TASK WORK PLAN OUTLINE AND CONTENT

CONCEPTUAL DESIGN PHASE FY 09 and 10
NEXT GENERATION NUCLEAR PLANT

Project Title: NGNP with Hydrogen Production Date/Rev: 010/20/08

WBS Title: Conceptual Design Work Plan

WBS Element Code Level: 2.32.EA2.000.P01
Activity: P 01
WEC Team Project Engineer: Doug Vandel

1.0 Description

As part of the ongoing NGNP Conceptual Design work, the need to identify, schedule, and cost the remaining activities that must be completed as part of Conceptual Design has been identified.

To fill this need, the WEC team is tasked to prepare a Conceptual Design Work Plan for all major facilities and systems in their reference design resulting in a prioritized resource-loaded schedule to support FY09 planning and study authorization efforts. The following Conceptual Design Work Plan identifies all remaining activities that must be completed as part of the NGNP Conceptual Design, and the schedule and cost for completing these activities. The activities will consist of prioritized discrete tasks that can be awarded as funding becomes available.

This schedule is based on the development of a NGNP demonstration unit with hydrogen production as defined in the reference design at completion of the preconceptual design phase in the WEC team pre-conceptual design report issued June 2007.

Figure 1 shows the Heat Transport System (HTS) heat balance at the Power Conversion System (PCS) design point, which is the plant condition with the HPS out-of-service. The PCS receives 520 MWt of heat from the SHTS through the steam generator. This heat is the net of 500 MWt heat from the nuclear reaction, less 3 MWt transported through other Nuclear Heat Supply Systems (NHSS), plus 23 MWt added work by the helium circulators. The PCS gross power output is 200 MWe.

When it is operating at design hydrogen production capacity, the HPS receives 50 MWt of heat at a temperature of 900°C at the Secondary Heat Transport System (SHTS) inlet to the Process Coupling Heat Exchanger (PCHX). The HTS heat balance at these conditions is shown in Figure 2.

The schedule also considers that the commercial implementation of the NGNP will be 4 reactor modules coupled to an HPS rated at a nominal 800 MWt with the remaining power available for a single PCS turbine, as described in the PCDR.

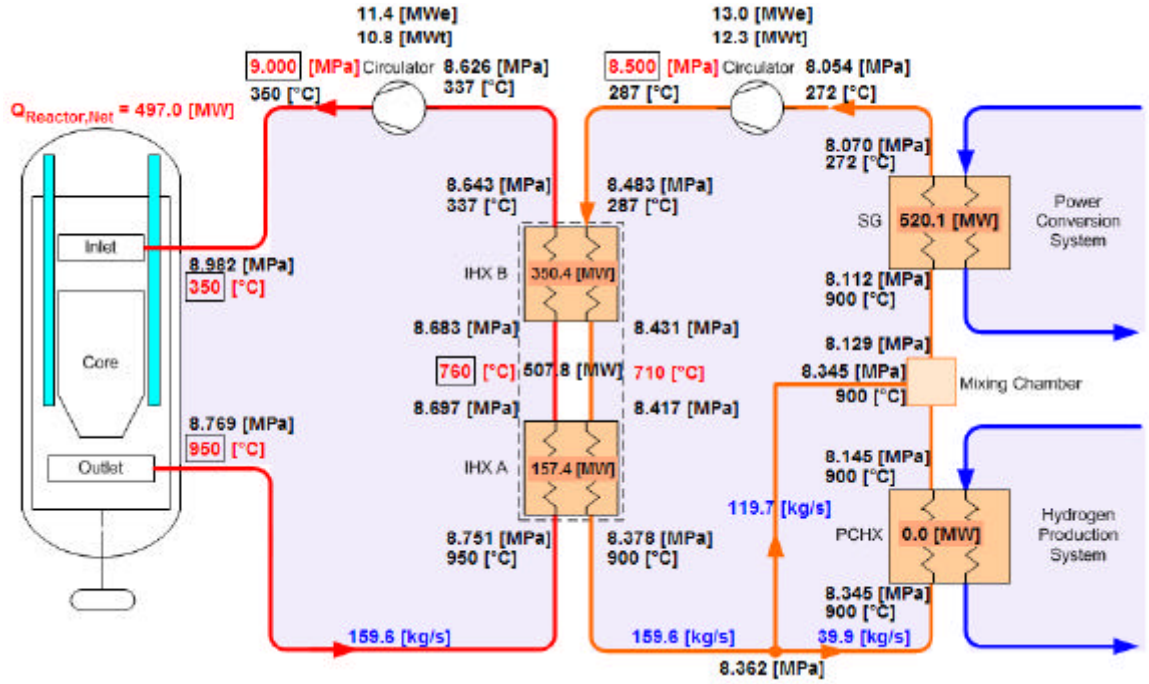


Figure 1: Final Heat Transport System at Full PCS Rated Power at Completion of Pre-conceptual Design

