

NE585 – Nuclear fuel cycle analysis
Project 6 – Back end of the nuclear fuel cycle

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1 Finding another repository

(25)

The United States has about 70000 metric tons of used fuel, stored onsite at the reactors. Even if Yucca Mountain opened tomorrow, it would be filled immediately and there would still be used fuel left over. Therefore, a second and third repository are going to be needed. Reprocessing aside, which significantly reduces waste volume, and given the high-level geologic criteria for a repository, where might a second or third repository be sited in the United States and why? Given the culture of the local population, how likely would they consent to a repository? Would your consent-based approach from PROJECT 3 be useful to this end?

2 Geologic analogue

(20)

Is there a natural analogue for a geologic repository?

3 Linear programming

(25)

Use the linear programming procedure to maximize the waste oxide mass for the glass waste form of the Japanese concept, subject to the six constraints discussed in class.

4 Rokkasho capacity

(25)

78 kg of waste oxide is produced per metric ton of used fuel (MTU) during reprocessing. If there are 15,000 MTU in Japan right now, how many waste canisters are needed (based on the answer obtained previously)? The Rokkasho reprocessing plant can hold 2880 canisters at any one time. Would the plant have enough space to store the canisters? If not, what should be done?

5 Rokkasho process modeling

(30)

Rokkasho can store 20,000 MTU on the site and process 800 MTU/year. A typical reactor produces 20 MTU/year, and Japan has 50 reactors. 1500 MTU can be stored onsite at each reactor. Derive a process model for the production of canisters per year. Assume the current 15000 MTU is stored equally at each plant at TIME = 0, so Rokkasho starts off totally empty of used fuel and canisters. Make any other reasonable assumptions. Produce several useful plots from the model simulation. Based on the results of the model, offer some insight into a waste management plan/policy for Japan.

6 Into eternity

(50)

Write an op-ed style piece (750 - 1000 words) on 'Into Eternity.' Do you think the safety of a repository is feasible centuries into the future? What would you say to future society about the repository? Write a short op-ed piece (500 words or so) on 'Into Eternity.' Do you think the safety of a repository is feasible centuries into the future? What would you say to future society about the repository?

We will verify if the movie is available first.

7 Consent-based approach

(50)

Everyone agrees that a ‘consent-based approach’ must be used when siting any nuclear facility. However, no one really says what this would look like. From an engineering perspective, we want models and easily quantifiable metrics. Within this context, what might a consent-based approach look like?

8 Yucca mountain

(50)

Give an update on the current status of the Yucca mountain geologic repository. Will it ever become a repository? What else could the facility/property be used for?

Tables

Figures