Scenarios of Global Warming and its Proposed Worldwide Action Plan

Bharat Raj Singh*[1] and Onkar Singh[2]

ABSTRACT

Global warming in today's scenario is threat to the survival of mankind. In 1956, Marion King Hubert, an US based Chief consultant and oil geologist predicted that if oil is consumed with high rate, US oil production may peak in 1970 and thereafter it will decline. He also described that other countries may attain peak oil day within 20-30 years and many more may suffer with oil crises within 40 years, when oil wells are going to dry. He illustrated the projection with a bell shaped Hubert Curve based on the availability and its consumptions of the fossil fuel. Large fields are discovered first, small ones later. After exploration and initial growth in output, production plateaus and eventually declines to zero.

It is known facts that crude oil, coal and gas are the main resources for world energy supply. The size of fossil fuel reserves and the dilemma that when non-renewable energy will be diminished, is a fundamental and doubtful question that needs to be answered. A new formula for calculating, when fossil fuel reserves are likely to be depleted, is presented along with an econometrics model to demonstrate the relationship between fossil fuel reserves and some main variables. The new formula is modified from the Klass model and thus assumes a continuous compound rate and computes fossil fuel reserve depletion times for oil, coal and gas of approximately 35, 107 and 37 years, respectively. This means that coal reserves are available up to 2112, and will be the only fossil fuel remaining after 2042.

In India, vehicular pollution is estimated to have increased eight times over the last two decades. This source alone is estimated to contribute about 70 per cent to the total air pollution. With 243.3 million tons of carbon released from the consumption and combustion of fossil fuels in 1999, India is ranked fifth in the world behind the U.S., China, Russia and Japan. India's contribution to world carbon emissions is expected to increase in the coming years due to the rapid pace of urbanization, shift from non-commercial to commercial fuels, increased vehicular usage and continued use of older and more inefficient coal-fired and fuel power-plants. Thus, peak oil year may be the turning point for mankind which in turn led to the end of 100 year of easy growth, if self-sufficiently and sustainability of energy is not maintained on priority. It may end up a better.

This paper describes the worldwide efforts being made to explore non-conventional energy resources such as: solar energy, wind energy, bio-mass and bio-gas, hydrogen, bio-diesel which may help for the sustainable fossil fuel reserves and reduce the tail pipe emission and other pollutants like: CO2, NOX etc.. Also an emphasis is also suggested for the storage of energy such as; battery, flywheel, capacitor devices and storage of air by compressing the air from natural energy sources like: solar, wind and or muscular power. These resources are available in plenty and free of cost and could maintain energy sustainability in 21st century. The tidal energy available in the sea and energy created on account extreme climatic conditions like: storms, tsunami, hurricanes etc. can also be captured and utilized in due course of time if proper diversion and storages are created. This may also definitely leads to environmentally and ecologically better future.

Keywords: *Global Warming, Energy Supply, Fossil Fuels, Non-Conventional Energy Resources, Climate Change.*

1* Bharat Raj Singh School of Man agement Sciences, Technical Ca mpus, Lucknow-227125, Mob: +91 -94150-25825; e-mail:brsinghlko @yahoo.com

2. Onkar Singh, Harcourt Butler T echnological Institute, Kanpur -208002, Uttar Pradesh, India

1. INTRODUCTION

Global warming primarily caused by increases in "greenhouse" gases such as Carbon Dioxide (CO_2), Nitrous oxide (NOX), Sulphur dioxide (SO_2), Hydrogen etc.,. Awarmi ng planet thus leads to climate changes which can a dversely affect weather in different ways.

Some of the prominent indicato rs for a global warming are detailed below:

i. Temperature over land
ii. Snow cover on Hills
iii. Glaciers on Hills
iv. Ocean Heat content
v. Sea Ice
vi. Sea level
vii. Sea surface temperature
viii. Temperature Over Ocean
ix. Humidity
x. Tropospheric Temperature

Due to increase in world's population, the transport becomes a primary necessity of every mankind. This has also generat ed huge consumption of hydrocarbon fuel and deplet ing the earth energy resources since crude oil, coal and gas es are the main resources for world energy sup ply. On other hand, large amount of carbon dioxide , carbon mono-oxide & other pollutants are being pumped in the atmosphere through tail pipe e mission that is causing serious threat to the survival of mankind.

