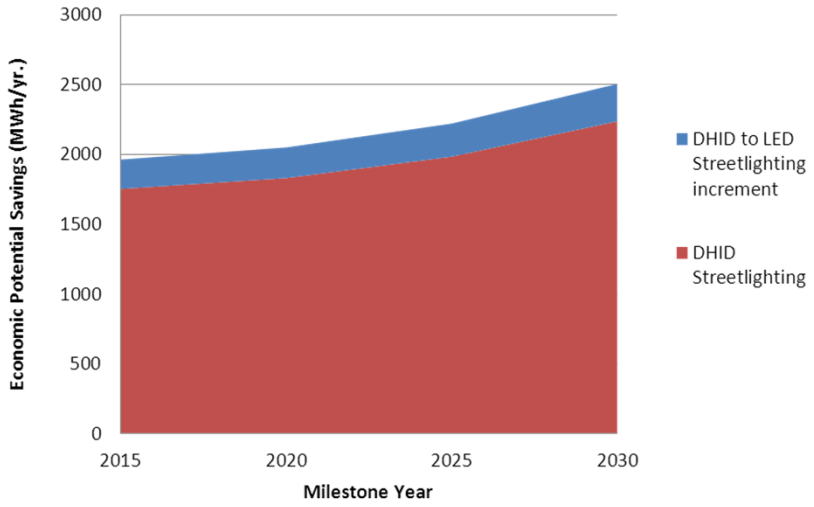
CPR Yukon

Commercial Opportunity 6: LED Street Lighting

- Financial and Economic Indicators
  - 18 year simple payback
  - CCE of 15.6 cents/kWh
  - Basis of assessment: full cost
- Eligible Participants
  - Approx. 5,700 streetlight fixtures
  - Eligible immediately

Yukon CPR

Commercial Opportunity 6: LED Street Lighting



CPR Yukon

Commercial Opportunity 7: Building Recommissioning

Measures	Economic Potential Savings (MWh/yr.)	% of Total Economic Potential	Weighted Average CCE (c/kWh)
Air Sealing	815	0.8%	3.5
Programmable Tstat	927	0.9%	9.5
Tank Insulation	101	0.1%	3.8
Building RCx	8,588	8.0%	5.1
DC Ventilation	464	0.4%	5.1
Low Flow Showerheads	245	0.2%	7.3
Low Flow Pre Rinse Spray Valve	118	0.1%	2.5
Low Flow Faucets	1,126	1.1%	0.4
Total	12,385	11.6%	

CPR Yukon

Commercial Opportunity 7: Building Recommissioning

- Technology Description
  - Holistic examination of building energy use & implementation of low and no - cost measures
  - Ensures systems are still operated as intended, & provides opportunity to optimize operations beyond original design intent.
- Discussion sub sector: applies to most sub sectors, but start with Non-government offices on the hydro grid
- Typical application
  - Cost: estimated at $0.40/ft^2
  - Useful life: 5 years
  - Savings: 15% of building energy use

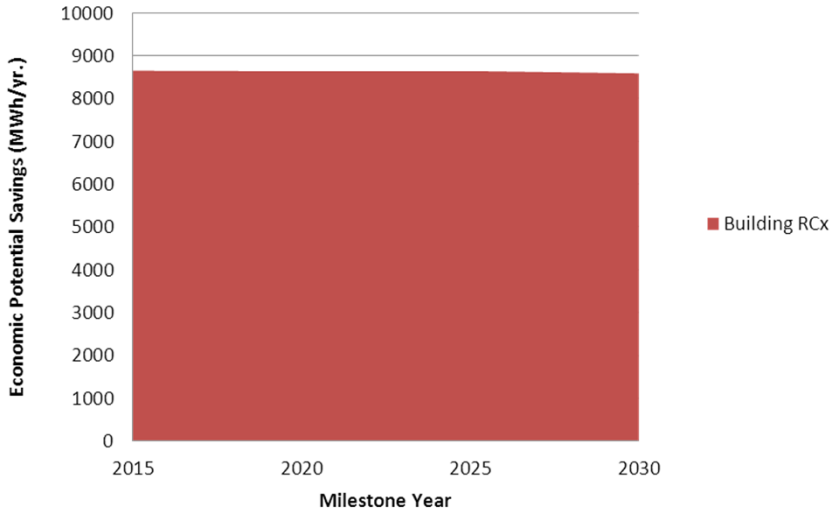
CPR Yukon

Commercial Opportunity 7: Building Recommissioning

- Financial and Economic Indicators
  - 1 year simple payback
  - CCE of 3.0 cents/kWh
  - Basis of assessment: full cost
- Eligible Participants
  - Approximately 90 Office buildings
  - Eligible Immediately

