



## NUCLEAR ENERGY FUNDAMENTALS

### Assignment

Please create a Microsoft® Word document and answer the below questions. Please email the completed assignment to the instructor ([info@technologyed.com](mailto:info@technologyed.com)).

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#### MODULE 1

1. Define a nuclear reactor
2. Are there any nuclear power plants in your state?
3. Briefly discuss the benefits of nuclear power
4. Define nuclear fission
5. Define half life. What does higher half life signify?
6. Define isotope
7. What is the purpose of a moderator?
8. What is the purpose of a coolant?
9. What is the purpose of a control rod?
10. List the 6 reactor technologies
11. What are the pros and cons of PWR?
12. What are the pros and cons of VVER?
13. What are the pros and cons of BWR?
14. What are the pros and cons of PHWR?
15. Briefly discuss the differences between nuclear fusion and fission reactors?

#### MODULE 2

1. List the 7 steps of the nuclear fuel cycle
2. Briefly describe the uranium mining and milling process
3. Over \_\_\_\_\_ of uranium production is achieved by the extraction of ore using conventional open pit or underground mining methods
4. What is ISL?
5. What is “yellow cake”?
6. What country is the most dominant producer of uranium?

7. Define tailings
8. Define enrichment
9. What are the 2 methods of enrichment? Please discuss
10. Define MOX
11. Briefly discuss some of the risks associated with decontamination
12. Briefly discuss some of the outlets for nuclear waste streams from decommissioning

### **MODULE 3**

1. List the different radioactive waste types
2. Waste generated during decommissioning of a nuclear power plant is normally referred to as \_\_\_\_\_?
3. Industrial, e.g. equipment that has been used in conjunction with nuclear materials or spent ion-exchange resins used in the clean-up of radioactive liquids is normally referred to as \_\_\_\_\_?
4. Highly radioactive and often long-lived remnants of the fission process is normally referred to as \_\_\_\_\_?
5. Define waste minimization
6. What are some common processes for reducing nuclear waste?
7. Define and briefly discuss HLW
8. Define interim storage
9. Define engineering barriers
10. What regulations are used to standardize nuclear waste transport practices?

### **MODULE 4**

1. What is the primary purpose of all nuclear safety measures?
2. Why does an accident at a nuclear power plant has a greater potential to do harm than accidents in other types of nuclear installation?
3. Nuclear designs strive to ensure \_\_\_\_\_?
4. The primary containment barriers against a release of radioactivity are \_\_\_\_\_.
5. Define commissioning.
6. Define deterministic approach.
7. What is one of the biggest reasons for a declining safety performance?
8. What are some of the roles of a regulatory agency?
9. What happened in the Three Mile Island incident?
10. What happened in the Chernobyl incident?

## MODULE 5

1. What are the various types of radiation?
2. Briefly discuss the differences between alpha, beta, and neutrons
3. What are some of the sources of radiation?
4. Define natural radiation
5. Define man-made radiation
6. Briefly discuss how radiation can damage tissue cells
7. Define deterministic effects
8. Define stochastic effects
9. For every sievert of exposure, the risk above the "normal" \_\_\_\_\_% chance of dying from cancer is an additional \_\_\_\_\_%
10. What is the International Commission on Radiological Protection?
11. What is the ALARA test?
12. In nuclear power plant, radiation is limited, within the plants, to the \_\_\_\_\_.
13. What are the benefits of preparedness programs?
14. What are the three types of countermeasure that can be taken during the early stages of a nuclear or radiological emergency?

## MODULE 6

1. What are some of the factors influencing the economics of nuclear energy?
2. What does the investment costs include?
3. What does the O&M costs include?
4. What are some of the long-term financial risks and liabilities associated with new nuclear power plants?
5. Briefly compare the costs between existing vs/ new nuclear power plants?
6. Briefly compare the costs between nuclear power plants v. fossil fuel power plants?
7. Define external costs. Provide 3 example elements.

## MODULE 7

1. Briefly discuss some of the public concerns around nuclear technology
2. What is the OECD? What is its purpose?
3. List the OECD countries
4. What are the things that national legislation regulates?
5. What is the IAEA? What is its purpose?
6. What is the Nuclear Non-Proliferation Treaty?
7. What is the NSG? What is its purpose?
8. Define nuclear terrorism

## MODULE 8

1. According to the International Institute for Applied Systems Analysis (IIASA) and the World Energy Council, by 2050, global energy demand would probably grow by a factor \_\_\_\_\_.
2. According to the International Institute for Applied Systems Analysis (IIASA) and the World Energy Council, by 2050, demand for electricity will grow by a factor of \_\_\_\_\_.
3. What are the 3 elements of sustainable development that is applicable to nuclear energy?
4. The environmental sustainability of a particular material is usually discussed in terms of its \_\_\_\_\_.
5. At the beginning of 2001, estimated conventional uranium resources is estimated to last nearly \_\_\_\_\_ years of supply at the prevailing rate of usage.
6. True|False: The nuclear industry also employs a high proportion of skilled, graduate staff relative to most other major energy and manufacturing industries.
7. True|False: Radiological risks from normal operation arise from the day-to-day discharges.
8. True|False: Nuclear installations are NOT among the numerous potential targets for terrorist activity.
9. True|False: The overall political trade-offs between the three dimensions of sustainability will differ from country to country.
10. The social element in sustainable development can only be met by addressing public \_\_\_\_\_ and gaining public \_\_\_\_\_.