

GENERATION IV REACTORS

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Today there is a need to improve nuclear reactors. Despite the availability of innovative ideas in the energy industry, such as thermonuclear fusion, which will probably be developed in the nearest future, we need some new and effective sources of energy now. The only way out is to improve technologies that have already been tested and proved to be reliable. The next step in the nuclear industry evolution is the development of generation IV reactors.

All the reactors created in the USA, USSR, Great Britain and France in 1950-1960 are called «I generation». Reactors of this generation are operated in Central Europe and will be decommissioned in the foreseeable future, because they do not have any backup warning systems and emergency core cooling system, which is a cause of concerns. These reactors can cause radiation leak even after decommissioning.

Generation II reactors were the next step in the development of nuclear power. Prototypes of this generation are PWR, BWR and AGR. The most common types of reactors are pressurized water reactors (PWR) and PHWR. Russian VVER has a similar structure. Today more than 50 reactors operate in Russia and Europe.

Third-generation reactors are improved reactors constructed on the basis of generation II reactors. The construction was simplified and became more secure; the life span was increased (about 60 years); the amount of nuclear waste and fuel consumption were reduced.

Generation IV reactor is the next step in development. A reactor and fuel reprocessing are to be combined to form a complicated system. These systems will have a high level of security, competitiveness and produce little nuclear waste. Reactors of the new generation will be able to transform ^{238}U into ^{239}Pu and produce 50 times more energy than older generations. According to the calculations, radioactive waste will create overmuch for the Earth, so closing the fuel cycle can solve this problem. A new generation will have a higher level of efficiency, as it will use other heat transfer agents and higher temperatures: 400 - 600°C with CO_2 , 500 - 700°C with liquid metals (sodium, lead) and 700 - 900 °C with helium. It can increase efficiency up to 44%. Today we have some projects of the new generation reactors, such as the GFR, VHTR, SCWR, MSR, etc.

In concision, it should be said that generation IV reactor is a next step in the nuclear industry, which can solve different problems, namely nuclear waste, low efficiency of reactors and proliferation of nuclear materials. Today generation IV reactors are being developed actively and will probably be created by 2060.

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