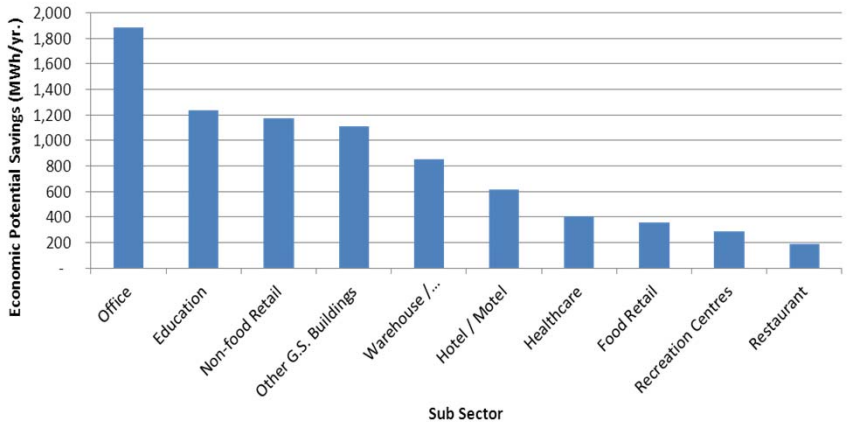
Yukon CPR

Commercial Opportunity 7: Building Recommissioning



Yukon CPR

Commercial Opportunity 7: Building Recommissioning



CPR Yukon

Commercial Opportunity 8: High Performance New Construction

Measures	Economic Potential Savings (MWh/yr.)	% of Total Economic Potential	Weighted Average CCE (c/kWh)
Whole Bldg - 60%	53,008	49.5%	17.9
Total	53,008	49.5%	

CPR Yukon

Commercial Opportunity 8: High Performance New Construction

- Technology Description
  - Measure involves constructing new commercial buildings using an integrated design process to lower overall energy use. Three measures are examined: 60%, 40% and 25% better than baseline construction.
- Discussion sub sector: applies to most sub sectors, but start with Non-government offices on the hydro grid
- Typical application
  - Cost: estimated at $1.70/ft^2, $5.15/ft^2, $17.25/ft^2 for 25%, 40% & 60% respectively
  - Useful life: 30 years

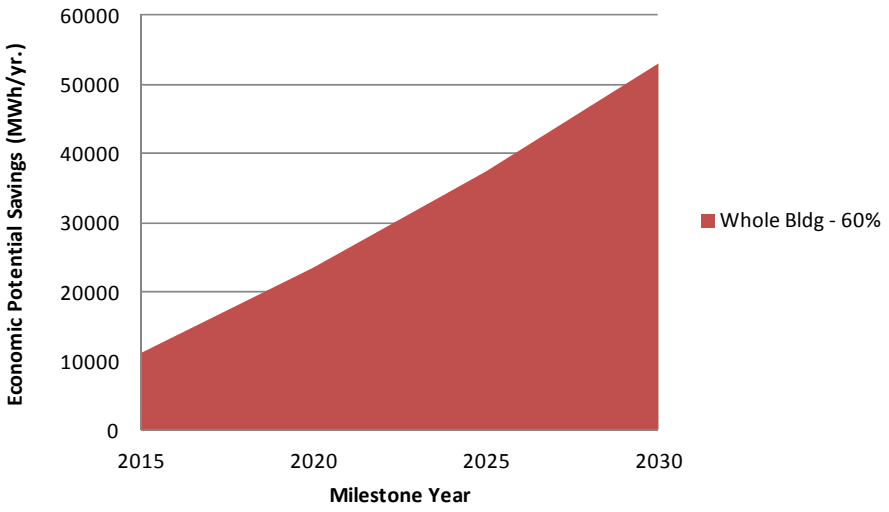
CPR Yukon

Commercial Opportunity 8: High Performance New Construction

- Financial and Economic Indicators
  - 2.8, 5.2 & 11.5 year simple paybacks
  - CCEs of 2.4, 4.6, 10.2 cents/kWh
  - Basis of assessment: incremental cost
- Eligible Participants
  - Approx. 380 equivalent 15,000 ft^2 buildings by 2030, including all Yukon. 15 -20 buildings/year.
  - Eligible at time of construction

