Nuclear Fusion

Nuclear fusion is a fairly recent discovery in the field of energy in technology. It is hoped by many to be fully discovered, so that its efficient supply of power can be used all over the world. The general process of nuclear fusion involves the fusion of the nuclei of two isotopes of hydrogen, Deuterium and Tritium, under the extremely high temperatures of 100 million degrees (Phil, Shannon). When the two nuclei fuse together, they enter a state of plasma, form a new nucleus, and a large amount of energy is released. In this case, the plasma consists of positive ions and unbound electrons. As this energy is released from the plasma, Helium is the end result. The electrons protons are all repelling and attracting to things they naturally shouldn’t, so when they get close enough a large amount of energy is created. It is this very energy that is contained in nuclear power plants and if done correctly, the reaction would produce enough energy to fuel an entire area of population. This process of fusing nuclei together is also what can be found in the energy created in stars (Britannica Online).

But because of the incredible amounts of fusion necessary to create enough heat and energy needed to power an entire city or state, the
researchers were not able to create enough energy to meet those needs. With their most successful tests they ended up only being able to produce energy that lasts approximately 2 seconds. To make enough energy to create and sustain a balance of the tritium and deuterium mix, it must reach 15 Mw, and they only created 2 Mw (Phil, Shannon). Because of the inability for scientists to currently create enough energy, it will be a while before technology has advanced enough to adapt to what nuclear fusion requires.

**How much do human societies use this energy source now?**

Due to the fact that it requires so much money, time, and incredible amounts of the nuclei fusing process, there hasn’t been enough exploration with this energy source to make it available to society. Scientists have only been able to create enough energy out of this process to last less than a few seconds. But they do believe that in a few years they will have the technology and knowledge available to be able to create and conserve enough of the energy created to supply some of the world’s energy. Scientists are steadily working towards discovering what conditions need to be met to keep the fusion lasting for a longer period of time. If scientists can come up with the answer, nuclear fusion can and will be used as a major supply of energy all around the world.
How do we (or how could we) use this energy source?

We could use nuclear fusion as an energy source to heat our homes, power our work industries, and supply the majority of any major part of the world’s power. Nuclear power plants would need to be created in many locations all over the world to produce enough power to sustain the lives of the people in every society. The benefits of doing so would vastly improve our energy efficiency rate. The positive side to using such an efficient form of energy is commented on by NuclearInfo.net. They declared “It is estimated that energy usage in the residential sector could be decreased by 13%, in the commercial sector by 10.4% and in the industrial sector by 6.2%. These improvements in energy efficiency could reduce total greenhouse emissions by 10 million tonnes per year.” This source is stating that the choice of using nuclear fusion as our energy source would drastically save money, resources, and be much more kind to our environment and ozone layer. Since the ozone is such a crucially important topic to stay on top of these days, it is important to know nuclear fusion can be helpful towards improving its future.

What are obstacles for using more of this in the future?

Australia’s government is considering the possibilities of converting their general energy source to nuclear energy due to its great efficiency and positive
environmental aspects. But to do so would require the funding of the necessary $30 billion dollars to be paid for by the majority of their citizens. (nuclearinfo.net) This sets an example of what would need to be done all over the world, the funding needs to come from those which the energy is being supplied for, but many people are just not able to help support such a large operation. Nuclear fusion is much cleaner, with no hazardous byproducts as with nuclear fission, and there is an unlimited supply of fuel, Cook said. When it comes to nuclear fusion, the atoms of hydrogen molecules are being used, fusing them together. So as a result of the abundance of hydrogen atoms in our world, this energy source is completely reliable and should never run out of resources. According to Merry Mayer, a member of the Government Computer News website, the process of nuclear fusion is very clean and does not create hazardous byproducts like nuclear fission does. Like all types of energy sources, it costs money to use them to generate power. But with nuclear fusion, so much pressure and heat is necessary to be contained in a machine to literally fuse two nuclei together to create the plasma substance that the entire process can be incredibly expensive. The costs of creating the machines designed to heat up the materials to a high enough temperature to fuse the nuclei together cost well over $1,000,000 and even with those machines we still don’t have the tools
needed to create enough energy to last a long enough time. In a recent case of nuclear fusion, it is reported by Phil Shannon that, “The $1 billion machine, attended by its 500 scientists, produced 1 Mw of power for 2 seconds, with a peak of 2 Mw (about the same as a windmill in a moderate breeze” (Phil, Shannon). It is clear that there is a much higher demand for the technology needed to create larger amounts of fusion in a more economic sort of way.

**How long will it take to develop this energy source?**

We still have not fully created the amount of nuclear fusion energy needed to sustain a constant reaction, so for this process to be used as a source of energy scientists still need to figure out a way to keep the fusion reaction lasting longer than it currently does. There are most likely several more years ahead of us before scientists can completely create a simple method of nuclear fusion to power our Earth.

**What are the drawbacks of this energy source?**

This is one of the most expensive and technologically difficult methods of creating energy in existence today. In the previous mentioning of Australia considering turning to nuclear power, it would evidently require an incredibly generous amount of money supplied either from the government or society to
create the nuclear power plants that cost millions of dollars. Nuclear fusion
overall, with the necessary amount of funding, research, and knowledge to fully
create and sustain it, could someday be a reliable source of energy for the United
States.
In the diagram to the left, we are looking at a depiction of two hydrogen nuclei fusing to form a Helium nucleus. We see fusion everyday. Fusion causes the energy release, and therefore the light we see from the sun and the stars. (http://www.aa.washington.edu/AERP/Propulsion/fusion1a.htm)

This chart shows the relation between temperature forced on the two nuclei versus reaction time of the fusion produced in cubic meters per second.
Sources

“Alternatives to Nuclear Power” 2006, University of Melbourne
http://www.nuclearinfo.net/Nuclearpower/AlterntiveToNuclearPower


“What is Fusion?”
<http://www.aa.washington.edu/AERP/Propulsion/fusion1a.htm>