1.1 Green House Emission & Fuel Reserves

The transport sector alone, is responsible to the faster consumption of hydrocar bon fuel and releases heavy tail pipe emissions, the reby adding billion tonnes of excessive carbon dioxide, c arbon monoxide and un-burnt hydrocarbon etc. (see Table-1), in the atmospheric air every day. Thi s is causing a serious threat to the global warming. Also the fuel reserves are depleting very fast.

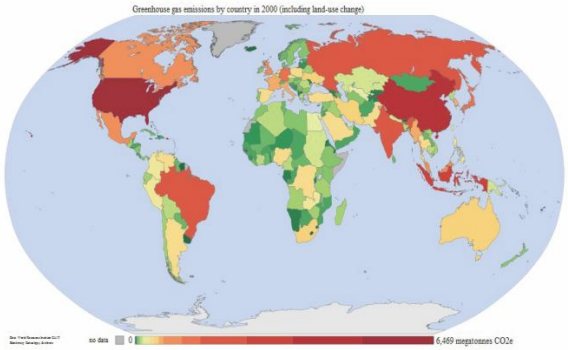

Fig. 1. Contrywise Green House Emission (Carbon Foot Print)

Table-1
List of 15-Countries Contributing Highest CO2

S.No.	Name of Major Countries	Population In Millions	Total CO2 Yearly Release (In Million Tonnes)	Remarks
1.	China	1334.8	6,126.7	
2.	USA	311.3	5,983.0	
3.	Russia	138.9	1,572.4	
4.	India	1183.3	1,526.5	
5.	Japan	126.6	1,316.6	
6.	Germany	82.1	878.5	
7.	Canada	33.8	561.0	
8.	Iran	77.5	519.3	
9.	Italy	57.9	486.4	
10.	South Korea	48.7	475.8	
11.	Mexico	113.5	440.0	
12.	South Africa	49.2	415.3	
13.	France	64.6	409.6	
14.	Australia	21.6	392.0	
15.	Saudi Arabia	26.0	385.6	

(Source: www.Breathingearth.net Feb'2011)

The Marion King Hubert, an US based Chief consultant and oil geologist p redicted in the year 1956, that if oil is consumed with h igh rate, US oil production may peak in 1970 and thereafter it will decline[1]. He also described that other c ountries may attain peak oil day within 20-30 years and many more may suffer with oil crises within 40 year s, when oil wells are going to dry. He illustrated the pro jection with a bell shaped Hubert Curve based on the availability and its consumptions of the fossil fuel. Large fields are discovered first, small ones later. After exploration and initial growth in output, production plateaus and eventually declines to zero. A new formula for calculating, when fossil fuel reserves are likely to be depleted, is presented along with an econometrics model to demonstrate the relat ionship between fossil fuel reserves and some main v ariables [2]. The new formula is modified from the Klass model and thus assumes a continuous compound rate and

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computes fossil fuel reserve depletion times for oil, coal and gas of approximately 35, 107 and 37 years, respectively. This means that coal reserves are available up to 2112, and will be the only fossil fuel remaining after 2042.

