APPENDIX VII: ALASKA ENERGY SECURITY TASK FORCE DEFINITIONS AND ACRONYMS

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ALASKA ENERGY SECURITY TASK FORCE REPORT DEFINITIONS

Active power: The component of electric power that performs work, typically measured in kilowatts (kW) or megawatts(MW). Also known as "real power." The terms "active" or "real" are used to modify the base term "power" to differentiate it from Reactive Power. See Power, Reactive Power, Apparent Power

Actual peak reduction: The actual reduction in annual peak load (measured in kilowatts) achieved by customers that participate in a utility demand-side management (DSM) program. It reflects the changes in the demand for electricity resulting from a utility DSM program that is in effect at the same time the utility experiences its annual peak load, as opposed to the installed peak load reduction capability (i.e., potential peak reduction). It should account for the regular cycling of energy efficient units during the period of annual peak load.

Adjusted electricity: A measurement of electricity that includes the approximate amount of energy used to generate electricity. To approximate the adjusted amount of electricity, the site-value of the electricity is multiplied by a factor of 3. This conversion factor of 3 is a rough approximation of the Btu value of raw fuels used to generate electricity in a steam-generation power plant.

All-electric home: A residence in which electricity is used for the main source of energy for space heating, water heating, and cooking. Other fuels may be used for supplementary heating or other purposes.

Alternative Fuel An alternative to gasoline or diesel fuel that is not produced in a conventional way from crude oil. Examples include **compressed natural gas (CNG)**, **liquefied petroleum gas (LPG)**, **liquefied natural gas (LNG)**, **ethanol**, **methanol**, and **hydrogen**.

Alternative fuel: Alternative fuels, for transportation applications, include the following:

- methanol
- denatured ethanol, and other alcohols
- fuel mixtures containing 85 percent or more by volume of methanol, denatured ethanol, and other alcohols with gasoline or other fuels
- natural gas
- liquefied petroleum gas (propane)
- hydrogen
- coal-derived liquid fuels
- fuels (other than alcohol) derived from biological materials (biofuels such as soy diesel fuel)
- electricity (including electricity from solar energy)

"... any other fuel the Secretary determines, by rule, is substantially not petroleum and would yield substantial energy security benefits and substantial environmental benefits." The term "alternative fuel" does not include alcohol or other blended portions of primarily petroleum-based fuels used as oxygenates or extenders, i.e. MTBE, ETBE, other ethers, and the 10-percent ethanol portion of gasohol.

Alternative fuel vehicle (AFV): A vehicle designed to operate on an alternative fuel (for example, compressed natural gas, liquefied propane gas, or electricity). The vehicle could be either a dedicated vehicle designed to operate exclusively on alternative fuel or a nondedicated vehicle designed to operate on alternative fuel and/or a gasoline or diesel fuel.

Amortization: The depreciation, depletion, or charge-off to expense of intangible and tangible assets over a period of time. In the extractive industries, the term is most frequently applied to mean either (1) the periodic charge-off to expense of the costs associated with non-producing mineral properties incurred prior to the time

when they are developed and entered into production or (2) the systematic charge-off to expense of those costs of productive mineral properties (including tangible and intangible costs of prospecting, acquisition, exploration, and development) that had been initially capitalized (or deferred) prior to the time the properties entered into production, and thereafter are charged off as minerals are produced.

Arbitrage: The simultaneous purchase and sale of identical or similar assets across two or more markets in order to profit from a temporary price discrepancy.

Average revenue per kilowatthour: The average revenue per kilowatthour of electricity sold by sector (residential, commercial, industrial, or other) and geographic area (State, Census division, and national) is calculated by dividing the total monthly revenue by the corresponding total monthly sales for each sector and geographic area.

Base gas: The quantity of natural gas needed to maintain adequate reservoir pressures and deliverability rates throughout the withdrawal season. Base gas usually is not withdrawn and remains in the reservoir. All natural gas native to a depleted reservoir is included in the base gas volume.

Base load: The minimum amount of electric power delivered or required over a given period of time at a steady rate.

Base load capacity: The generating equipment normally operated to serve loads on an around-the-clock basis.

Base load plant: A plant, usually housing high-efficiency steam-electric units, which is normally operated to take all or part of the minimum load of a system, and which consequently produces electricity at an essentially constant rate and runs continuously. These units are operated to maximize system mechanical and thermal efficiency and minimize system operating costs.

Base rate: A fixed kilowatthour charge for electricity consumed that is independent of other charges and/or adjustments.

Battery: An energy storage device that produces electricity by means of chemical action. It consists of one or more electric cells each of which has all the chemicals and parts needed to produce an electric current.

Biodiesel (B100): Renewable fuel consisting of mono alkyl esters (long chain fatty acids) that are produced through the conversion of animal fats, vegetable oils, and recycled grease feedstocks (transesterification) to produce biodiesel. Biodiesel is typically blended with petroleum diesel in concentrations of 2% to 20% biodiesel, or B2 to B20.

