Everything, including yourself, is made of atoms. All atoms have nucle
You
have many atomic nuclei inside yourself since you are made of atoms.
The
simplest nucleus is one proton. That would be a hydrogen atom. An
oxygen
atom has 8 protons and either 8, 9 or 10 neutrons in its nucleus. All oth
nuclei
also have neutrons. Uranium has 92 protons and either 143 or 146
neutrons. If it
has 143 neutrons it is U235. If it has 146 neutrons, it is U238. Nuclear
fuel is
only 2% to 8% U235, the kind that fissions/divides, providing energy.
The rest is
U238 that doesn't fission. A nuclear reaction happens when a neutron is
captured
by a nucleus. If a U235 nucleus captures a neutron, the nucleus and the
atom split
approximately in half and 3 more neutrons are released because the 2
smaller
nuclei don't need so many neutrons. If a U238 nucleus captures a
neutron, it
ejects an electron and the neutron becomes a proton. The U238 thus
becomes
Plutonium 239. Plutonium is fissionable, which means that plutonium i
a good
fuel. If you add Thorium to the fuel, you can make more fissionable
uranium. If
a Thorium atom nucleus captures a neutron, it ejects an electron and the
neutron

becomes a proton. The Thorium atom thus becomes U233. U233 is fissionable.

Depending on the design of the reactor and the mix of the fuel, the fuel % in the
reactor can either grow or shrink. It is kind of like the fuel gauge can go either up
or down, but it is more like the reactor can run hotter or cooler over time. The
temperature is kept constant by adjusting the control rods. A breeder reactor is a
reactor designed to make the fissionable part of the fuel load grow rapidl
Normally, fuel is left in the reactor for about 10 years, or 10% of the fuel is
replaced each year. The reprocessing step sorts out the fuel and puts the
percentage of fissionable fuel back to the starting percentage. In the process,
plutonium may be removed and either wasted or used as fuel. If we add thorium
to the fuel, we can make more uranium than we put in. Since the earth contains
more than twice as much thorium as uranium, it would be wise to make thorium
into uranium. By reprocessing nuclear fuel, we get an enormous, many centuries
long fuel supply without doing much mining. Only minute amounts of un-
enriched uranium or thorium need to be added to lower the percentage of
fissionable fuel. The products of fission are also removed when fuel is
reprocessed. These are just other ordinary atoms that are no longer usef
as fuel.

The quantity is very small. We should reprocess fuel to keep the fuel lo
at the
correct percentage of fissionable fuel for the particular reactor design.
Instead, we
go through the expensive process of making more "virgin" fuel for each
new fuel
load. This greatly increases the price you pay for electricity. We are n
reprocessing nuclear fuel for political reasons.