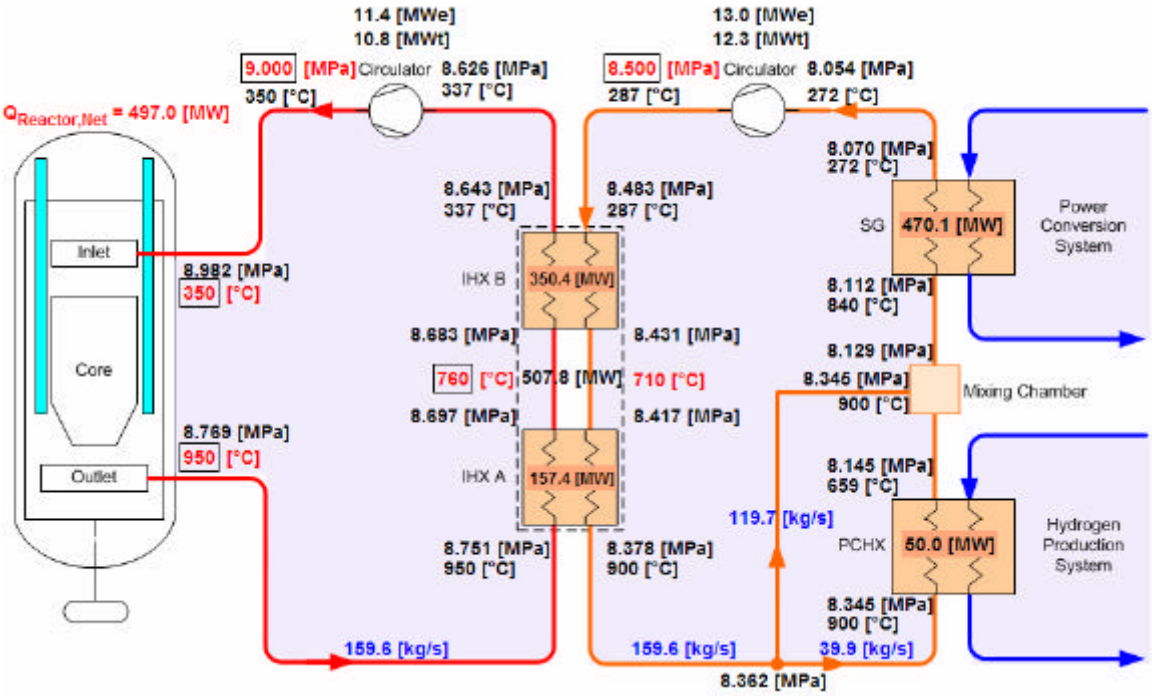


Figure 2: Heat Transport System with HPS at 50 MWt at Completion of Pre-conceptual Design

The work approach is an iterative design process involving interaction between the design team, R&D participants, Licensing, and the integrated safety review team to meet the mission needs as indicated in Figure 3 and 4.

