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The Importance of the Energy of Electricity for the Economic Development of Countries

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Abstract

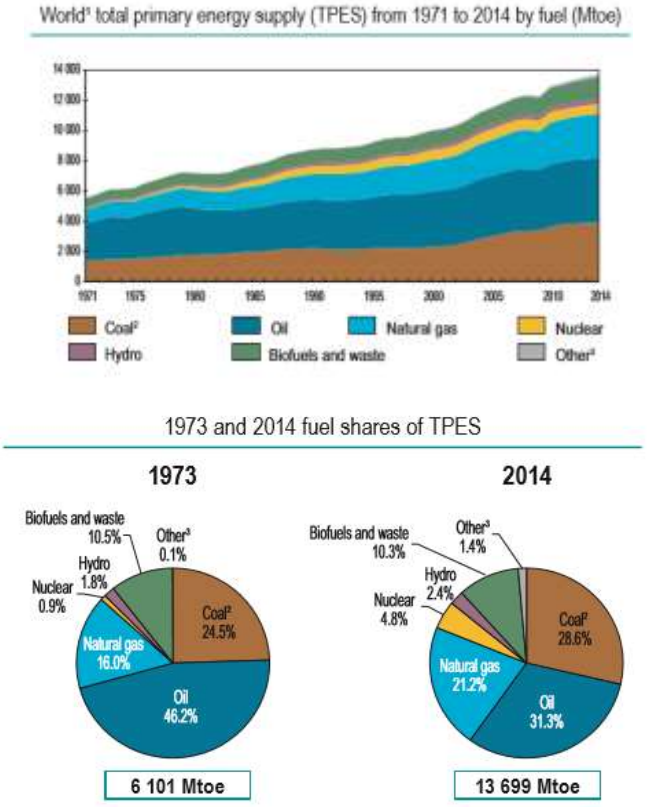
An economic growth is upmost desire of government of every country in the World. It is well known that industrial revolution created huge economic power to Britain. Within a short period of time, to some degree, other European countries also followed Britain. Now this age is called as an age of science and technology. In this age for economic growth, numbers of factors can be taken into consideration. Energy is one of the most important major factors for the economic development of countries. Some scientists are pointing out that they are realizing the 4th revolution in technology. All technologies, especially high technology, use electric energy. Energy of electricity is the secondary energy. It can be produced from coal, natural gas, oil, nuclear power reactors and renewable energy resources include: hydro (conventional hydroelectric power), geothermal, solar, tidal action, ocean thermal, wave action, wind and biomass. It is necessary to collect data from reliable sources. It is no doubt that data of World Energy Council, OECD International Energy Agency and International Atomic Energy Agency….so forth have accepted reliable sources. Then regression and correlation analysis have been made for energy and GDP. Data has been pointing out that electric energy (electric energy consumption kWh per capita) are directly correlated with GDP and ppp. It means energy of electricity has an important contribution to the economic growth of the countries in the world.

Keywords: Electricity, Development, International Institutions, Growth Rate

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Introduction

Energy is one of important major factor for the economic development of countries. Total primary energy supply of the World is shown below.



İea key World energy statistics 2016[1]

As it is seen Global fossil fuels(coal,oil and gas) demand continues to grow. Alltough climate change is primary issue because of global warming due to CO_2 emission, but oil still continues to grow until 2040, mostly because of the lack of easy alternatives to oil in road freight, aviation and petrochemicals, according to *WEO-2016*[2]

The share of coal is barely grows but natural gas is growing more then coal and oil to meet demand growth until 2040[1]

Anyhow, to reduce emission of CO_2, USA, China and India must keep their pledges about the Paris Agreement on climate change. Even they keep their pledges about the Paris Agreement on climate change, fossil fuels will still dominate untill 2040.

