

## ONTARIO TRM GLOSSARY

This glossary includes terms used throughout the Ontario Technical Reference Manual. The definitions are common to the energy industry and have been adjusted for Canadian standards and the local conditions of the Ontario service territory, as appropriate. A list of glossary reference materials follows the definitions.

### A

**Affinity laws** – Laws that describe the relationship between motor power and speed. These laws indicate that the power output of a motor theoretically has a cubic relationship with motor speed. [1]

**Air change** – The replacement of a quantity of air in a space within a given period of time, typically expressed as air changes per hour (ACH). If a building has one air change per hour, this is equivalent to all of the air in the building being replaced in a one-hour period. [2]

**Annual Fuel Utilization Efficiency (AFUE)** – AFUE is the average annual efficiency of equipment reflecting the seasonal and other shorter term variations in operating efficiency. It is also defined as the ratio of useful output energy to input energy.

**Algorithm** – Equation or set of equations, more broadly a method, used to calculate a number. In this case, it is an estimate of energy use or energy savings tied to operation of a piece of equipment or a system of interacting pieces of equipment. An algorithm may include certain standard numerical assumptions about some relevant quantities, leaving the user to supply other data to calculate the use or savings for the particular measure or equipment. [3]

**American National Standards Institute (ANSI)** – ANSI is a national organization in the United States that coordinates development and maintenance of consensus standards and sets rules for fairness in their development for the federated national standards system. The ANSI federation consists of nine hundred companies, large and small, and some two hundred trade, technical, professional, labor, and consumer organizations. ANSI also represents the United States in developing international standards. [3]

**Annual energy savings** – The reduction in fossil fuel use (in cubic meters of gas) or electricity usage (**kWh**) from the savings associated with an energy saving measure, project, or program in a given year. [3]

## B

**Balance Point** – Also referred to as the *building balance point temperature*, it is the outdoor air temperature required for the indoor temperature to be comfortable without the use of any mechanical heating or cooling. For example, this is the outdoor air temperature at which the heat gains due to electric lighting and equipment, body heat and solar radiation are in balance with the heat losses through the building envelope due to temperature differences. For most buildings it is in the range of 50°F to 65°F.

**Baseline**– Conditions that would have occurred without implementation of the subject measure or project. Additional details regarding baseline on different types of market conditions is provided in the front end section of the TRM.

**British Thermal Unit (Btu)** – A standard measure of heat energy. It takes one Btu to raise the temperature of one pound of water one degree Fahrenheit under standard pressure [4]

**Btuh** – British Thermal Units (**Btu**) per hour

**Building envelope**— The assembly of exterior partitions of a building which enclose conditioned spaces, through which thermal energy may be transferred to or from the exterior, unconditioned spaces, or the ground. [2]

**Bypass damper** – A device to manage airflow and airflow in a zoned HVAC system. It is usually a damper in the airstream that allows for airflow to zones to be completely or partially shut off. [5]

## C

**Capacity** –A measure of the rate of natural gas, usually expressed in Btuh, that is either delivered to (input) or converted by (output) an appliance or piece of equipment.

**Combustion** – Rapid combination of a substance with oxygen that releases energy in the form of heat and light, usually by a boiler or a furnace [2]

**Condensate** –Liquid product recovered from exhausted gases. [2]

**Conduction** – The transfer of heat energy through a material (solid, liquid or gas) by the motion of adjacent atoms and molecules without gross displacement of the particles. [6]

**Constant air volume (CAV)** – A type of HVAC system where the supply air to the space is constant, but the supply air temperature varies to meet the thermal loads in the space [7] Schedule 5 Page 3 of 12

**Convection** – Transferring heat by moving air, or transferring heat by means of upward motion of particles of liquid or gas heat from beneath. [6]

**CO2 sensor** – an instrument to measure carbon dioxide concentration in the air.

**CSA** - The CSA Group (formerly the **Canadian Standards Association** or **CSA**), is a not-for-profit standards organization which develops standards in 57 areas, many relating to various aspects of natural gas utilization and equipment installation. CSA publishes standards in print and electronic form and provides training and advisory services. CSA is composed of representatives from industry, government, and consumer groups. CSA began as the Canadian Engineering Standards Association (CESA) in 1919, federally chartered to create standards. CSA is accredited by the Standards Council of Canada, which promotes efficient and effective standardization in Canada.

**Cubic feet per minute (CFM)** – A volumetric flow measurement that indicates the amount of cubic feet of air passing through a stationary point in one minute. Typically used to measure airflow.