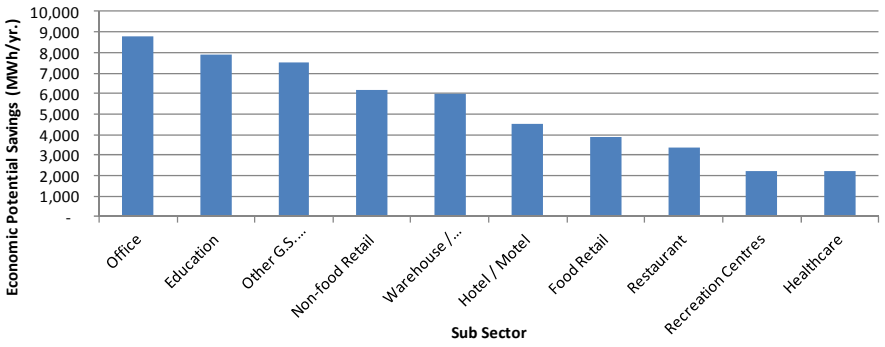
Yukon CPR

Commercial Opportunity 8: High Performance New Construction



Yukon CPR

Commercial Opportunity 8: High Performance New Construction



Yukon CPR

Wrap Up

- Closing remarks
- Roundtable comments on the workshop
  - How well it matched your objectives
  - Things you liked
  - Things we should improve
- Thank you all around!

H2 Achievable Workshop Measure Worksheets

Commercial Sector
C1 -- High Performance T8s

Sub Sector for Discussion: RW T8 > Large Office > Existing > Hydro				
Measure information	CCE (¢/kWh)	1.5	Incremental Cost	
	Approx. Payback (years)	1		
Approximate Economic Savings Potential (MWh/yr) in 2015		7,900	Includes T12 -> RW T8	
Approximate Economic Savings Potential (MWh/yr) in 2030		4,200		
Market Size	Total ft^2 (approx.)	1,360,000	(Incl. Gov't & Non-Gov't)	
	Total # of sites	90	Eq. 15,000 ft^2 buildings	
	% eligible	95%	Exclude "can't" + current	
	# eligible sites/yr.	5		
	# eligible sites by 2030	90		
Participation Rates, by Year (% of Eligible Sites)		**2015**	**2030**	**Curve**
HP T8	Low		50%	Curve A/B
	High		95%	Curve A/B
Achievable Potential (# Buildings)				
HP T8	Low	0	3	
	High	0	5	

Participation Rates for Other Regions / Subsectors (H=higher; L=lower; S=same; N/A=not applicable)

Office		Government	a bit higher or same
Food Retail	higher		
Non-Food Retail	same	Diesel Grids	lower
Hotel / Motel	same		
Education	higher	Standard T8 (T12 baseline)	
Restaurant	lower		
Recreation Centres	same		
Warehouse / Wholesale	same		

Commercial Sector
C2 -- White LEDs

Sub Sector for Discussion: White LEDs > Non-food Retail > Existing > Hydro				
Measure information	CCE (¢/kWh)	5.9	Full Cost	
	Approx. Payback (years)	3		
Approximate Economic Savings Potential (MWh/yr) in 2015		7,600	Includes Incandescent & CFL baseline	
Approximate Economic Savings Potential (MWh/yr) in 2030		7,500		
Market Size	Total ft^2 (approx.)	912,000		
	Total # of sites	50	Eg. 20,000 ft^2 buildings	
	% eligible	95%	Exclude "can't" + current	
	# eligible sites/yr.	40		
	# eligible sites by 2030	40		
Participation Rates, by Year (% of Eligible Sites)		**2015**	**2030**	**Curve**
White LEDs	Low		50%	Curve B
	High		80%	Curve A/B
Achievable Potential (# Buildings)				
White LEDs	Low	0	20	
	High	0	32	

Participation Rates for Other Subsectors (H=higher; L=lower; S=same; N/A=not applicable)			
Office	tors a bit lower than the big	Government	
Food Retail			
Non-Food Retail		Diesel Grids	a bit lower
Hotel / Motel			
Education		CFL Lamps (Incandescent Baseline)	Probably everyone who doesn
Restaurant			
Recreation Centres			
Warehouse / Wholesale			

