DEFINITIONS

BC hydro powersmart

Annual Thermal Load—(MWht/year or GJ/year)—Customer's annual thermal energy requirements.

Ambient Temperature System or Low Temperature System—Design concept for district energy systems, recommending the use of low temperature energy sources (e.g. wastewater heat recovery) which allow for a wide range of decentralized energy sources and energy sharing between users with different needs (the heating required for one building can be supplied from another building, which needs cooling and removes the excess heat into the system).

Base Load—The minimum amount of energy required over a period of time at a steady rate.

Biomass—Organic material derived from living or recently living organisms such as: a) wood and wood waste (from demolition, landscaping and land clearing); wood chips from lumber operations and construction projects; wood pallets; beetle-killed pine and bioenergy crops; b) Municipal Solid Waste (garbage); c) agriculture waste (chicken or turkey litter, animal offal and manures, other farm waste); d) food waste; e) industrial waste (examples include brewery waste and grease); f) landfill gas and biogas.

B.C. Energy Plan—A statement of B.C. government policy issued by the Minister of Energy and Mines. See the BC Energy Plan website, www.energyplan.gov.bc.ca

British Columbia Utilities Commission (BCUC)—An independent regulatory agency of the provincial government operating under and administering the Utilities Commission Act. Its primary responsibility is the regulation of the energy utilities under its jurisdiction to ensure that the rates charged to customers for energy are fair, just and reasonable. The BCUC is required to ensure that utility operations provide safe, reliable and non-discriminatory service to their customers and a fair return to shareholders. It approves the construction of new facilities planned by utilities and their issuance of securities. See the *Utilities Commission Act*.

Building Mechanical System—All infrastructure within a building (except for the Energy Transfer Station) that comprises the system that delivers heart and hot water to individual consumers and building common spaces. Owned and operated by the building owner(s).

Business as Usual (BAU)—The way that heating, cooling and domestic hot water would be provided to a building in the absence of a district energy system.

Cap-and-Trade—A form of regulation used to reduce the cost of pollution control by providing economic incentives for achieving emissions reductions. In a cap-and trade system, the regulator sets limits or "caps" on emissions. Groups that intend to exceed the limits may buy emissions credits from entities that are able to below their designated limits. This transfer is normally referred to as a trade.

Capacity—Capacity measures the quantity of instantaneous energy use. Capacity refers to the highest level of energy that the utility can supply at any one time.

Carbon Monoxide (CO)—A colorless, odourless and tasteless gas, which results from incomplete oxidation of carbon in combustion.

Carbon Tax Act—The *Carbon Tax Act* comes into force on July 1, 2008 and imposes the revenue neutral carbon tax announced on February 19, 2008 as part of the Government of B.C.'s budget.

Certificate of Public Convenience and Necessity (CPCN)—A certificate issued to a public utility by a regulatory body such as the *B.C. Utilities Commission*, for the construction or operation of a generating plant.

DEFINITIONS

Clean Biomass—In Emission Regulation, unless otherwise authorized by the district director, Biomass does not include substances that contain any of the following: a) glue, paint or preservative, or foreign substances harmful to humans, animals or plants when combusted; b) wood or wood products with chloride content greater than 0.05% dry basis; c) wood or wood products with moisture content greater than 60% dry basis; d) manure; e) recyclable post consumer waste; f) paper or paper products; g) demolition waste or other municipal solid waste containing materials other than uncontaminated wood waste.

Clean Electricity—Defined pursuant to the B.C. Government's Clean or Renewable Electricity Guidelines. See the BC Energy Plan website, www.energyplan.gov.bc.ca

Clean or Renewable Resource—Biomass, biogas, geothermal heat, hydro, solar, ocean, wind, waste heat, or any other prescribed resource.

Class A Estimate—Based on complete working drawings and specifications, and prepared prior to calling competitive tenders, this estimate should be sufficient to allow a detailed reconciliation/ negotiation with any contractors proffered tender.

Class B Estimate (-5%, +10%)—Based on design/ preliminary drawings and outline specifications for the project, which include the design of all major systems and subsystems, as well as the results of all site/ installation investigations, this estimate should provide for the establishment of realistic cost objectives and be sufficient to obtain effective project approval.