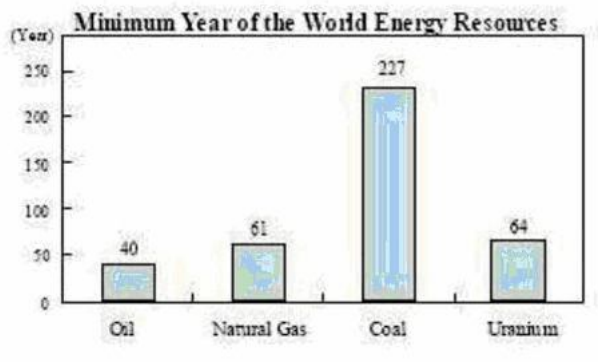

Fig. 2. Status of World's Fuel Reserves

1.2. *Global Warming Impacts on Climate Change*

According to different levels of future global warming, impacts of climate has been used in the IPCC's Assessment Reports on climate change[3]. The instrumental temperature record shows global warming of around 0.6 °C over the entire 20 th century[4]. The future level of global warming is uncertain, but a wide range of estimates (projections) have been made[5]. The IPCC's "SRES" scenarios have been frequently used to make projections of future climate change[6]. Climate models using the six SRES "marker" scenarios suggest future warming of 1.1 to 6.4 °C by the end of the 21st century (above average global temperatures over the 1980 to 1999 time period as shown in Fig.3) [7]. The projected rate of warming under these scenarios would very likely be without precedent during at least the last 10,000 years [8]. The most recent warm period comparable to these projections was the mid-Pliocene, around 3 million years ago [9]. At that time, models suggest that mean global temperatures were about 2–3 °C warmer than pre-industrial temperatures [10].

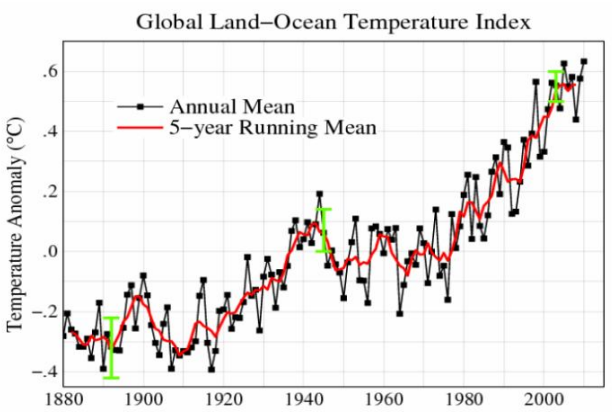

Fig. 3. Global Land-Ocean, mean surface temperature difference from the average for 1880-2009 (Courtesy: Wikipedia.com)

The most recent report IPCC projected that during the 21st century the global surface temperature is likely to rise a further1.1 to 2.9 °C (2 to 5.2 °F) for the lowest emissions scenario used in the report and 2.4 to 6.4 °C (4.3 to 11.5 °F) for the highest (Fig.4).

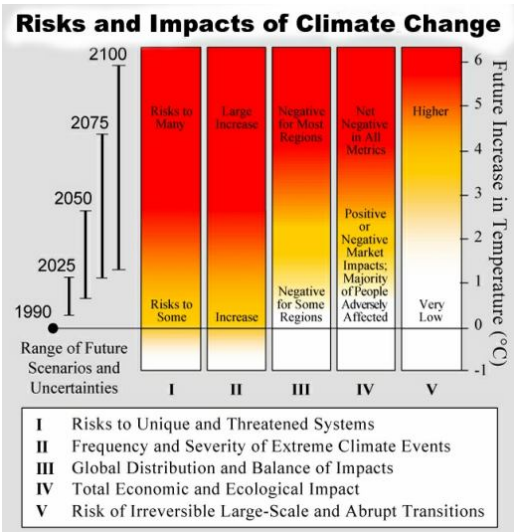

Fig. 4. Projected Global Temperature Rise 1.1 to 6.4 °C during 21st Century

Thus the worldwide serious efforts are to be made to explore non-conventional energy resources such as: solar energy, wind energy, bio-mass and bio-gas, hydrogen, bio-diesel which may help for the sustainable fossil fuel reserves and reduce the tail pipe emission and other pollutants like: CO_2, NO_X etc.. This paper also high lights and suggests the emphasis required to be made for the storage of energy such as; battery, flywheel, capacitor devices and storage of air by compressing the air from natural energy sources like: solar, wind and or muscular power. These resources are available in plenty and free of cost and could maintain energy sustainability in 21st century. The tidal energy available in the sea and energy created on account extreme climatic conditions like: storms, tsunami, hurricanes etc. can also be captured and utilized in due course of time if proper diversion and storages are created. This may also definitely leads to environmentally and ecologically better future.

