

My Blog Statement

Nuclear energy is the future

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Introduction

The world's energy need is ever expanding due to an increase in population, industrialization, wealth, etc (see figure 1). This energy needs to be produced from primary and secondary energy and transformed to usable energy as end product. Creating this energy, and creating enough of it is the energy problem with which we are now confronted.

Around 22% of the world's energy is produced by nuclear energy, the rest using coal, gas, combined cycles and a few renewable energy sources. Due to the recent nuclear disaster in the Fukushima Daiichi nuclear plant the debate on nuclear safety has reappeared in the media causing countries to temporarily shut down nuclear production of electricity. With the result that other combined cycle turbines need to provide the energy normally produced by nuclear fuels, causing more emissions than before.

This is a step in the wrong direction, we should be moving towards a world with more energy while emitting less emissions. This is the main advantage of nuclear power, very low emissions while supplying a constant source of energy that cannot be matched using other technologies that are currently available. Which is the starting point of our blog, are there other fuel sources more environmental friendly and energy dense than nuclear energy?

1. CURRENT TECHNOLOGIES

1.1 Renewable sources

Since we are searching for a long lasting energy source it is important to search for green alternatives that can provide energy. The sun is a reliable source so solar panels are an option, but they are only usable with sunlight and not very efficient. Alternatives for the future however are infrared panels. They can absorb IR rays before the sun has risen and after the sun has set, giving a higher efficiency due to more contact hours.

Wind is also a durable source but again is only usable when there is wind. So one should have a lot of turbines at different locations to achieve a stable output of electricity. The major problem with wind energy are the turbines, nobody wants to live next to them, claiming that they cause property values to decrease, headaches, inducing epilepsy attacks, etc.

The sea can also be a source of energy, the tides and the waves can be used, a lot of research has been done towards capturing wave energy. Findings show that the energy density of water is much lower than wind or solar energy, ruling out wave energy for the future.

Looking at locations where there is an abundance of energy might be the key to profitable and sufficient amounts of energy.

The jet stream in the stratosphere is one of these places, the wind is present 24/7 and airspeeds are very high, they are already used by aircrafts to shorten flights. The only hiccup

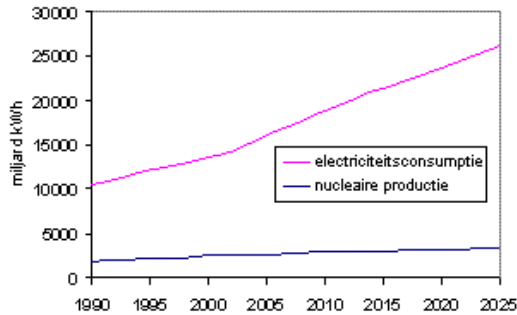
is the needed technology to transfer the harnessed power to earth, nanotube wires are a possibility and so is beaming the energy down, but more research is needed. Another advantage to these high altitude winds is that these turbines are not visually polluting. The same train of thought can be applied to solar power, in the atmosphere where there are no clouds the sun is always present. It is just a matter of transferring this energy back to earth to be used.

1.2 Non-renewable technologies

As seen in figure 2 the largest part of the world's energy is produced by fossil fuels, this includes coal, gas and combined cycle plants. These fossil fuels do not burn cleanly, emitting greenhouse gasses in high concentrations during production. Another factor that should be listed as negative is the energy yield from burning fossil fuels. The yield is very low, somewhere from 40 to 50% in the newer plants.

The most controversial technology is nuclear energy, creating a stable and clean energy output is a sought after property. No greenhouse gasses are emitted during the production of energy. There is only one downside to the fuel source, and that is its half life time. The storage of the spent fuel must be planned with an eye on the long run, providing a safe last resting place for the nuclear waste.

wereld consumptie electriciteit en nucleaire productie



figuur gemaakt voor Hoesnel.nl, gebaseerd op projecties EIA - IEO2005

Figure 1. Worlds energy need

2. NUCLEAR ENERGY

2.1 Safety

Due to the recent events in China all the other nations using nuclear energy shut down some nuclear station out of precaution, and maybe just to ensure political safety. There are however some major differences between the stations in China and Europe in safety aspects. Belgium is the leader in plant safety with Doel 3. They have two bell covers with recombination gas between the two to neutralize H_2 gas and prevent explosions. There are emergency generators to keep the cooling going during a power outage, and they have back up emergency generators 12 meters above sea level in a Boeing 747 crash and earthquake safe bunker.

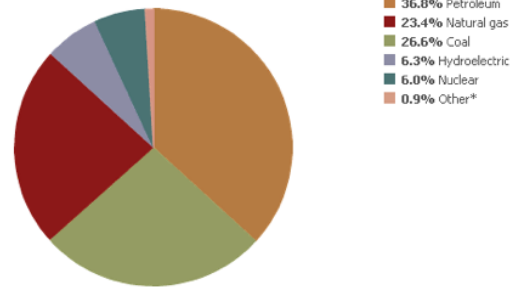
Compared to the safety precautions in China these are very thorough. The Fukushima plant had back-up generators but they were placed below sea level behind a small barrier protecting it from a 10 meter high wave. Even though the plant was situated on a plate with high seismic activity, the engineers did not think of a possible tsunami that could flood these emergency generators. Bad management and an eye on profit caused a lack of safety procedures.

With proper procedures, trained staff and low risk geographical locations all the previous nuclear disasters could have been avoided. The Doel 3 reactor is a perfect example of safe nuclear energy.

Not so long ago there was another disaster in the Gulf of Mexico, the Deepwater Horizon was drilling for oil when an explosion occurred in the drill column setting the whole platform on fire. Over 4.9 million barrels of oil spilled into the sea causing an environmental catastrophe. A part of this oil would have been used for energy production, showing that every fuel source is prone to disasters.

2.2 The future

Not only uranium is a radioactive element that can be used in nuclear power plants, thorium is a very promising replacement. Some of its advantages are safer plants, less expensive, smaller and only 1% of the waste produced by uranium reactors. Thorium is more abundant than uranium and theoretically it produces 40% more energy than one can produce from uranium.



* Includes geothermal, solar, wind, and wood and waste electric power. Source: Energy Information Administration, 2005 data.

Figure 2. Worlds energy production

Another possible path is nuclear fusion instead of the fission we use today. Combining atoms creates a larger amount of energy than pulling the atoms apart. An advantage of this technology is a less intense radioactivity of the participating materials and a larger net amount of energy produced.

Anti-matter is also an option for future generations. It is a more abstract but plausible technology based on the recombination of matter with its anti-matter, which creates large amounts of energy. This research is being done in CERN.

These technologies are still in their development phase meaning that a commercial plant, be it thorium, fission or anti-matter plants, will not be available for at least the next 20 years.

3. CONCLUSION

During the research for our blog we have seen a lot of debates pro and contra nuclear energy, showing that the views are divided. What we can however be very clear on is that there is no other current technology that matches the efficiency and carbon neutralness of nuclear energy. This will remain so for the foreseeable future.

The consumers have not welcomed renewable energy with open arms, as we saw in the example of the wind turbines.

Currently there is not a single technology that can replace the nuclear energy. If Belgium would stop their nuclear plants today the combined cycle plants would need to compensate the loss. This would not be possible because the other plants do not have the capacity, meaning that we would have to buy our energy from France where it is produced by nuclear fuel making us hypocrites.

During our research for new technologies we can come to the conclusion that new sources are not for the foreseeable future. In the mean time the answer to the problem is not "or or or" but "and and and". Renewable energy must be promoted together with nuclear energy and even combined cycle plants.

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