

FBNR Letter

FIXED BED NUCLEAR REACTOR – FBNR

<http://www.rcgg.ufrgs.br/fbnr.htm>

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Dear coworkers and potential coworkers around the world,

As the number of coworkers is increasing, we are issuing a circular letter to communicate about the matters of general interest to the FBNR project. Please consider this as a personal letter to yourself. Those who are not involved in the project as yet may participate at any appropriate moment. The project has manifold aspects including scientific, technological, economical, political, and sociological.

A new era of nuclear energy is emerging. The International Atomic Energy Agency has committed itself to “Help to ensure that nuclear energy is available to contribute in fulfilling energy needs in the 21st century in a sustainable manner; and to bring together both technology holders and technology users to consider jointly the international and national actions required to achieve desired innovations in nuclear reactors and fuel cycles.”- IAEA-TECDOC-1362.

The objective is to develop an innovative nuclear reactor to be inherently safe, passively cooled, small, modular, and simple in design with integrated primary circuit. Safety is achieved by design, and has reduced adverse impact on environment. It is to meet the requirements of GEN IV and IAEA-INPRO as being economic, safe, proliferation resistant and sustainable.

The FBNR may be called People’s Reactor. It is intended to be developed by the peoples for the peoples of the world in the spirit of cooperation and service to humanity. It is intended to be a near term deployment project. Let us form an international consortium to develop this reactor where all members are stakeholders.

An IAEA Coordinated Research Project (CRP) includes FBNR in its program.

Participate in the project and make a proposal on a particular activity of your interest.

FBNR Letter 08 August 18, 2004

The estimated dimensions and volume fractions of the materials in the FBNR module.