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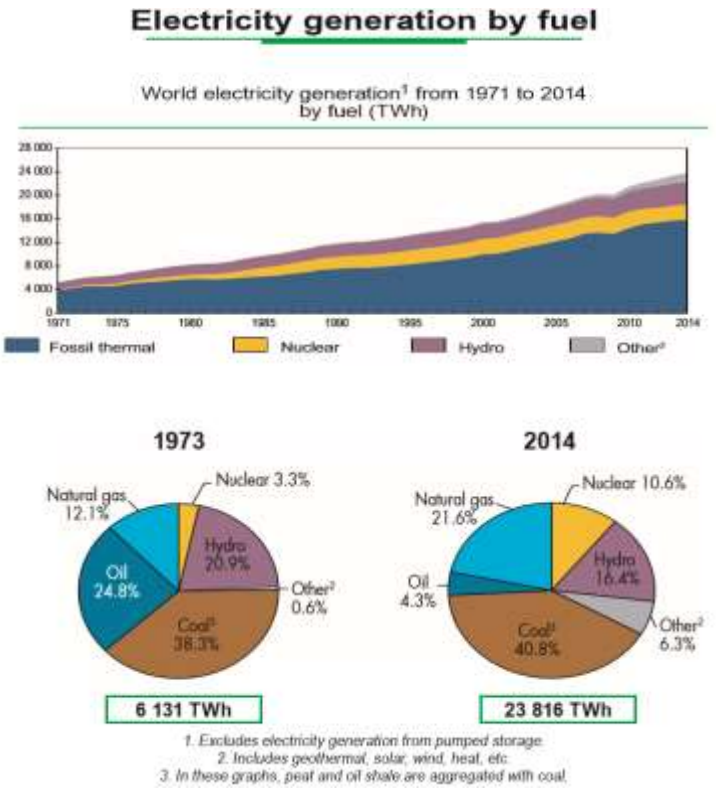
To fight air pollution and to minimize environmental problems it is necessary to incease the share of renewable energy such as wind, geothermal, solar, hydro, tidal action, biomass, wave action…so forth and nuclear energy.

Electrical Energy

Energy of electricity is the world's fastest growing form of energy for many decades. Some scientists are pointing out that they are realizing the 4th revolution in technology. All technologies, especially high technology, use electric energy. Also modern life desparetely needs electricity. It lights factories, ofis buildings.houses, streets,……etc and power most of equipments used in offices, houses and machineries in factories. It is also used for heating.

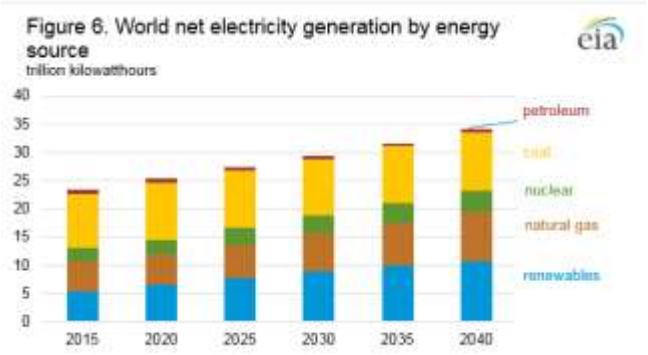
First of all, energy of electricity is the secondary energy. It can be produced from coal, natural gas, oil, nuclear power reactors and renewable sources.

Fossil fuels and nuclear power reactors have a great advantage for electricity production. For instance with the same installed capacity (1000MW_e), electricity production is 7-8 000 hours in a year from fossil fuels and nuclear power reactors while avarage 3000 hours from hydro and wind türbine. World electricity generation from 1971 to 2014 is shown below.