Commercial Sector
C3 -- HP Glazing

Sub Sector for Discussion: HP Glazing > Office> Existing > Hydro				
Measure information	CCE (¢/kWh)	6.0, 12.5	HP/SHP, Incremental Cost	
	Approx. Payback (years)	7.3, 14.1	HP/SHP	
Approximate Economic Savings Potential (MWh/yr) in 2015		500		
Approximate Economic Savings Potential (MWh/yr) in 2030		2,000		
Market Size	Total ft^2 (approx.)	151,111	(Incl. Gov't & Non-Gov't)	
	Total # of sites	10	Eg. 15,000 ft^2 buildings	
	% eligible	80%	Exclude "can't" + current	
	# eligible sites/yr.	1		
	# eligible sites by 2030	8		
Participation Rates, by Year (% of Eligible Sites)		**2015**	**2030**	**Curve**
SHP Glazing	Low		20%	Curve irrelevant
	High		70%	Curve A
Achievable Potential (# Sites)				
SHP Glazing	Low		1	
	High		2	
Remaining	Low		2	
	High		1	
HP Glazing	Low		0	
	High		0	
Total	Low	0	1	
	High	0	2	

Participation Rates for Other Subsectors (H=higher; L=lower; S=same; N/A=not applicable)			
Office		Government	same
Food Retail			
Non-Food Retail		Diesel Grids	n/a
Hotel / Motel			
Education		Roof insulation	
Restaurant		Wall insulation	
Recreation Centres			
Warehouse / Wholesale			

Commercial Sector
C4 -- ENERGY STAR Computers

Sub Sector for Discussion: ES Computers > Large Office > Existing > Hydro				
Measure information	CCE (¢/kWh)	4.8	Incremental Cost	
	Approx. Payback (years)	1.6		
Approximate Economic Savings Potential (MWh/yr) in 2015		2,000		
Approximate Economic Savings Potential (MWh/yr) in 2030		3,000		
Market Size	Total ft^2 (approx.)	1,364,000	(Incl. Gov't & Non-Gov't)	
	Total # of sites	90	Eq. 15,000 ft^2 buildings	
	% eligible	75%	Exclude "can't" + current	
	# eligible sites/yr.	14	Approx 1000 machines/year	
	# eligible sites by 2030	70		
Participation Rates, by Year (% of Eligible Sites)		**2015**	**2030**	**Curve**
ENERGY STAR Computers	Low		25%	Curve B
	High		50%	Curve A
Achievable Potential (# Buildings)				
ENERGY STAR Computers	Low	0	4	
	High	0	7	

Participation Rates for Other Subsectors (H=higher; L=lower; S=same; N/A=not applicable)			
Office		Government	D 100% 2010
Food Retail			
Non-Food Retail		Diesel Grids	
Hotel / Motel			
Education		ENERGY STAR Office Equip.	
Restaurant		ENERGY STAR Servers	
Recreation Centres		ENERGY STAR Fridges/Freezers	
Warehouse / Wholesale			

Commercial Sector
C5 -- HE Refrigeration - Full Cost Measures

Sub Sector for Discussion: HE Refrigeration > Large Office > Existing > Hydro				
Measure information	CCE (¢/kWh)	3.5	Full Cost	
	Approx. Payback (years)	2.0		
Approximate Economic Savings Potential (MWh/yr) in 2015		1,800		
Approximate Economic Savings Potential (MWh/yr) in 2030		1,800		
Market Size	Total ft^2 (approx.)	195,483		
	Total # of sites	7	Eq. 105,000 ft^2 buildings	
	% eligible	75%	Exclude "can't" + current	
	# eligible sites/yr.	5		
	# eligible sites by 2030	5		
Participation Rates, by Year (% of Eligible Sites)		**2015**	**2030**	**Curve**
HE Refrigeration	Low		100%	Curve D by 2020
	High		100%	Curve D by 2015
Achievable Potential (# Buildings)				
HE Refrigeration	Low	0	5	
	High	0	5	

Participation Rates for Other Subsectors (H=higher; L=lower; S=same; N/A=not applicable)			
Office		Government	
Food Retail			
Non-Food Retail		Diesel Grids	higher
Hotel / Motel			
Education		HE Refrigeration - Incremental Cost	
Restaurant	lower		
Recreation Centres			
Warehouse / Wholesale			

