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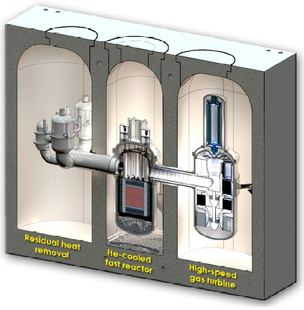
# 4th generation reactor: General Atomics EM2 uses spent fuel, runs for 30 years!



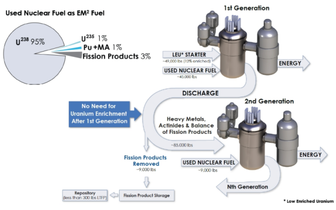
We all are accustomed here in Europe (old Europe!) to the hysterical noise that rises when talks about nuclear energy are made. It comes as a big relief that in other parts of the world at least some scientists and engineers have kept their reason and are intensively working on new reactor technologies that will be both save, tamper proof, secure, reliable and most important can use spent fuel. One should keep in mind that traditional reactors use only 5% energy stored in the fuel rods containing enriched uranium. When these 5% are used, the rods have to be changed, stored away or reprocessed.

General Atomics is working on a smaller kind of reactor called EM2 (Energy Multiplier Module ). As the "Hyperion power Module" (now called Gen4 Module) of former Hyperion Power Company (now Gen4Energy) the aim is to build a self-contained module. The EM2 is rated at 240 MW, with a 70 MW prototype in the planning stage. The reactor will be of the well known gas-cooled type: gaseous helium will be pumped through the reactor core, heated up to approx. 850 °C and drive a fast (gas) turbine coupled to an electrical generator:




What makes the system so interesting and novel is that there will be a two stage operation:

First the EM2 core will be started using 12% enriched uranium and used fuel or depleted uranium (DU). After the initial U235 amount has been consumed in the "starter-part" of the core, enough fissionable material will have been created to switch over to a second part of the core where the nuclear reactions will continue and be fed nuclear waste..




(picture from GA presentation)

General Atomics plans a whopping 30 years time span of continuous operation without refueling or opening the reactor!

Small nuclear reactors should have a bright future, at least in regions of the world where reliable and non-intermittent energy remains mandatory.



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## One Response to "4th generation reactor: General Atomics EM2 uses spent fuel, runs for 30 years!"

**Yotsubishi Says:**
December 20, 2012 at 06:18 | Reply

The General Atomics EM2 is just another re-incarnation of the helium-cooled fast neutron spectrum reactor, referred to as the Gas-Cooled Fast Reactor (GCFR). While this type of reactor has some attractive characteristics, safety is not one of them. To achieve its objectives of high nuclear fuel utilization with relatively compact size, the reactor must operate with very high power density with very little material in the reactor core that can absorb heat during a severe accident. As a result, this type of reactor will undergo a very rapid meltdown during severe accidents, and represents a substantially less safe alternative to modern commercial reactors that use water cooling. Every major nuclear country has rejected this type of reactor concept, in part because of its relatively poor safety characteristics.

The EM2 introduces additional safety and practical engineering challenges beyond the conventional GCFR. The EM2 fuel is an unproven concept and is expected to vent (release) its radioactive fission products while the reactor is operating, which essentially eliminates the fuel as a barrier to radioactivity release and defeats the concept of defense-in-depth to radioactivity release required by the U.S. Nuclear Regulatory Commission. The EM2 proponents also claim the reactor core can last 30 years without requiring refueling. Proving a new nuclear fuel can last this long without significant levels of failure is practically impossible, especially from a nuclear regulatory licensing perspective. Furthermore, this type of fuel cycle represents a significant risk for proliferation of nuclear fissile material, since the EM2 core will contain large quantities of weapons-usable plutonium long before the end of its claimed 30 year fuel cycle. In terms of safety and proliferation risks, the EM2 is an unacceptable nuclear reactor concept, especially for commercial deployment in a post-Fukushima world.

Until recently, General Atomics was the industry champion of the world's safest reactor concept, a modular, helium-cooled thermal neutron spectrum reactor, sometimes referred to as a Modular Helium Reactor (MHR). In contrast to the EM2, this reactor concept has a large quantity of material in the core that absorbs heat and prevents the reactor fuel from reaching meltdown temperatures, even if all of the coolant is permanently lost. Unfortunately, the senior management at General Atomics abandoned the MHR in favor of EM2, and has stuck with this strategy even in the aftermath of the Fukushima accident. The proponents of the EM2 concept have falsely claimed the EM2 has the same inherent safety characteristics as the MHR.

Japan has the high temperature engineering test reactor (HTTR), which is an operational, engineering-scale prototype of the MHR. It has been used to demonstrate the intrinsic safety characteristics of the MHR. Perhaps the events in Japan can lay the foundation for developing, demonstrating, and commercializing a next generation of nuclear power with inherent safety. International collaboration among the U.S., Japan, and other nations on the MHR would provide a relatively quick path for achieving this goal. More information on the HTTR is available at:

http://www.jaea.go.jp/04/o-arai/nhc/index.html

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