REPOSITORY PERFORMANCE SENSITIVITY ANALYSIS WITH AN INTEGRATED USED FUEL DISPOSITION MODEL

by

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A dissertation submitted in partial fulfillment of
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2011

Please insert your dedication here.

ACKNOWLEDGMENTS

It is customary for authors of academic books to include in their prefaces statements such as this: "I am indebted to ... for their invaluable help; however, any errors which remain are my sole responsibility." Occasionally an author will go further. Rather than say that if there are any mistakes then he is responsible for them, he will say that there will inevitably be some mistakes and he is responsible for them....

Although the shouldering of all responsibility is usually a social ritual, the admission that errors exist is not — it is often a sincere avowal of belief. But this appears to present a living and everyday example of a situation which philosophers have commonly dismissed as absurd; that it is sometimes rational to hold logically incompatible beliefs.

— David C. Makinson (1965)

Above is the famous "preface paradox," which illustrates how to use the `wbepi` environment for epigraphs at the beginning of chapters. You probably also want to thank the Academy.

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REPOSITORY PERFORMANCE SENSITIVITY ANALYSIS WITH AN INTEGRATED USED FUEL DISPOSITION MODEL

Kathryn D. Huff

Under the supervision of Professor Paul P. H. Wilson
At the University of Wisconsin-Madison

FIXME: basically a placeholder; do not believe

I did some research, read a bunch of papers, published a couple myself, (pick one):

1. ran some experiments and made some graphs,
2. proved some theorems

and now I have a job. I've assembled this document in the last couple of months so you will let me leave. Thanks!

Paul P. H. Wilson

ABSTRACT

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1 INTRODUCTION

1.1 Cyclus : Fuel Cycle Simulator

Cyclus is a fuel cycle simulation software created at the University of Wisconsin.

2 MOTIVATION

This is a motivational chapter.

3 LITERATURE REVIEW

The following literature review addresses four areas of current research integral to the work at hand. First, a review of the contribution of computational nuclear fuel cycle simulation tools to sensitivity analyses of repository performance metrics for various fuel cycle parameters. A review of current computational repository models both standalone and those incorporated into nuclear fuel cycle simulation tools, follows. Special focus is paid to the availability and parametric regimes of supporting data and algorithms informing geochemical and hydrogeological transport-models on long time scales and in various geologies. Finally, a gap analysis demonstrates the reange of available waste form performance models applicable to used fuel streams likely to result from various advanced fuel cycles.

3.1 Sensitivity Analyses of Repository Performance

Comprehensive fuel cycle sensitivity analyses with an emphasis on used fuel disposition and waste management have been conducted by Li, Piet, and âĽĹ

Independent Fuel Cycle Parameters

Repository Performance Metrics

¡++¿

Criticality Safety

Source Term

Peak Dose (Sv/y)

Integrated Dose (Sv)

Maximum Environmental Release (Sv/y)

Integrated Envrionmental Release (Sv)

Necessary Repository Volume

Thermal Load

Cost

Current Methodologies

¡++¿

3.2 Geochemical Migration Models

3.3 Repository Models

Stand Alone Models

FSCNE

A^{3}MCNP

SCANS 1A

ReFREP

Refrep is a near-field model. A. Hautojarvi and T. Vieno Model For A Spent Fuel Technical Research Centre of Finland (VTT) Repository.**?**

Models Incorporated into Systems Analysis Codes

VISION

DANESS

¡++¿

COSI

¡++¿

DYMOND

¡++¿

NFCSim

¡++¿

CAFCA

¡++¿

SMAFS

¡++¿

NFCSS

¡++¿

3.4 Waste Form Models

TAD Canisters

Borosilicate Glass

Glass Ceramic

Metal Alloy

Advanced Ceramic

Separated Streams

Classes A, B, and C waste

GTCC LTHLW

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