2.0 POTENTIAL OF RENEWABLE ENERGY

2.1 USA Renewable Energy

The new NREL report, US RE Technical Potential, maps the "could be" scenarios for key renewable technologies in each state. The forecasts strictly consider technical system performance, topographical limitations, environmental and land-use constraints but they don't account for economic conditions.

The US forecasts that the total technical capacity potential for renewable energy predicted by the National Renewable Energy Laboratory (NREL) technologies is 212,224 gigawatts (GW). In June, the NREL predicted that 80% of the nation's power could be generated by clean energy sources by 2050. About 5% of US power today comes from renewable energies such as solar, wind, hydropower, geothermal or biomass.

What's the high-level view on which states hold the most promise?

When it comes to solar, large populations and abundant sunlight make Texas and California key locations. There is offshore wind potential along all US coasts, while potential for onshore development exists in almost every state. Meanwhile, 13 states show particular promise when it comes to geothermal development, says NREL.

Updates to the report are planned over time. For now, though, here is a snapshot of the annual technical potential for each renewable energy type, according to the NREL analysis:

2.1.1 Solar (155,000 GW for PV, 38,000 GW for CSP) :

Rural utility-scale solar projects lead all other clean energy technologies in terms of their overall estimated technical potential, says NREL .

Texas and California have the highest estimated capacity because of their geography and because their large populations make solar projects more attractive than in other places.

Texas accounts for 14% of the utility-scale PV potential and 20% of the CSP potential, while California leads when it comes to rooftop PV.

2.1.2 Wind (11,000 GW for onshore, 4,200 GW for offshore) :

There is potential for wind projects in every state, although the best opportunities are still in Western and Central Great Plains states. The potential is lowest in the Southeast, while certain states in the East and West are constrained by environmental exclusions.

Here again, Texas looks good: it has the highest estimated potential for onshore wind, roughly 17% of capacity.

When it comes to offshore wind power, wind speeds off Atlantic Coast and in the Gulf of Mexico are lower than they are off the Pacific Coast, but their shallower waters make them more attractive for development. Hawaii has the highest estimated annual potential of all the states, about 17% of the total.

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2.1.3 Geothermal (38 GW conventional, 4,000 GW enhanced) :

13 states lead the way when it comes to hydrothermal projects including (in alphabetical order) Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming.

When it comes to enhanced systems, the Rocky Mountain states and those associated with the Great Basin offer the most favorable resources.

2.1.4 Hydropower (68 GW) :

Much of the opportunity lies in the Northwest and Alaska, which together account for about 27% of the technical potential.

2.1.5 Biopower (62 GW) :

Solid biomasses, especially crop residues, are the largest contributor in this area accounting for about 82% of total technical capacity. The rest comes mainly from energy generated by landfill gases. While potential is spread across all of the states, the five with the highest capacity potential are Illinois, Iowa, California, Texas and Minnesota.

2.2 China Renewable Energy

2.2.1 Hydropower :

The total cumulatively Hydro-renewable energy will have 19.5 GW of power generating capacity. New hydropower projects that were approved and began construction in 2006 include the Jinsha River Xiangjiaba Dam (6000 MW), the Yalong River Mianpi (Second Phase) (4800 MW), the Lancang River Jinghong Dam (1750 MW), the Beipan River Guangzhao (1040 MW) and the Wu River Silin Dam (1080 MW). In 2005 the following hydroelectric power projects were approved by the NDRC and began construction: the Jinsha River Xiluo Crossing (12600 MW); the Yellow River Laxiwa Dam (4200 MW) and the Yalong River Mianpi (First Phase) (3600 MW).

2.2.2 Wind Power :

Wind power generation in China had already reached 25.1 GW by the end of 2009. China aims to have 100 GW of wind power capacity by 2020. China encourages foreign companies, especially from the USA to visit and invest in Wind Power Generation.

2.2.3 Solar Power :

About 50 MW of installed solar capacity was added in 2008, more than double the 20 MW capacity of 2007. According to some studies, the demand in China for new solar modules could be as high as 232 MW each year from now on until 2012. The government has announced plans to expand the installed capacity to 20 GW by 2020.

