Power Uprates

GE BWR/4 Technology Course
R-504B – 4.11

Objectives

1. Define Licensed Thermal Power and recognized how it is measured

2. Identify the three different types of Power Uprates.

Objectives

3. Recognize the major design considerations that must be reevaluated when applying for a power uprate including reduction in safety and operating margins.
4. Identify the components in a typical BWR design that can limit the amount of a power uprate.

Purpose

- To increase the power output of a reactor and therefore increase the amount of power supplied to the grid.

Introduction

- License sets limit
  - Maximum thermal power output
    - Licensed Thermal Power– defined in license and can be found in the front of the plants Technical Specifications
    - Defined as - The maximum total allowed reactor core heat transfer rate to the reactor coolant
    - Calculated using Calorimetric
- A License Amendment Request (LAR) requiring NRC approval is needed.

Types

1. Measurement Uncertainty Recapture
2. Stretch
3. Extended

Measurement Uncertainty Recapture

- < 2% of RTP
- Obtained by using improved calculation techniques
  - Improved measurement devices for feed flow and other calorimetric parameters
  - More precise measurement reduces uncertainty in calculations

Stretch

- 2% - 7% RTP
- Involve changes to instrumentation settings allowing operation closer to design margin
- No major plant modifications

Extended Power Uprate

- Up to 20%

- Significant plant modifications
  - Motors, Generators, Turbines, Transformers, Condensate Pumps, Steam Dryers etc..

Discussion

- How
  - Use more new fuel
  - Higher enrichment

- This results in higher steam flows, feed & condensate flows, electrical requirements, etc..

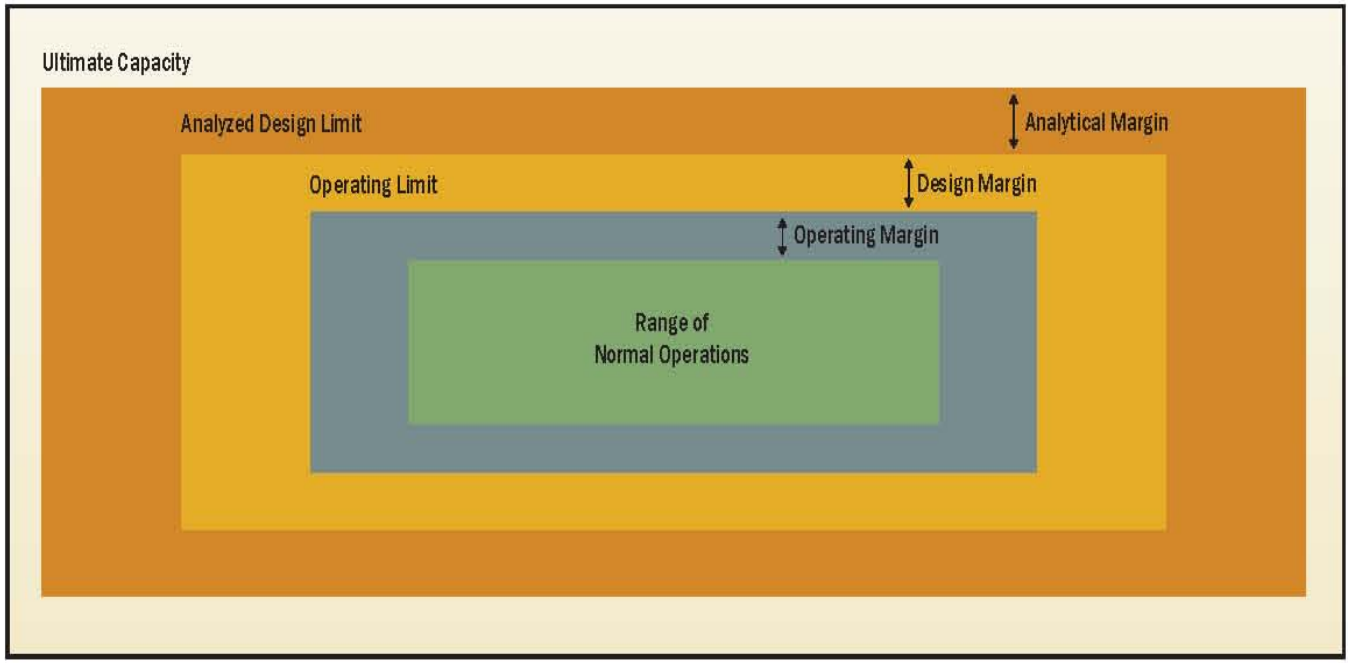
Equipment

May need to replace

- HP and LP turbines (replacement)
- Main and auxiliary generators (upgrades)
- Transformers (replacement)
- Feedwater heaters (replacement)
- Steam Dryers
- Pumps and motors (feedwater, condensate, heater drains, component cooling water)
- Spent fuel pool cooling heat exchangers
- Moisture Separator Reheaters
- Condenser and/or cooling tower (upgrades)
- Water treatment system (upgrades)

Margin Management

- Safety limits
- Design limits
- Operational limits


Ultimate Capacity
Analyzed Design Limit
Analytical Margin
Operating Limit
Design Margin
Operating Margin
Range of
Normal Operations

Review Process

- License amendment application –IAW 10CFR50.90-92
- May involve the Advisory Committee on Reactor Safeguards (ACRS)
- Licensee request placed in Federal Registry
- Public
  - 30 days to comment, 60 days to request hearing

Application status On-line

- **Information On-line**
- **Pending**
- **Expected**
- **Approved**

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