

Jacobian-Free Newton- Krylov (JFNK) Methods for Nonlinear Neutronics/Thermal-Hydraulic Equations

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Outline

1 Introduction

1 Governing Equations

1 Solvers

1 Results

1 Conclusions

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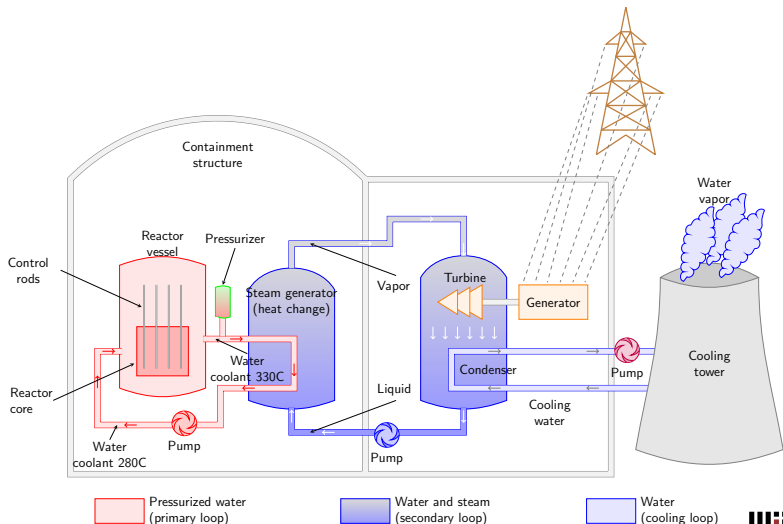
1 Results

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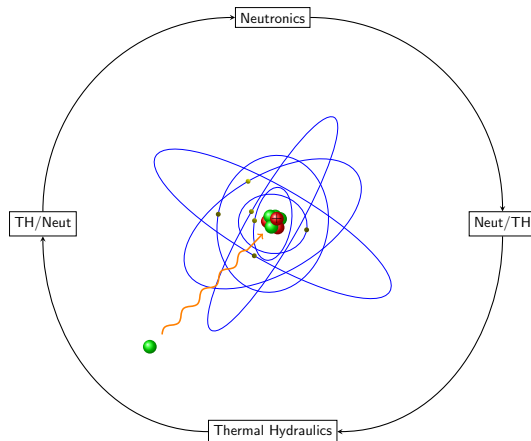
Motivation

- Eventually will be part of thesis work
- JFNK method not currently used in nuclear reactor analysis
- Incorporates a lot of ideas from 2.29 class
- Coupled physics is fun!

Nuclear Reactor Systems



Nuclear Feedback



- Doppler Feedback
- Coolant Density Feedback

1-D Slab Reactor Geometry

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Neutronics

Neutronics to Thermal Hydraulics

Thermal Hydraulics

Thermal Hydraulics to Neutronics

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Newton's Method

Krylov Subspace Methods

Generalized Minimal RESidual Method

Inexact Newton's Method

Jacobian-Free Approximation

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