



**US-APWR  
Public Meeting  
Design Certification Application Review  
Schedule**

**March 25, 2008  
U.S. Nuclear Regulatory Commission**

# Objectives

- To outline the general design certification review process
- To explain and discuss the US-APWR Design Certification Licensing Review Schedule

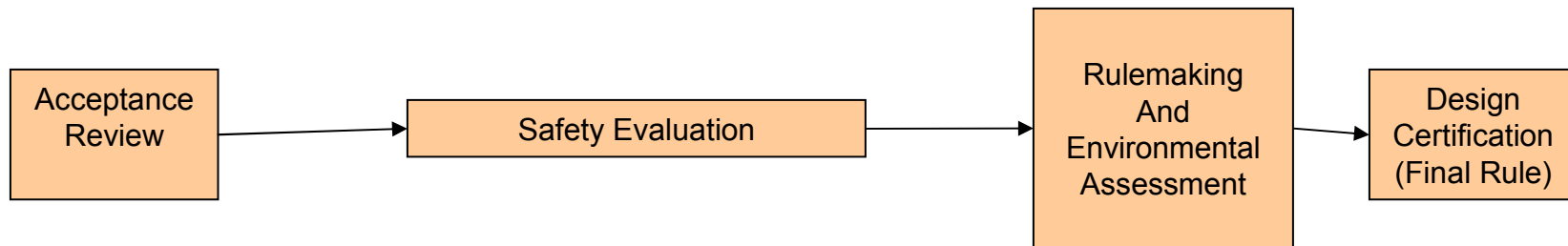


# **Design Certification Review Process**

**Steve Bloom, Chief  
Planning and Scheduling Branch  
U.S. Nuclear Regulatory Commission**

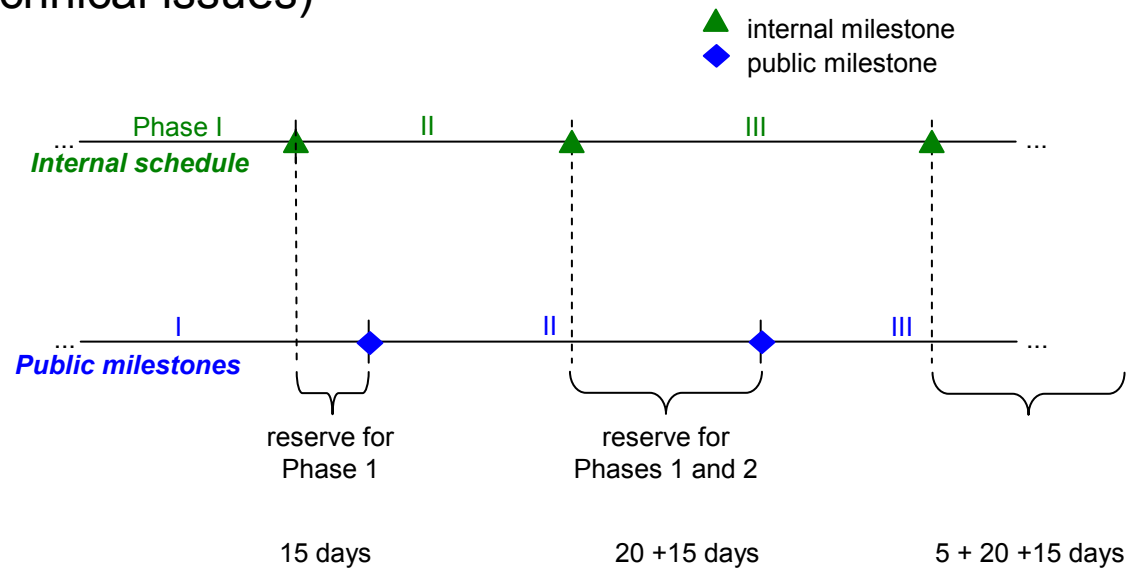
## Licensing Review Process

- NRC's Design Certification review includes:
  - Acceptance Review
  - 6-Phase Safety Review of Design Control Document resulting in Safety Evaluation Report
  - Rulemaking & Environmental Assessment