Biofuels: Liquid fuels and blending components produced from biomass feedstocks, used primarily for transportation.

Biogas: A mixture of methane and other gases produced by decomposing matter in an oxygen-free (anaerobic) environment with the assistance of microbes. Biogas is typically produced at landfills and anaerobic-digesters.

Biomass: Organic nonfossil material of biological origin constituting a renewable energy source.

Biomass gas: A medium Btu gas containing methane and carbon dioxide, resulting from the action of microorganisms on organic materials such as a landfill.

Boiling-water reactor (BWR): A light-water reactor in which water, used as both coolant and moderator, is allowed to boil in the core. The resulting steam can be used directly to drive a turbine.

Breeder reactor: A reactor that both produces and consumes fissionable fuel, especially one that creates more fuel than it consumes. The new fissionable material is created by a process known as breeding, in which neutrons from fission are captured in fertile materials.

British Thermal Unit (Btu): The mean British thermal unit is 1/180 of the heat required to raise the temperature of one pound (1 lb) of **water** from 32°F to 212°F at a constant **atmospheric pressure**. The Btu is equal to the quantity of heat required to raise one pound (1 lb) of water 1°F.

Btu conversion factor: A factor for converting energy data between one unit of measurement and British thermal units (Btu). Btu conversion factors are generally used to convert energy data from physical units of measure (such as barrels, cubic feet, or short tons) into the energy-equivalent measure of Btu. (See http://www.eia.gov/totalenergy/data/monthly/pdf/sec13.pdf for further information on Btu conversion factors.)

Btu per cubic foot: The total heating value, expressed in Btu, produced by the combustion, at constant pressure, of the amount of the gas that would occupy a volume of 1 cubic foot at a temperature of 60 degrees F if saturated with water vapor and under a pressure equivalent to that of 30 inches of mercury at 32 degrees F and under standard gravitational force (980.665 cm. per sec. squared) with air of the same temperature and pressure as the gas, when the products of combustion are cooled to the initial temperature of gas and air when the water formed by combustion is condensed to the liquid state.(Sometimes called gross heating value or total heating value.)

Bunker fuels: Fuel supplied to ships and aircraft, both domestic and foreign, consisting primarily of residual and distillate fuel oil for ships and kerosene-based jet fuel for aircraft. The term "international bunker fuels" is used to denote the consumption of fuel for international transport activities. Note: For the purposes of greenhouse gas emissions inventories, data on emissions from combustion of international bunker fuels are subtracted from national emissions totals. Historically, bunker fuels have meant only ship fuel.

Capacity (purchased): The amount of energy and capacity available for purchase from outside the system.

Capacity charge: An element in a two-part pricing method used in capacity transactions (energy charge is the other element). The capacity charge, sometimes called Demand Charge, is assessed on the amount of capacity being purchased.

Capacity factor: The ratio of the electrical energy produced by a generating unit for the period of time considered to the electrical energy that could have been produced at continuous full power operation during the same period.

Capacity transaction: The acquisition of a specified quantity of generating capacity from another utility for a specified period of time. The utility selling the power is obligated to make available to the buyer a specified quantity of power.

Capacity utilization: Capacity utilization is computed by dividing production by productive capacity and multiplying by 100.

Capital cost: The cost of field development and plant construction and the equipment required for industry operations.

Capital stock: Property, plant and equipment used in the production, processing and distribution of energy resources.

Carbon Dioxide (CO_2): A colorless, odorless, noncombustible gas that is slightly more than 1.5 times as dense as air and becomes a solid (dry ice) below -78.5°C. It is present in the atmosphere as a result of the decay of organic material and the respiration of living organisms. It is produced by the burning of wood, coal, coke, oil, natural gas, or other fuels containing carbon.

Carbon Monoxide (CO): A colorless, odorless, tasteless, poisonous gas that results from incomplete **combustion** of **carbon** with **oxygen**.

Carbon intensity: The amount of carbon by weight emitted per unit of energy consumed. A common measure of carbon intensity is weight of carbon per British thermal unit (Btu) of energy. When there is only one fossil fuel under consideration, the carbon intensity and the emissions coefficient are identical. When there are several fuels, carbon intensity is based on their combined emissions coefficients weighted by their energy consumption levels. Also see Emissions coefficient and Carbon output rate.

Carrying costs: Costs incurred in order to retain exploration and property rights after acquisition but before production has occurred. Such costs include legal costs for title defense, ad valorem taxes on nonproducing mineral properties, shut-in royalties, and delay rentals.

Chemical energy is energy stored in the bonds of atoms and molecules. Batteries, biomass, petroleum, natural gas, and coal are examples of chemical energy. For example, chemical energy is converted to thermal energy when people burn wood in a fireplace or burn gasoline in a car's engine.

Chlorofluorocarbon (CFC): Any of various compounds consisting of carbon, hydrogen, chlorine, and flourine used as refrigerants. CFCs are now thought to be harmful to the earth's atmosphere.

