CLEAN FUEL AND ADVANCEMENTS IN RENEWABLE TECHNOLOGY

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Air pollution is one of the greatest environmental threats, indoor smoke is a serious health risk for some 2.6 billion people who cook and heat their homes with biomass, kerosene fuels, and coal. Air pollution affects the cardiovascular and respiratory health of the population. It causes diseases like stroke, heart disease, lung cancer, and both chronic and acute respiratory diseases, including asthma. Ambient (outdoor) air pollution in both cities and rural areas was estimated to cause 4.2 million premature deaths worldwide, this mortality is due to exposure to fine particulate matter of 2.5 microns or less in diameter (PM2.5), which cause cardiovascular and respiratory disease, and cancers. In addition to outdoor air pollution, indoor smoke from household air pollution is a serious health risk for some 2.6 billion people who cook and heat their homes with biomass fuels and coal. Greenhouse gases (GHGs) like carbon dioxide, methane, nitrous oxide, and ozone are a set of gases that accumulate in the lower layer of the atmosphere, the troposphere, and absorb infrared radiation, which contributes to increasing the average temperature of the Earth's surfaces and are the result of excessive fossil fuel combustion

FOSSIL FUELS AND ITS ENVIRONMENTAL IMPACT

Fossil fuels are nonrenewable energy formed from prehistoric biomass that accumulated at the bottom of water bodies faster than ambient microbes could remineralize and recycle it. Coal and petroleum theoretically exhibit formation-specific source signatures resulting from the accumulation of characteristics associated with the prehistoric biomass, depositional environment, and formation conditions. The chemical composition and the source signatures of fossil fuels vary considerably around the world. Fossil fuels are a finite source of energy and are going to deplete with time, possibly running out in a couple of decades. The importance of environmentally friendly biofuels has been realized in the last few decades. The highest change in fossil fuel consumption has happened and is predicted that it will continue to happen in natural gas, a cleaner fossil fuel compared to oil and coal; however, extraction of and burning of all fossil fuel forms have serious environmental consequences, which will require further and

closer attention as more unconventional fossil fuel resources are explored and their overall consumption expands further. Fossil fuels constitute more carbon content and hence emit carbon dioxide as by-product after combustion.

CLEAN FUEL TECHNOLOGY

Bioenergy is defined as renewable energy produced from natural sources capable of replacing fossil energy. Bioenergy is a key strategy for climate change mitigation in many national and international climate change and renewable energy policies. Ensuring that bioenergy offers the required holistic emission reduction, context, specific and long-term approaches are necessary to understand synergies and trade-offs between the bioenergy and related agricultural and forestry systems. Public policy and markets have led to clean energy technologies being economically competitive. Decades of early stimulus policies and public R&D investments played an important role in the progress achieved to date. Markets structures in the industry are evolving in response. The distributed nature of wind and solar resources is providing customers new options outside of traditional utilities, whereas ownership of 470 Advances in Clean Energy Technologies conventional assets are consolidating to manage new risks from clean energy.

SOLAR POWER

Solar energy is generated by nuclear reactions within the body of the sun. This energy reaches the surface of the earth in the form of electromagnetic radiation. The sunlight which reaches the earth's surface comprises 50% visible radiation and 47% infrared. Solar power is the conversion of sunlight into electricity. There are two ways of doing this-

1.)Concentrated Solar Power (CSP), in which sunlight is focused on an area containing water which is converted into steam and is used to generate power, as in a thermal power plant. CSP produces concentrated solar beam irradiation to heat liquid, solid, or gas as in a regular TPS. The best sites for CSP are in equatorial belt cloud-free regions.

2.) PV cells, in which light is converted into electricity using photovoltaic cells (PV). Solar cells produce DC power, which fluctuates according to the intensity of irradiated light. This requires an inverter to produce power at the desired voltage frequency and phase. PV Systems are connected to the grid. They need batteries for backup. Centralized, distributed, on-grid, and off-grid are several options for solar power installations.

As with several other renewable technologies, solar energy is intermittent; it is only available during hours of daylight. In many parts of the world where there is a good solar resource, high levels of sunlight often coincide with a peak in demand for air conditioning, so solar power, particularly in the form of rooftop solar panels, can provide synchronized peak power.

WIND ENERGY

Modern technologies are making the extraction of wind energy much more efficient. The wind is free, so only installation cost is involved and running costs are low. Wind energy is the most convenient resource to generate electrical energy in remote locations, where conventional power lines cannot be extended due to environmental and economic considerations. A windmill converts the energy in wind into electrical energy or mechanical energy to pump water or grind cereals. The most common windmills in operation today generate power from three-blade, horizontal-axis windmills with the nacelle mounted on steel towers that can be cylindrical steel plates or lattice towers. The main disadvantage of wind energy is varying and unreliable wind speed. When the strength of the wind is too low to support a wind turbine, little electricity is generated.

BIOMASS

Biomass is a natural carbonous resource. It is used to produce syngas. Biomass is a complex natural renewable material with enormous chemical variability. Its potential for energy production varies on the process used, which may involve elementary or highly sophisticated technologies. Biomass is any kind of organic feedstock that can be replenished or renewed naturally. Biomass to liquids (BTL) is a thermochemical process, currently moving from pilot scale to demonstration scale worldwide, that can convert a range of biomass types to a range of fuels and chemicals. The uptake of BtL can help decarbonize the transport fuel sector and is of considerable interest worldwide as policy increasingly focuses on the environmental implications of biofuel use.

HYDROGEN

Hydrogen and fuel cells could make the most important contribution in the transportation sector, where the introduction of alternative energy sources such as renewables has been most elusive. Hydrogen does not generally exist in the free state rather it occurs in compounds which means other energy sources have to be used to separate it. As an energy carrier, hydrogen has many applications which can be categorized as stationary, mobile, backup, or specialty. Storage is another concern for hydrogen and methods for storage are still under construction. Hydrogen has a much lower density than gasoline so it must be stored either in the liquid state at low temperature or as compressed gas. This complicates the feasibility of the transport and widespread use of hydrogen. Hydrogen can be burned in internal combustion engines (ICE) or converted to electricity in fuel cells. A fuel cell is a device that uses the chemical reaction between hydrogen and oxygen to produce electricity.

When renewable energy sources such as solar, wind, and other forms, distributed generation, energy storage and their related technologies, and demand responses are integrated with transmission and distribution systems, several benefits can be realized. By using advanced system design, planning, and operation, we reap several benefits. Utilization of clean power instead of conventional fuel-based power generation carbon emission is reduced. Better utilization of assets results in a cost of production is reduced and peak demand is also reduced. The system reliability, resiliency, and security are increased. Oil consumption can be reduced by plug-in electric vehicle operation.