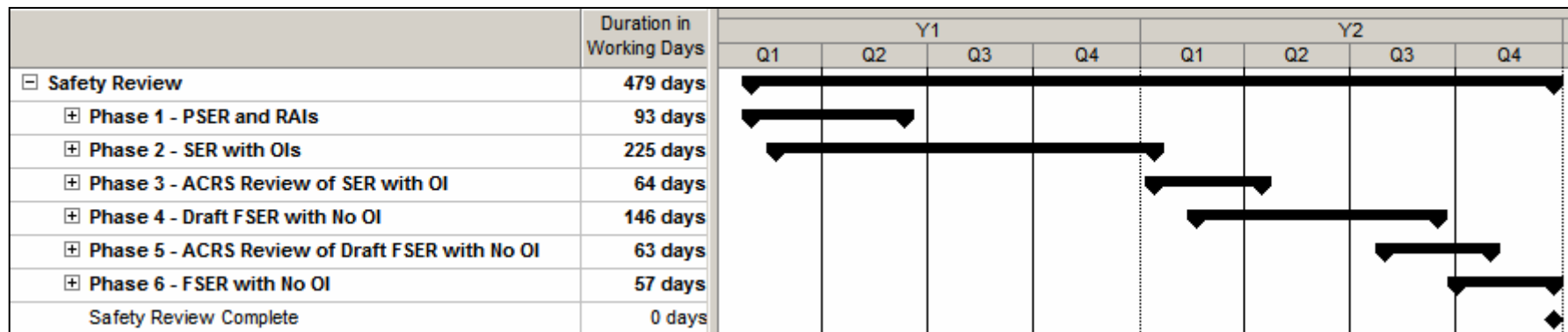
# Managed Reserve

- A designated amount of time to account for parts of the project that can't be predicted
- Nominal amount of management reserve 60 working days (12 weeks)
- Could increase with increased application uncertainty (technical issues)



# Safety Review 6-Phase SER

1. PSER & RAIs
2. SER with Open Items
3. ACRS Meetings (SER with OIs)
4. Advanced FSER, no open items
5. ACRS Meetings
6. FSER



(Note: Durations in this figure differ from nominal durations.)

## **Phase 1 – PSEER and RAIs**

- Begins with start of review
- Ends when all RAIs issued for the chapter
- Includes (for example):
  - Reading Design Control Document
  - Preparing PSEER and RAIs
  - Internal peer reviews and concurrence
  - Interactions with applicant
  - Site audit