**Cubic meters of natural gas (m<sup>3</sup>)** – The most common unit of measurement of natural gas volume. It equals the amount of gas required to fill a volume of one cubic meter under stated conditions of temperature, pressure and water vapor. One cubic meter of natural gas has an energy content of approximately 35,738 Btu. [4] [8]

**Cycling losses** – The loss of heat as the water circulates through a water heater tank, and/or inlet and outlet pipes. [9]

## D

**Degree Days (DD)** – For any individual day, degree days indicate how far that day's average temperature departed from a **balance point**: Heating Degree Days measure heating energy demand. It is a measure to indicate how far the average temperature fell below the balance point. Similarly, Cooling Degree Days, which measure cooling energy demand, indicate how far the temperature averaged above the balance point. In both cases, smaller values represent less fuel demand, but values below 0 are set equal to 0, because energy demand cannot be negative. Furthermore, since energy demand is cumulative, degree day totals for periods exceeding 1 day are simply the sum of each individual day's degree day total. For example, using 65°F as the balance point, if a location has a mean temperature of 60°F on day 1 and 80°F on day 2, there would be 5 HDDs for day 1 (65 minus 60) and 0 for day 2 (65 minus 80, set to 0). For the day 1 + day

2 period, the HDD total would be  $5 + 0 = 5$ . In contrast, there would be 0 CDDs for day 1 (60 minus 65, reset to 0), 15 CDDs for day 2 (80 minus 65), resulting in a 2-day CDD total of  $0 + 15 = 15$ . Annual degree days designate thermal demand for the entire year. [10]

**DOE Water Heater Analysis Model (WHAM)** – A tool developed by Lawrence Berkeley National Laboratory (LBNL); the water heater analysis model (WHAM) was developed as a simple energy equation that accounts for different operating conditions and water heater characteristics when calculating energy consumption [11]

## E

**Effective Useful Life (EUL)** –See **Measure Life**.

**End-use** –Refers to service provided by the equipment (e.g. space heating, water heating, or food service).

**Energy efficiency** – The use of less energy to provide the same or an improved level of service to the energy consumer; or the use of less energy to perform the same function. [3]

**Energy efficiency measure (EEM)** – An installed piece of equipment or system, or modification of equipment or system, on end-use customer facilities that reduces the total amount of electrical or gas energy and capacity that would otherwise have been needed to deliver an equivalent or improved level of **end-use** service. [3]

**Energy Efficiency Ratio (EER)** – The ratio of cooling capacity of an air conditioning unit in **Btuh** to the total electrical input in watts under specified test conditions. [2]

**Energy Factor (EF)** – The measure of overall efficiency for a variety of appliances. For water heaters, the energy factor is based on three factors: 1) the **recovery efficiency**, or how efficiently the heat from the energy source is transferred to the water; 2) **stand-by losses**, or the percentage of heat lost per hour from the stored water compared to the content of the water; and 3) **cycling losses**. [9]

**Energy Management System (EMS)** – A control system (often computerized) designed to regulate the energy consumption of a building by controlling the operation of energy consuming systems, such as the heating, ventilation and air conditioning (HVAC), lighting, and water heating systems. [2]

**Engineering methods** – The use of standard formulas or models based on those formulas, typically accepted by ASHRAE, as the basis for calculating energy use. [3]

**Engineering model** – Engineering equations used to calculate energy usage and savings. These models are usually based on a quantitative description of physical processes that transform delivered energy into useful work such as heat, lighting, or motor drive. In practice, these models may be reduced to simple equations in spreadsheets that calculate energy usage or savings as a function of measurable attributes of customers, facilities, or equipment [3]

**ENERGY STAR** – Energy Star (trademarked ENERGY STAR) is an international standard for energy efficient consumer products originated in the United States. It was created in 1992 by the Environmental Protection Agency and the Department of Energy. [12]

**Equivalent Full load hours** – The full load heating or cooling hours is the number of hours during the year for which a heating or cooling system must operate at full load under design conditions or the peak capacity, in order for the system to satisfy the annual heating or cooling requirements of a new building. For example, a furnace that runs 50% loaded for two hours runs for one equivalent full load hour.

## F

**Flue gas** – Gas that is left over after fuel is burned and which is disposed of through a pipe or stack to the outer air. [6]

## H

**Heat load** – Typically used to define the balance of heat loss and heat gain in a space to determine the heating or conditioning requirements of a space. The heat load may include the contribution of external loads (from infiltration, outdoor air temperatures, and solar heat gains, etc.) and internal loads (heat from occupants and equipment).

