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STUDY OF ENERGY PERSPECTIVE OF CLIMATE CHANGE

Moudud Ahmed[1], Rabiul islam[2], Md. Jillur Rahaman Sohel[3], A. Z. M. Shariful Alam[4] and Mohammad Rafiqul Alam[5]

[1-3,5]Department of EEE, Chittagong University of Engineering & Technology (CUET), Bangladesh
[4]Department of ME, Chittagong University of Engineering & Technology (CUET), Bangladesh

[1]moudud.eee@gmail.com,[2]rabiul.islam07@gmail.com,[3]mjrsohel.eee@gmail.com,
[4]azmsharif7@gmail.com, [5]mra_cueteee@yahoo.com

Abstract-*Climate change is a serious and urgent issue. While climate change and climate modeling are subject to inherent uncertainties, it is clear that human activities have a powerful role in influencing the climate and the risks and scale of impacts in the future. All the science implies a strong likelihood that, if emissions continue unabated, the world will experience a radical transformation of its climate. In this paper the adverse effect of greenhouse gases produced by burning of fossil foil are discussed. Also include the estimation of the amount of carbon dioxide released from power plant daily in Bangladesh. The most recent stabilization scenarios, assessed by this paper including outline greenhouse gas mitigation strategies, technology needs, structural changes and possible policy levers, comparative benefits of advanced technology with that of conventional technology. In this paper we also find out the solution of present climate change indirectly security of world energy. Such finding solutions along with the problems are very helpful for future energy crisis.*

Keywords: Climate change, Greenhouse gases, Future energy solution.

1. INTRODUCTION

Climate change is arguably one of the greatest environmental threats the world is facing. The impacts of disruptive change leading to catastrophic events such as storms, droughts, sea level rise and floods are already being felt across the world. The dual objectives of the United Nations Framework Convention on Climate Change (UNFCCC) are greenhouse gas (GHG) reduction and achievement of sustainable development[1].Global emissions of carbon dioxide (CO2) – the main cause of global warming. Global CO2 emissions increased by 3% in 2011, compared to the previous year, reaching an all-time high of 34 billion tones . For the next two decades a warming of about 0.2°C per decade is projected for a range of SRES emissions scenarios. Even if the concentrations of all GHGs and aerosols had been kept constant at year 2000levels, afurther warming of about 0.1°C per decade would be expected[2]. Scientists have a well-developed understanding of the contributions of thermal expansion and melting glaciers to sea-level rise . Recent observations of the polar ice sheets show that a number of complex processes control the movement of ice to the sea, and thus affect the contributions of ice sheets to sea-level rise. Projected a rise of the world's oceans from 8 inches to 2 feet by the end of this century. Approximately 20 to 30% of plant and animal species assessed so far are likelyto be at increased risk of extinction if increases in global average temperature exceed 1.5 to 2.5°C[3] .

2. WORLD ENERGY STATUS

World proved reserves of coal in 2010 were sufficient to meet 118 years of global production by far the largest R/P ratio of any fossil fuel but well below the 2000 R/P ratio of 2010 years [4]. World proved oil reserves in 2010 were sufficient to meet 46.2 years of global production, down slightly from the 2009 R/P ratio because of a large increase production , global proved reserves rose slightly last year. World natural gas proved reserves in 2010 were sufficient to meet 58.6 years of global production. R/P ratios declined for each region, driven by rising production [5]. Worldwide energy usage In 2011 averaged 16 TW and 85% of that energy depended on fossil fuels (coal, oil, and natural gas) .The predicted energy consumption for 2050 will amount to as much as 30 TW [6]. The question arises how to supply all that energy. The primary solution is to burn more fossil fuels (coal, oil, and natural gas) or build more nuclear power plants. However, the greenhouse gasses produced by burning fossil fuels have been responsible for global warming, and the unanswered question of safe disposal of radioactive waste from nuclear plants raises several issues. The next chapter is about to discussed the possible solution of energy crisis in near future.

3. MITIGATION OF CLIMATE CHANGE

If current trends in CO_2 emissions continue, The consequence would be significant change in all aspects of life and irreversible change in the natural environment. Thus, there is an urgent need to mitigate greenhouse gas emissions in order to confine global warming to within permissible limit.

