ТОМСКИЙ
ПОЛИТЕХНИЧЕСКИЙ
УНИВЕРСИТЕТ

Nuclear Power Plant steam generators

Lecture I. Introduction.

2018

Curriculum
(*in a spring semester*)

- Lectures – 16 h
- Practical – 16 h
  - 6 individual tasks – 6 points each
- Laboratory classes– 16 h
  - 5 labs (4 – calculation, 1 – actual equipment) – 2 points each calculational and 6 points for actual
- Current control in form of tests
  - 2 control tests on conference weeks – 15 points each
- Final control in form control test (in case of insufficient points) – 20 points

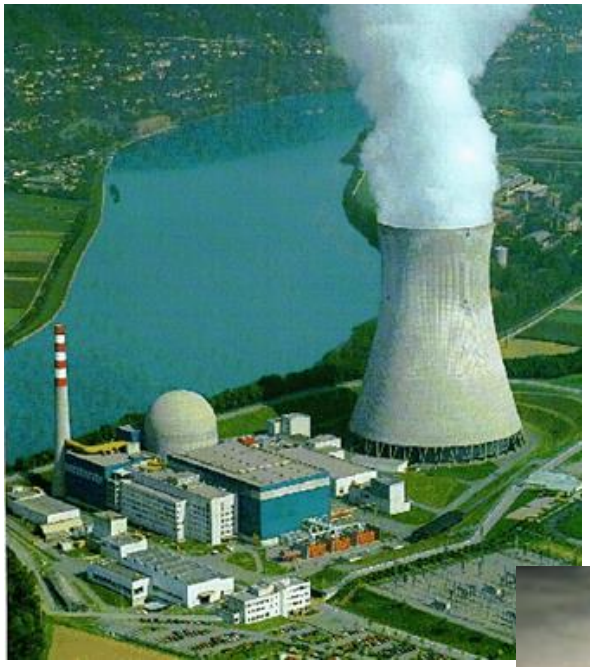
Subject and objectives of the course

The subject of the study is a steam generator of the nuclear power plant (hereinafter – NPP SG).

The main objectives of the course:

- study of the NPP SG operation principle;
- experience of the NPP SG basic designs;
- obtaining design skills for the efficient NPP SG construction;
- mastering the principles of the NPP SG safe and economical operation.

CURRENT STATE AND PROSPECTS OF NUCLEAR ENERGY DEVELOPMENT



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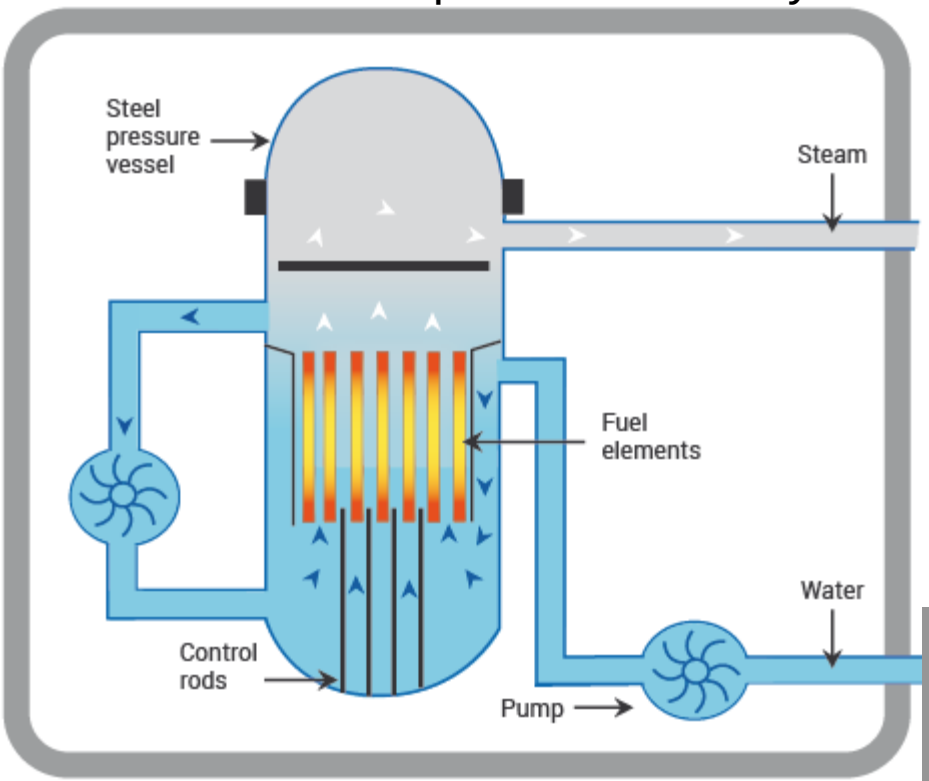
Types of modern nuclear energy reactors

BWR – Boiling Light-Water Cooled and Moderated Reactor

1.Coolant and working fluid – boiling water.