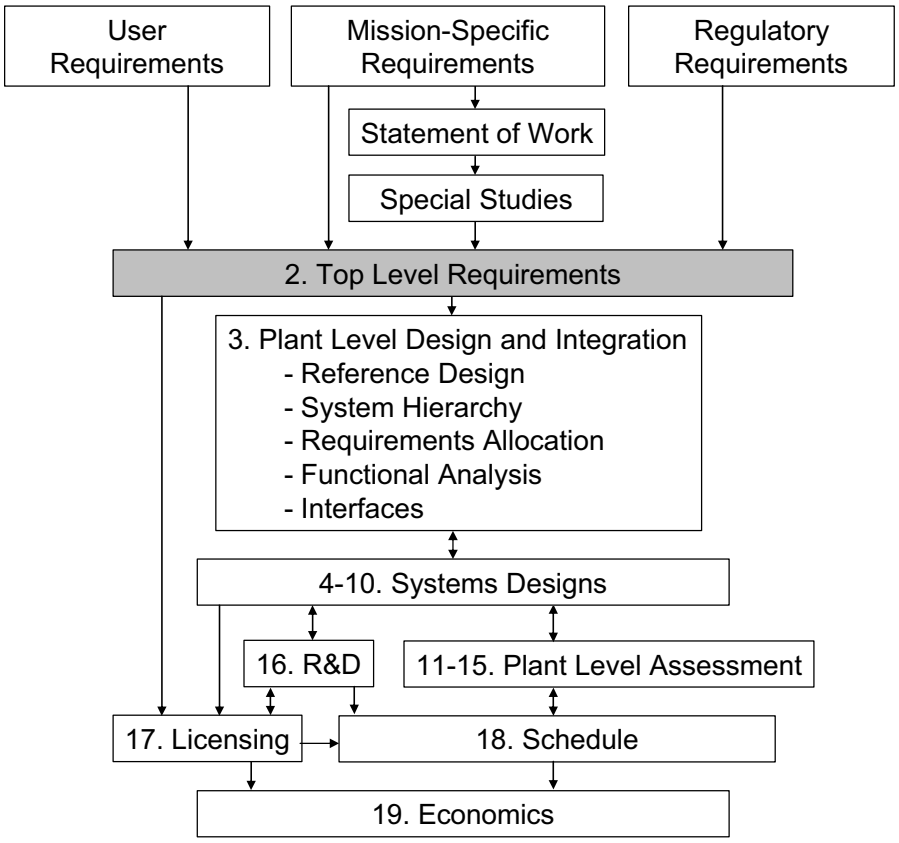


Figure 3: Design Process

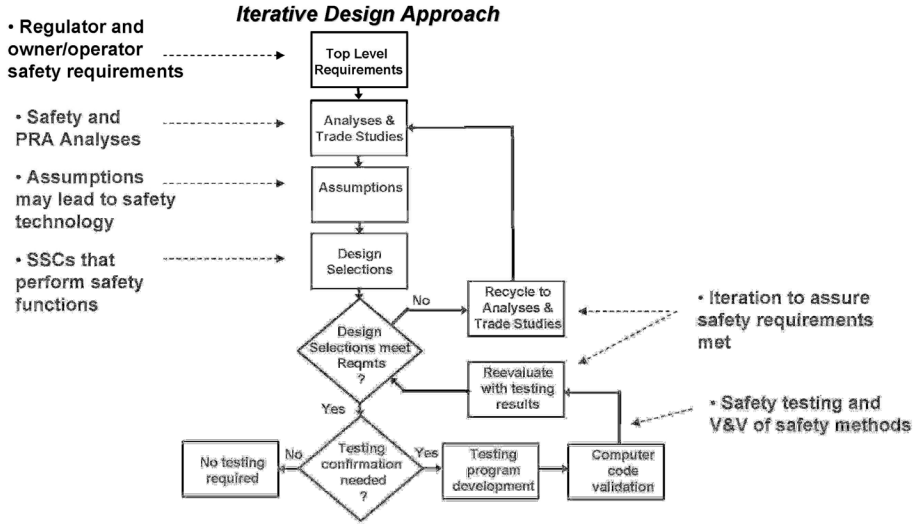


Figure 4: Iterative Design Approach

2.0 Organization and Responsibilities

The conceptual design work plan is organized into eight major Work Breakdown Structure (WBS) elements as follows:

- Programmatic Activities
- Technology Development (Interface only)
- Plant Level design and integration (PLD)
- Overall Site (OS) and Balance of Plant (BOP)
- Nuclear Heat Supply Facility (NHS) (including heat transport systems)
- Power Conversion System Facility (PCS)
- Hydrogen Production System Facility (HPS)
- Licensing and Permitting Activities

2.1 Lead: Shaw (Programmatic, OS and BOP, HPS, and PCS), PBMR(NHS, PLD), M-Tech (Technology Development),WEC (Licensing, Permitting)

3.0 Work approach

3.1 Assumptions

- There are no funding, resource, or schedule constraints.
- The start of the Conceptual Design Phase is October 1, 2008.
- The Pre-Conceptual Design Report (PCDR) serves as the basis and starting point for Conceptual Design. As such, this plan at this time is for the demonstration of hydrogen production and power generation.
- The NGNP reference site is Idaho National Laboratory (INL): however the plant design will be based on an enveloping site.
- Site selection studies are performed by others if required
- The plant is based on a four reactor module design consistent with the PCDR
- The plan is developed as a logical, integrated conceptual design effort, including the iterative systems engineering approach, starting with top level requirements, proceeding through the functional analyses and plant level trade studies and analyses, including a systematic safety analysis. A major assumption in the planning is that there is sufficient design of the NHSS and particularly the reactor system is undertaken to support the plant level assessments and safety analysis.