Commercial Sector
C6 -- LED Streetlighting

Sub Sector for Discussion: LED Streetlighting > Existing				
Measure information	CCE (¢/kWh)	15.6		Full Cost
	Approx. Payback (years)	18.0		
Approximate Economic Savings Potential (MWh/yr) in 2015		2,500		
Approximate Economic Savings Potential (MWh/yr) in 2030		2,500		
Market Size	Total ft^2 (approx.)	n/a		
	Total # of sites	5,700		
	% eligible	100%		
	# eligible sites	5,700		
	# eligible sites by 2030	5,700		
Participation Rates, by Year (% of Eligible Sites)		**2015**	**2030**	**Curve**
LED Street Lighting	Low		100%	Curve B
	High		100%	Curve B
Achievable Potential (# Lamps)				
LED Street Lighting	Low	0	5,700	
	High	0	5,700	

Participation Rates for Other Subsectors (H=higher; L=lower; S=same; N/A=not applicable)

Office		Government	
Food Retail			
Non-Food Retail		Diesel Grids	same
Hotel / Motel			
Education		DHID	
Restaurant		Pulse Start MH (Outdoor)	
Recreation Centres			
Warehouse / Wholesale			

Commercial Sector
C7 -- Recommissioning

Sub Sector for Discussion: RCx > Office > Existing > Hydro				
Measure information	CCE (¢/kWh)	3.0	Full Cost	
	Approx. Payback (years)	1.0		
Approximate Economic Savings Potential (MWh/yr) in 2015		8,600		
Approximate Economic Savings Potential (MWh/yr) in 2030		8,600		
Market Size	Total ft^2 (approx.)	1,364,000		
	Total # of sites	90	Eg. 15,000 ft^2 buildings	
	% eligible	33%	Exclude "can't" + current	
	# eligible sites	30		
	# eligible sites by 2030	30		
Participation Rates, by Year (% of Eligible Sites)		**2015**	**2030**	**Curve**
RCx	Low		40%	Curve B
	High		80%	Curve B
Achievable Potential (# Buildings)				
RCx	Low	0	12	
	High	0	24	
Total	Static	0	12	
	Aggressive	0	24	

Participation Rates for Other Measures (H=higher; L=lower; S=same; N/A=not applicable)			
Office		Government	slower
Food Retail	same		
Non-Food Retail	same	Diesel Grids	
Hotel / Motel	same		
Education	same	Programmable T'Stats	
Restaurant	same	Air Sealing	
Recreation Centres	higher	Low Flow Fixtures	
Warehouse / Wholesale	same		

Commercial Sector
C8 -- Advanced New Construction Measures

Sub Sector for Discussion: New Construction > All Subsectors > New				
Measure information	CCE (¢/kWh)	4.0/7.6/16.8	25%/40%/60%	
	Approx. Payback (years)	4.9/9.2/20.5		
Approximate Economic Savings Potential (MWh/yr) in 2015		10,000		
Approximate Economic Savings Potential (MWh/yr) in 2030		53,000		
Market Size	Total # of sites (estimated)	380	Eq. 15,000 ft^2 buildings	
	% eligible	100%		
	# eligible sites per year	19		
	# eligible sites by 2030	380		
Participation Rates, by Year (% of Eligible Sites)		**2015**	**2030**	**Curve**
60% Better	Low		45%	Curve B
	High		95%	Curve B
Remaining	Low	19	10	
	High	19	1	
40% Better	Low		54%	
	High		100%	
Remaining	Low	19	5	
	High	19	0	
25% Better	Low		100%	
	High			
Achievable Potential (# Buildings)				
60% Better	Static	0	9	
	Aggressive	0	18	
40% Better	Static	0	6	
	Aggressive	0	1	
25% Better	Static	0	5	
	Aggressive	0	0	
Total	Static	0	19	
	Aggressive	0	19	

Participation Rates for Other Subsectors/Regions (H=higher; L=lower; S=same; N/A=not applicable)			
Office		Government	
Food Retail			
Non-Food Retail		Diesel Grids	
Hotel / Motel			
Education			
Restaurant			
Recreation Centres			
Warehouse / Wholesale			

H3 Detailed Achievable Potential Results

Exhibit H 1 and Exhibit H 2 provide detailed results for the hydro grid for the upper and lower Achievable Potential scenarios respectively.