Class C Estimate (-15%, +25%)—Based on a full description of the preferred option, construction / design experience, and market conditions, this estimate should be sufficient for making the correct investment decision, and obtaining preliminary project approval.

Class D Estimate (-25%, +50%)—Based upon a statement of requirements, and an outline of potential solutions, this estimate is strictly an indication (rough order of magnitude) of the final project cost, and should be sufficient to provide an indication of cost and allow for ranking all the options being considered.

Cogeneration (See also Combined Heat and Power)—The simultaneous production of electrical energy and heat energy from a single fuel source, both of which are utilized.

Combined Cycle Gas Turbine (CCGT)—The combination of combustion and steam turbines to generate electricity from two thermodynamic cycles. Exhaust gases from a combustion turbine flow to a heat recovery steam generator (HRSG) that produces steam to power a steam turbine, resulting in higher thermal efficiency than achievable by operating the combustion or steam turbines individually.

Combined Heat and Power (CHP) (See also Cogeneration)—The use of a heat engine or a power station to simultaneously generate both electricity and useful heat.

Community Energy and Emissions Inventory (CEEI)—An initiative of the BC Ministry of Environment. The 2007 CEEI Reports, hosted on CEEI website, represent high-level estimated community energy consumption and greenhouse gas emissions from on-road transportation, buildings, solid waste and land-use change (deforestation at regional district scale only).

Community Energy and Emissions Plan (CEEP)—Long-term integrated land use plan & policies to limit energy consumption & GHG emissions, increase energy efficiency and foster local green energy solutions in communities, to be adopted by Local Governments as part of their Official Community Plan.

DEFINITIONS

Community Energy Manager (CEM)—Dedicated staff resource within the Local Government who is responsible for driving sustainable policies and projects into community planning. The CEM has the role to create the foundation for a profound reduction in energy consumption and emissions community-wide in the Local/Regional Government and initiate catalytic action towards transition to more sustainable energy systems.

Conservation—A reduction in energy usage through a reduction in the level of energy service, such as turning off unnecessary lights.

Cooling Loop—A system of insulated steel cold water pipes (one supply and one return) with the supply pipe operating at a temperature that is sufficient for the intended cooling application at its point of use. For example if the intended cooling application is the cooling deck of a Makeup Air Unit the temperature of the supply pipe is not greater than 7 degrees C.

Criteria Air Contaminant (CAC)—These are air contaminants for which the Federal and/or Provincial government have established air quality objectives, criteria or standards. There are seven air pollutants that are considered Criteria Air Contaminants that are emitted predominantly to the air: Total Particulate Matter, Particulate Matter with a diameter less than 10 microns (see PM10), Particulate Matter with a diameter less than 2.5 microns (see PM2.5), Carbon Monoxide, Nitrogen Oxide, Sulphur Dioxide, and Volatile Organic Compounds (see VOC).

Definition Phase—The project development phase when preliminary design occurs, project scope is defined and licensing/regulatory approvals are received.

Demand—The rate at which energy is delivered to or by a system: it is generally expressed in kilowatts (kW) or megawatts (MW) when it refers to a given instant and in kilowatt-hours (kWh), megawatt-hours (MWh) or gigawatt-hours (GWh) when accumulated over any designated time interval; the demand for thermal energy is also expressed in gigajoule (GJ) per designated time interval.

Demand Side Management (DSM)—Actions that modify customer demand for electricity and/or other energy sources helping to defer the need for new energy and capacity supply addition.

Discount Rate—A rate used to determine the present value of expenses and revenues that will occur over a period of time, reflecting the cost of capital.

Discounted Cash Flow—Financial evaluation method that uses future free cash flow projections and discounts them to arrive at a present value, which is used to evaluate the potential for investment.

Distributed Energy Systems—Building scale systems that can produce both electricity and thermal energy to meet on-site needs for power, air conditioning, humidity control, refrigeration, space heating, and industrial process heating.