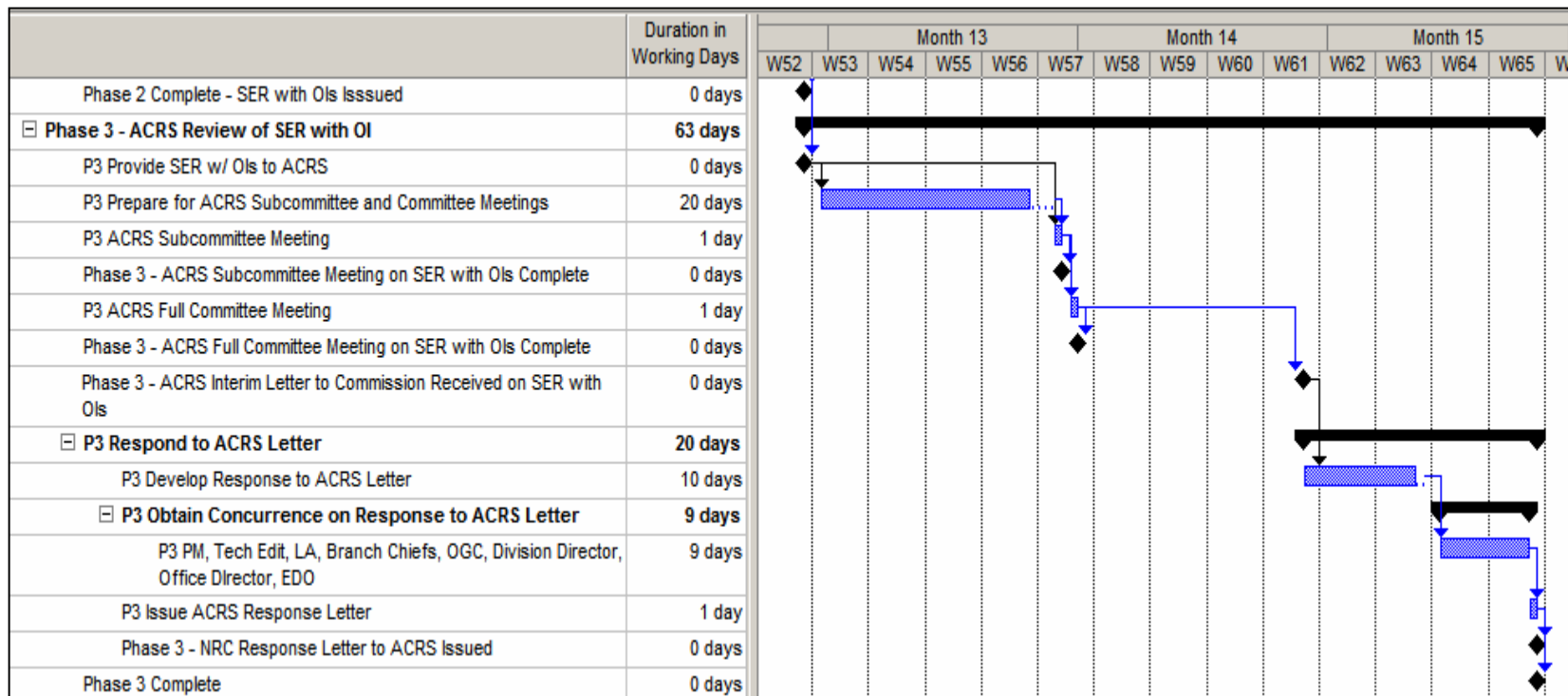
## Phase 2 – SER with Open Items

- Begins with review of RAI responses
- Ends with submission of completion of SER w/OI
  - Includes:
    - Reading responses
    - Preparing SER w/OI input
    - Internal peer reviews and concurrence
    - Interactions with applicant
  - Can be extended – by late RAI responses
  - Staff will evaluate timing of the first ACRS interaction based on the number and complexity of Open Items