Exhibit H 1 Total Upper Achievable Potential Electricity Savings by End Use, Sub Sector and Milestone Year (MWh/yr.) – Hydro Grid

Sub Sector / Milestone Year	General Lighting	Architectural Lighting	High-bay Lighting	Outdoor Lighting	Space Heating	Space Cooling	HVAC Fans and Pumps	Water Heating	Computer Equipment	Other Plug Loads	Cooking Equipment	Refrigeration	Elevators	Miscellaneous	Non Buildings	Street Lighting	Block Heater	Grand Total
Office																		
2015	304	433	-	68	212	6	39	42	706	6	-	1	-	-	-	-	-	1,819
2020	717	779	-	147	770	34	178	99	946	17	-	7	-	-	-	-	-	3,695
2025	1,235	1,052	-	243	1,770	100	448	179	1,250	35	-	11	-	-	-	-	-	6,323
2030	1,987	1,279	-	366	3,325	224	890	295	1,631	62	-	17	-	-	-	-	-	10,076
Food Retail																		
2015	33	133	35	32	18	0	7	10	10	-	0	1,572	-	-	-	-	-	1,850
2020	76	239	103	68	74	2	33	24	23	-	2	2,102	-	-	-	-	-	2,748
2025	129	324	213	111	187	6	85	43	40	-	4	2,900	-	-	-	-	-	4,042
2030	204	396	374	164	375	14	171	72	63	-	6	3,577	-	-	-	-	-	5,416
Non-food Retail																		
2015	239	567	31	95	69	2	20	15	35	-	-	4	-	-	-	-	-	1,077
2020	560	1,013	92	208	294	10	94	37	69	-	-	17	-	-	-	-	-	2,393
2025	952	1,351	193	354	741	30	242	69	114	-	-	29	-	-	-	-	-	4,076
2030	1,511	1,611	344	552	1,493	67	493	119	173	-	-	44	-	-	-	-	-	6,407
Hotel / Motel																		
2015	42	315	-	31	67	1	14	68	16	1	-	5	-	-	-	-	-	560
2020	98	566	-	67	276	8	61	184	37	3	-	23	-	-	-	-	-	1,322
2025	167	764	-	111	675	22	152	398	64	5	-	39	-	-	-	-	-	2,397
2030	266	929	-	167	1,325	47	298	770	99	10	-	58	-	-	-	-	-	3,969
Healthcare																		
2015	53	93	-	21	22	0	17	7	91	1	0	1	-	-	-	-	-	308
2020	128	166	-	44	100	2	79	20	107	3	2	4	-	-	-	-	-	655
2025	226	221	-	72	263	6	202	43	126	6	3	6	-	-	-	-	-	1,175
2030	367	262	-	108	550	14	405	82	149	11	5	10	-	-	-	-	-	1,962

Sub Sector / Milestone Year	General Lighting	Architectural Lighting	High-bay Lighting	Outdoor Lighting	Space Heating	Space Cooling	HVAC Fans and Pumps	Water Heating	Computer Equipment	Other Plug Loads	Cooking Equipment	Refrigeration	Elevators	Miscellaneous	Non Buildings	Street Lighting	Block Heater	Grand Total
Education																		
2015	177	307	18	45	119	0	22	98	383	3	2	5	-	-	-	-	-	1,179
2020	423	547	55	99	481	2	98	226	457	8	9	19	-	-	-	-	-	2,424
2025	740	728	117	164	1,230	7	249	406	545	17	15	31	-	-	-	-	-	4,249
2030	1,206	864	211	248	2,547	16	498	665	651	31	23	45	-	-	-	-	-	7,004
Recreation Centres																		
2015	25	56	60	63	8	0	10	14	2	-	-	144	-	-	-	-	-	382
2020	58	100	179	135	35	0	26	36	4	-	-	311	-	-	-	-	-	883
2025	97	132	366	222	95	0	50	71	6	-	-	523	-	-	-	-	-	1,564
2030	150	156	637	328	209	1	86	127	10	-	-	808	-	-	-	-	-	2,512
Restaurant																		
2015	16	339	-	60	53	1	17	35	6	-	3	337	-	-	-	-	-	867
2020	44	609	-	129	167	4	49	95	13	-	15	472	-	-	-	-	-	1,598
2025	85	820	-	212	361	10	104	208	24	-	26	683	-	-	-	-	-	2,534
2030	149	994	-	317	654	22	195	409	37	-	40	909	-	-	-	-	-	3,726
Warehouse / Wholesale																		
2015	42	148	197	72	71	0	23	13	81	2	-	0	-	-	-	-	-	650
2020	99	267	589	156	241	0	62	32	127	5	-	1	-	-	-	-	-	1,581
2025	170	361	1,234	259	603	1	124	66	187	11	-	2	-	-	-	-	-	3,016
2030	270	440	2,201	390	1,272	2	218	123	263	19	-	3	-	-	-	-	-	5,201
Other General Service																		
2015	288	530	20	94	160	7	60	30	441	-	1	3	-	-	-	-	-	1,634
2020	689	963	61	207	519	14	170	71	578	-	4	15	-	-	-	-	-	3,291
2025	1,199	1,313	129	350	1,178	21	361	129	749	-	7	25	-	-	-	-	-	5,461
2030	1,934	1,611	231	540	2,261	27	670	215	960	-	11	38	-	-	-	-	-	8,498

