

## UNENE UN 901 - Assignment 4

1. What requirements are imposed on fuel design by the design of:
  - a) the heat transport system
  - b) the fuel channel
  - c) the fuel handling system?
2. Describe four tests that are done on a new fuel design.
3. What manufacturing variable is principally responsible for the crystallographic texture of fuel cladding? What is a desirable texture for fuel cladding and why is this texture desirable?
4. Give a brief account of the fuelling procedure for a CANDU reactor during normal operation with reference to the zone controller levels.
5. What are “critical channel power” and “critical heat flux”? What are the consequences of exceeding them? How are they affected by diametral creep of the pressure tube?
6. Describe and explain the end-plate cracking phenomenon that occurred at the Darlington station and its solution.
7. What is a “power ramp defect” defect? What are its characteristics?
8. Explain the mechanical failure hypothesis for power ramp defects. What evidence was used to discard this hypothesis?
9. Explain the alternative hypothesis to the mechanical failure hypothesis for power ramp defects.
10. What changes to fuel design have been made to reduce the incidence of power ramp defects in CANDU and BWR? Explain how these changes work.
11. Describe three measurements or tests that are performed on fuel removed from service.
12. What are five of the major steam generator degradation mechanisms? In what locations do they occur in a recirculating steam generator?
13. Describe the major primary side degradation mechanisms for steam generator tubes and the factors that affect it. How can it be mitigated?
14. Residual stresses play a major role in the degradation mechanism in Question 13. In what locations are high residual stresses found in steam generator tubes and how do they arise?
15. What is the origin of the “sludge” found in the secondary side of a nuclear steam generator and to what degradation mechanisms does sludge contribute? What can be done to mitigate the effects of the sludge?
16. What are two methods of steam generator repair? Describe one variant of each in detail.
17. What improved design features are typically included in a replacement steam generator?
18. Describe the mechanism of feeder thinning with reference to the variation in the solubility of magnetite around the primary coolant system of a CANDU reactor.
19. Describe the features of the two types of cracking seen in feeders and their hypothesised mechanisms.