2.Russian analogue – RBMK reactor (RBMK – reactor bolshoy moshnosty canalniy – powerful reactor of channel-type).

3.Steam generator is combined with reactor. The separator in such systems sometimes is called steam generator but its operation principle is different.



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Types of modern nuclear energy reactors

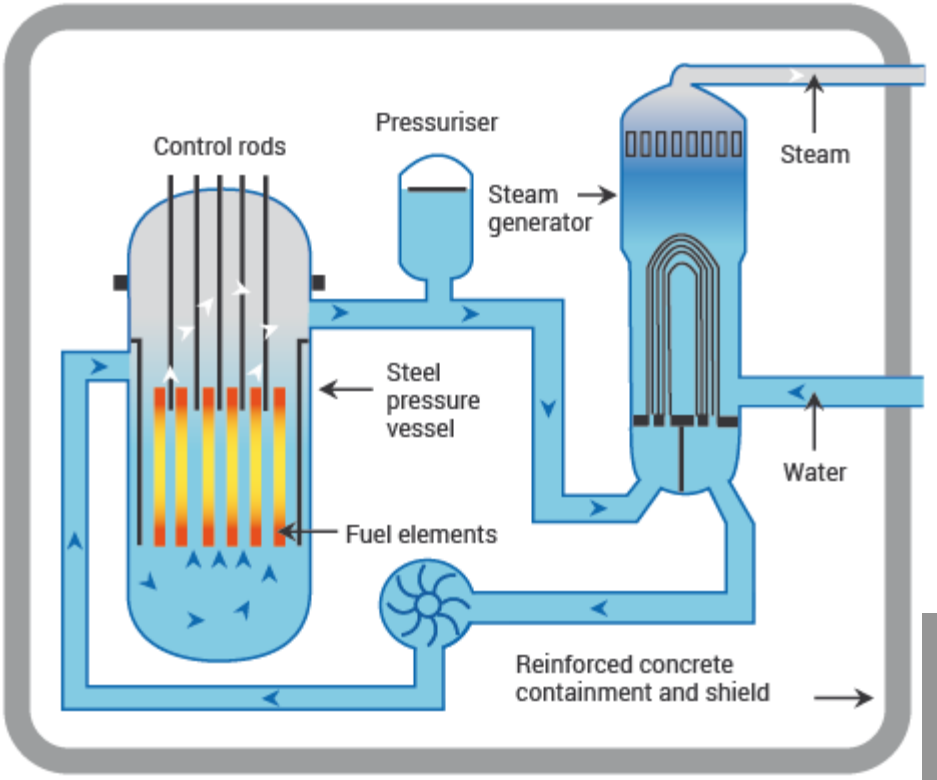
PWR – Pressurized Light-Water Moderated and Cooled Reactor

1.Coolant – pressurized non-boiling water.

2.Working fluid – saturated or slightly superheated steam.

3.Russian analogue – WWER reactor (WWER – vodo–vodanoy energeticheskiy reactor – water-water energy reactor). The difference is scheme of active zone and type of steam generator – the horizontal in Russia and vertical abroad.

4.Steam generator is tube-type heat exchanger where working fluid evaporation and drying of produced steam is realized.