Clean Development Mechanism (CDM): A Kyoto Protocol program that enables industrialized countries to finance emissions-avoiding projects in developing countries and receive credit for reductions achieved against their own emissions limitation targets. Also see Kyoto Protocol.

Climate change: A term used to refer to all forms of climatic inconsistency, but especially to significant change from one prevailing climatic condition to another. In some cases, "climate change" has been used synonymously with the term "global warming"; scientists, however, tend to use the term in a wider sense inclusive of natural changes in climate, including climatic cooling.

Coincidental demand: The sum of two or more demands that occur in the same time interval.

Coincidental peak load: The sum of two or more peak loads that occur in the same time interval.

Combined-heat-and-power (CHP) plant: A plant designed to produce both heat and electricity from a single heat source. Note: This term is being used in place of the term "cogenerator" that was used by EIA in the past. CHP better describes the facilities because some of the plants included do not produce heat and power in a sequential fashion and, as a result, do not meet the legal definition of cogeneration specified in the Public Utility Regulatory Policies Act (PURPA).

Combustion: The burning fire produced by the proper combination of fuel, heat, and **oxygen**. In the engine, the rapid burning of the air-fuel mixture that occurs in the **combustion chamber**.

Combustion Chamber: In an internal combustion engine, the space between the top of the piston and the cylinder head in which the air-fuel mixture is burned.

Commercial building: A building with more than 50 percent of its floor space used for commercial activities. Commercial buildings include, but are not limited to, stores, offices, schools, churches, gymnasiums, libraries, museums, hospitals, clinics, warehouses, and jails. Government buildings are included except for buildings on military bases or reservations.

Commercial facility: An economic unit that is owned or operated by one person or organization and that occupies two or more commercial buildings at a single location. A university and a large hospital complex are examples of a commercial multi-building facility.

Commercial sector: An energy-consuming sector that consists of service-providing facilities and equipment of businesses; Federal, State, and local governments; and other private and public organizations, such as religious, social, or fraternal groups. The commercial sector includes institutional living quarters. It also includes sewage treatment facilities. Common uses of energy associated with this sector include space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a wide variety of other equipment. Note: This sector includes generators that produce electricity and/or useful thermal output primarily to support the activities of the above-mentioned commercial establishments.

Composite: Material created by combining materials differing in composition or form on a macroscale to obtain specific characteristics and properties. The constituents retain their identity; they can be physically identified, and they exhibit an interface among one another.

Compressed Hydrogen Gas (CHG): Hydrogen gas compressed to a high pressure and stored at **ambient temperature**.

Compressed Natural Gas (CNG): Mixtures of **hydrocarbon** gases and vapors, consisting principally of **methane** in gaseous form that has been compressed.

Conservation: A reduction in energy consumption that corresponds with a reduction in service demand. Service demand can include buildings-sector end uses such as lighting, refrigeration, and heating; industrial processes; or vehicle transportation. Unlike energy efficiency, which is typically a technological measure, conservation is better associated with behavior. Examples of conservation include adjusting the thermostat to reduce the output of a heating unit, using occupancy sensors that turn off lights or appliances, and car-pooling.

Consumer (energy): Any individually metered dwelling, building, establishment, or location using natural gas, synthetic natural gas, and/or mixtures of natural and supplemental gas for feedstock or as fuel for any purpose other than in oil or gas lease operations; natural gas treating or processing plants; or pipeline, distribution, or storage compressors.

Consumer charge: An amount charged periodically to a consumer for such utility costs as billing and meter reading, without regard to demand or energy consumption.

Cooperative electric utility: An electric utility legally established to be owned by and operated for the benefit of those using its service. The utility company will generate, transmit, and/or distribute supplies of electric energy to a specified area not being serviced by another utility. Such ventures are generally exempt from Federal income tax laws. Most electric cooperatives have been initially financed by the Rural Utilities Service (prior Rural Electrification Administration), U.S. Department of Agriculture.

Cost of capital: The rate of return a utility must offer to obtain additional funds. The cost of capital varies with the leverage ratio, the effective income tax rate, conditions in the bond and stock markets, growth rate of the utility, its dividend strategy, stability of net income, the amount of new capital required, and other factors dealing with business and financial risks. It is a composite of the cost for debt interest, preferred stock dividends, and common stockholders' earnings that provide the facilities used in supplying utility service.

Cost of debt: The interest rate paid on new increments of debt capital multiplied by 1 minus the tax rate.

Cost-based rates (electric): A ratemaking concept used for the design and development of rate schedules to ensure that the filed rate schedules recover only the cost of providing the service. FERC definition

Cost-of-service regulation: A traditional electric utility regulation under which a utility is allowed to set rates based on the cost of providing service to customers and the right to earn a limited profit.

Current assets: Cash and other assets that are expected to be turned into cash, sold, or exchanged within the normal operating cycle of the utility, usually one year. Current assets include cash, marketable securities, receivables, inventory, and current prepayments.