İea key World energy statistics 2016[3]

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https://www.eia.gov/outlooks/ieo/exec_summ.php[4]

As far as pollution and waste concern fossil fuels have a great disadvantage, nuclear power plants and renewables do not produce greenhouse gasses or other air pollution

Comparison of 1000MW$_e$ nuclear power plants and coal-fired power plants in terms of wastes and air pollution (tons/year)

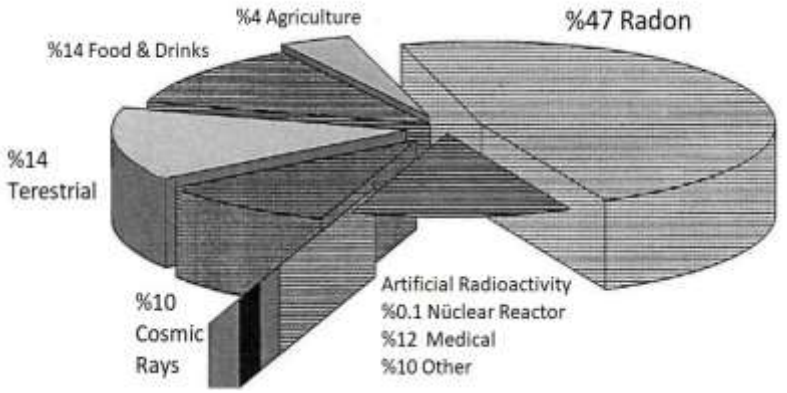
	Coal-fired power plants	Nunlear power plants
Fuel	2 000.000-2 600.000	27-35
O_2	6 200.000	-
NO_x	22 000-28 000	-
CO_2	6 600.000	-
SO_2	44 000-57 000	-
Solid waste	320 000-415 000	-
High level waste	-	10-27
Intermediate level waste	-	310-400
Low level waste	-	460-600
Heavy,metals (Lead,Mercury,Arsenic)	400	-

Radioactive Waste Managament IAEA,Information series,1993[5]

Nuclear scientist did not spent much efford to give information and to convince people(public) about nuclear energy. Perhaps people who does not have any information about nuclear technology, think about radiation hazard. First of all, on average, people's radiation exposure due to all natural sources is about 2.4 mSv a year. Because, naturally occurring radiation can be found all around us. Radiation can be found in soils, in our air and water, and in our body.

People, everywhere, is exposed to radiation every day in all their life. It is a natural part of the environment in which we live.

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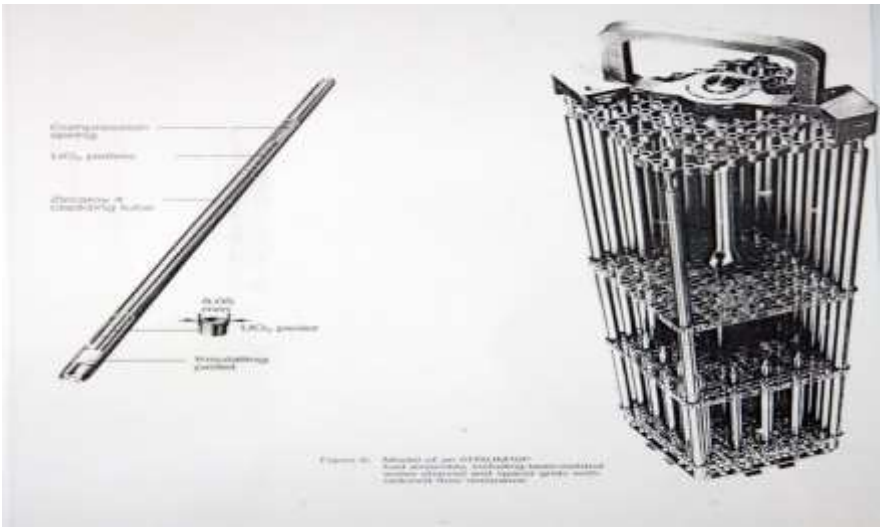


http://www.icrp.org/icrpaedia/exposure.asp[6]

One who stand by the Reactor building, expose to cosmic radiation dose 100 times mor than nuclear Reactor. In houses or in Office 470 times mor than nuclear Reactor

Secondly, they may think about radioactive waste. For instace ($1000MW_e$) PWR starts operation aproximately 27 tons of of 3.5-5 percent enriched uranium fuel as assemblies, about one-fourth to one-third of the total fuel load is spent and is removed from the reactor every 12 to 18 months and replaced with fresh fuel.

