FRONTIER ENERGY TECHNOLOGY FOR THE MARTIAN FRONTIER.
(Poster)

Wesley Bruce
wesleybruce@iinet.net.au

There are several energy technologies out on the edge of the world energy markets that may come into the main stream without warning and may be extremely useful on Mars or in space.

These include technologies that are based on new but well understood principles of nuclear physics. They include two classes of technology that are so radical that they are hotly disputed in the scientific arena but they still stand and may break through becoming commercially viable and seriously upsetting the scientific paradigm. *Who said we'd discovered all there was to be discovered in physics?*

Hafnium

Hafnium has a half-life of 31 years, some of the protons and neutrons orbit the nucleus and their orbital mechanics can be manipulated with X-rays so that they give out a greater energy flux as gamma rays. These can be trapped by moderators and turned into heat. This is called a 'triggered nuclear decay' reaction or a Quantum nucleonic reactor.

The beauty of this device is that it is almost inert when the X-ray flux is off. The US Air Force has funded at least two feasibility studies on nuclear-powered versions of the Northrop-Grumman Global Hawk UAV. A 2003 in *New* Scientist raised the possibility that the hafnium reactor could be the first nuclear power plant to power an aircraft.

The gamma-ray hazard eliminates this kind of reactor as an option for the Mars rover but it could power a base or a drone. It might also power a two rover system for Mars operations with a manned rover and an unmanned robot rover that has the reactor. The latter follows the former at a safe distance under its own power converting water and CO2 into methane and oxygen as it goes. When the manned rover stops. The robot rover shuts down its reactor and moves up to transfer fuel to the manned rover. The option is also open for this robot reactor vehicle to debog the manned rover. To do engineering tasks such as mining ice and ore; grading roads; digging big holes to build the next of your bases underground buildings.

LENR

Another more radical nuclear option is Low Energy Nuclear Reactions or Chemically Assisted Nuclear Reactions other wise popularly known as Cold Fusion. Despite considerable public and scientific controversy there have been a number of successful (albeit inconsistent) replications of the Fleischmann/Pons experiments and variants of it and there is ongoing commercial research.

Current invesigtaions focus on reactions occurring on the surface in 1-micrometer layer impurities including various elements. Cracks of a specific geometry in the palladium substrate and dendrites on the surface create a nano-structure. They either function as a nanoscale Deuteron/ electron accelerator or a quantum tunnelling device that negates the coulomb barrier. The reactions are nuclear but nothing like hot fusion.
Hard numbers on power output have been measured but are changeable.

Should this phenomena eventually lead to a viable technology it is possible that power plants little larger than internal combustion power plants of a given power may be built. They will be optimised to run continuously in a hybrid configuration. Too much load variation could cause the cell to become temperamental. There will be no high energy radiation and a litre of deuterium could power a rover for about a year.

Power on Mars.

If any of these technologies are available in the near future then our options for Mars exploration and colonization widen significantly. Instead of crawling around at a snails pace and waiting a day for the batteries to charge; we could have powerful energy systems allowing high performance air and ground vehicles. Any of these power systems could give a base energy to burn. If either ‘low energy nuclear technology’ or ‘blacklight’ power technology become available then the third generation of these technologies might be compact enough to fit in a vac-suits backpack yielding a portable life support system with unlimited endurance.

If these technologies never eventuate then I have written some interesting fiction. If they never eventuate true colonisation of Mars may not be seen for decades. However if they appear on the horizon in the near future you are forewarned and forearmed. Ready to integrate these technologies into our future plans.

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