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Types of modern nuclear energy reactors

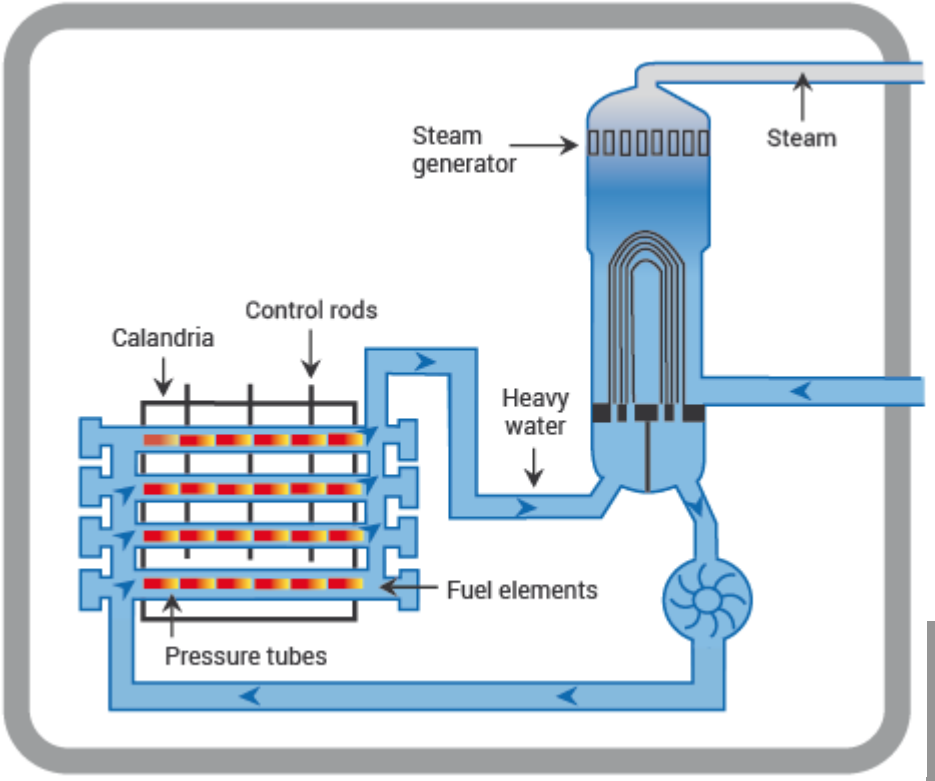
PHWR – Pressurized Heavy-Water Moderated and Cooled Reactor

1.Coolant – pressurized non-boiling heavy water.

2.Working fluid – saturated or slightly superheated steam.

3.No russian analogue exist. Such reactors are used in Canada (CANDU) and India.

4.Steam generator is same with PWR reactor.



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Types of modern nuclear energy reactors

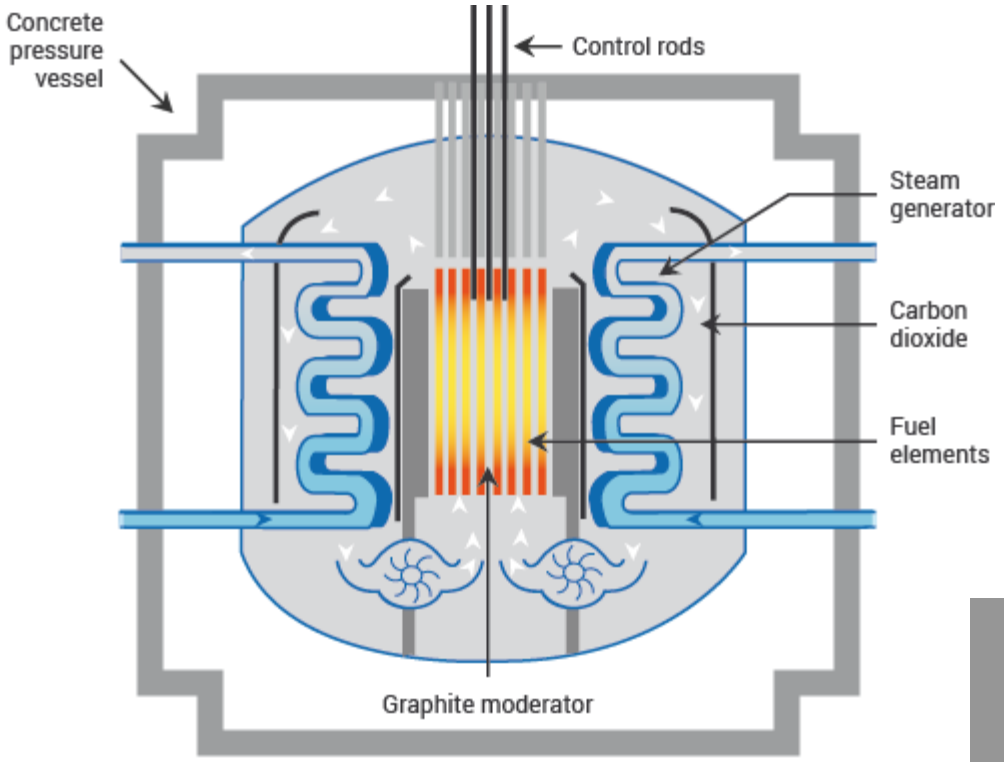
GCR – Gas Cooled, Graphite Moderated Reactor

1.Coolant – gas (usually, carbon dioxide or helium).