- High technical risk areas, such as those identified in the PCDR DDNs and PIRT meetings/reports related to the NHSS, is addressed early in FY2009 and reviewed at the end of CD.
- Schedule development includes activities in a logical timed sequence.
- The Conceptual Design Work Plan allows for periodic reviews of the Conceptual Design work.
- DOE Order 413.3A is followed as applicable.
- The NGNP Conceptual Design Phase is completed by September 30, 2010.

3.2 Work Plan Schedule

A detailed resource loaded schedule prepared in Primavera format is included in Section 9.0 of this work plan. Work on conceptual design will commence in the beginning of FY 2009 with a task meeting with BEA to finalize the task plan and schedule. A finalized schedule will be completed to incorporate BEA comments upon notice to proceed. Activities on the schedule are organized by major WBS element. The description of the activities is as follows:

3.3 Programmatic Activities

Programmatic activities comprise preparation and issue of various plans and procedures in the first 2 to 4 months, project management functions throughout the full two year period, the 35, 50 and 90 percent review process including constructability, and Value Engineering reviews, and the preparation and compilation of the conceptual design report in the final 2 to 4 months of the two year conceptual design period.

2.00.PRG.GEN.00 Programmatic Activities (Shaw Lead)

2.00.PRG.GEN.01 Kick off meeting

The Project Team will assemble to review the task scope and confirm contractual requirements. Requirements for resources, and the schedule will be reviewed in detail.

2.00.PRG.GEN.02 Planning Workshop

This effort will review the CDWP and develop detailed working schedules based on the evolving scope and interfaces with ongoing R&D, licensing activities, and other program developments.

2.00.PRG.GEN.03 WBS Dictionary (Deliverable)

Detailed WBS dictionary sheets will be developed for the awarded scope of work.

2.00.PRG.GEN.04 Project Management Plan (Deliverable)

The project management plan will provide organizational direction of all Contractual, Technical and Administrative activities for the project. It will address the relationship for all project team member activities including, final WBS, Responsibility Assignment Matrix, Cost account management, reporting requirements, invoicing requirements, etc.

2.00.PRG.QAP.00 Quality Assurance Plan and Program

It is anticipated that the conceptual design task order will require conformance to ASME NQA-1 2001. These requirements will be passed contractually by WEC to all project team participants.

2.00.PRG.QAP.01 WEC Program QAP (Deliverable)

Effort for WEC to develop a Project QAP to charge each project team participant with responsibility to invoke conforming QA programs procedures.

2.00.PRG.QAP.02 Shaw and WEC Team MPPQ (Deliverable)

Effort for Shaw to invoke, and adapt for project specific use, corporate QA programs and procedures conforming to NQA-1. Also effort to coordinate and develop WEC team project specific QA plans and procedures.

2.00.PRG.QAP.03 PBMR MPPQ (Deliverable)

Effort for PBMR to invoke, and adapt for project specific use, corporate QA programs and procedures conforming to NQA-1.

2.00.PRG.QAP.04 TI MPPQ (Deliverable)

Effort for TI to invoke, and adapt for project specific use, corporate QA programs and procedures conforming to NQA-1.

2.00.PRG.QAP.05 M-Tech MPPQ (Deliverable)

Effort for M-Tech to invoke, and adapt for project specific use, corporate QA programs and procedures conforming to NQA-1.

2.00.PRG.QAP.06 WEC review and approve Sub Contractor Programs

As prime contractor WEC will review and approve all subcontractors' programs.

2.00.PRG.EPP.00 Engineering procedures

2.00.PRG.EPP.01 PBMR Procedures

Effort for PBMR to invoke and adapt for project use engineering procedures and issue in a project manual or intranet web page.

2.00.PRG.EPP.02 Shaw and WEC Team Procedures

Effort for Shaw to invoke, and adapt for project specific use, corporate engineering procedures and issue in a manual or intranet website. Also effort to coordinate and develop WEC team project specific procedures and post to project extranet web page.

2.00.PRG.EPP.03 WEC Procedures

Effort for WEC to invoke and adapt for project use engineering procedures and issue in a project manual or intranet web page.

2.00.PRG.EPP.04 M-Tech Procedures

Effort for M-Tech to invoke and adapt for project use engineering procedures and issue in a project manual or intranet web page.

2.00.PRG.EPP.05 TI procedures

Effort for TI to invoke and adapt for project use engineering procedures and and issue in a project manual or intranet web page.

2.00.PRG.RMP.01 Regulatory Management Plan (Deliverable)

The RMP will identify protocol for interaction with BEA, DOE, and regulatory agencies, including NRC, NEPA, state agencies. It will focus on key regulations, pertaining to the licensing of the NGNP.