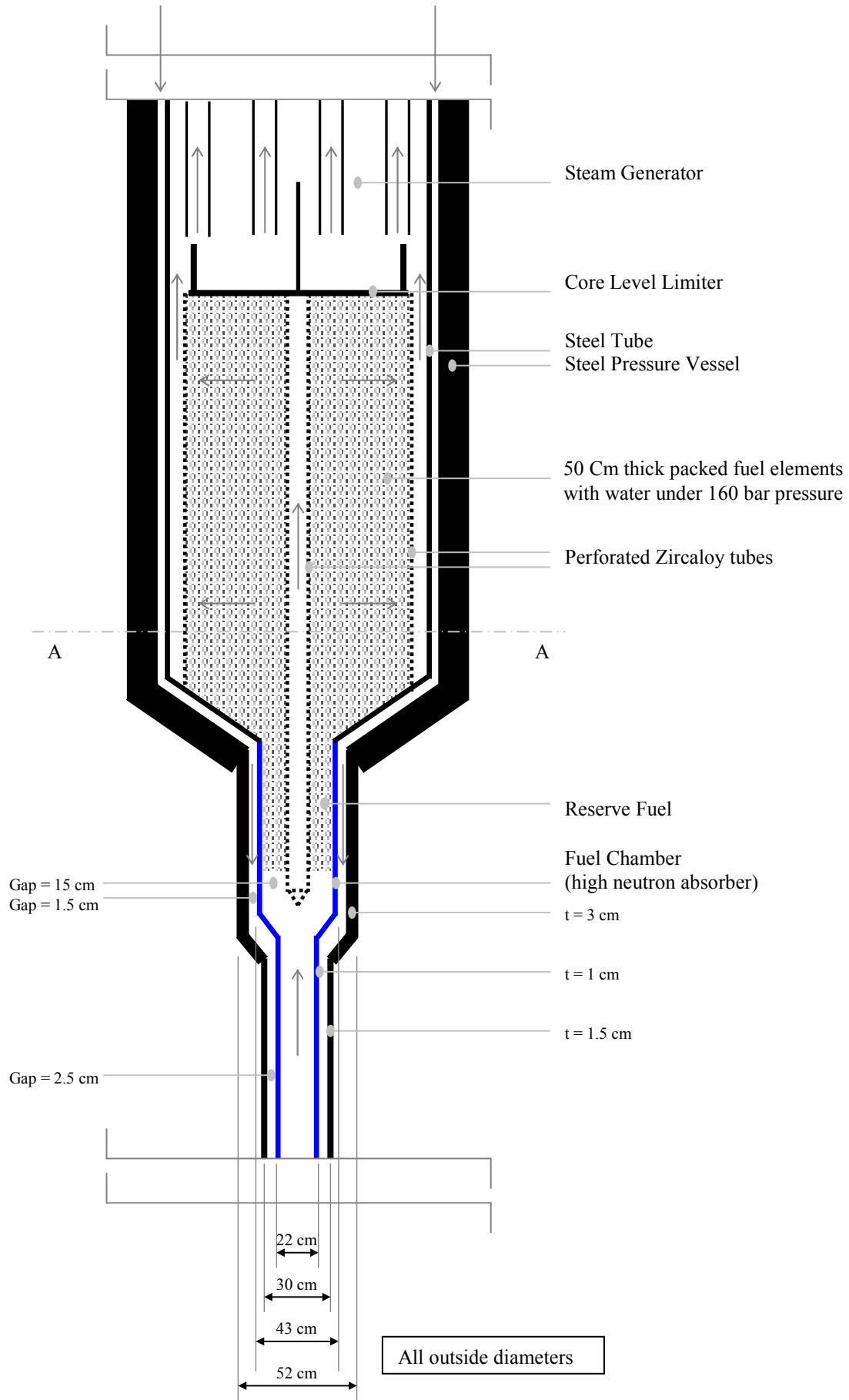
Fuel Elements

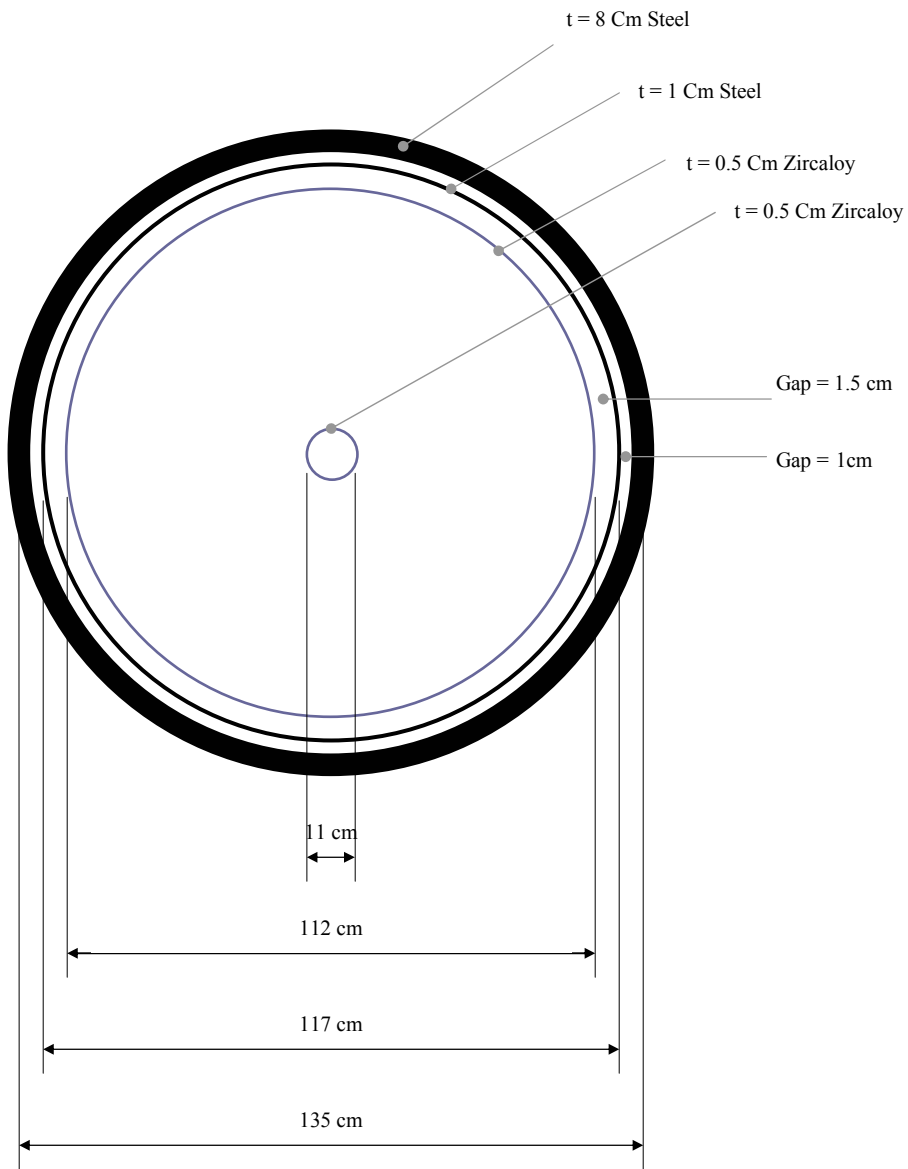
The 15 mm diameter spherical fuel elements are made of compacted coated particles in a graphite matrix. The coated particles are similar to TRISO fuel with outer diameters about 2mm. They consist of 1.58 mm diameter uranium dioxide spheres coated with 3 layers. The inner layer is of 0.09 mm thick porous pyrolytic carbide (PYC) with density of 1 g/cm³ called buffer layer, providing space for gaseous fission products. The second layer is of 0.02 mm thick dense PYC (density of 1.8 g/cm³) and the outer layer is 0.1 mm thick corrosion resistant silicon carbide (SiC, density of 3.17 g/cm³). The fuel element is clad by 1mm thick SiC.

Volume fraction (%) of the materials in a FBNR module.

	UO ₂	H ₂ O	C	Steel	Zircaloy	SiC	Fuel	Total
Region I	0	91.32	0	0	8.68	0	0	100%
Region II	11.55	40.00	31.62	0	0	16.83	60.00	100%
Region III	0	21.42	0	76.69	1.89	0	0	100%

- Stainless steel with a density of 7.758 g/cm³ is composed of 67.84% Fe, 10.86% Ni, 19.22% Cr, 1.88% Mn, and 0.20% Si.
- Zircaloy with a density of 5.874 g/cm³ is composed of 99.69% Zr, 0.21% Fe, and 0.10% Cr.
- Uranium dioxide has a density of 10.5 g/cm³.





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