

The invention relates to designs of light-water nuclear reactors in which thorium is used as the fuel, in particular to designs of jacketless fuel element assemblies which are used to form the active zones in water-cooled power reactors, such as reactors of the PWR type (for example, the AP1000, the EPR, etc.). A fuel assembly (1) for a light-water reactor has a square cross-section and comprises a seed module (2), a breeding module (3) surrounding said seed module, a head (4), a tailpiece (5) of the seed module and a tailpiece (6) of the breeding module. A bundle of fuel elements of the seed module (2) is arranged in the rows and columns of a square grid of coordinates and has a tetrapetalous profile forming helical spacer ribs along the length of the fuel element. The breeding module (3) comprises a body in which a bundle of fuel elements formed from thorium with enriched uranium added is arranged. The fuel elements of the breeding module are arranged in two rows and columns in a square grid of coordinates. In another embodiment of the invention, a fuel assembly for a light-water reactor has an analogous design, wherein the fuel elements of the breeding module are arranged in three rows and columns in a square grid of coordinates. The invention also relates to fuel elements which can be used in fuel assemblies and light-water reactors of the PWR type (for example, the AP1000, the EPR, etc.) which use fuel assemblies.