2.00.PRG.SEP.01 Systems Engineering Plan (Deliverable)

The SEP will identify the project approach to System Engineering, including a hierarchy of design requirements, work methods, and procedures. It will establish standard nomenclature and tag numbering for systems, structures, and components. It will identify approaches to requirements analysis, functional analysis, trade studies, design, integrated data package development, design review and life cycle analysis. The approaches may vary between the major facilities, due to inherent differences between design cultures in the nuclear power, and chemical process industries.

2.00.PRG.ISP.01 Integrated Safety Analysis Plan (Deliverable)

The ISP will establish the approach to risk informed performance based safety analysis and licensing strategies. It will identify the relationships between preliminary hazard assessments, HAZOPs, Probabilistic Risk Assessments, Failure Modes and effects analyses, Integrated Safety Assessments, etc.

2.00.PRG.FHP.01 Fire Hazard Analysis Plan

The FHP will establish methodology based on NFPA and NRC standards for fire hazard analysis and performance based fire protection. It will identify approaches for establishing fire zoning and maximum permissible fire loading in critical areas of the plant. It will establish protocols for communications with authorities having jurisdiction over fire safety matters. This item will interface with the integrated safety analysis plan.

2.00.PRG.LOE.00 Project Management (LOE)

2.00.PRG.LOE.01 Shaw and WEC Team Project Manager (FT)

Shaw WEC Team Project Manager Full Time

2.00.PRG.LOE.02 Shaw and WEC Team Project Controls (50%)

Part time position to handle Shaw and WEC team schedule and cost controls, reporting to BEA, invoicing, etc.

2.00.PRG.LOE.03 Shaw and WEC Team Document Control (50%)

Part time position to control all issued documents and project correspondence to captured in project records as required by PMP and QAPs.

2.00.PRG.LOE.04 WEC Project Manager(50%)

WEC project manager Part time

2.00.PRG.LOE.05 WEC Project Controls/ Contracts/Document Control(50%)

Part time position to handle WEC and prime contractors responsibilities, and to assist with project document control.

2.00.PRG.LOE.06 PBMR Project Manager(FT)

PBMR project manager part time

2.00.PRG.LOE.07 PBMR Project Controls/Document Control

Part time position to handle PBMR contract responsibilities, and reporting and to assist with project document control.

2.00.PRG.LOE.08 TI Project Manager/ Project Controls/ Document Control(25%)

Part time positions to handle TI contract responsibilities, and reporting and to assist with project document control.

2.00.PRG.LOE.09 M-Tech Project Manager/ Project Controls/ Document Control(25%)

Part time positions to handle M-Tech contract responsibilities, and reporting and to assist with project document control.

2.00.PRG.LOE.10 Shaw Construction Manager(25%)

2.00.PRG.REV.00 Client and Specialty Reviews

The following client reviews are shown of the schedule, effort includes time for preparation of presentation material, travel time and attendance at a location to be named later.

2.00.PRG.REV.01 35 Percent Review

The 35 percent review will focus on the System Requirements Manual, Basis of Design documents, results and conclusions of studies and layout of the facilities.

The documents available for 35 percent review will provide input for the constructability review and Value Engineering workshops.

2.00.PRG.REV.02 50 Percent Review

This will be a status review of products and deliverables at the halfway point in the conceptual design phase.

2.00.PRG.REV.03 90 Percent Review

The 90 percent review will allow the client to see the majority of completed work prior to incorporation in to the Conceptual Design Report. All issues identified in the VE and Constructability review will have been resolved with path forward implemented when applicable..

2.00.PRG.REV.04 Constructability Review

Effort for a team of construction specialists to review the design after the 35 percent review to identify approaches to modularization, construction sequencing, special transportation needs, and other items that can effect the conceptual design configuration.

2.00.PRG.REV.05 Constructability Review report (Deliverable)

Formal report to document the construction review.

2.00.PRG.REV.06 Value Engineering Workshop with 35 percent review

This exercise will immediately follow the 35 percent review and will be facilitated by a representative certified by the Society of American Value Engineers. An independent team of discipline engineers will assemble to conduct the VE review.

2.00.PRG.REV.07 Value Engineering Report (Deliverable)

Formal report to document the value engineering review.