Current liabilities: A debt or other obligation that must be discharged within one year or the normal operating cycle of the utility by expending a current asset or the incurrence of another short-term obligation. Current liabilities include accounts payable, short-term notes payable, and accrued expenses payable such as taxes payable and salaries payable.

Current ratio: The ratio of current assets divided by current liabilities that shows the ability of a utility to pay its current obligations from its current assets. A measure of liquidity, the higher the ratio, the more assurance that current liabilities can be paid.

Dedicated reserves: The volume of recoverable, salable gas reserves committed to, controlled by, or possessed by the reporting pipeline company and used for acts and services for which both the seller and the company have received certificate authorization from the Federal Energy Regulatory Commission (FERC). Reserves include both company-owned reserves (including owned gas in underground storage),reserves under contract from independent producers, and short-term and emergency supplies from the intrastate market. Gas volumes under contract from other interstate pipelines are not included as reserves, but may constitute part or all of a company's gas supply.

Deliverability: Represents the number of future years during which a pipeline company can meet its annual requirements for its presently certificated delivery capacity from presently committed sources of supply. The availability of gas from these sources of supply shall be governed by the physical capabilities of these sources to deliver gas by the terms of existing gas-purchase contracts, and by limitations imposed by State or Federal regulatory agencies.

Delivered (gas): The physical transfer of natural, synthetic, and/or supplemental gas from facilities operated by the responding company to facilities operated by others or to consumers.

Delivered cost: The cost of fuel, including the invoice price of fuel, transportation charges, taxes, commissions, insurance, and expenses associated with leased or owned equipment used to transport the fuel.

Delivered energy: The amount of energy supplied to the end-use sectors (residential, commercial, industrial, and transportation). Includes the coal, natural gas, petroleum products, renewable energy, and electricity sales to ultimate customers purchased by consumers in the end-use sectors. Excludes electricity generated on-site

(such as from rooftop solar panels or combined-heat-and-power systems) and non-marketed renewable energy (solar water heating, ground-source heat pumps, wood from your backyard, etc.) produced and consumed entirely within the sector.

Deliveries (electric): Energy generated by one system and delivered to another system through one or more transmission lines.

Deliveries (electric): Energy generated by one system and delivered to another system through one or more transmission lines.

Diesel fuel system: Diesel engines are internal combustion engines that burn diesel oil rather than gasoline. Injectors are used to spray droplets of diesel oil into the combustion chambers, at or near the top of the compression stroke. Ignition follows due to the very high temperature of the compressed intake air, or to the use of "glow plugs," which retain heat from previous ignitions (spark plugs are not used). Diesel engines are generally more fuel-efficient than gasoline engines but must be stronger and heavier because of high compression ratios.

Diesel-electric plant: A generating station that uses diesel engines to drive its electric generators.

Distributed generator: A generator that is located close to the particular load that it is intended to serve. General, but non-exclusive, characteristics of these generators include: an operating strategy that supports the served load; and interconnection to a distribution or sub-transmission system (138 kV or less).

Distribution provider (electric): Provides and operates the wires between the transmission system and the end-use customer. For those end-use customers who are served at transmission voltages, the Transmission Owner also serves as the Distribution Provider. Thus, the Distribution Provider is not defined by a specific voltage, but rather as performing the Distribution function at any voltage. NERC definition

Electrical energy is delivered by tiny, charged particles called electrons, that typically move through a wire. Lightning is an example of electrical energy in nature.

Electric utility: A corporation, person, agency, authority, or other legal entity or instrumentality aligned with distribution facilities for delivery of electric energy for use primarily by the public. Included are investor-owned electric utilities, municipal and State utilities, Federal electric utilities, and rural electric cooperatives. A few entities that are tariff based and corporately aligned with companies that own distribution facilities are also included.

Electric utility divestiture: The separation of one electric utility function from others through the selling of the management and ownership of the assets related to that function. It is most commonly associated with selling generation assets so they are no longer owned or controlled by the shareholders that own the company's transmission and distribution assets.

Electric utility generator: A generator that is owned by an electric utility, (see definition of electric utility) or a jointly owned generator with the greatest share of the generator being electric utility owned. Note: If two or more owners have equal shares of ownership in a generator, it is considered to be an electric utility generator if any one of the owners meets the definition of electric utility.

Electric utility restructuring: The introduction of competition into at least the generation phase of electricity production, with a corresponding decrease in regulatory control.

Electric utility sector: The electric utility sector consists of privately and publicly owned establishments that generate, transmit, distribute, or sell electricity primarily for use by the public and that meet the definition of an electric utility. Non utility power producers are not included in the electric sector.

Electric zone: A portion of the grid controlled by the independent system operator.

Electrical system energy losses: The amount of energy lost during generation, transmission, and distribution of electricity, including plant and unaccounted for use.

Electricity: A form of energy characterized by the presence and motion of elementary charged particles generated by friction, induction, or chemical change.

Electricity broker: An entity that arranges the sale and purchase of electric energy, the transmission of electricity, and/or other related services between buyers and sellers but does not take title to any of the power sold.