2.2.4 Biomass and biofuels :

China emerged as the world's third largest producer of ethanol-based bio-fuels (after the U.S and Brazil) at the end of the 10th Five Year Plan Period in 2005 and at present ethanol accounts for 20% of total automotive fuel consumption in China.

2.2.5 Geothermal :

China has conducted extensive explorations aiming at identifying high temperature resources for electric generation. Until 2006, 181 geothermal systems had been found on mainland China, with an estimated generation potential of 1,740 MW. However, only seven plants, with a total capacity of 32 MW, had been constructed and were operating in 2006.

2.3 Russia Renewable Energy

Russia has substantial and diverse renewable energy resources — wind, geothermal, hydro, biomass and solar. Practically all regions have at least one or two forms of renewable energy that are commercially exploitable, while some regions are rich in all forms of renewable energy resources. The volume of renewable energy with economic potential corresponds to about 30% of the country's actual total primary energy supply (TPES), while the technical potential is estimated to be more than 5 times greater than TPES.

Russian experts estimate that the amount of renewable energy that is economically re coverable is more than 270 million tonnes of coal equ ivalent (Mtce) per year 1, including 115 Mtce/y of geo thermal energy, 65.2 Mtce/y of small hydropower, 35 Mtce/y of biomass, 12.5 Mtce/y of solar, 10 Mtce/ y of wind and 36 Mtce/ y of low potential heat.

Wind power in Russia

Current Russian wind energy projects have a combined capacity of over 1,70 0 MW, although less than 17 MW had been installed as of the end of 2010. The Russian Wind Energy Associ ation predicts that if Russia achieves its goal of ha ving 4.5% of its energy come from renewable sources by 2020, the country will have a total wind capacit y of 7,000 MW.

2.4 India's Renewable Energy Potential

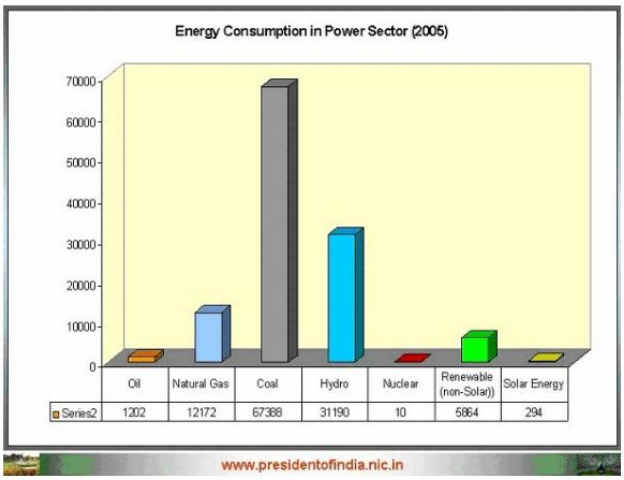

Fig. 5. Renewable Energy Potential in India

2.4.1 Hydro power :

The hydroelectric power refers to the energy produced from water (rainf all flowing into rivers, etc). Consequently, rainfall can be a good indicator to investors looking for a location to implement or build a new hydroelectric power plant in India as shown in Fig. 5. If we consider the annual rainfall of Bangalore (central south), we see that most of the rainfall occurs from May to No vember. Consequently, we can predict that hydro ener gy could be harnessed during the rainy season. Good water management and storage allows for continuous electrical generation throughout the year.

Source	Units	Installed
Windfarms	MW	557
Windpumps	Nos	3289
Small Hydro (upto 3 MW)	MW	122
Biomass Gasifiers	X 10 6	2.12
Solar PV	kW	825

Fig.6. India's Current Installed Capacities

Advantages of Hydro power

In India, small hydro is the most utilized renewable energy source for energy production. Some key figures concerning sm all hydro in India:

- Less than 25 MW is in the "smdl hydro" designation
- There is a potential of 15,000 MW
- Installed is 1,520 MW to date
- 4,096 potential sites hav e been identified
- Technology is mature and reliable
- Two types of technology a re used:
  - High-head systems
  - Low-head systems
- Ministry of Non-conventional E nergy Sources is focused on:
  - nation-wide resource assessmen t
  - setting up of commercial proje cts
  - renovation and modernization
  - development and up-gradation o f water mills
  - industry based research and de velopment