## Phase 3 – ACRS Review of SER

- Begins with Issuance of SER w/OI
- Ends with staff response letter to ACRS

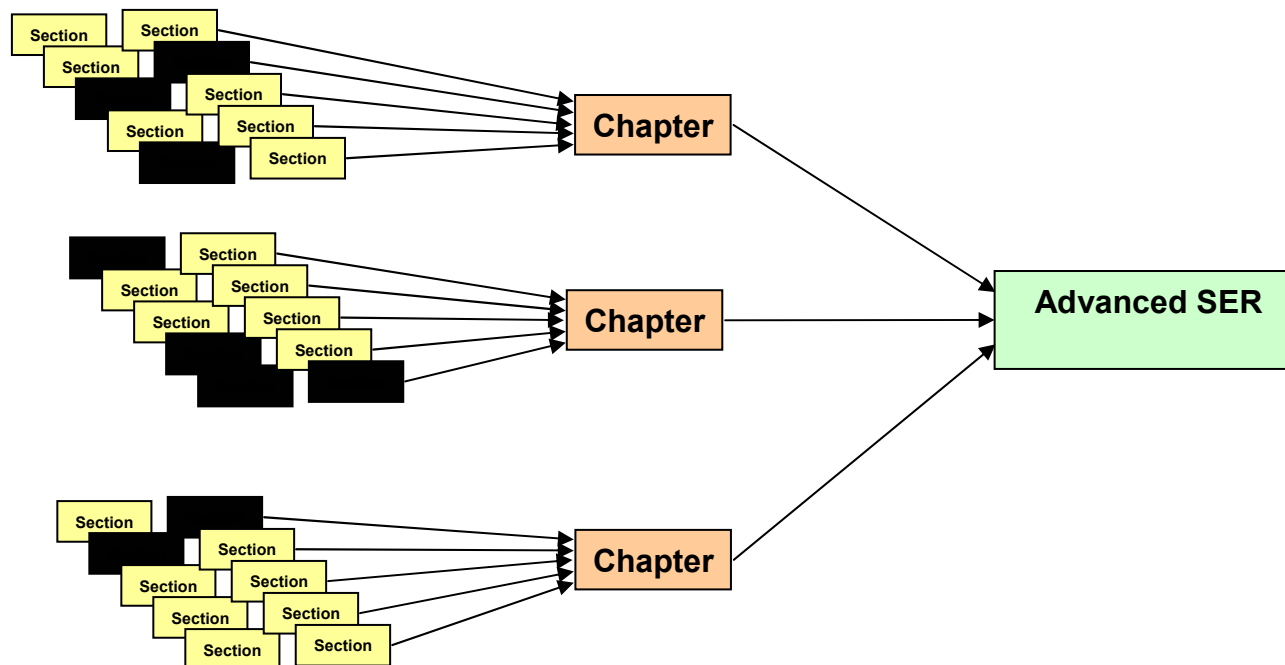


## Phase 4 – Advanced SER

- Begins with receipt of first input from applicant
- Ends with completion of Advanced SER
  - Includes:
    - Reading and evaluating applicant input
    - Interactions with applicant
    - Preparing Draft FSER section
    - Internal peer reviews and concurrence
    - Other activities . . .
- Can be extended – by late applicant responses

## Phase 4 – Advanced SER

- Advanced SER contains no open items
- Resolves identified open items plus issues resulting from ACRS review
- Includes four general sub-phases (similar to SER w/ OI)
  1. Awaiting input from applicant
  2. Resolution of OIs and issues by Technical Reviewer
  3. Chapter completion process
  4. Document completion process
- Work excludes SER chapters and sections without OIs and issues





## Phase 5 – ACRS Review of Advanced SER

- Activities **ARE THE SAME** as ACRS Review of SER w/OI

## Phase 6 – Final SER & Rulemaking

- Final Safety Evaluation Report (FSER)
  - Contains no open items
  - Differs from Advanced SER only in those areas addressed in ACRS review
  - We won't know what these areas are until after ACRS meeting
  - Work in these areas can begin as soon as issues are known
  - Activities occur in 2 sub-phases:
    - ACRS Issue Resolution
    - Document Completion
- Rulemaking
  - Proposed Rule
  - Public Comment Period
  - Final Rule

## Environmental Review

- Environmental Assessment
  - Input is Applicant's Environmental Report
  - Proposed Environmental Assessment referenced in the proposed rule
  - Public comment period
  - Final Environmental Assessment at time of final rule



# **US-APWR Design Certification Review Schedule**

Jeff Ciocco

U.S. Nuclear Regulatory Commission

## **US-APWR Application Status**

- MHI submitted its application for standard design certification of the US-APWR on December 31, 2007.
- The application was docketed on February 29, 2008.
- *A Federal Register* Notice of docketing was issued on March 10, 2008.
- The docket number is 52-021
- NRC will issue a scheduling letter to MHI by March 28, 2008.



# Review Schedule Background

- The application contains the Design Control Document & identifies the approach to replacing proposed design criteria with detailed design information from Technical Reports and Audits
- The application references the 12 Topical Reports and over 35 Technical Reports