Sub Sector / Milestone Year	General Lighting	Architectural Lighting	High-bay Lighting	Outdoor Lighting	Space Heating	Space Cooling	HVAC Fans and Pumps	Water Heating	Computer Equipment	Other Plug Loads	Cooking Equipment	Refrigeration	Elevators	Miscellaneous	Non Buildings	Street Lighting	Block Heater	Grand Total
Non-Buildings																		
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Street lighting																		
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	145	-	145
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	592	-	592
2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,387	-	1,387
2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,620	-	2,620
Parking Lot Plug																		
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	10
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	25
2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	47	47
2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	82	82
Grand Total																		
2015	1,219	2,922	362	581	800	20	229	332	1,770	13	7	2,072	-	-	-	145	10	10,481
2020	2,892	5,251	1,080	1,261	2,957	78	848	823	2,361	36	32	2,971	-	-	-	592	25	21,207
2025	5,000	7,067	2,253	2,099	7,102	204	2,016	1,612	3,105	74	56	4,251	-	-	-	1,387	47	36,271
2030	8,044	8,542	3,999	3,179	14,012	433	3,926	2,876	4,035	132	84	5,508	-	-	-	2,620	82	57,472

Exhibit H-2 Total Lower Achievable Potential Electricity Savings by End Use, Sub Sector and Milestone Year (MWh/yr.) – Hydro Grid

Sub Sector / Milestone Year	General Lighting	Architectural Lighting	High-bay Lighting	Outdoor Lighting	Space Heating	Space Cooling	HVAC Fans and Pumps	Water Heating	Computer Equipment	Other Plug Loads	Cooking Equipment	Refrigeration	Elevators	Miscellaneous	Non Buildings	Street Lighting	Block Heater	Grand Total
Office																		
2015	162	422	-	49	91	4	21	22	615	3	-	0	-	-	-	-	-	1,390
2020	399	747	-	102	383	22	101	53	765	9	-	2	-	-	-	-	-	2,583
2025	727	988	-	165	975	68	267	101	985	18	-	4	-	-	-	-	-	4,299
2030	1,234	1,165	-	246	1,993	157	556	176	1,299	33	-	9	-	-	-	-	-	6,868
Food Retail																		-
2015	18	129	19	23	8	0	4	5	1	-	0	1,017	-	-	-	-	-	1,224
2020	42	229	57	47	40	1	19	13	6	-	1	2,386	-	-	-	-	-	2,842
2025	76	304	123	75	111	4	51	25	15	-	1	3,157	-	-	-	-	-	3,943
2030	126	361	226	109	240	10	108	44	32	-	2	3,681	-	-	-	-	-	4,938
Non-food Retail																		-
2015	128	552	16	68	33	1	11	8	14	-	-	0	-	-	-	-	-	831
2020	310	973	51	145	160	7	54	20	27	-	-	4	-	-	-	-	-	1,751
2025	555	1,274	113	243	443	20	149	40	52	-	-	11	-	-	-	-	-	2,900
2030	928	1,479	210	378	959	47	317	74	95	-	-	22	-	-	-	-	-	4,510
Hotel / Motel																		-
2015	22	306	-	22	32	1	7	34	2	1	-	1	-	-	-	-	-	428
2020	54	542	-	47	147	5	34	105	9	1	-	6	-	-	-	-	-	950
2025	98	717	-	75	393	14	90	252	24	3	-	14	-	-	-	-	-	1,680
2030	164	845	-	112	830	32	184	522	49	5	-	29	-	-	-	-	-	2,773
Healthcare																		-
2015	28	91	-	15	11	0	9	4	90	1	0	0	-	-	-	-	-	249
2020	71	160	-	31	58	1	45	11	105	2	1	1	-	-	-	-	-	486
2025	132	209	-	49	166	4	122	27	123	3	1	2	-	-	-	-	-	839
2030	227	241	-	72	369	10	256	55	145	6	1	5	-	-	-	-	-	1,386