Distribution System, Distribution Piping System or **Distribution Pipe System**—Underground pipes (one supply and one return pipe each for heating and cooling) that distribute hot and chilled water to individual buildings.

District Energy Feasibility Study—A process that defines exactly what the district energy project is and what strategic issues need to be considered to assess its likelihood of succeeding. The research and information uncovered in the feasibility study will support the detailed planning and reduce the research time.

District Energy Prefeasibility Study—Study performing a valuation of the potential for district energy opportunities and site specific conditions identified for a particular neighbourhood in community.

District Energy Screening Study—An initial survey to determine potential opportunities for district energy applications within a community or a specified area.

DEFINITIONS

District Energy System (DES)—A system for generating and distributing thermal energy for space heating, space cooling and domestic hot water to a cluster of buildings ranging from a precinct to an entire community.

District Heating System (DHS)—A system for distributing heat generated in a centralized location for residential and commercial heating requirements.

Diversity—A relative measure of the likelihood that a series of connected loads will reach peak demand at the same time. A high diversity implies that the individual connected loads will reach their peak demand at different times while a low diversity implies that they will reach peak demand at the same time.

Electricity—A form of energy associated with charged particles, which can provide power to devices that produce heat, light, magnetism and chemical changes.

Emissions—Any direct or indirect discharge of solid, liquid or gaseous pollutants into the air.

Energy

1. The ability to do work.
2. Exists in several forms such as electrical, mechanical, chemical, thermal, nuclear, or other forms and can be transformed from one form to another.
3. For electricity, it represents the amount of electricity produced or used over a period of time, usually measured in kilowatt hours or gigawatt hours.

Energy Design Charrette—Intensive, interactive workshop where a multidisciplinary team (including municipal planners and engineers, land owners and developers, utilities and design professionals, residents, business owners and other stakeholders), collaborate to find ways of optimizing energy conservation and green energy opportunities for a specific planning area.

Energy Efficiency (EE)—A reduction in energy usage to provide the same level of energy service, such as heating, cooling, lighting or motor torque.

Energy Generation Centre—Generates hot water from a renewable source and from natural gas boilers for a district heating system, or chilled water for a district cooling system.

Energy Service—An amenity or service produced jointly by energy and other components or equipment such as building, motors and lights. Examples of energy services include space heating and cooling. The same energy service can frequently be supplied with different mixes of equipment and sources of energy.

Energy Task Force / Committee—Specific committee created within a community and tasked with energy management planning and implementation.

Energy Transfer Stations (ETS)—An assemblage of components located on the customer's premises that meter and control the heat energy passed between the district energy system and the building.

Energy Use Intensity Factors—EUI (in W/m^2 and kWh/m^2 per year)—Heat peak demand and annual heat demand per unit of gross building area for various building archetypes.

Floor Area Ratio (FAR)—Is the ratio of the total floor area of buildings on a certain location to the size of the land of that location, or the limit imposed on such a ratio. The Floor Area Ratio is the total building square footage (building area) divided by the site size square footage (site area).

- As a formula: Floor Area Ratio = (Total covered area on all floors of all buildings on a certain plot)/ (Area of the plot).

Floor Space Ratio (FSR)—See Floor Area Ratio (FAR).

Fuel Substitution—The ability to use a different fuel to produce the same energy service.

Gap or **Load Resource Gap**—The difference between a load forecast and resources available to meet the load.

Gigawatt Hour (GWh)—One billion watt-hours; one million kilowatt hours.

DEFINITIONS

Greenfield Site—Land on which no development has previously taken place.

Greenhouse Gases (GHG)—Gases thought to contribute to global climate change, or the "greenhouse effect", including carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O).

Greenhouse Gas Emissions Intensity—Refers at CO_2 equivalent per unit of energy produced; measured in tonnes of CO_2e/GWh or CO_2e/GJ.

Greenhouse Gas Offset—Reducing total emissions of greenhouse gases by decreasing emissions from sources other than a given source. For example, reducing methane emissions from landfill sites can be an offset for a thermal generation plant.