**Horsepower (hp)** – A unit for measuring the rate of doing work. One horsepower equals about three-fourths of a kilowatt (745.7 watts). [3]

## I

**Incremental cost** –. The difference in cost between the high efficiency technology and the baseline technology. The incremental cost includes incremental installation costs where appropriate. Incremental cost is dependent on the measure category. More detailed definitions of the incremental cost by measure category are included in the front end section of the TRM.

**Infiltration** – The uncontrolled inward leakage of air through cracks and gaps in the building envelope, especially around windows, doors and duct systems. [2]

**Infrared** – Infrared is invisible **radiant** energy, typically used to heat an object or an occupant directly.

**Insulation** – Material used to prevent or slow down heat transfer between two bodies

## **K**

**Kilowatt-hour**– The unit of energy-use equivalent to one kilowatt of power expended for one hour of time. A kilowatt is equivalent to 1,000 watts.

## **L**

**Latent effectiveness** – The ratio of actual moisture transferred to the maximum moisture that could be transferred (usually used to measure efficiency of heat or energy recovery devices). It refers to a specific calculation using only measured humidity ratios, heat of vaporization values, and mass airflow rates as per section 3.5 from AHRI standard 1061.

**Lifetime natural gas savings** – The gas energy savings over the lifetime of an installed measure(s), calculated by multiplying the annual gas usage reduction associated with a measure(s) by the measure life. [3] Also referred to as cumulative cubic meters (ccm)

**Load factor** – A percentage indicating the difference between the amount of electricity or natural gas a consumer used during a given time span and the amount that would have been used if the usage had stayed at the consumer's highest demand level during the whole time. The term also is used to mean the percentage of capacity of an energy facility, such as a power plant or gas pipeline that is utilized in a given period of time. [3]

## **M**

**Measure life** – The length of time that a measure is expected to provide its estimated annual savings. Measure Life is a function of equipment life and measure persistence (not savings persistence): 1) Equipment Life means the number of years that a measure is installed and will operate until failure; 2) Measure Persistence takes into account business turnover, early retirement of installed equipment, and other reasons measures might be removed or discontinued. Measure Life is also referred to as Expected Useful Life (EUL). Based on [3]

**MMBtu** – A thermal unit of energy equal to 1,000,000 Btu, the equivalent of 988 cubic feet of gas having a heating content of 1,012 Btu per cubic foot. [3]

## O

**OBC SB-12** – The current building energy code is Part 12 of the Ontario Building Code, which is split into two sections (2012 amendments), SB-10 for large buildings and SB-12 for Housing (3 stories or less). The building code is a provincial regulation that applies across Ontario. Both sections address the thermal envelope requirements and energy consumption is addressed through performance requirements for most systems including, heating, cooling, ventilation, hot water systems and lighting (SB-10 only). [13]

## P

**Part-load performance** – The ability of the system to handle energy use at conditions lower than the rated **capacity** of equipment. For example, a boiler may be sized to meet a maximum capacity to meet the load during the coldest day of the year. However, during warmer temperatures, the equipment will operate at some part-load depending on its ability to turn down to a lower firing rate. The operation and efficiency of the boiler will vary depending on the load conditions.

**Penalty** – Usually an impact that increases the energy use in one fuel type as a consequence of reducing another. For example, adding air curtains will reduce natural gas consumption, but it will result in an electric penalty due to the addition of a fan.

**Polyvinyl chloride (PVC)** – A plastic polymer, usually used for piping liquids but can be used for flue gases for condensing boilers.

## R

**Radiation** – The flow of energy across open space via electromagnetic waves such as light. Passage of heat from one object to another without warming the air space in between. [6]

**Recovery efficiency (RE)** – How efficiently the heat from the energy source is transferred to the water. [9]

**R-Value** – A measure of thermal resistance of a material to conductive heat flow (equal to the reciprocal of the **U-Value**). The R-Value is expressed in area times degrees Fahrenheit divided by the heat transfer in Btu per hour ( $\text{ft}^2 \cdot ^\circ\text{F}/\text{Btu}\cdot\text{h}$ )

## S

**Seasonal Energy Efficiency Ratio (SEER)** – The total cooling output of a central air conditioning unit in **Btu** during its normal usage period for cooling divided by the total electrical energy input in watt-hours during the same period, as determined using specified federal test procedures. [6]

**Secondary benefits** – The impacts of an energy efficiency program other than the direct purpose for which it was designed. The substantiation documents in this TRM have a primary purpose of determining natural gas savings in m<sup>3</sup>. Any electric and water savings are secondary benefits.