2.4.2 Solar Energy

Because of its location between the Tropic of Cancer and the Equator, India has an average annual temperature that ranges from 25°C – 27.5 °C. This means that India has huge solar potential. The sunniest parts are situated in the south/east coast, from Calcutta to Madras. Solar energy has several applications: photovoltaic (PV) cells are placed on

the roof top of houses or commercial buildings, and collectors such as mirrors or parabolic dishes that can move and track the sun throughout the day are also used. This mechanism is being used for concentrated lighting in buildings see Fig. 6.

Photovoltaic (PV) cells have a low efficiency factor, yet power generation systems using photovoltaic materials have the advantage of having no moving parts. PV cells find applications in individual home rooftop systems, community street lights, community water pumping, and areas where the terrain makes it difficult to access the power grid. The efficiency of solar photovoltaic cells with single crystal silicon is about 13 % - 17%. High efficiency cells with concentrators are being manufactured which can operate with low sunlight intensities.

Table-2
Estimated Wind Power Potential in India

State	Gross Potential (MW)
Andhra Pradesh	9063
Gujarat	7362
Karnataka	7161
Kerala	1026
Madhya Pradesh	4978
Maharashtra	4519
Orissa	1520
Rajasthan	6672
Tamil Nadu	4159
West Bengal	32
TOTAL	**46,092**

Currently, 45 percent of households in India do not have access to electricity Table 2. New legislation has set a target of electrifying all households by 2010. As in the past, the ongoing challenge in providing electricity is the ability of the poor to pay. India announced plans in March, 2005, to continue subsidizing electricity consumption for rural and poor households that use less than 30 kilowatt hours per month. The total power consumption in India is shown in Fig. 7.

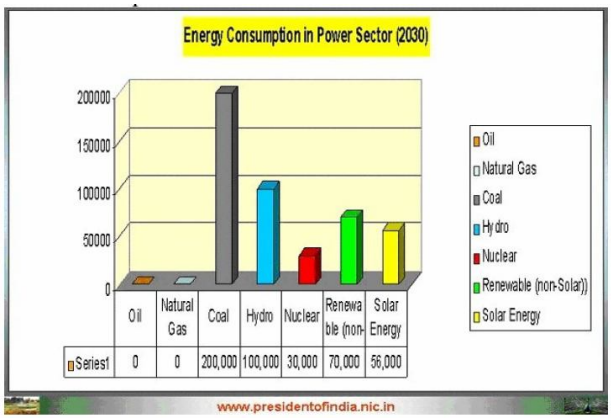

Fig.7. Energy Consumption in Power Sector in India

Table-3
Estimates of Potential Capacities from Renewable Energy Sources (in MW)

Source	Approx. Potential
Biomass energy	19,500
Solar energy	20,000
Wind energy	47,000
Small hydropower	15,000
Ocean energy	50,000

Source: India Ministry of Non-Conventional Energy Sources

Table - 4
Renewable Energy Sources Being Explored in Different Countries

S. NO.	Countries	Solar	Wind	Geothermal	Hydro	Bio-Power	Total (in GW)
1.	**USA**	155,000 for PV +38,000 for CSP	11,000-Onshore 4,200 off-shore	4038	68	62	212,224
2.	**China**	20GW	100 GW	32 MW	19.5 GW	144 GW	
3.	**Russia**						1200 MW
4.	**India**	20,000	47,000	50,000	15,000	19,500	1,52,500 MW

3.0 CONCLUSION

From the present scenario show n in Table 3, 4, it is observed that USA is now exploring maximum towards the renewable energy where as India and china are at 2nd and 3rd position. It is also very cle ar that the percentage potential of renewable as compare to the current installed capac ity are as under:

i). USA-80%
ii). India-65%
iii). Russia-30%
iv). China-70%

Thus, it is essential to impos e ban the use of natural energy and start using maximum renewable energy resources to **Save Our Planet** and save humanities at large.

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