Electricity congestion: A condition that occurs when insufficient transmission capacity is available to implement all of the desired transactions simultaneously.

Electricity demand: The rate at which energy is delivered to loads and scheduling points by generation, transmission, and distribution facilities.

Electricity generation: The process of producing electric energy or the amount of electric energy produced by transforming other forms of energy, commonly expressed in kilowatthours(kWh) or megawatthours (MWh).

Electricity paid by household: The household paid the electric utility company directly for all household uses of electricity (such as water heating, space heating, air-conditioning, cooking, lighting, and operating appliances.) Bills paid by a third party are not counted as paid by the household.

Electricity sales: The amount of kilowatthours sold in a given period of time; usually grouped by classes of service, such as residential, commercial, industrial, and other. "Other" sales include sales for public street and highway lighting and other sales to public authorities, sales to railroads and railways, and interdepartmental sales.

Electricity sales to ultimate customers: Electricity sales that are consumed by the customer and not available for resale. Includes electric sales to end users by third-party owners of behind-the-meter solar photovoltaic systems.

Electricity-only plant: A plant designed to produce electricity only. See also Combined heat and power (CHP) plant.

Energy Affordability: Consumers should be able to pay for their electricity use without being overburdened to meet basic needs.

Energy consumption: The use of energy as a source of heat or power or as a raw material input to a manufacturing process.

Energy deliveries: Energy generated by one electric utility system and delivered to another system through one or more transmission lines.

Energy demand: The requirement for energy as an input to provide products and/or services.

Energy Efficiency: A ratio of service provided to energy input (e.g., lumens to watts in the case of light bulbs). Services provided can include buildings-sector end uses such as lighting, refrigeration, and heating: industrial processes; or vehicle transportation. Unlike conservation, which involves some reduction of service, energy efficiency provides energy reductions without sacrifice of service. May also refer to the use of technology to reduce the energy needed for a given purpose or service.

Energy efficiency, Electricity: Refers to programs that are aimed at reducing the energy used by specific end-use devices and systems, typically without affecting the services provided. These programs reduce overall electricity consumption (reported in megawatthours), often without explicit consideration for the timing of program-induced savings. Such savings are generally achieved by substituting technologically more advanced equipment to produce the same level of end-use services (e.g. lighting, heating, motor drive) with less electricity. Examples include high-efficiency appliances, efficient lighting programs, high-efficiency heating, ventilating and air conditioning (HVAC) systems or control modifications, efficient building design, advanced electric motor drives, and heat recovery systems.

Energy efficient motors: Are also known as "high-efficiency motors" and "premium motors." They are virtually interchangeable with standard motors, but differences in construction make them more energy efficient.

Energy management and control system(EMCS): An energy conservation feature that uses mini/microcomputers, instrumentation, control equipment, and software to manage a building's use of energy for heating, ventilation, air conditioning, lighting, and/or business-related processes. These systems can also manage fire control, safety, and security. Not included as EMCS are time-clock thermostats.

Energy management practices: Involvement, as a part of the building's normal operations, in energy efficiency programs that are designed to reduce the energy used by specific end-use systems. This includes the following EMCS, DSM Program Participation, Energy Audit, and a Building Energy Manager.

Energy Reliability: The ability of a power system to withstand instability, uncontrolled events, cascading failures, or unanticipated loss of system components.

Energy reserves: Estimated quantities of energy sources that are demonstrated to exist with reasonable certainty on the basis of geologic and engineering data (proved reserves) or that can reasonably be expected to exist on the basis of geologic evidence that supports projections from proved reserves (probable/indicated reserves). Knowledge of the location, quantity, and grade of probable/indicated reserves is generally incomplete or much less certain than it is for proved energy reserves. Note: This term is equivalent to "Demonstrated Reserves" as defined in the resource/reserve classification contained in the U.S. Geological Survey Circular 831,1980. Demonstrated reserves include measured and indicated reserves but exclude inferred reserves.

Energy savings: A reduction in the amount of electricity used by end users as a result of participation in energy efficiency programs and load management programs.

Energy Security/Resilience: Uninterrupted availability of energy sources at an affordable price.

Energy service provider: An energy entity that provides service to a retail or end-use customer.

Energy source: Any substance or natural phenomenon that can be consumed or transformed to supply heat or power. Examples include petroleum, coal, natural gas, nuclear, biomass, electricity, wind, sunlight, geothermal, water movement, and hydrogen in fuel cells.

Energy supplier: Fuel companies supplying electricity, natural gas, fuel oil, kerosene, or LPG (liquefied petroleum gas) to the household.

Energy supply: Energy made available for future disposition. Supply can be considered and measured from the point of view of the energy provider or the receiver.

Energy used in the home: For electricity or natural gas, the quantity is the amount used by the household during the365- or 366-day period. For fuel oil, kerosene, and liquefied petroleum gas (LPG), the quantity consists of fuel purchased, not fuel consumed. If the level of fuel in the storage tank was the same at the beginning and end of the annual period, then the quantity consumed would be the same as the quantity purchased.

