

B&W Medical Isotope Production System

Meeting with USNRC

February 2, 2010



Agenda

- Introductions and project status
- 10 CFR 50 licensing approach overview
- Application content & technical approach
 - Environmental Report
 - PSAR/FSAR and appendices
- Actions and path forward



Introductions (Representing B&W)

- Evans Reynolds – MIPS Program Manager
- Jack Dillich – Chief Reactor Engineer
- Robert Hogg – Licensing
- Steve Schilthelm – Licensing Lead
- Bob Pierson – Talisman International
- Sy Weiss – Talisman International
- Jack Rosenthal – Talisman International

MIPS Project Status

- Agreement with pharmaceutical partner
 - Initial meeting with FDA
- Cooperative agreement with DOE
 - LANL and ANL supporting R&D
- Completed conceptual engineering design of all systems
- R&D progressing (INVAP, Argonne, AFRRI, Purdue)
- Environmental report being prepared
- Preliminary engineering beginning

Schedule Milestones

- Submit QA program description – April 2010
- Submit environmental report – July 2010
- Submit PSAR – January 2011
- Construction permit – December 2011
- Submit operating license application – March 2012
- Operating license – July 2013

10CFR50 Licensing Approach Overview

Background

Initial B&W Approach (July 2008 Meeting)

- Reactor: 10 CFR 50
 - NUREG 1537 guidance for non-power reactor
- SNM possession and processing: 10CFR70
 - NUREG 1520 guidance for SNM facilities
- Byproduct material: 10CFR30 (agreement state)
- Environmental report
 - NUREG 1555 (tailored for non-power reactor)
- Safety analysis report
 - Content from NUREG 1537 and 1520
- Other licensing documents

October 2009 NRC Direction

- Single license under 10 CFR 50 is acceptable. Technical aspects of the integrated facility to be addressed
- MIPS is a utilization (reactor) and production (remaining portions) facility
- MIPS is non-power reactor to be licensed under Section 103 of the Atomic Energy Act
- MIPS requires both construction authorization and operating license

B&W views this as fully achievable from a process and technical standpoint, in a reasonable timeframe

Overview of Process

- Licensed under Section 103 of Atomic Energy Act
- Single license under 10 CFR 50 that covers entire MIPS facility (non-power reactor and production facility)
- License will incorporate other parts of 10 CFR as necessary (similar to current reactor licenses)
- Two-step process (construction permit approval and operating license approval)

Section 103 License

- 10 CFR 50.22 (Class 103) applies
 - NUREG 1537 for non-power reactor
- Construction permit application
 - Environmental report
 - PSAR and appendices
 - Mandatory hearing
- Operating license application
 - Environmental report
 - FSAR and appendices
 - Opportunity for hearing

Single License Under 10 CFR 50

- Single construction application and subsequent single operating application that addresses the following MIPS processes
 - Fresh fuel (LEU) storage and handling
 - Non-power reactor(s) (utilization facility)
 - Isotope extraction and purification (production facility)
 - Used liquid fuel handling (production facility)
 - Associated operations (e.g., packaging and shipping product, waste solidification, waste storage, etc.)
- Outcome is NRC issuance of a single construction permit and subsequent single operating license for the MIPS facility

MIPS is a relatively small facility that has common and integrated systems; therefore, B&W believes a single, integrated license approach is appropriate.

Incorporation of Other Parts of 10 CFR

- 10 CFR 50 license
 - Production and utilization facilities
 - Materials “produced by reactor or required to operate the reactor” (NUREG 1537)
 - Fresh fuel (LEU) storage and handling
 - Used liquid fuel handling (production facility)
 - Associated operations (e.g., packaging and shipping product, waste solidification, waste storage, etc.)
- May also be a state license for byproduct materials
 - Further discussion necessary with NRC and state
 - B&W believes the integrated nature of the facility supports a single NRC license for all MIPS operations and no state license

Two Step Process

- Traditional process of construction authorization then operating license
- No limited work authorization expected at this time
- Supports accelerated schedule requested by DOE
- Provides for appropriate level of engineering to support applications
- Provides for appropriate level of NRC review when necessary

Overall Concept

Part 50 license for entire facility per NUREG 1537, enhanced by integrated safety assessment tools and concepts described in NUREG 1520 to thoroughly address worker and public safety related to criticality, radiation and chemical hazards, without adopting duplicative administrative processes of Parts other than 10 CFR 50.

