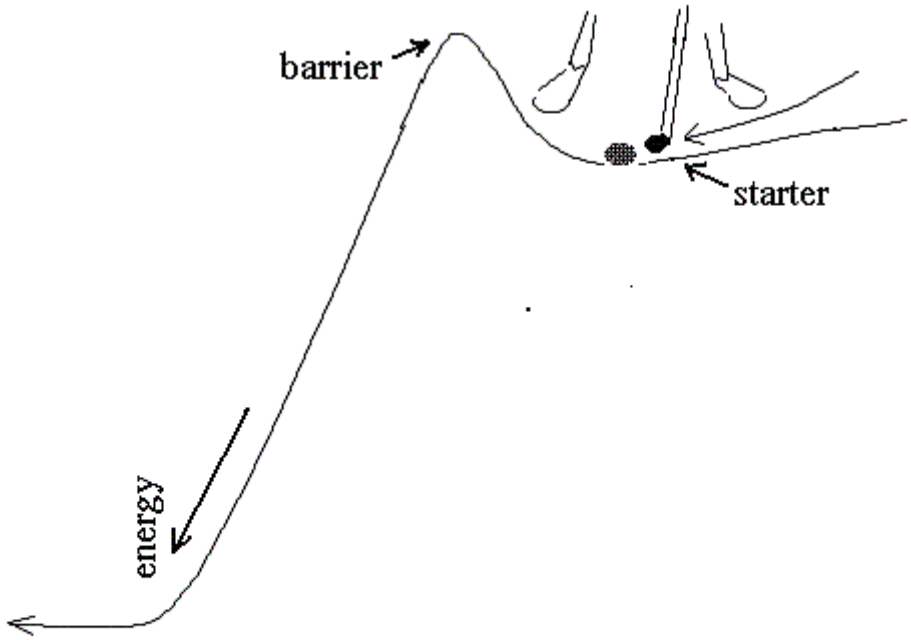
# Energy sources on tap

We need a bit of energy to tap energy, says S.Ananthanarayanan.

This is because all energy sources need to be ‘locked’ somewhere, else they would expend themselves and not be sources at all.

In the case of a match-stick, for instance, the hydrocarbons in wood have stored energy that can be released when the hydrogen and carbon combine with oxygen. But this reaction needs a minimum temperature, which is provided when friction when we strike the match sets match head on fire. Once the wood starts burning, the temperature of burning keeps the reaction going.




**Other forms of energy**

The energy in wood is a form of stored chemical energy. Another form is nuclear energy. Atoms of the elements have a nucleus containing a number of positive particles called protons and about the same number of neutral particles called neutrons. Most chemical behaviour is because of electric forces between atoms. The number of protons thus decides the chemical properties of the element, while the total number of particles in the nucleus decides how heavy the atoms are.

Sometimes, the atom may have one or two neutrons more than usual. The atom would still behave in the same way, because the number of protons is the same. But the extra neutrons are usually pushed in there by using some energy and the nucleus is eager to get rid of this 'overload', either by ejecting the extra particles, or by breaking up into two or more, smaller nuclei. Naturally, as all this is being done to get rid of extra energy, the reaction results in the release of energy, which can then be tapped, converted into electricity, etc.

If all such 'inclined to split' nuclei just went ahead and got done with it, then where would be no such nuclei left to talk about! The reason this does not happen is that the 'overload' in such nuclei is also 'locked in' behind some work that needs to be done to release the stored energy.

It is the nature of the world of atoms and the like that such things can happen, nevertheless, once in a way, and so they do, 'spontaneously'. But for sustained release fo energy, to be useful, we need a mechanism to continuously 'spark' the nuclei to split. In nuclear reactors, what happens is that the neutrons, the products of the 'spontaneous' splitting of nuclei, can 'spark' other nuclei to split. Hence, if there are enough nuclei around, the reaction can go on by itself, and may only need to be controlled. In nuclear reactors, this control is done by pushing graphite rods into the mass of fuel, to slow things down. In atom bombs, the reaction is not controlled and it becomes an explosion!

**Nuclear Fusion**

Another type of nuclear reaction is when two simple nuclei come together to form a pair, which has much less energy than the two when they are apart. The 'fusion' then releases energy, except that it usually takes immense effort to bring the two nuclei close enough to merge. This is the principle of the hydrogen bomb, which needs a normal, 'fission' type atom bomb to start it. It is also the process that is fueling the fires in the sun and stars!