If countries do not evaluate spent fuel as an economic value or military purpose no need to talk to much about hazard of radioactive waste. Because spent fuels very hot and highly radioactive when they are taken out of reactor core(vessel). Spent fuels as fuel assemlies shown below are kept in a pool of nuclear santral for ten yers in which time the most of highly radioactive isotopes decay.



Siemens PWR nuclear reactor information catalog[7]

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The fuel pools capacity depends on intention of investment expenditures, in South Korea there are now 20 power reactors in operations since first reactor built 1974. It has not been publicly debated about radiactive waste so far.

Curently 449 nuclear power reactors in operation392 168 MW_e total net installed capacity and 60 new nuclear power reactors under construction

Most of the countries in the World have a greatest will to produce electricity from renewable energy but except conventional hydroelectric power, especially unit price of electricity from solar and wind are more expensive than coal, natural gas, hydro and nuclear.

Renewable energy resources include: hydro (conventional hydroelectric power), geothermal, solar, tidal action, ocean thermal, wave action, wind and biomass Although unit price of electricity not competitive with fossil fuels, hydro and nuclear, renewable energy especially solar, wind, biomass and geothermal must be supported with subsidy for long term to boost their competitiveness. By research and development technological improvement will definitively be achieved in the future and then will be competitive with fossil fuels. It is clear that renewable energy will be the world's fastest growing energy in the future for electricity production

Consumption per capita
kWh
2014

Australia	10,134
Austria	8,513
Belgium	7,967
Bulgaria	4,640
Canada	15,519
China	3,762
Croatia	3,754
Cuba	1,425
Curacao	5,006
Czech Republic	6,285
Denmark	6,040
Estonia	6,665
Finland	15,510
France	7,374
Germany	7,019
Greece	5,029
Iran, Islamic Rep.	2,899
Hungary	3,890
India	765
Ireland	5,702

Norway	23,326
Poland	3,938
Portugal	4,685
Romania	2,495
Russian Federation	6,539
Serbia	4,444
Slovak Republic	5,202
Slovenia	6,833
Spain	5,401
Switzerland	7,807
Turkey	2,745
Israel	6,559
Italy	5,159
Japan	7,836
Korea, Rep.	10,428
Lithuania	3,664
New Zealand	9,084
Ukraine	3,600
United Kingdom	5,407
United States	12,988
World	**3,104**

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Gross domestic product 2015

	Ranking	Economy	(millions of US dollars)
USA	1	United States	18.036.648
CHN	2	China	11.007.721
JPN	3	Japan	4.383.076
DEU	4	Germany	3.363.447
GBR	5	United Kingdom	2.858.003
FRA	6	France	2.418.836
IND	7	India	2.095.398
ESP	14	Spain	1.199.057
ITA	8	Italy	1.821.497
BRA	9	Brazil	1.774.725
CAN	10	Canada	1.550.537
KOR	11	Korea, Rep.	1.377.873
AUS	12	Australia	1.339.141
RUS	13	Russian Federation	1.331.208
MEX	15	Mexico	1.143.793
NLD	17	Netherlands	750.284
TUR	18	Turkey	717.880
CHE	19	Switzerland	670.790
SAU	20	Saudi Arabia	646.002
ARG	21	Argentina	583.169
SWE	22	Sweden	495.624

https://www.worldbank.org/[9]

http://da.worldbank.org/

Conclusion

Technologies and energy are most important major factors for the economic development of countries. Technologies are advancing very fast in a very short period of time and all technologies, especially high technology, require electrical energy. Concerning air pollution and global warming, to save the future of human being and the earth electrical energy must be produced from renewable energy. If it is given priority to solar and hydrogen energies. By research and development technological improvement will definitively be achieved in the future. Regression and correlation analysis have been made for energy and GDP. Data has been pointing out that electric energy (electric energy consumption kW h per capita) are

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