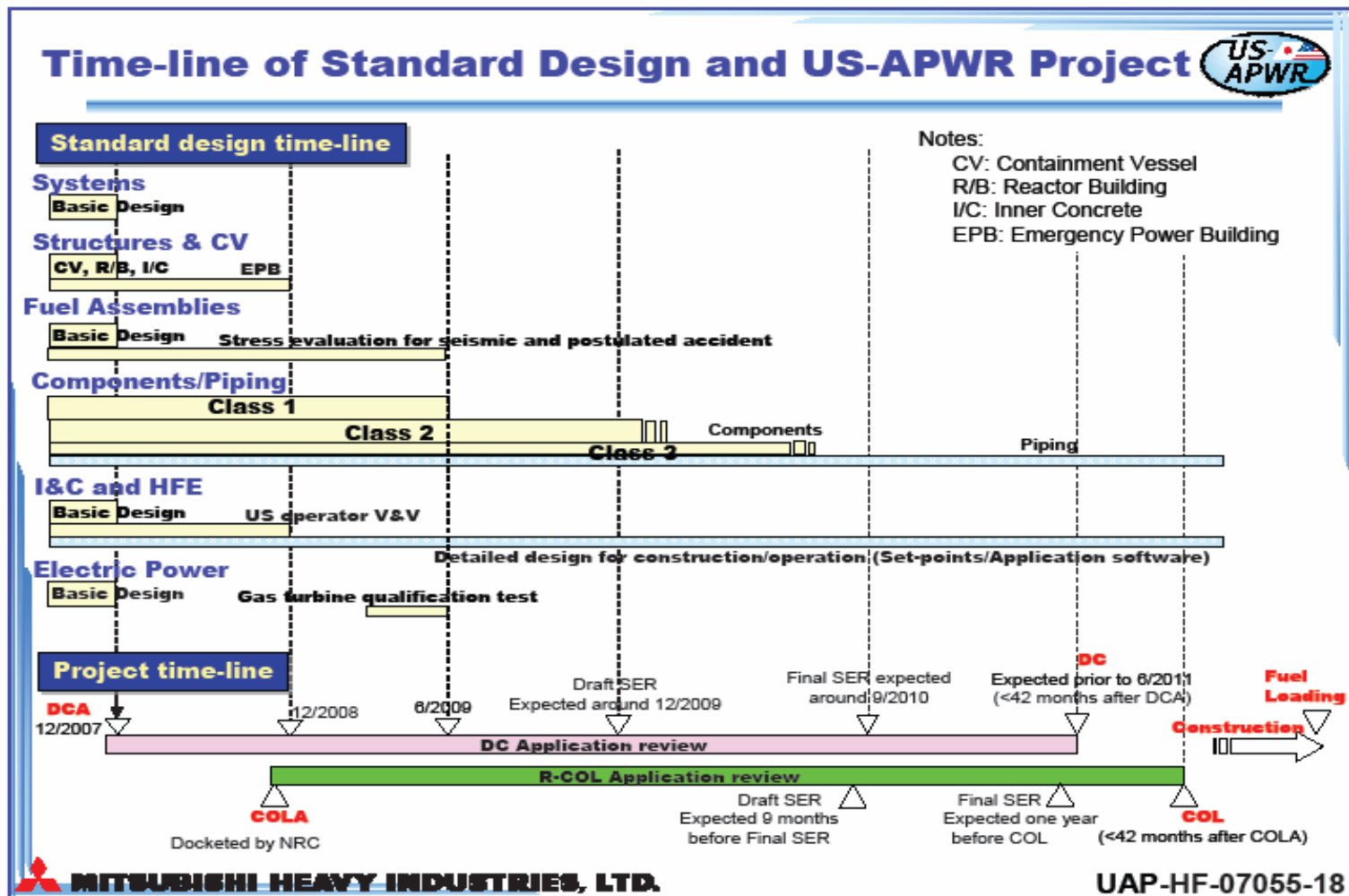
# Inputs That Built The NRC Review Schedule

## US-APWR Standard Design Completion



- **Standard design completion** will be accomplished and verified:
  - ❑ **Topical reports** [during Pre-application review phase]
  - ❑ **DCD with Technical reports** [ Dec. 2007 ]
  - ❑ **Technical reports** [after the DCD submittal]
    - Will contain analyses and other information that supplement the materials included in the DCD and are incorporated by reference therein.
    - Will close DAC (Design ITAAC) for representative examples of ASME class CS, ASME class 1/2 piping and components, Fuel assemblies/RCC, and HFE design
  - ❑ **NRC Audit** [during DCD review phase]
    - Review of activities and documents related to detailed design
    - Will close DAC (Design ITAAC) for remaining ASME class 1 piping and components and new design of ASME class 2 components.
- **Remaining detailed design results** will be verified and/or reconciled during plant construction phase
  - ❑ Close ITAAC for ASME class 2 & 3 piping and components

# MHI's Design Time-Line and Viewpoint on NRC's Review Schedule



# NRC's Assumption-Based Schedule

- Schedule is assumption-based, driven by the inputs and dependencies identified in the application, including the 12 Topical Reports
- Assumptions assess the unknown and become project risks that are managed, make judgments for future actions, & bridge the knowledge gaps
- Assumptions may or not come true
- Overall goal is to minimize Open Items by reviewing the DCD and most Technical Reports, Topical Reports, and Audits in Phases 1 and 2

# Universal Assumptions

- All future submittals will be complete and of high quality
- All future submittals will arrive on or before the committed date
- Topical and Technical report reviews will be successfully completed on schedule with assumed dates
- Schedule allows Mitsubishi to complete the design and get it reviewed (replace proposed design criteria with detailed design information)
- If necessary, the staff will review and re-baseline the review schedule after completion of Phase 2