Energy-consuming sectors: The residential, commercial, industrial, transportation, and electric power sectors of the economy.

Energy-use sectors: A group of major energy-consuming components of U.S. society developed to measure and analyze energy use. The sectors most commonly referred to in EIA are: residential, commercial, industrial, transportation, and electric power.

Electrode: A conductor through which electrons enter or leave an **electrolyte**. **Batteries** and **fuel cells** have a negative electrode (the **anode**) and a positive electrode (the **cathode**).

Electrolysis: A process that uses electricity, passing through an electrolytic solution or other appropriate medium, to cause a reaction that breaks chemical bonds (e.g., electrolysis of water to produce hydrogen and oxygen).

Electron: A stable atomic particle that has a negative charge; the flow of electrons through a substance constitutes electricity.

Emission Standards: Regulatory standards that govern the amount of a given pollutant that can be discharged into the air from a given source.

Endothermic: A chemical reaction that absorbs or requires energy (usually in the form of heat).

Energy: The quantity of work a system or substance is capable of doing, usually measured in **British thermal units** (Btu) or Joules (J).

Energy Content: Amount of energy for a given weight of fuel.

Energy Density: Amount of potential energy in a given measurement of fuel. See **Gravimetric Energy Density** and **Volumetric Energy Density**.

Engine: A machine that converts heat energy into mechanical energy.

Ethanol (CH_3CH_2OH): An alcohol containing two **carbon** atoms. Ethanol is a clear, colorless liquid and is the same alcohol found in beer, wine, and whiskey. Ethanol can be produced from cellulosic materials or by fermenting a sugar solution with yeast.

Exhaust Emissions: Materials emitted into the atmosphere through any opening downstream of the exhaust ports of an engine, including water, particulates, and pollutants.

Exothermic: A chemical reaction that gives off heat.

Fuel: A material used to create heat or power through conversion in such processes as combustion or electrochemistry.

Fuel Cell: A device that produces electricity through an electrochemical process, usually from hydrogen and oxygen.

Fuel Cell Stack: Individual **fuel cells** connected in a series. Fuel cells are stacked to increase voltage.

Fuel Processor: Device used to generate hydrogen from fuels such as **natural gas**, **propane**, **gasoline**, **methanol**, and **ethanol** for use in **fuel cells**.

Gas: Fuel gas such as natural gas, undiluted **liquefied petroleum gases** (vapor phase only), liquefied petroleum gas-air mixtures, or mixtures of these gases.

- **Natural Gas**—Mixtures of hydrocarbon gases and vapors consisting principally of **methane** (CH_4) in gaseous form.
- **Liquefied Petroleum Gases** (LPG)—Any material composed predominantly of any of the following **hydrocarbons** or mixtures of them: propane, propylene, butanes (normal butane or isobutane) and butylenes.
- **Liquefied Petroleum Gas-Air Mixture**—Liquefied petroleum gases distributed at relatively low pressures and normal atmospheric temperatures that have been diluted with air to produce desired heating value and utilization characteristics.

Graphite: Mineral consisting of a form of **carbon** that is soft, black, and lustrous and has a greasy feeling. Graphite is used in pencils, crucibles, lubricants, paints, and polishes.

Greenhouse Effect: Warming of the Earth's atmosphere due to gases in the atmosphere that allow solar radiation (visible, ultraviolet) to reach the Earth's atmosphere but do not allow the emitted infrared radiation to pass back out of the Earth's atmosphere.

Greenhouse Gas (GHG): Gases in the Earth's atmosphere that contribute to the **greenhouse effect**.

Heat Exchanger: Device (e.g., a radiator) that is designed to transfer heat from the hot coolant that flows through it to the air blown through it by the fan.

Heating Value (TOTAL): The number of British thermal units (**Btu**) produced by the **combustion** of one cubic foot of gas at constant pressure when the products of combustion are cooled to the initial temperature of the gas and air, when the **water** vapor formed during combustion is condensed, and when all the necessary corrections have been applied.

- **Lower (LHV)**—The value of the heat of combustion of a fuel measured by allowing all products of **combustion** to remain in the gaseous state. This method of measure does not take into account the heat energy put into the vaporization of water (heat of vaporization).
- **Higher (HHV)—**The value of the heat of combustion of a fuel measured by reducing all of the products of combustion back to their original temperature and condensing all water vapor formed by combustion. This value takes into account the heat of vaporization of water.

Hydrocarbon (HC): An organic compound containing carbon and hydrogen, usually derived from fossil fuels, such as petroleum, **natural gas**, and coal.

Hydrogen (H_2): Hydrogen (H) is the most abundant element in the universe, but it is generally bonded to another element. Hydrogen gas (H_2) is a diatomic gas composed of two hydrogen atoms and is colorless and odorless. Hydrogen is flammable when mixed with **oxygen** over a wide range of concentrations.