2.00.PRG.EDM.00 EDMS

2.00.PRG.EDM.01 EDMS Plan (CAD, CAE, Doc Control, etc.) (Deliverable)

The EDMS plan will be prepared by a team of representatives from the WEC team member companies. It will review the software capabilities and practices within each organization as well as popular software packages used in the nuclear and process industries. The goal is establish a strategy for selection and implementation of a common software platform to be used by team beginning in the preliminary design phase with continued evolution in the final design and construction phases. The plan will address selection of software, and plans for procurement, implementation, training, validation and verification, and integration of the programs. Items to be addressed in the plan included:

- Electronic Document Management System for file sharing, work flow, and management of project records.
- 2D CAD for schematic design (P&IDs, Schematics, Details, etc.)
- 3D CAD (Piping, Equipment, Structures, Raceway, etc.)
- Engineering Analysis Software
- Master Equipment List
- Procurement management and material tracking
- Configuration Management (Change Control, Requirements Tracking, Control of Items requiring Confirmation)
- Project Controls (Earned Value Management System)

2.00.PRG.EDM.02 EDMS Implementation (CAD, CAE, Doc Control, etc.)

2.00.PRG.EDM.02.01 EDMS Document Control Implementation

Effort for procurement, implementation, testing of selected Document Management System based on EDMS Plan.

2.00.PRG.EDM.02.02 CAD,CAE Implementation

Effort for procurement, implementation, testing of selected CAD and CAE programs. The objective will be to support start of preliminary design beginning with training of production design personnel.

2.00.PRG.SCH.00 Project Schedules

2.00 PRG.SCH.01 Conceptual Integrated Project Schedule (Deliverable)

Based on results from the planning workshop a conceptual integrated project schedule will be developed to show key ties to required R&D and licensing and long lead procurement activities that occur beyond the two year conceptual design phase.

2.00.PRG.SCH.02 Preliminary Design Schedule (Deliverable)

A resource loaded Primavera Schedule of all Preliminary design phase activities, with detail emphasis on the first year of effort.

2.00.PRG.SCH.03 Updated Overall Project Schedule (Deliverable)

Primavera Project Schedule (resource loaded) showing completion of design, long lead procurement, R&D, Licensing, Constructions, Startup and initial operations.

2.00.PRG.ECO.00 Update Project Economics

2.00.PRG.ECO.01 Conceptual Cost Estimate

Capital cost estimate based on conceptual design development for NGNP with Hydrogen Production.

2.00.PRG.ECO.02 Conceptual Life Cycle Economic Analysis (Deliverable)

Updated Economic Model based on Conceptual design development for NGNP with Hydrogen Production.

2.00.PRG.CDR.00 Conceptual Design Report (Deliverable)

The end result of the NGNP Conceptual Design effort will be a Conceptual Design Report. Common elements of the report may include the following as necessary to support the transition from conceptual to preliminary design.

- A description of the recommended alternative (design or characterization) and a synopsis of the development activities.
- A schedule and cost range (or rough order of magnitude cost) including resources necessary to complete the design and preparation activity. Including identified resources necessary for a Project Engineering Design budget request, when required.
- Alternatives analysis including life-cycle costs, operational considerations, site development considerations, relationships to other site activities, and the comparison of alternatives, the risks, and the determined preferred alternative. Life-cycle costs are to include decontamination and decommissioning, transition (personnel and equipment moves), utilities, and maintenance including comparisons that incorporate a review of research and development and/or technology development challenges presented by the selected alternative.
- Preliminary Safeguards and Security Plan

- Performance parameters that are responsive to the mission need
- A preliminary Project Execution Plan to accompany the updated overall project schedule
- The summary test and acceptance criteria
- The Work Breakdown Structure, which identifies the elements of the end product and dictionary
- Assessments of and strategy for:
    - The *National Environmental Policy Act (NEPA).* The level of NEPA documentation required and the plan for completing these documents in support of the proposed project schedule.
    - *Safety*. The level of safety documentation required for the project, and the plan for completing these documents in support of the proposed project schedule. An initial Hazards Assessment and/or Preliminary Safety Analysis.
    - *Security Considerations*.
    - *Site Selection*. The application of a coherent, defensible methodology to identify and evaluate site options.
    - *Waste Management*. Decontamination and decommissioning plans where appropriate and applicable; waste minimization efforts.
- Public and/or stakeholder input
- Preliminary interface control documents
- System requirements and applicable codes and standards for design, procurement, construction, or characterization
- Site selection criteria and site surveys/evaluations
- Anticipated/project products/deliverables (project end-state)
- Known and anticipated project constraints
- Conceptual design drawings/renderings/calculations
- Readiness assessment or readiness review concepts
- A vulnerability assessment
- Documentation of meeting Sustainable Design per DOE O 450.1
- List of Assumptions, including a ranking of in terms of impact to the Work Plan (i.e. High, Medium, or Low)

The Conceptual Design Report will address the items specified in DOE M 413.3-1, as applicable.