# Chapters 1 and 2

## Assumptions

### Chapter 1

- Technical Reports submitted
  - US-APWR Reactor Vessel Lower Plenum 1/7 Scale Model Flow Test Report
  - APWR Reactor Internals 1/5 Scale Model Flow Test Report
- Milestones
  - **Phase 1 – 04/08**
  - **Phase 2 – 09/08**

### Chapter 2

- No related topical or technical reports
- Milestones
  - **Phase 1 – 08/08**
  - **Phase 2 – 02/09**

# Chapter 3 Assumptions

- Technical reports submitted
  - Comprehensive Vibration Assessment Program for Reactor Internals
  - Enhanced Information for PS/B Design
- Technical Reports to be submitted
  - Dynamic Analysis of the Coupled RCL-R/B-PCCV-CIS Lumped Mass Stick Model (04/08)
  - Environmental Qualification Plan (12/08)
  - Summary of Design Transient (01/09)
  - Summary of Stress Analysis Results (06/09)
- Audit of Stress Analysis Results of ASME Class 1 and 2 Piping and Components (09/09)
- Milestones
  - **Phase 1 – 03/09**
  - **Phase 2 – 02/10**

# Chapter 4 Assumptions

- Topical Reports submitted
  - Fuel System Design Criteria and Methodology (FSER 10/09)
  - Thermal Design Methodology (FSER 05/09)
  - FINDS: Mitsubishi Fuel Assemblies Seismic Analysis Code (FSER 04/09)
- Technical Reports submitted
  - FMEA of Control Rod Drive Mechanism Control System
  - US-APWR Fuel System Design Evaluation
  - US-APWR Fuel System Design Parameters List
  - Qualification of Nuclear Design Methodology Using PARAGON/ANC
  - Validation of Criticality Safety Methodology
  - US-APWR Incore Power Distribution Evaluation Methodology
- Technical Reports to be submitted
  - Evaluation Results of Structural Response Analysis of US-APWR Fuel System Under Seismic and LOCA (06/09)
- Milestones
  - **Phase 1 – 03/09**
  - **Phase 2 – 01/10**



# Chapter 5 Assumptions

- Technical Reports submitted
  - Structural Analysis for US-APWR Coolant Pump Motor Flywheel
  - Mitsubishi Reload Evaluation Methodology
- Technical Reports to be submitted
  - Summary of Stress Analysis Results (06/09)
- Audit – Stress Analysis Results (06/09)
- Milestones
  - **Phase 1 – 03/09**
  - **Phase 2 – 08/09**

# Chapter 6 Assumptions

- Topical Reports submitted
  - The Advanced Accumulator (FSER 04/09)
  - LOCA Mass and Energy Release Analysis Code Applicability Report for US-APWR (FSER 06/08)
- Technical Reports submitted
  - Subcompartment Analyses for US-APWR Design Confirmation
- Sump Strainer Design and Evaluation
  - Sump Strainer Design Performance (02/08)
  - Additional Design Information (Description of Strainer, Debris Head Loss, Chemical Effects) (09/08)
  - Design Confirmatory Tests
    - Debris Head Loss
      - Test Plan 01/09
      - Audit 03/09
      - Test Results Technical Report 06/09
    - Chemical Effects
      - Test Plan 06/08
      - Audit 11/08
      - Test Results Technical Report 04/09
- Milestones
  - **Phase 1 – 02/10**
  - **Phase 2 – 08/10\***

# Chapter 7 Assumptions

- Topical Reports submitted
  - Safety I&C System Description and Design Process (FSER 02/09)
  - Safety System Digital MELTAC Platform (FSER 02/09)
  - Defense-in-Depth and Diversity (FSER 10/08)
- Technical Reports submitted
  - Defense-in-Depth and Diversity Coping Analysis
  - Software Program Manual
- Technical Reports to be submitted
  - Software Quality Assurance Manual (03/08)
- Milestones
  - **Phase 1 – 02/09**
  - **Phase 2 – 07/09**

# Chapter 8 Assumptions

- Technical Reports submitted
  - Qualification and Test Plan of Class 1E Gas Turbine Generator System
- Milestones
  - **Phase 1 – 07/08**
  - **Phase 2 – 11/08**

## Chapter 9 Assumptions

- Technical Report submitted
  - Criticality Analysis for US-APWR New and Spent Fuel Racks
- Technical Report to be Submitted
  - Mechanical Analyses for US-APWR New and Spent Fuel Racks (03/09)
- Milestones
  - **Phase 1 – 03/09**
  - **Phase 2 – 07/09**