Remainder of presentation outlines how B&W intends to efficiently accomplish the concept

Discussion

- Pause presentation to discuss the general process and address any NRC comments or questions

Application Content and Technical Approach

Overview of Application Content

- Construction application
 - Environmental report (early submittal)
 - PSAR and appendices
- Operating application
 - Environmental report update
 - FSAR and appendices

Intend for the PSAR and FSAR to have identical format with different levels of detail in the content, based on what is necessary to perform appropriate safety and safeguards evaluations to authorize construction and subsequently to authorize operation

Environmental Report

- Per 50.30(f) and Subpart A of 10 CFR Part 51 to address construction and operation of MIPS
- Following guidance contained in NUREG 1555 as applied to a non-power reactor developing a comprehensive ER
- Intent of the report is to document the potential environmental impacts of MIPS, and at this time we are not aware of any significant impacts.
- The content will reflect the current level of detail available at this stage of the design
- Bounding consequences for accidents will be provided and discussed

PSAR/FSAR Content

- Key content to address
- Format of PSAR/FSAR
- Incorporation of key content into PSAR/FSAR

PSAR/FSAR Key Content

Highlighted in Blue in Later Slides

- Appropriate design criteria in construction application (Chapter 3)
- Definition of “safety related SSCs” tailored for MIPS (Chapter 3)
- Non-reactor design and accident analysis sections (Chapters 4b & 13b)
- Integrated confinement strategy (Chapter 6)
- Integrated auxiliary systems (Chapter 9)
- Licensed operators for reactors and production facility (App F)
- Technical Specifications for reactors and production facility (App G)

PSAR/FSAR Content

Chapter Number	SAR Chapter Title (Formatted per NUREG 1537)
1	Facility
2	Site Characteristics
3	Design of Structures Systems and Components
4a	Reactor Description
4b	Processing System Description
5	Reactor Coolant Systems
6	Engineered Safety Features
7	Instrumentation and Control Systems
8	Electrical Power Systems
9	Auxiliary Systems
10	Experimental Facilities and Utilization
11	Radiation Protection Program and Waste Management
12	Conduct of Operations
13a	Reactor Accident Analysis
13b	Processing System Accident Analysis
14	Technical Specifications
15	Financial Qualifications
16	Other License Considerations
17	Decommissioning – NA for MIPS
18	HEU to LEU Conversion – NA for MIPS
App A-H	(discussed in detail Later)

PSAR/FSAR Content

Chapter 1

1	Facility	Construction Application Content	Operating Application Content
1.1	Introduction	Content consistent with NUREG 1537 and preliminary design Describe shared facilities, equipment and infrastructure if co-located with another licensed facility and make firm commitments regarding designing to minimize impact to and from other licenses	Content consistent with NUREG 1537 and final design Describe shared facilities, equipment and infrastructure if co-located with another licensed facility and demonstrate throughout FSAR no impact to and from other licenses
1.2	Summary and conclusions on principal safety considerations		
1.3	General description of facility		
1.4	Shared facilities and equipment		
1.5	Comparison with similar facilities		
1.6	Summary of operations		
1.7	Compliance with 1982 NWPA	Preliminary discussion of arrangements being pursued with DOE for disposition of HLW	Reference to and evidence of actual agreements for HLW disposition
1.8	Renewal	NA	NA

PSAR/FSAR Content

Chapter 2

2	Site Characteristics	Construction Application Content	Operating Application Content
2.1	Geography and demography	Content will be similar to what is contained in the environmental report, which will be separately and previously submitted	Content will be similar to what is contained in the updated environmental report, which will be submitted with the FSAR
2.2	Nearby industrial, transportation and military facilities		
2.3	Meteorology		
2.4	Hydrology		
2.5	Geology, seismology, and geotechnical engineering		

PSAR/FSAR Content

Chapter 3

3	Design of Structures Systems and Components	Construction Application Content	Operating Application Content
3.1	Design criteria	Description of the design criteria (per NUREG 1537) to be applied to the MIPS facility in its entirety (reactor and processing). Identification of design criteria to include unique aspects of the processing facility (e.g., additions from 70.64) Include a definition of safety related SSCs that expands definition in 10 CFR 50 to include other appropriate consequence criteria to protect against criticality, co-mingled chemicals and worker exposures	Description of all design criteria applied from the PSAR and the application of the criteria into the final facility design as it relates to facility safety, worker protection, and protection of the public
3.2	Meteorology		
3.3	Water damage		
3.4	Seismic damage		
3.5	Systems and components		
3.6	Research and testing (if necessary)	Describe those safety related structures, systems, or components of the facility, if any, which require research and development per 10 CFR 50.34(a)(8)	Description and evaluation of the results of the R&D programs, including research and development to demonstrate that any safety questions identified at the construction permit stage have been resolved per 10 CFR 50.34(b)(5)

PSAR/FSAR Content

Chapters 4a & 4b

4a	Reactor description	Construction Application Content	Operating Application Content
4a.1	Summary description	Content per NUREG 1537 based on preliminary design	Content per NUREG 1537 based on final design
4a.2	Reactor core		
4a.3	Reactor tank or pool		
4a.4	Biological shield		
4a.5	Nuclear design		
4a.6	Thermal-hydraulic design		
4a.7	Reactor gas management system design		