Greenhouse Gas Reduction (Cap and Trade) Act (GHG Cap and Trade Act)—The *Greenhouse Gas Reduction (Cap and Trade) Act* comes into force by regulation. The purpose of this Act is to enable the reductions of GHG emissions through a cap-and-trade system.

Greenhouse Gas Reduction (Emission Standards) Statutes Amendment Act, 2008 (Emission Standards Act)—The *Greenhouse Gas Reduction (Emissions Standards) Statutes Amendment Act, 2008* amends the *B.C. Environmental Management Act* to require all new electricity generating facilities and expansion to existing facilities using fossil fuels other than coal to have net zero GHG emissions as soon as the Act comes into force.

Greenhouse Gas Reduction Targets Act (GGRTA)—The Greenhouse Gas Reduction Targets Act was brought into force on January 1, 2008 and sets into law British Columbia's greenhouse gas emissions target of at least 33 per cent below 2007 levels by 2020, and at least 80 per cent below 2007 levels by 2050.

Heat Content—A measure of the energy released when a fuel is burned, and the basis of calculating the energy efficiency of a thermal process.

- Higher heating value (HHV) includes the heat released when water produced by combustion of the fuel's hydrogen condenses.
- Lower heating value (LHV) excludes the heat released by condensing water, assuming it stays in vapour form. For natural gas, LHV is about 90% of HHV.

Heat Energy Density—Energy demand for heating, cooling and domestic hot water per area of land.

Heat Rate—A measure of generating station thermal efficiency, computed by dividing the heat content of the fuel used for generating electricity by the resulting net electric energy generated. Typically expressed in GJ/GWh or kJ/kWh.

High Grade Energy Source—An energy source whose quality (exergy) is sufficient such that no additional thermal energy is required for the intended heating application at its point of use. Examples include energy from combustible fuels (natural gas and biomass), high temperature (T > approximately 65 degrees C) recovered heat and electricity to provide space heating and domestic hot water.

High Temperature Loop or Heating Loop—A system of insulated steel hot water pipes (one supply and one return) with the supply pipe operating at a temperature that is sufficient such that no additional thermal energy is required for the intended heating application at its point of use. For example if the intended heating application is domestic hot water the temperature of the supply pipe must be greater than 65 degrees C.

A high temperature loop can be connected to either a high grade energy source or a low grade energy source.

DEFINITIONS

Hydronics or Hydronic System—Components of a heating or cooling system that transfers heat by circulating a fluid in either vapour or water form through a closed system of pipes to produce a desired room temperature.

Identification Phase—The phase when a project is conceptualized and feasibility is determined.

Implementation Phase—The phase in which detailed design is performed, equipment is procured, and the project is constructed and commissioned.

Incentive—Certain financial features in the utility's demand-side management (DSM) programs designed to motivate customer participation. They may include features designed to reduce a customer's net cash outlay, pay-back period or cost of finance to participate.

Incentive Costs

- Types of Incentives to consider are as follows:
  - $/Unit which is the incentive paid by BC Hydro per unit (e.g. $1 coupon for a CFL).
  - Levelized $/kWh is dependent on the amount of energy saved. It is the rate BC Hydro will pay the customer per present value kWh saved (e.g. a 3.5 c/kWh levelized incentive means BC Hydro will pay the customer an incentive calculated by multiplying 3.5c by the present value of electricity savings over 10 years).

Incentive Persistence—By default, the persistence of the savings to a maximum of 10 years is used to calculate a levelized incentive payment.

Kilowatt (kW)—One thousand watts; the commercial unit of measurement of electric power. A kilowatt is the flow of electricity required to light ten 100-watt light bulbs.

Kilowatt Hour (kWh)—One thousand watts used for a period of one hour; the basic unit of measurement of electric energy. On average, residential customers in B.C. use about 10,000 kWh per year.

Levelized Cost, Levelized Price—Levelizing is a method of converting a non-uniform stream of energy costs (or prices) into a present value equivalent uniform cost (or price). Costs are levelized in real dollars.

