

# Comparison of nuclear power in different countries engineering essay

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Nuclear power is produced with the use of nuclear reactions and it uses nuclear fission to produce electricity. Many nations use nuclear power plants for electricity and it provides 14% of world's electricity and there are 440 Commercial Nuclear reactors over 30 countries with 376, 000 MW. And the first Nuclear power station is Obninsk Nuclear power plant had started in Russia in 1950s[1]. And it is a non renewable source, the fuel used in these power stations is Uranium and the world uranium supply may run it over 50 years. The Uranium atom splits in two types and energy releases in heat and radiation. Nuclear energy is produced in two ways; one is large nuclei and second is small nuclei. Large nuclei separate from end to end to release energy is called fission and produces electricity, and small one is combined or fused together to release energy is called fusion. These plants are very clean and able to operate easily, and the fuel used is less but it gives more energy and fewer emissions and produces low waste than fossil fuels and the power is reliable, and the gas which is produced from the plant is radioactive gases. Waste produced from the plant is very dangerous, and it must be put in underground for thousands of years and to allow radioactive to die. Now many countries are using nuclear energy for reducing the CO<sub>2</sub> emissions, waste and for climate controls. By using nuclear energy the US can help reduction of ozone depletion and the cost of energy is low and it can supply so many years. Nuclear Power in USA is the world's largest producer of nuclear power, more than 30% of world's nuclear power in electricity. And second largest source of electricity in their nation after coal, they are having 104 nuclear plants in 31 states which are giving 800TWh in 2009 and produces 20% of nation's electricity. The President of USA had given

\$8 billion loan for the construction of new power plant at Georgia and this is the first construction after 1980. Since 1973 nuclear power has saved American's consumer about 44\$ billion to other fuels which is used to make electricity[3]. The USA had started the new plants because in 1980 the plants produce nearly 250 billion kWh, over 11% of nation's electricity, and they stopped for 20 years due to the Three Mile Island accident on March 28, 1979 and no deaths or injuries and in last 15 years they closed nearly 8 power plants due to increase in cost and about radiation[4]. But at present the remaining all countries are keeping concentration on Nuclear power instead of fossil fuels to reduce emissions and risks, so the US also had known and studied about that and again started the new plants, in 2009, 20% of nation electricity from nuclear power. In US, they are planning to store waste in Yucca Mountain, Nevada which is nearer to lass Vegas and it is very dry area, and they will be stored about 1500 feet underground and it minimizes the water which leaks through the rock and wear away slowly from large containers, if the large barrels get breaks away, there is no water flow to carry the nuclear waste away. And a small research also going about the mountain and the work on the mountain has been started. By 2010 it will be ready. So there will be a no problem about nuclear waste and it won't harm the public living in lass Vegas[5]. A View of Yucca Mountain[6]The clean and safe energy commission in US said that they are going to build more plants in the coming years and they are in proposals, and to clear the problems from fossil fuels and to reduce the carbon emissions. Nuclear Power in INDIAThe consumption of electricity in India is very low, and most of the people do not have access to power. Most of the people in India who are

leaving in villages are without regular and reliable power supply and most of cities also starved for power. Nuclear power is the fourth largest source of electricity in India and they are currently operating 19 power plants with 4,560 MW and the 4 power plants are in under construction, and some other plants which are in proposal. By the time of 2020 the country is going to aim 20,000 MW and it aims 25% of electricity from nuclear power[7]. So, the nuclear power will be affordable source of energy. Increasing nuclear power in Indian energy it will reduce the carbon emissions and gives a clean energy. ITER project which is the development of fission reactors and India participates in that project. India does not possess technologies to utilize such energy source in a full fledged manner. It is just in the process of acquiring radioactive waste disposal technology from Germany, it's the same case with many other nations too. In India the fuel used is Uranium and Thorium, but Thorium is more available in India and it gives a less amount of heat. In early 1990s Russia is the major source of nuclear fuel to India. India deals a nuclear with some countries which are France, UK, USA, Canada etc. India's Atomic Energy department is interacting with Canada, Kazakhstan, and some African countries to get uranium. At present India and china are targeting in nuclear energy to increase their economic growth, according to official announcements India is adding 20GW and china is adding 40GW in next 20 years. India and US agreement on bilateral civil nuclear co-operation, this agreement is in 2005 and at that time, the US president George bush said that we will work to achieve civil nuclear with India as it realizes and to achieve energy security[8]. Nuclear Power in FRANCE France is the first in the world, which gives more electricity from nuclear power,

nuclear gives 75% of nation's electricity. Due to very low cost, one of the largest net exporters for electricity is France and it gains nearly EUR 3 billion per year from this. In 2007 the electricity generated from nuclear is 76.9%, fossil fuels is 10.1%, hydro is 11.6% and other renewable (solar, wind) is 1.4%. Waste from nuclear power plant is to be recycled and gives 17% of nation's electricity[9]. The cost of oil increases four times of that and OPEC nation was indeed a shock for France and at that the electricity is coming from oil plants. France has very few natural energy resources and no oil, gas and coal resources are also very poor. French government had got an idea to achieve energy independence: nuclear energy, in the next 15 years they installed 56 nuclear reactors and exporting electricity to European countries. So this is the main reason why they like nuclear more. France has 59 nuclear plants and EDF department (Electricite de France) is operating the plants with total capacity of over 63GWe, supplying over 430 billion KW per year of electricity. And France has exported 65-70 TWh/yr to some countries. It develops clean technology for radioactive disposal. The French Nuclear safety Authority (ASN) created in 2006 from DSIN (Directorate for the safety of nuclear facilities) which is for nuclear safety and radiation protection which protects the people from environmental problems, risks in nuclear and informs to public, like that so many departments are there in France[10].