## Chapter 10 Assumptions

- Technical Reports submitted
  - Probability of Missile Generation from Low Pressure Turbine
  - Probabilistic Evaluation of Turbine Valve Test Frequency
- Milestones
  - **Phase 1 – 03/09**
  - **Phase 2 – 07/09**

# Chapters 11 and 12

## Assumptions

- No related topical or technical reports
- Milestones
  - **Phase 1 – 09/08**
  - **Phase 2 – 03/09**

## Chapter 13 Assumptions

- Technical Reports submitted
  - Design Certification Physical Security Element Review
- Technical Reports to be submitted
  - Security Assessment Report – High Assurance Evaluation, Mitigative Measures Evaluation, Cyber Assurance Evaluation (07/08)
  - Evaluation of mitigation of beyond DBT aircraft crash (date TBD)
- All safeguards approvals will be in place
- Milestones
  - **Phase 1 – 10/08**
  - **Phase 2 – 05/09**



# Chapter 14 Assumptions

- No related topical or technical reports
- Milestones
  - **Phase 1 – 10/08**
  - **Phase 2 – 06/09**

# Chapter 15 Assumptions

- Topical Reports submitted
  - Fuel System Design Criteria and Methodology (FSER 10/09)
  - Thermal Design Methodology (FSER 05/09)
  - Non-LOCA Methodology (FSER 05/09)
  - Large Break LOCA Code Applicability Report for US-APWR (FSER 05/09)
  - Small Break LOCA Methodology for US-APWR (FSER 05/09)
- Technical Reports submitted
  - Small Break LOCA Sensitivity Analyses for US-APWR
- Section 15.6.5 – see Sump Strainer Design (Chapter 6)
- Milestones
  - **Phase 1 – 01/10**
  - **Phase 2 – 07/10\***

# Chapters 16 and 17 Assumptions

## Chapter 16

- Topical Reports submitted
  - Safety Instrumentation and Controls System Description and Design Process, (FSER 02/09)
- Technical Reports submitted
  - Mitsubishi Reload Evaluation Methodology
  - Justification for Deviations Between NUREG-1431 Rev. 3.1 and US-APWR Technical Specifications

## Chapter 17

- Topical Report submitted
  - Quality Assurance Program (QAP) Description for Design Certification of the US-APWR (SER 01/08)
- Milestones
  - **Phase 1 – 10/08**
  - **Phase 2 – 05/09 (Ch. 17) and 06/09 (Ch. 16)**

# Chapter 18 Assumptions

- Topical Reports submitted
  - HFE Process and HSI System Design (FSER 09/08)
- Technical Reports to be submitted
  - US Operator Static V&V Results (including HFE analysis results) (12/08)
  - HSI Design (06/09)
  - Both to be reviewed in Phase 4
- Milestones
  - **Phase 1 – 08/08**
  - **Phase 2 – 01/09**

# Chapter 19 Assumptions

- Technical Report submitted
  - Probabilistic Risk Assessment (Level 1)
    - Review completed 11/08
- Technical Report to be submitted
  - Probabilistic Risk Assessment (Level 3) – Environmental Report (03/08)
    - Review completed 02/09
- Other
  - DCWG Meeting on Risk-Managed Tech Specs (04/08)
  - No additional design changes or non-PRA technical issues affecting PRA
- Milestones
  - **Phase 1 – 12/08**
  - **Phase 2 – 08/09**

# US-APWR Review Schedule

## US-APWR DCD Review Schedule Phase Milestones

Task	End date
Phase 1* PSER & RAIs	<b>February 2010</b>
Phase 2* SER with Open Items	<b>December 2010</b>
Phase 3 ACRS Meetings (SER with OIs)	<b>March 2011</b>
Phase 4 Advanced SER, no Open Items	<b>January 2012</b>
Phase 5 ACRS Meetings	<b>April 2012</b>
Phase 6 FSER	<b>June 2012</b>

\* See Gantt Chart handout for additional details

# Summary

- NRC understands the Mitsubishi application and design time-line
- NRC built a schedule which envelops a staff review of most design submittals within Phase 1 and Phase 2 of the safety review
- Allows Mitsubishi to complete the design during the DCD review