Hydrogen-Rich Fuel: A fuel that contains a significant amount of **hydrogen**, such as gasoline, diesel fuel, **methanol** (CH_3OH), **ethanol** (CH_3CH_2OH), **natural gas**, and coal.

Kilowatt (kW): A unit of power equal to about 1.34 horsepower or 1,000 watts.

Liquefied Hydrogen (LH$_2$): Hydrogen in liquid form. Hydrogen can exist in a liquid state but only at extremely cold temperatures. Liquid hydrogen typically has to be stored at -253°C (-423°F). The temperature requirements for liquid hydrogen storage necessitate expending energy to compress and chill the hydrogen into its liquid state.

Liquefied Natural Gas (LNG): **Natural gas** in liquid form. Natural gas is a liquid at -162°C (-259°F) at ambient pressure.

Liquefied Petroleum Gas (LPG): Any material that consists predominantly of any of the following hydrocarbons or mixtures of **hydrocarbons**: **propane**, propylene, normal butane, isobutylene, and butylenes. LPG is usually stored under pressure to maintain the mixture in the liquid state.

Megawatt (MW): A unit of power equal to one million watts or 1,000 kilowatts.

Membrane: The separating layer in a **fuel cell** that acts as **electrolyte** (an ion-exchanger) as well as a barrier film separating the gases in the **anode** and **cathode** compartments of the fuel cell.

Methanol (CH_3OH): An alcohol containing one carbon atom. It has been used, together with some of the higher alcohols, as a high-octane gasoline component and is a useful automotive fuel.

Miles Per Gallon Equivalent (MPGE): Energy content equivalent to that of a gallon of gasoline (114,320 **Btu**).

Molten Carbonate Fuel Cell (MCFC): A type of **fuel cell** that contains a molten carbonate **electrolyte**. Carbonate ions (CO_3^{-2}) are transported from the **cathode** to the **anode**. Operating temperatures are typically near 650°C.

Natural Gas: A naturally occurring gaseous mixture of simple **hydrocarbon** components (primarily **methane**) used as a fuel.

Nitrogen (N_2): A diatomic colorless, tasteless, odorless gas that constitutes 78% of the atmosphere by volume.

Nitrogen Oxides (NO_x): Any chemical compound of nitrogen and **oxygen**. Nitrogen oxides result from high temperature and pressure in the **combustion chambers** of automobile engines and other power plants during the combustion process. When combined with **hydrocarbons** in the presence of sunlight, nitrogen oxides form smog. Nitrogen oxides are basic air pollutants; automotive exhaust emission levels of nitrogen oxides are regulated by law.

Nuclear energy: is energy stored in the nucleus of an atom—the energy that holds the nucleus together. Large amounts of energy can be released when the nuclei are combined or split apart.

Polymer Electrolyte Membrane (PEM): A fuel cell incorporating a solid polymer membrane used as its **electrolyte**. Protons (H^+) are transported from the anode to the cathode. The operating temperature range is generally 60°C–100°C.

Polymer Electrolyte Membrane Fuel Cell (PEMFC or PEFC): A type of acid-based **fuel cell** in which the transport of **protons** (H^+) from the **anode** to the **cathode** is through a solid, aqueous membrane impregnated with an appropriate acid. The **electrolyte** is a called a **polymer electrolyte membrane (PEM)**. The fuel cells typically run at low temperatures (<100°C).

Radiant energy: is electromagnetic energy that travels in transverse waves. Radiant energy includes visible light, x-rays, gamma rays, and radio waves. Light is one type of radiant energy. Sunshine is radiant energy, which provides the fuel and warmth that make life on earth possible.

Reactor: Device or process vessel in which chemical reactions (e.g., catalysis in **fuel cells**) take place.

Reformate: Hydrocarbon fuel that has been processed into hydrogen and other products for use in **fuel cells**.

Reformer: Device used to generate hydrogen from fuels such as **natural gas**, **propane**, **gasoline**, **methanol**, and **ethanol** for use in **fuel cells**.

Reforming: A chemical process in which hydrogen-containing fuels react with steam, **oxygen**, or both to produce a hydrogen-rich gas stream.

Reformulated Gasoline: Gasoline that is blended so that, on average, it reduces volatile organic compounds and air toxics emissions significantly relative to conventional gasolines.

Regenerative Fuel Cell: A **fuel cell** that produces electricity from hydrogen and oxygen and can use electricity from solar power or some other source to divide the excess water into oxygen and hydrogen fuel to be re-used by the fuel cell.

Renewable Energy: A form of energy that is never exhausted because it is renewed by nature (within short time scales; e.g., wind, solar radiation, hydro power).

Solid Oxide Fuel Cell (SOFC): A type of **fuel cell** in which the **electrolyte** is a solid, nonporous metal oxide, typically zirconium oxide (ZrO_2) treated with Y_2O_3, and O^{-2} is transported from the **cathode** to the **anode**. Any CO in the reformate gas is oxidized to CO_2 at the anode. Temperatures of operation are typically 800°C–1,000°C.