Energy Generating in France in 2009 French Electricity consumption 1990-2007 (by source, in kWh)[11]. Nuclear power in UK In UK there are 19 Nuclear reactors and gives 18% of nation's electricity. In these one of the plant will be retired by 2023 and 19 GWe of new plants are expecting by 2018. In late 1990s nuclear power generates 25% of nation's electricity, but due to shut

down of some power plants the electricity from nuclear is came to 18%. France exports 1% of electricity to UK's net, in that mostly is nuclear, in 2009 were 2.8 billion kWh and 1% in that, compared to 2008 the final electricity is 12.5 billion kWh in that 3.7 of final electricity consumption and it decrease. The UK's government had committed to built a new nuclear power plants and they are expecting places are Hartlepool, Heysham and Dungeness and these are related to England and there are some more nuclear sites in that which is going to built reactors[12]. And the UK government wants to reduce the carbon emissions and environmental problems from fossils and which is needed nuclear to reduce and secure energy supplies. In UK, the countries like Scotland and Wales are supporting Renewable for clean energy, have to improve technology for solar and wind. So, nuclear is the best because it is safe and clean. The Britain government has signed a deal Nuclear Power in RUSSIA Russia is first nuclear plant in the world to produce the electricity from it in 1954 and started up in 1973-73. In the mid 1980 Russia had 25 reactors in operation. The nuclear accident held in Russia after US in 1986 Chernobyl accident. From 1992-1995 the percentage of nuclear in nation's electricity is 11.2-12.5%, at present 16% of nation's electricity is from nuclear and the government is trying to increase to 25% by 2030 and they are operating 31 nuclear reactors. In 2000 the nuclear is revived and Rostov-1 is delayed and started up in 2001 by adding 21GWe to grid. The Rosatom energy corporation had announced that the two 1200MWe plants per year from 2011-2014 and 3 per year till 2020 of giving 44,000 MWe for nuclear capacity. In 2006 Russian government adopted US\$ 55 billion for the development of nuclear which comes from the Rosatom funds[13]. The

Uranium resources in Russia is increase, in 2007 it produce 3413 tons of uranium from mines and in 2009 it was 31% higher at 3546 tons uranium plus 1060 tons uranium from ARMZ Kazakh operations. In April 2007 Russia has signed an agreement with Mongolia for uranium exploration, mining and processing. Russia had constructed the first Iran's nuclear plant named as Bushehr in 1974, but 1979 it was stopped due to Islamic revolution in Iran. After that in 1990 the Russia had took the project and completed the construction of plant[14]. Advantages of Nuclear Power: Reduce Green house gases and it is safe and clean. The power plants are more efficient and the technologies made reliable, compare to before. The fuel used is uranium, which needs a less fuel than fossil; one truck of uranium produces nearly 100 trucks of energy. Initial cost of plant is high and running costs are low, because the fuel used is uranium and it gives a lot of energy. And it does not produce any harmful gases like Co<sub>2</sub>, So<sub>2</sub>. The main benefit is, the nuclear power is reliable power because most of the nuclear reactors life cycle is 40 years and it can be extended to 20 more years, so it is very safe. The availability of nuclear power is high compared to other sources like oil, natural gas and the cost is small. Nuclear waste can be safely stored in underground. Waste comes from nuclear power is more compared to fossil fuels and it confirms that no affect to anyone in the plant surroundings. The source of nuclear power is available now and for centuries also, and it is inexhaustible. Nuclear plant doesn't take much space and the power will not transfer to long distances. Disadvantages of Nuclear power: Most of the safety aspects include in the plant itself but disposal of radioactive wastes is crucial. The waste produced from nuclear fuel is radioactive and it is very

dangerous. There is one more aspect, the usage of nuclear technology in war scenarios thro defense. Nuclear power harnessing needs lots of expertise and technology involved mainly due to safety aspects related. The extraction, handling and possession of nuclear fuel resources is other criteria. These are some of the reasons why many nations did not opt or not willing to opt for nuclear based technology. Nuclear plants are costly to replace and it takes long time to construct the plant. Some reactors produce plutonium which is used to make nuclear weapon, if the world is to use these for weapon there is an unlimited access to weapons. Plant workers exposes to high level of radiation and it causes cancer and other ailments. The accidents are due to core meltdown. ConclusionAt present there are many types of Sources available for generating Electricity. There is no ideal fuel, because some sources are emitting high amount of green house gases and some are expensive. World is going to depend on the sustainable energy and less dependent on fossil fuels which are better to environment. Nuclear power is multipurpose power source which provides base load electricity and offers a potential application in non electric sector. From the first nuclear power plant to till the first nuclear accident taken place, the nuclear world expanded tremendously. After that it became slow and even stopped in many countries because of opposition from public on its safety. But the problem of Climatic change and the depletion of fossil fuels in recent Years made the world to rethink about the nuclear technology. Technology transfer and human sources are needed for nuclear to develop their energy future and the developed countries are will be opt for nuclear energy for their



future. So, nuclear power is a safe and clean and it is useful for future energy.