Report on Liquid Fluoride Thorium Reactors – 10/05/2011

Introduction by Stuart Agnew MEP

I have commissioned this little bit of research as Nuclear energy has recently become topical. What it demonstrates is that technology never stands still and that blind opposition to this source of energy, irrespective of the detail, is a totally unreasonable approach.

The Japanese Nuclear Accident

The ongoing Fukushima Daiichi disaster is making many people ask about the safety of nuclear power. Below are the basic facts of what is known to have happened at the Fukushima Daiichi plant:

- There was a massive earthquake, much larger than the plant was designed for, which caused loss of external power.

- A tsunami, also much larger than the plant was designed for, washed through, destroying the backup generators, and several hours later the battery backups ran out of power.

- Without the electrically driven pumps for the water cooling system a partial meltdown occurred and the coolant water overheated, building up pressure, resulting in several explosions due to water cracking and producing hydrogen, which exploded in the presence of oxygen.

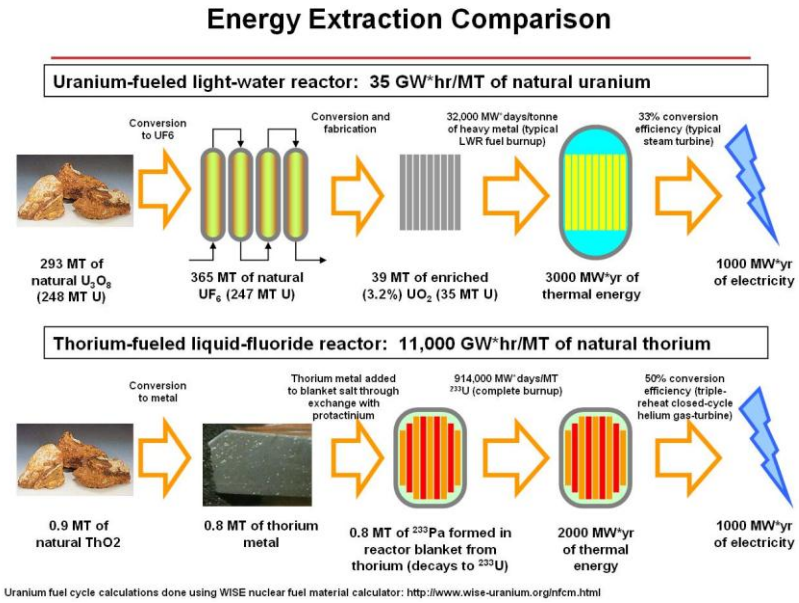
The foregoing highlights the weakness in a conventional pressurised water reactor. Nuclear power does not have to be generated in this way.

Alternative power systems

Liquid Fluoride Thorium Reactors (LFTR – one of a range of Molten Salt Reactors) can be used instead. The main advantages are:

- Much less fuel needed (see diagram).

- No high pressure coolant needed.



- No heavy wall container needed.

- Plentiful supply of inexpensive fuel.

Additionally the LFTR is inherently safer. It can easily be configured to shut itself down passively (without external power) in the event of a fault developing. The overall cost of a LFTR plant is also likely to be much less than conventional pressurised water Uranium Oxide fuelled reactor. Much of the cost of the PWR is in building the massive pressure containment structures and coolant systems required, together with the raw fuel cost being at least three times higher. So why are they not currently used or actively being developed? They are in an early development stage in several countries; however any foreseeable nuclear power plants in the UK are likely to be of the old pressurised water reactor type, probably bought from France.

Alternative power system development status

None of the molten salt reactor developments are being carried out directly by the UK and research organisations interested in investing in these new technologies are told they can offer to participate in such research via Euratom within the Generation IV International Forum.

The GIF (Generation IV International Forum) is a cooperative international endeavour organised to carry out the research and development (R&D) needed to establish the feasibility and performance capabilities of the next generation nuclear energy systems.

The Forum has 13 Members, which are signatories to its founding document, the GIF Charter. Argentina, Brazil, Canada, France, Japan, the Republic of Korea, the Republic of South Africa, the United Kingdom and the United States signed the GIF Charter in July 2001. Subsequently, it was signed by Switzerland in 2002, Euratom in 2003, and the People's Republic of China and the Russian Federation, both in 2006.

The goals adopted by GIF provided the basis for identifying and selecting six nuclear energy systems for further development. Depending on their respective degrees of technical maturity, the Generation IV systems are expected to become available for commercial introduction in the period between 2015 and 2030 or beyond.

The UK's contribution

The UK contribution is to fund the Engineering and Physical Science Research Council's (EPSRC's) 'Keeping the Nuclear Option Open' Programme worth £6 million. EPSRC has also provided funding of ca £1 million to a "Nuclear Technology Education Consortium" (NTEC) to provide masters-level and continuing professional development training for the nuclear industries and an Engineering Doctorate Centre in Nuclear Engineering is to be set up, with funding of £5 million available from EPSRC at Imperial College, London. Perhaps all the UK's development funds have been allotted to the ITER fusion project instead – but that's another story.

References:

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