

Nuclear Refueling Challenge

Divide class into two or three teams (need equal supplies for each team)

Create two (or 3) of the largest circles possible within the room.

Place three “Fuel Bundles” in the center of the large circle (a small circle can be used to define the fuel area)

Give each team a variety of materials from which they can build a fuel bundle replacement tool.

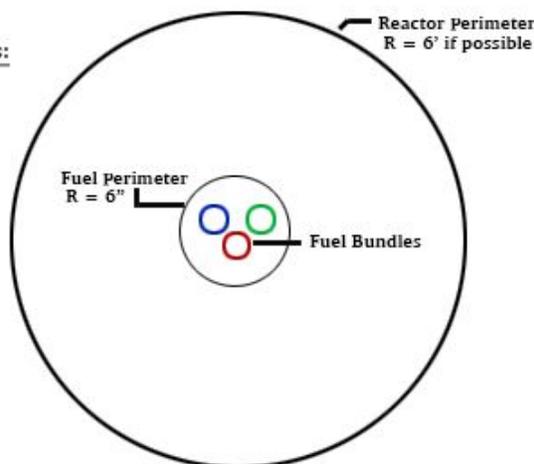
Scenario:

Our local power provider is preparing for a refueling outage at the nuclear power plant. Unfortunately the robotic arm used to replace the fuel bundles is currently not functioning. A group of engineers has been assembled to develop a safe, reliable, and accurate replacement. The acceptable supplies are limited so the team must use them wisely and follow all of the rules governing a fuel replacement procedure.

Reactor Set Up:

Material Suggestions:

- (2) lengths of string
- (2) dowel sticks
- (2) Meter of 1”
Gorilla Tape
- (2) squares of foil
- (4) sheets of paper
- (4) rubber bands
- (4) clothes pins
- (6) zip ties



- Adjust materials to match radius of reactor perimeter
- Shorten supplies to make challenge more difficult as needed

Rules:

1. All actions must be documented within the engineering journal
 - a. Assembly instructions for refueling tool including a detailed parts list
 - b. All steps required to accomplish the task must be recorded in a logical order
2. No human can enter the reactor area
 - a. You cannot break the plane of the outer perimeter without significant shielding (no exposed skin) – even with shielding no body part may be within the perimeter for more than 5 seconds. All time over 5 seconds must be recorded as an EOP
 - b. You cannot touch the reactor floor within the perimeter in any manner
3. All materials exposed to the reactor area will become “RadWaste” – according to federal regulations all RadWaste materials must be weighed and recorded. This includes any shielding materials used in rule 2a.
4. No fuel bundles can be harmed in the making of this procedure
 - a. Knocking over a fuel bundle or dropping a bundle will result in the start of an Emergency Operation Procedure (EOP).
 - b. If an EOP is triggered a certified RadTech must reset the bundles to their original positions and all time taken by the RADTech will be recorded
5. Refueling is completed when the designated fuel bundle is replaced by a new fuel bundle and Rule #1 is completed.

In a nuclear refueling procedure the following things are a major factor in the success:

Time – the amount of time it takes to successfully replace the fuel bundle (SCORE = recorded time in minutes)

RadWaste – the materials exposed to the reactor area (SCORE = weight in grams)

EOP – an emergency procedure due to carelessness with fuel bundle (SCORE = number of EOP's x 10)

Engineering Journal – documentation is complete and accurate (SCORE = 20 points for a completed journal, 10 points for a journal that is missing important procedures, 0 points for a journal that is incomplete)

Your Refueling Grade will use the following formula:

Grade = (Time score + Radwaste score + EOP score) – Engineering Journal

The lower your score the better your Refueling Grade