2.00.PRG.SSP.01 Safeguards and Security Plan (Deliverable)

The SSP will establish requirements for obtaining and controlling access to safeguards and physical security related information including data on Design Basis

Threats (DBT) and Beyond design basis threats (BDBT). This requires establishing a protocol with the NRC based on an agreed upon "need to know" this information.

2.00.PRG.RSK.01 Risk Management Plan (Deliverable)

The Risk Management Plan will define the process of managing risks throughout the life cycle of the NGNP project, to minimize impact on cost, schedule, construction, and operational performance. The initial Risk Management Plan will be prepared to address elements identified in the project management plan. The plan will be expanded to address risk concerns identified in the integrated Risk Management Program that will be developed by NGNP engineering (focusing on R&D scope and expected to become available in the spring of 2009). The plan incorporates risk handling strategies to facilitate future project task planning including the following activities:

- Identification
- Quantification
- Handling
- Impact Determination
- Reporting
- Tracking

3.4 Technology Development

A prioritization of DDNs, and a reconciliation of the DDNs with the items identified in the NRC Phenomena Identification and Ranking Table (PIRT) Meetings/Reports will be conducted. Details of this effort are also discussed in the technology development for each of the major facilities.

2.22.000 Technology Development (M-Tech Lead)

2.22.PM2.00 Technology Development Management

2.22.PM2.01 Technology Development Project Management

This activity covers the management of the ongoing technology development effort as identified during the CTF Initial Concept Design Special Study, which generates the technology development roadmaps for the SSCs considered to be critical in accordance with the definition provided in section 3 of the PBMR PCDR.

2.22.PM2.02 Tech Dev Progress Report 1 (Deliverable)

This activity covers the status determination and progress reporting of the ongoing technology development effort as per the technology development roadmaps for the SSCs considered to be critical in accordance with the definition provided in section 3 of the PBMR PCDR. This report is scheduled to coincide with the release of the initial updated DDNs from the CD effort (Preliminary design review).

- Output: Tech Dev Progress Report 1.

2.22.PM2.03 Tech Dev Progress Report 2 (Deliverable)

This activity covers the status determination and progress reporting of the ongoing technology development effort as per the technology development roadmaps for the SSCs considered to be critical in accordance with the definition provided in section 3 of the PBMR PCDR. This report is scheduled to coincide with the release of the updated DDNs from the CD effort (Critical design review).

- Output: Tech Dev Progress Report 2.

2.22.TMP.00 Execution of Technology Maturation Plans for Critical SSCs

This activity covers the execution of the technology maturation plans as compiled during the CTF Initial Concept Design Phase 1. Currently these plans are being developed and estimates of work required are not yet available. The following 3 lines have been created to provide a link in the schedules for the activities. Allocations of hours and cost will only be done when the CTF ICD Phase 1 Report is released.

2.22.TMP.01 NHSF

Refer to 2.22.TMP.00 for the task description.

2.22.TMP.02 PCS

Refer to 2.22.TMP.00 for the task description.

2.22.TMP.03 HPS

Refer to 2.22.TMP.00 for the task description.

2.22.TRM.01 Update TDRMs 1 (Deliverable)

This task covers the activity of updating the Technology Development Road Maps as developed during the CTF ICD Phase 1 for the critical SSCs. The input is the progress of the execution of the TMPs as well as the DDNs as identified / updated during the CD effort for the NGNP.

- Output: Updated TDRMs 1.

2.22.TRM.02 Update TDRMs 2 (Deliverable)

This task covers the activity of updating the Technology Development Road Maps as developed during the CTF ICD Phase 1 for the critical SSCs. The input is the progress of the execution of the TMPs as well as the DDNs as identified / updated during the CD effort for the NGNP.

- Output: Updated TDRMs 2.

3.5 Plant Level Design and Integration

2.32.PLD.00 Plant Level Design & Integration (PBMR Lead)

2.32. PLD.01 SRM Update 1 (Deliverable)

This activity covers the update of the System Requirements Manual as a result of the knowledge gained during through the special studies conducted subsequent to the publication of the Pre-Conceptual Design Report. This is necessary to establish the baseline for commencement of the Concept Design Phase.

- Output: Updated SRM.

2.32. PLD.02 Maintain TLR's (Deliverable)

This activity covers the continuous maintenance of the top level requirements of the integrated NGNP, as they are affected and refined by the increasing knowledge of the system through the concept design process.