4b	Processing Systems Description	Construction Application Content	Operating Application Content
4b.1	Extraction system	Description of the non-reactor processing systems based on preliminary design	Description of the non-reactor processing systems based on final design
4b.2	Purification system		
4b.3	Reactor fuel handling		
4b.4	Irradiated SNM handling		

PSAR/FSAR Content

Chapter 5

5	Reactor Coolant Systems	Construction Application Content	Operating Application Content
5.1	Summary description	Content per NUREG 1537 based on preliminary design	Content per NUREG 1537 based on final design
5.2	Primary Coolant System		
5.3	Secondary coolant system		
5.4	Primary Coolant Cleanup System		
5.5	Primary Coolant Makeup Water System		
5.6	N-16 Control system		
5.7	Auxiliary systems Using Primary Coolant		

PSAR/FSAR Content

Chapters 6 & 7

6	Engineered Safety Features	Construction Application Content	Operating Application Content
6.1	Summary description	Content per NUREG 1537 based on preliminary design Description of integrated confinement strategy for reactor and processing system	Content per NUREG 1537 based on final design Description of integrated confinement system for reactor and processing system
6.2	Detailed descriptions		
6.2.1	Confinement		
7	Instrumentation and Control Systems	Construction Application Content	Operating Application Content
7.1	Summary description	Content per NUREG 1537 based on preliminary design	Content per NUREG 1537 based on final design
7.2	Design of I&C systems		
7.3	Reactor control system		
7.4	Reactor protection system		
7.5	Engineered safety feature actuation systems		
7.6	Control console and display instruments		
7.7	Radiation monitoring systems		
7.8	Processing system I&C		

PSAR/FSAR Content

Chapters 8 - 10

8	Electrical Power Systems	Construction Application Content	Operating Application Content
8.1	Normal electrical power systems	Content per NUREG 1537 based on preliminary design	Content per NUREG 1537 based on final design
8.2	Emergency electrical power systems		
9	Auxiliary Systems	Construction Application Content	Operating Application Content
9.1	HVAC systems	Description of auxiliary systems including the integrated nature of these systems regarding the reactor and non-reactor parts of the MIPS facility based on preliminary design	Description of auxiliary systems including the integrated nature of these systems regarding the reactor and non-reactor parts of the MIPS facility based on final design
9.2	Handling and storage of reactor fuel		
9.3	Fire protection systems and programs		
9.4	Communication systems		
9.5	Possession and use of byproduct source and SNM		
9.6	Cover gas control in closed primary coolant systems	Address aspects of byproduct, source and SNM licensing including determinations regarding state license	Address aspects of byproduct, source and SNM licensing including determinations regarding state license
9.7	Other auxiliary systems		
9.9	Combustible gas control		
10	Experimental Facilities and Utilization	Construction Application Content	Operating Application Content
		NA - MIPS has no such facilities	NA - MIPS has no such facilities

PSAR/FSAR Content

Chapters 11 & 12

11	Radiation Protection Program and Waste Management	Construction Application Content	Operating Application Content
11.1	Radiation protection	Preliminary description of the radiation protection program and waste management program	Description of the operational radiation protection program and waste management program
11.2	Radioactive waste management		
12	Conduct of Operations	Construction Application Content	Operating Application Content
12.1	Organization & technical qualification	Description of construction aspects of conduct of operations with a brief overview of the operating aspects	Description of operational aspects of conduct of operations
12.2	Review and audit activities		
12.3	Procedures		
12.4	Required actions		
12.5	Reports		
12.6	Records		
12.7	Emergency planning	Brief discussion of the plan(s) to be developed and submitted and general design concepts and attributes of the facility	Reference appendices
12.8	Security planning		
12.9	Quality assurance program	Reference appendix containing quality assurance program description for design and construction	
12.10	Operator training and qualification	Preliminary summary of how operators will be qualified and licensed according to 10 CFR 55	
12.11	Startup and power ascension plan	Preliminary concepts for startup and power ascension	
12.12	Environmental reports	Previously submitted ER and referenced here	Update of ER with reference here

PSAR/FSAR Content

Chapters 13a, 13b & 14

13a	Reactor Accident Analysis	Construction Application Content	Operating Application Content
13a.1	Accident initiating events and scenarios	General and bounding accident analyses focusing on potential consequences and general protective measures	Detailed accident analyses per NUREG 1537
13a.2	Accident analysis and determination of consequences		
13b	Processing System Accident Analysis	Construction Application Content	Operating Application Content
13b.1	Accident initiating events and scenarios	General and bounding accident analyses focusing more on potential consequences and general protective measures	Accident analysis summary resulting from an integrated safety assessment process similar to NUREG 1520 Chapter 3
13b.2	Accident analysis and determination of consequences		
14	Technical specifications	Construction Application Content	Operating Application Content
		Description of development of TS with reference to TS Appendix G	Description of development of TS with reference to TS Appendix G