3.1 CCS:

Carbon dioxide (CO_2) capture and storage (CCS) is a process consisting of the separation of CO2 from industrial and energy-related sources, transport to a storage location and long-term isolation from the atmosphere. Potential storage methods include injection into underground geological formations, injection into the deep ocean (at depths greater than 1,000 m), where most of it would be isolated from the atmosphere for centuries, or industrial fixation in inorganic carbonates. CO_2 capture systems reduce CO_2 emissions per kWh by approximately 80–90%[7]

3.2 Clean coal technology:

The most promising "*clean coal*" technology involves using the coal to make hydrogen from water, then burying the resultant carbon dioxide by-product and burning the hydrogen. 23% of primary energy needs are met by coal and 39% of electricity is generated from coal. However, burning coal produces about 12 billion tons of carbon dioxide each year[8]. Development of new "clean coal" technologies is addressing this problem so that the world's enormous resources of coal can be utilized for future generations without contributing to global warming. Much of the challenge is in commercializing the technology so that coal use remains economically competitive despite the cost of achieving low and eventually near "zero emissions"[8].

3.3 IGCC:

In a coal IGCC, syngas exiting the gasified is cleaned of particles, H_2S and other contaminants and then burned to make electricity via a gas turbine/steam turbine combined cycle. The syngas is generated and converted to electricity at the same site, both to avoid the high cost of pipeline transport of syngas (with a heating value only about 1/3 of that for natural gas) and to cost-effectively exploit opportunities for making extra power in the combined cycle’s steam turbine using steam from syngascooling. Advanced technologies such as Integrated Gasification Combined Cycle (IGCC) were originally the prospects of exploiting continuing advances in gas turbine technology, the ease of realizing low levels of air-pollutant emissions when contaminants are removed from syngas, and greatly reduced process stream volumes compared to flue gas streams from combustion which are at low pressure and diluted with nitrogen from air.[9].

3.4 DLE:

There has been significant advance in the last 20 years in combustion technology designed to substantially reduce emissions of NOx. Typically these DLE combustion systems can reduce NOx emissions by a factor of 10-15 at full load compared to conventional combustion systems[10]. Gas turbine manufacturers in particular have developed DLE systems employing lean pre-mixed combustion for a wide range of ratings of gas turbines to reduce the conversion of atmospheric nitrogen to NOx.

3.5 AIMS:

CO2 sequestration has been naturally occurring for billions of years. The current strategies used to capture CO2 involve the use of the ocean, geological, terrestrial and also biological ways. AIMS use the biological process to sequestrate CO2 through algae cultivation. The concept of this system is applied through an on-going cycle of CO2 captured by algae[11]. The production of algae can be used to manufacture ethanol and biodiesel, that in turn yields CO2 from the combustion of ethanol; conceivably a cycle is generated. Algae are subsequently sequestering carbon; an important process for the world today as it generates viable, highly efficient form of oil from algae. Alga is currently the most viable oil source available and grows more rapidly than alternative plant oil producing organisms. Illustration 1 explains this concept of biodiesel and ethanol production. As a rule of thumb, approximately one ton of carbon dioxide is removed (from otherwise airborne emissions) via the growth of two tons of algae[11].

4. CLIMATE CHANGE AND RENEWABLE ENERGY

Solar energy is abundant and offers significant potential for near-term (2020) and long-term (2050) climate change mitigation[12]. Even though solar energy generation still only represents a small fraction of total energy consumption, markets for solar technologies are growing rapidly. Potentialdeployment scenarios range widely—from a marginal role of direct solar energy in 2050 to one of the major sources of energy supply Solarenergy is the most abundant of all energy resources [12]. Indeed, the rate at which solar energy is intercepted by the