Steam Reforming: The process for reacting a **hydrocarbon** fuel, such as natural gas, with steam to produce hydrogen as a product. This is a common method for bulk hydrogen generation.

Thermal energy: or heat, is the energy that comes from the movement of atoms and molecules in a substance. Heat increases when these particles move faster. Geothermal energy is the thermal energy in the earth.

Turbine: Machine for generating rotary mechanical power from the energy in a stream of fluid. The energy, originally in the form of head or pressure energy, is converted to velocity energy by passing through a system of stationary and moving blades in the turbine.

Turbocharger: A device used for increasing the pressure and **density** of a fluid entering a **fuel cell** power plant using a compressor driven by a turbine that extracts energy from the exhaust gas.

Turbocompressor: Machine for compressing air or other fluids (**reactant** if supplied to a **fuel cell** system) in order to increase the reactant pressure and concentration.

Water (H_2O): A colorless, transparent, odorless, tasteless liquid compound of **hydrogen** and **oxygen**. The liquid form of steam and ice. Fresh water at **atmospheric pressure** is used as a standard for describing the relative **density** of liquids, the standard for liquid capacity, and the standard for fluid flow. The melting and

boiling points of water are the basis for the **Celsius** temperature system. Water is the only byproduct of the combination of hydrogen and oxygen and is produced during the burning of any **hydrocarbon**. Water is the only substance that expands on freezing as well as by heating and has a maximum density at 4°C.

Watt (W): A unit of power equal to one Joule of work performed per second; 746 watts is the equivalent of one horsepower. The watt is named for James Watt, Scottish engineer (1736–1819) and pioneer in steam engine design.

ALASKA ENERGY SECURITY TASK FORCE REPORT ACRONYMS

ACRONYMS

AC - Alternating Current

AFC - Alkaline Fuel Cell

ANL - Argonne National Laboratory

ANSI - American National Standards Institute

APU - Auxiliary Power Unit

ASME - American Society of Mechanical Engineers

ASNT - American Society for Nondestructive Testing

BOCA - Building Officials Code Administration

CaFCP - California Fuel Cell Partnership

CARB - California Air Resources Board

CGA - Compressed Gas Association

CSA - Canadian Standards Association

DC - Direct Current

DMFC - Direct Methanol Fuel Cell

DOD - Department of Defense

DOE - Department of Energy

DOT - Department of Transportation

EERE - Office of Energy Efficiency and Renewable Energy (an office within the U.S. Department of Energy)

FCHEA - Fuel Cell and Hydrogen Energy Association

FCV - Fuel Cell Vehicle

FCT - Fuel Cell Technology (Program within **EERE**)

FMEA - Failure Mode and Effects Analysis

FY - Fiscal Year

GHG - Greenhouse Gas

HAHC - Hydrogen Ad Hoc Committee

HCSCC - Hydrogen Codes and Standards Coordinating Committee

HTAP - Hydrogen Technical Advisory Panel

ICBO - International Conference of Building Officials

ICC - International Code Council

IEC - International Electrochemical Commission

IEEE - Institute of Electrical & Electronics Engineers

IFGC - International Fuel Gas Code

IRC - International Residential Code

ISA - Instrument Society of America

ISO - International Organization for Standardization

JIGA - Japan Industrial Gases Association

LANL - Los Alamos National Laboratory

LFL - Lower Flammability Limit

LHV - Lower Heating Value

MCFC - Molten Carbonate Fuel Cell

MEA - Membrane/Electrode Assembly

MSDS - Material Safety Data Sheet

NAS - National Academy of Sciences

NES - National Evaluation Services

NFPA - National Fire Protection Association

NGV - New Generation of Vehicles

NGVC - Natural Gas Vehicle Coalition

NIST - National Institute of Standards and Technology

NHA - National Hydrogen Association (NHA merged with the U.S. Fuel Cell Council to form FCHEA in 2011)

NREL - National Renewable Energy Laboratory

OSHA - Occupational Safety and Health Administration

PAFC - Phosphoric Acid Fuel Cell

PATH - Partnership for Advancing the Transition to Hydrogen

PDA - Personal Digital Assistant

PEC - Photoelectrochemical

PEM - Polymer Electrolyte Membrane / Proton Exchange Membrane

PEMFC - Polymer Electrolyte Membrane Fuel Cell

PNNL - Pacific Northwest National Laboratory

PV - Photovoltaic

R&D - Research & Development

SAE - Society of Automotive Engineers

SBCCI - Southern Building Code Congress International

SBIR - Small Business Innovations Research

SMR - Steam Methane Reforming

SOFC - Solid Oxide Fuel Cell

STTR - Small Business Technology Transfer Program

SUV - Sport Utility Vehicle

SWNT - Single Wall Nanotube

TC - Technical Committee

UBC - Uniform Building Committee

UFL - Upper Flammability Limit

UL - Underwriter's Laboratory

USFCC - U.S. Fuel Cell Council (USFCC merged with the National Hydrogen Association to form FCHEA in 2011)

WHEC - World Hydrogen Energy Conference