PSAR/FSAR Content

Chapters 15 - 18

15	Financial Qualifications	Construction Application Content	Operating Application Content
15.1	Financial ability to construct	Demonstrate financial ability to construct	Demonstrate financial ability to operate and decommission
15.2	Financial ability to operate		
15.3	Financial ability to decommission		
16	Other License considerations	Construction Application Content	Operating Application Content
16.1	Prior use of reactor components	NA	NA
16.2	Medical use of non-power reactors		
16.3	Other considerations	TBD	TBD
17	Decommissioning	Construction Application Content	Operating Application Content
		NA - Financial ability to decommission included in Chapter 15.	NA - Financial ability to decommission included in Chapter 15.
18	HEU to LEU Conversion	Construction Application Content	Operating Application Content
		NA - Only applies to HEU to LEU downgrades	NA - Only applies to HEU to LEU downgrades

PSAR/FSAR Appendices

Appendix Number	SAR Appendix Title
A	Emergency Plan
B	Material Control and Accounting Plan
C	Security Plan(s)
D	SNM Transportation Plan
E	Quality Assurance Program
F	Licensed Operator Training and Qualification Program
G	Technical Specifications
H	Reactor Startup Plan

PSAR/FSAR Content

Appendix A & B

App A	Emergency Plan	Construction Application Content	Operating Application Content
		Not submitted PSAR Chapter 12 will contain preliminary discussion of emergency preparedness.	A detailed emergency plan will be submitted. This plan will be consistent with the concepts of Appendix E to the extent that they apply to a non-power reactor and the hazards of MIPS. If MIPS is co-located on a site that has an existing emergency plan, consideration will be given to creating a consolidated site emergency plan.
App B	MC&A Plan	Construction Application Content	Operating Application Content
		Not submitted PSAR Chapter 12 will contain preliminary discussion of MC&A concepts	A detailed MC&A plan will be submitted in accordance with 10 CFR 74

PSAR/FSAR Content

Appendix C & D

App C	Security Plan(s)	Construction Application Content	Operating Application Content
C.1	Physical security	Not submitted PSAR Chapter 12 will contain preliminary discussion of security as it relates to design and construction May require early submittal of safeguards information program for access to safeguards design requirements	Detailed physical security plans per requirements of 10 CFR 73 and any applicable orders.
C.2	Safeguards contingency		
C.3	Safeguards information		
App D	SNM Transport Plan	Construction Application Content	Operating Application Content
		Not submitted. PSAR Chapter 12 will contain preliminary discussion of SNM transport concepts if necessary	If SNM transport is necessary as part of the MIPS facility, a plan will be submitted.

PSAR/FSAR Content

Appendix E - H

App E	Quality Assurance Program	Construction Application Content	Operating Application Content
		QA program description per ANSI 15.8 (early submittal)	QA program description per ANSI 15.8 for operations
App F	Licensed Operator Training and Qualification Plan	Construction Application Content	Operating Application Content
		Not submitted	
		General concepts of operator training, qualification and licensing will be discussed in Chapter 12 of the PSAR.	Operator licensing plan for reactor and production facility.
App G	Technical Specifications (TS)	Construction Application Content	Operating Application Content
		Identification of items resulting from preliminary safety analysis as probable technical specifications for the facility	Full description of proposed TS
App H	Reactor Startup Plan	Construction Application Content	Operating Application Content
		Not submitted	
		General concepts will be discussed in Chapter 12 of the PSAR.	Detailed plan describing reactor startup

Discussion

- Pause presentation to discuss the PSAR/FSAR approach and address any NRC comments or questions

Actions and Path Forward

For Discussion During Meeting

Process Information

- B&W and NRC alignment on licensing approach presented today
- Alignment on PSAR/FSAR content

For Discussion During Meeting

Technical Information

- Early licensing submittals
 - Environmental report (July 2010)
 - QA program description per ANSI 15.8 (April 2010)
- Early discussions
 - Materials/state licensing
 - Design criteria and safety related SSC definition
 - AHR technical experience
 - Reactor core modeling
 - Security requirements
 - Discuss others NRC believes would make process more efficient

Conclusion

- B&W believes the policy decisions of NRC can be efficiently implemented without rulemaking, exemptions or significant guidance document development
- B&W looks forward to alignment with NRC on the process and technical approach presented today for licensing MIPS
- Time and efficiency are key to standing up a domestic supply of ^{99}Mo using LEU

Thank You

Questions?