Earth is about 10,000 times greater than the rate at which humankind consumes energy[12]. opting for such home improvements can allow one to reduce almost 70% of one's overall contribution to pollution[13]. This is a big number considering that most people are highly dependent upon non-renewable energy sources that have grave contributions to overall amounts of pollution. The Earth's internal thermal energy flows to the surface by conduction at a rate of 44.2 terawatts (TW), and is replenished by radioactive decay of minerals at a rate of 30 TW. These power rates are more than double humanity's current energy consumption from all primary sources, but most of this energy flow is not recoverable[14]. Geothermal utilization is commonly divided into two categories, i.e. electricity production and direct application If the electricity that drives the heat pump is produced from a renewable energy source like hydropower or geothermal energy, the emission savings are even higher. The total CO2 reduction potential of heat pumps has been estimated to be 1.2 billion tons per year or about 6% of the global emission (ISEO)[12].As Congress considers clean energy legislation, one of the options for "green" electricity being discussed is the development of new hydropower resources. The IPCC's Fourth Assessment Report (AR4) assumed that hydropower could contribute 17% of global electricity supply by 2030[12]. The estimated reduction potential of Micro/Mini hydro as a CDM project is 2.3 tons of CO2 equivalent per kilo watt of generated power per year. According to the International Energy Agency (IEA, 2010c), 1.4 billion people have no access to electricity[15]. SHP can provide a decentralized electricity supply in those rural areas that have adequate hydropower technical potential. [15] This opportunity of carbon market may support in further development and promotion of the technology in the rural areas of the country, which will not only increase access to decentralized energy but also supports in the sustainable development. Wind power, as an alternative to fossil fuels, is plentiful, renewable, widely distributed, clean, produces no greenhouse gas emissions during operation and uses little land. Any effects on the environment are generally less problematic than those from other power sources. As of 2010 wind energy production was over 2.5% of worldwide power, growing at more than 25% per annum. use the IEA's estimate of 600g/kWh as an average value for the carbon dioxide reduction to be obtained from wind generation[16]. The most ambitious scenario by the Global Wind Energy Council (GWEC) show that, with growth rates much lower than the 30% the wind sector has experienced over the past decade, global wind energy capacity could increase from 121GW at the end of 2008 to over 1,000GW by 2020 and 2,400 GW by 2030. This would result in annual CO2 savings of more than 1.5 billion tons in 2020 and 3.2 billon tons in 2030[16].

5. CONCLUSION

Properly designed climate change policy can be part and parcel of sustainable development, and the two can be mutually reinforcing. Sustainable development path can reduce GHG emissions and reduce venerability to climate change. Projected climate change can exacerbate poverty and undermine sustainable development, essentially in least developed countries. Hence global mitigation efforts can enhance sustainable development prospects in part by reducing the risk of adverse impacts on climate change. Mitigation can also provide co-benefits, such as improved health outcomes. Mainstreaming climate change mitigation is thus an integral part of sustainable development.

7. REFERENCES

[1] C. Change, "Climate Change and Development climatechange, sustainable development and energy : future perspectives for south africa."

[2] T. Barker, "Climate Change 2007 : An Assessment of the Intergovernmental Panel on Climate Change," no. November, pp. 12-17, 2007

[3] K. Richardson, D. M. Kammen, and N. Stern, *REPORT*.

[4] http://www.howstuffworks.com (5/18/2012) "World energy resources - Wikipedia, the free encyclopedia."

[5] B. P. S. Review and W. E. June, "BP Statistical Review What's inside ?," no. June, 2011.

[6] "Googling World Energy Reserves by Bill Walker."

[7] G. Pepermans and S. Proost, "Climate Change and Energy Perspectives."

[8] http://www.worldnuclear.org/about/contact.

html (4/30/2012).

[9] A. Part, I. R. Summefield, S. H. Goldthorpe, and C. J. Bower, "Combating global warming-reducing CO_2emissions from coal-fired power plant," 1993.

[10] R. Mcmillan, P. Martin, and R. Noden, "gas fuel flexibility in a dry low emissions combustion system Demag Delaval Industrial Turbomachinery Ltd., UK."

[11] S. Isa, S. Alwi, R. A. Rahman, M. Norsham, and B. Che, "Advance Emission Control & Precision Agriculture ; CO 2 Sequestration

Using Algae Integrated Management System," ICCCE, pp. 350-353, 2010.
[12] S. Report, I. Panel, and C. Change, Renewable Energy Sources and Climate Change Mitigation Special Report of the Intergovernmental Panel on Climate Change.
[13] http://www.residentialsolarpanels.org/"Residential Solar Power." (5/22/2012).
[14] "geothermal energy_wikipedia free encyclopedia.".
[15] R. Parajuli, "Micro and Mini HydroTechnologies- Vulnerability and Adaptation to Climate Change," 2011.
[16] "Wind power is crucial for combating climate change." pp. 0-3.