**Sensible effectiveness** – The ratio of actual heat energy captured to the maximum heat energy that could be captured (usually used to measure efficiency of heat or energy recovery devices). It refers to a specific calculation using only measured dry bulb temperature differences, specific heat capacities and mass airflow rates as per section 3.5 from AHRI standard 1061.

**Setback** – An energy saving strategy used to reduce energy consumption during unoccupied or low usage periods. Some common examples are ventilation reduction during low occupancy or setting a temperature higher or lower during unoccupied cooling or heating periods to reduce conditioning requirements, respectively.

**Standby losses** – The percentage of heat loss per hour from the stored water compared to the heat content of the water (water heaters with storage tanks) [9]

**Stratification** – A phenomenon used to describe the temperature difference in an air column in a given space. In a room for example, temperatures near the ceiling will be higher than temperatures near the floor, since heat rises

**Supply air temperature** – Temperature of the conditioned air leaving an HVAC unit to enter a space, or ductwork

## T

**Therm** – One hundred thousand (100,000) British Thermal Units (1 therm = 100,000 Btu). [3]

**Thermal efficiency** – Thermal efficiency is a measure of the effectiveness of the heat exchanger of the boiler. It measures the ability of the exchanger to transfer heat from the combustion process to the water or steam in the boiler. Because thermal efficiency is solely a measurement of the effectiveness of the heat exchanger of the boiler, it does not

account for radiation and convection losses due to the boiler's shell, water column, or other components. [14]

**Thermostat** – An automatic control device designed to be responsive to temperature and typically used to maintain set temperatures by cycling the HVAC system. [6]

**Thermostat setback** – A control strategy that automatically changes the indoor setpoint temperature maintained by the HVAC system according to a preset schedule. The heating or cooling requirements can be reduced when a building is unoccupied or when occupants are asleep. [6]

**Ton** – Unit of measure for determining cooling **capacity**. One ton equals 12,000 **Btu** heat removed per hour. [3]

## U

**U-Value** – The quantity of heat transmitted per hour through one square foot of a building section (wall, roof, window, etc.) for each degree Fahrenheit of temperature difference between the air on the warm side and the air on the cold side of the building section. [3] This is also equal to the reciprocal of R-Value.

## V

**Variable Air Volume (VAV)** – A type of HVAC system that manages the conditioning and distribution of air, where the supply air to the space varies depending on the thermal load. There are terminal boxes in each space called VAV boxes that modulate how much air is delivered. Sometimes, these boxes have reheat coils.

**Variable Frequency Drive (VFD)** – A piece of equipment that regulates the speed and rotational force, or torque output, of an electric motor (sometimes variable speed drives or VSD) [15]

## W

**Wet-Bulb Temperature** – The temperature at which water, by evaporating into air, can bring the air to saturation at the same temperature. Wet-bulb temperature is measured by a wet-bulb psychrometer. [3]

## ACRONYMS

Acronym	Definition
ACEEE	American Council for an Energy-Efficient Economy
ACH	Air changes per hour
AFUE	Annualized fuel utilization efficiency
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
AHU	Air handling unit
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
Btu	British thermal unit
CFM	Cubic feet per minute
CDD	Cooling degree day
CEE	Consortium for Energy Efficiency
CFM,	cfm Cubic feet per minute
C/I	Commercial and industrial
CO <sub>2</sub>	Carbon dioxide
COP	Coefficient of performance
DD	Degree-day
DHW	Domestic hot water
DOE	Department of Energy
DOE-2	Building energy simulation model
DSM	Demand Side Management
ECM	Electronically commutated motors
EE	Energy efficiency
EER	Energy efficiency ratio
EFLH	Equivalent full load hours
EPA	Environmental Protection Agency
EPACT	Energy Policy Act of 1992 or 2005
EUI	Energy use index
EUL	Effective useful life
FTE	Full time equivalent
FSTC	Food Service Technology Center
GHG	Greenhouse gas
GPM	Gallons per minute

<b>Acronym</b>	<b>Definition</b>
HDD	Heating degree days
Hp	Horsepower
HVAC	Heating, ventilation, and air conditioning
IECC	International Energy Conservation Code
kW	Kilowatt
kWh	Kilowatt-hour
LED	Light emitting diode
MMBtu	One million Btu
NRCAN	Natural Resources Canada
NGTC	Natural Gas Technology Center
OBC	Ontario Building Code
PSI	Pounds per square inch (a measure of pressure)
PVC	Polyvinyl chloride
SEER	Seasonal energy efficiency ratio
VAV	Variable air volume
VFD	Variable frequency drive
VSD	Variable speed drive

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