Line Losses—For Electrical Systems: Reduction in capacity and energy transferred as resistance converts electricity to heat in electrical equipment and along transmission lines. For Thermal Distribution Systems: Reduction in capacity and thermal energy transferred as a result of the heat losses in distribution lines."

Load—The amount of energy required by a customer or group of customers.

Load Displacement—The reduction of electricity supply from existing utility due to customer self-generation.

Load Duration Curve—A load curve having the demand data ordered in descending order of magnitude, rather than chronologically. The LDC curve shows the capacity utilization requirements for each increment of load. The height of each slice is a measure of capacity, and the width of each slice is a measure of the utilization rate or capacity factor. The product of the two is a measure of energy (e.g. GJ or MWh).

The Load Duration Curve consists of a set of time series data such as hour-to-hour energy usage, sorted in a way so that it can be easily seen how frequently values are very high or very low. A relatively flat duration curve means the values tend to fall within a small range. A steep curve means that usage varies widely over a time period.

Load Factor—The ratio of the average demand supplied during a given period to the peak demand occurring during the same period.

Load Forecast—The expected load requirements that an energy service system will have to meet in future years.

DEFINITIONS

Load Profile—The pattern of energy supply or demand over a time period. For example, a one-day hourly load profile for a customer shows hourly consumption over a 24-hour period.

Long-Term Acquisition Plan (LTAP)—A Long-Term Acquisition Plan (LTAP) is BC Hydro's action plan to cost-effectively meet growing customer electricity requirements. An LTAP translates the Integrated Electricity Plan (IEP) analysis and acquisition strategy into a series of actions that sets the course for the first 10 years of the 20-year IEP horizon.

Low Grade Energy Source—An energy source whose quality (exergy) is deficient such that additional thermal energy (from heat pumps for example) is required for the intended heating application at its point of use. Examples include energy from low temperature (T < approximately 65 degrees C) recovered heat, waste water and geoexchange.

Low Temperature Loop—A system of uninsulated plastic water pipes (one heating and one cooling) which allow for a range of decentralized energy sources and energy sharing between users with different heating and cooling needs. In heating mode, heat is drawn from the heating pipe and charges the cooling pipe and in cooling mode the opposite occurs. The temperatures are seasonally adjusted to optimize heating and cooling but heating pipe temperatures are typically 10–20 degrees C and cooling pipe temperatures are typically 5–15 degrees C.

A low temperature loop is usually connected to a low grade energy source. It is also called an Ambient Temperature Loop.

Mayor's Task Force—A multi-stakeholder team whose mandate is to implement a strategic sustainability plan for the community including the development of a Community Energy and Emissions Plan or implementing district energy systems.

Multi-Unit Residential Building (MURB)—Buildings containing more than two attached dwelling units, including buildings containing non-residential units if the building also contains more than two attached dwelling units.

Municipal Solid Waste (MSW)—Solid waste from municipal collections, of which some can be burned as a fuel.

Neighbourhood Energy Utility (NEU)—A municipality or corporation that owns and operates a district energy system.

Neighbourhood Service Plan—A plan indicating the manner and timing of the district energy distribution system designated to service the specific neighbourhood.

Net Present Value (NPV)—The difference between the present value of benefits and the present value of costs (including capital, operating, maintenance and administration costs) for a given discount rate.

Official Community Plan (OCP)—The OCP provides the longer term vision for a community. Under the *Local Government Act* section 875, an OCP is a statement of objectives and policies to guide decisions on planning and land use management, within the area covered by the plan, respecting the purposes of local government. It can be developed by both municipalities and regional districts.

Organic Rankine Cycle (ORC)—An Organic Rankine Cycle engine uses working fluids other than water (silicon oil) in order to produce electricity from low-temperature sources such as waste heat.

Particulate Matter—A complex mixture of extremely small particles and liquid droplets. It is made up of a number of components, including acids, organic chemicals, metals, and soil or dust particles.

Payback—The time it takes for positive cash flow to match capital costs.

Peak Thermal Load or **Peak Thermal Demand** (in MWt or GJ)—The maximum heat requirement of a system at a given time, or the amount of heat required to supply customers at times when need is greatest (See also Annual Thermal Load).