Sub Sector / Milestone Year	General Lighting	Architectural Lighting	High-bay Lighting	Outdoor Lighting	Space Heating	Space Cooling	HVAC Fans and Pumps	Water Heating	Computer Equipment	Other Plug Loads	Cooking Equipment	Refrigeration	Elevators	Miscellaneous	Non Buildings	Street Lighting	Block Heater	Grand Total
Education																		-
2015	95	299	10	32	55	0	12	50	380	2	1	1	-	-	-	-	-	935
2020	236	526	31	68	267	2	56	120	450	4	2	5	-	-	-	-	-	1,767
2025	437	687	69	110	760	5	149	227	536	9	4	12	-	-	-	-	-	3,005
2030	751	794	131	166	1,689	11	313	391	639	16	6	23	-	-	-	-	-	4,931
Recreation Centres																		-
2015	13	54	32	45	5	0	5	7	0	-	-	47	-	-	-	-	-	209
2020	32	96	98	93	22	0	14	20	1	-	-	113	-	-	-	-	-	488
2025	55	124	209	150	65	0	28	43	3	-	-	215	-	-	-	-	-	892
2030	90	143	379	219	149	0	51	83	5	-	-	375	-	-	-	-	-	1,495
Restaurant																		-
2015	9	330	-	44	25	1	9	18	1	-	1	216	-	-	-	-	-	654
2020	25	584	-	90	85	3	28	56	4	-	4	517	-	-	-	-	-	1,396
2025	51	770	-	145	199	7	63	135	9	-	8	711	-	-	-	-	-	2,096
2030	94	906	-	214	387	16	124	281	19	-	12	885	-	-	-	-	-	2,938
Warehouse / Wholesale																		-
2015	23	144	105	52	33	0	12	7	57	1	-	0	-	-	-	-	-	433
2020	55	256	328	108	136	0	33	18	79	3	-	0	-	-	-	-	-	1,017
2025	99	339	720	175	386	1	71	41	116	6	-	1	-	-	-	-	-	1,954
2030	167	400	1,344	262	875	1	133	80	175	10	-	2	-	-	-	-	-	3,449
Other General Service																		-
2015	153	513	11	68	79	4	31	15	389	-	0	0	-	-	-	-	-	1,265
2020	380	913	34	144	281	7	95	38	476	-	1	4	-	-	-	-	-	2,373
2025	694	1,214	75	238	690	10	217	73	601	-	2	10	-	-	-	-	-	3,824
2030	1,176	1,437	139	364	1,414	14	426	128	777	-	3	19	-	-	-	-	-	5,897

Sub Sector / Milestone Year	General Lighting	Architectural Lighting	High-bay Lighting	Outdoor Lighting	Space Heating	Space Cooling	HVAC Fans and Pumps	Water Heating	Computer Equipment	Other Plug Loads	Cooking Equipment	Refrigeration	Elevators	Miscellaneous	Non Buildings	Street Lighting	Block Heater	Grand Total
Non-Buildings																		-
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Street lighting																		-
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	145	-	145
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	592	-	592
2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,387	-	1,387
2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,620	-	2,620
Parking Lot Plug																		-
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5
2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	13
2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	25
2030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43	43
Grand Total																		-
2015	651	2,841	193	417	372	11	121	170	1,551	7	2	1,282	-	-	-	145	5	7,768
2020	1,604	5,025	600	874	1,579	48	480	454	1,923	19	9	3,038	-	-	-	592	13	16,258
2025	2,924	6,626	1,308	1,426	4,188	135	1,207	962	2,464	39	16	4,137	-	-	-	1,387	25	26,843
2030	4,957	7,772	2,430	2,143	8,905	298	2,467	1,835	3,236	70	24	5,048	-	-	-	2,620	43	41,849