2.Working fluid – superheated steam (rarely, gas by itself).

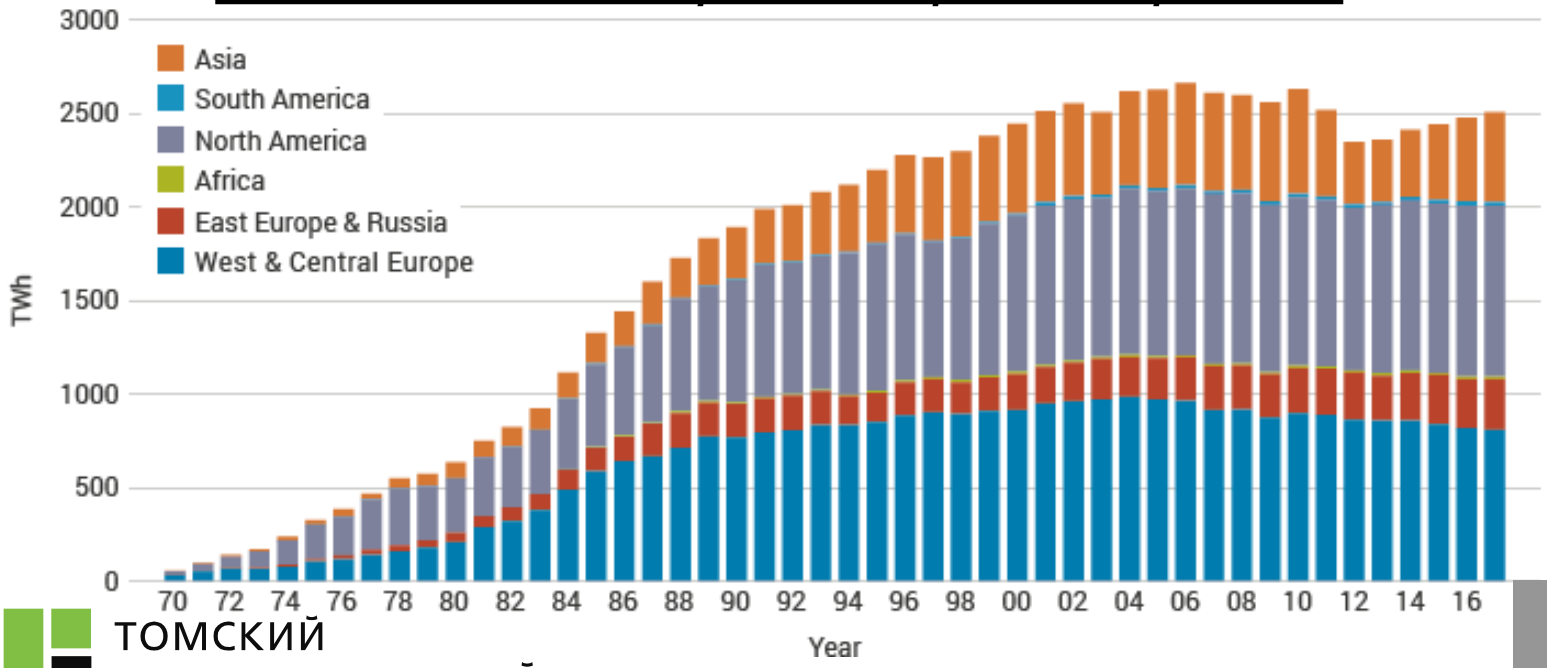
3.No russian analogue exist. AGR (Advanced Gas-cooled Reactor) was developed in England. The last one was taken out of operation in 2015.

4.Steam generator is complex heat exchanger of gas-to-steam type.



The main trends in the development of the world nuclear energy

1. *The displacement of the vector of construction of new nuclear power plants in Asia and Africa.*
2. *Lifetime extension.*
3. *Improving the competitiveness of nuclear power plants.*
4. *The formation of positive public opinion.*



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Thank you for attention!

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