DEFINITIONS

PM10—Inhalable particulate matter; airborne particles smaller than 10 micrometers in diameter (see Criteria Air Contaminant). Sources of particulate matter can be man made or natural.

PM2.5—Respirable particulate matter; airborne particles smaller than 2.5 micrometers in diameter (see Criteria Air Contaminant). Sources of particulate matter can be man made or natural.

Power—The instantaneous rate at which energy is produced, transmitted or consumed, typically measured in watts (W), kilowatts (kW), or megawatts (MW).

Power Smart—BC Hydro's demand side management (DSM) program to encourage energy efficiency by its customers. Originally launched in 1989, Power Smart includes a full range of DSM programs aimed at BC Hydro's residential, commercial and industrial customers as well as communities, rates/codes, and other strategy.

Public Consultation—Public consultation takes place when decision makers give the public an opportunity to influence planning and decision making through collecting feedback on analysis, alternatives and/or decisions. It is the decision makers' responsibility to keep the public informed, acknowledge the public's concerns, and provide feedback on how public input will influence the decision.

Rate Structure—The formulas used by a utility to calculate charges paid by the classes of customers for use of energy.

Renewable Electricity—Defined pursuant to the B.C. Government's Clean or Renewable Electricity Guidelines. See the BC Energy Plan website, www.energyplan.gov.bc.ca

Revenue Requirements Application (RRA)—Hearing before the B.C. Utilities Commission expected to determine the revenues a utility will need for its operations, to ensure a safe and reliable supply of electricity to its customers.

Run rate—Run rate is the rate at which the Power Smart programs or projects are saving electricity at a given point in time. This is usually expressed as GWh/yr at the end of the month or year being reported.

Self-Generation—Generation of electricity by an industry or commercial enterprise whose principal product is not electricity. Self-generation can either reduce the amount of electricity purchased from the utility or it may be sold to the utility as a supply-side resource.

Stakeholder Engagement—Is an umbrella term that covers the full range of an organization's efforts to understand and involve stakeholders in its activities and decisions. Stakeholder engagement initiatives can range from informing stakeholders of plans to collaborating with stakeholders and incorporating their advice and recommendations into the decision-making process.

Structured Decision Making (SDM)—A method for creating a clear and concise summary of a problem and the possible solutions to it so that the decision-maker can easily see the consequences of each choice. The decision-making process will explicitly integrate environmental, social and financial decision criteria where they are relevant to a decision. The framework helps define the problem under consideration, determine who needs to be involved in the process of developing alternatives and compare the trade-offs created by each alternative solution to the problem, to ensure that the competing interests of stakeholders are reconciled.

System Operator—The Company responsible for the operation of the district energy system.

Thermal Generation—Generation of electricity by converting heat energy into electric energy through the controlled combustion of fossil fuels or biomass.

DEFINITIONS

Utilities Commission Act (UCA)—B.C. legislation creating and empowering the B.C. Utilities Commission, which regulates BC Hydro and other utilities. See the Utilities Commission Act and the DSM Related Legislation and Regulation page.

Volatile Organic Compound (VOC)—Health Canada classes VOCs as organic compounds that have boiling points roughly in the range of 50 to 250°C (120 to 480 °F). VOCs are emitted as gases from certain solids or liquids and include a variety of chemicals, some of which may have short- and long-term adverse health effects or are common ground-water contaminants.

Volt (V)—The basic unit of measurement of electromotive force, the force required to change the random motion of electrons into an electric current.

Waste Heat—Heat produced by machines, electrical equipment and industrial processes for which no useful application is found, and is regarded as a waste by-product. Potential waste heat sources are: sewage lines, water treatment plants, ice arenas, industrial processes, power generation.

Watt (W)—The basic unit of measurement of electric power, indicating the rate at which electric energy is generated or consumed. (1 watt = 1 J/s.)

Weighted Average Cost of Capital—A company's assets are financed by either debt or equity. WACC is the average of the costs of these sources of financing, each of which is weighted by its respective use in the given situation. By taking a weighted average, we can see how much return the company has to earn for every dollar it finances.

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