EXAMEN : BACCALAUREAT GENERAL	
EPREUVE : Evaluation spécifique de langue section européenne	
PHYSIQUE-CHIMIE en langue ANGLAISE	Sujet N°10

Can nuclear plants face the current energy challenge ?

How does a nuclear reactor work? (video1)

Most nuclear reactors are essentially high-tech kettles that efficiently boil water to produce electricity. They rely on harnessing nuclear fission, which also yields heat and sends neutrons flying. If another atom absorbs one of those neutrons, the atom becomes unstable and undergoes fission itself, releasing more heat and more neutrons. The chain reaction becomes self-sustaining, producing a steady supply of heat to boil water, drive steam turbines and thereby generate electricity.
Most nuclear reactors use uranium fuel that has been "enriched" in uranium 235, an isotope of uranium that fissions readily. Uranium 238 is much more common in nature than uranium 235 but does not fission well, so fuel manufacturers boost the uranium 235 content to a few percent, which is enough to maintain a continuous fission reaction and generate electricity.

International Thermonuclear Experimental Reactor (ITER) (video2)

ITER is an international nuclear fusion research and engineering project, which is currently building the world's largest and most advanced experimental tokamak nuclear fusion reactor at Cadarache in the south of France. The project is funded and run by seven member entities - the European Union (EU), India, Japan, the People's Republic of China, Russia, South Korea and the United States. The reactor itself has been designed to produce 500 megawatts of output power for 50 megawatts of input power, or ten times the amount of energy put in. The machine is expected to demonstrate the principle of getting more energy out of the fusion process than is used to initiate it, something that has not been achieved with previous fusion reactors. Construction of the facility began in 2007, and the first plasma is expected in 2019.

Fission and fusion (document3)

Fission occurs when a neutron slams into a larger atom, forcing it to excite and spilt into two smaller atoms—also known as fission products. Additional neutrons are also released that can initiate a chain reaction. When each atom splits, a tremendous amount of energy is released. Uranium and plutonium are most commonly used for fission reactions in nuclear power reactors because they are easy to initiate and control.
Fusion occurs when two atoms slam together to form a heavier atom, like when two hydrogen atoms fuse to form one helium atom. This is the same process that powers the sun and creates huge amounts of energy—several times greater than fission. It also doesn't produce highly radioactive fission products. Fusion reactions are being studied by scientists, but are difficult to sustain for long periods of time because of the tremendous amount of pressure and temperature needed to join the nuclei together.

Questions:

1. Introduce and comment on this documents.
2. How do we produce electricity in nuclear power plants ?
3. Describe and compare fission and fusion reactions.
4. Can nuclear energy face the current energy challenge ?