- Output: TLR database.

2.32.PLD.03 SRM Update 2 (Deliverable)

This activity covers the end-of-phase update of the System Requirements Manual as a result of the developed design and its consequential evolved requirements.

- Output: Updated SRM.

2.32. PLD.04 Preliminary Design Review (Deliverable)

A Preliminary Design Review is scheduled to be held on completion of the initial next-level conceptual design work. This is to ensure that there is alignment within the team and that the design decisions taken up to that point have taken all the necessary considerations into account and that an interim baseline can be established prior to a significant ramp-up in activities.

- Output: Preliminary Design Review Report.

2.32. PLD.05 System Design Review (Deliverable)

A System Design Review is scheduled to be held on completion of Concept Design Phase. This is to ensure that all the intended design and development goals have been achieved and that the there is alignment within the team and that the design decisions taken up to that point have taken all the necessary considerations into account and that a baseline can be established.

- Output: Design Review Report.

2.32. PLD.PSI.00 Preliminary Safety Information

2.32. PLD.PSI.01 Preliminary Safety Information Document Outline (Deliverable)

This activity covers the compilation of a framework for a Preliminary Safety Information Document (PSID) for establishing a basis for early engagement with the regulator.

- Output: Preliminary Safety Information Document Outline.

2.32. PLD.PSI.02 Preliminary Integrated Safety Assessment (Deliverable)

This activity covers the assessment of the design with a view to the verification of the information to be contained in the Preliminary Safety Information Document.

- Output: Preliminary Safety Information Document.

2.32. PLD.PSI.03 Preliminary Safety Information Document (Deliverable)

This activity covers the compilation of the Preliminary Safety Information Document for engagement with the regulator.

- Output: Preliminary Safety Information Document.

2.32. PLD.PSI.04 Host Site Process Safety Guidance Document (Deliverable)

This activity covers the compilation of the Safety Guidance Document, which lists the principle hazards, materials and operations requiring review by the Process Host Site Owner which could potentially impact the design and safety case of the nuclear plant. Using this guidance document, the Process Host would develop a Process Safety Analysis Report to be submitted to the Project Nuclear Safety Lead Engineer for consideration in developing preliminary safety assessments for the project.

- Output: Host Site Process Safety Guidance Document.

2.32. PLD.PSI.04 Long Term Host Site Process Safety Constraints Document (Deliverable)

This activity covers the preparation of a proposed attachment to a long term Host Site Agreement that documents constraints imposed on the Host Site Owner during the life of the Nuclear Operating License. Process Safety Constraints are limitations to the addition or modification of facilities, materials and operations that could impact the long term viability of the Nuclear Operating License, based on an analysis of potential safety vulnerabilities of the nuclear plant.

- Output: Long Term Host Site Process Safety Constraints Document.

2.32. PLD.06 HAZOPs (Deliverable)

A Hazard and Operability Assessment is to be performed of all the Major SSCs. This task is to be performed at Plant level in order to assess the operator safety and effectiveness aspect of operating the plant. This assessment serves as a fundamental input into the next phase design as well as the critical design review.

- Output: HAZOP Report.

2.32. PLD.PRA.00 Probabilistic Risk Assessment (PRA)

The scope of work for the USDC PRA is organized into the following six major tasks and subtasks. These tasks cover the full PRA scope as defined in the USDC white paper on the PBMR PRA Approach , as well as the PRA associated activities associated with the selection of LBEs as described in the LBE white paper, Safety classification of SSCs and formulation of Regulatory Design Criteria as described in the SSC white

paper, and the risk informed evaluation of defense-in-depth as described in the associated white paper.

2.32. PLD.PRA.01 Internal Events PRA Model

The Internal Events model will be developed from the PBMR DPP PRA models. This involves the following:

- Review DPP PRA Models
- Definition of Modes and States
- Initiating Events Analysis
- Accident Sequence Analysis
- Systems Analysis
- Data Analysis
- Human Reliability Analysis

- Output: Internal Events PRA Model

2.32. PLD.PRA.02 External Events PRA Model

The Internal Events model will be developed from the PBMR DPP PRA models. This involves the following:

- Internal Flooding Analysis
- Internal Fire Analysis
- Seismic Risk Analysis
- Hydrogen Hazards Analysis
- Other External Hazards Analysis
- Preliminary External Events Analysis

- Output: External Events PRA Model

2.32. PLD.PRA.03 Event Consequence Analysis

This activity covers the thermal and fluid flow analysis which covers the definition of the scope of analysis cases and addresses the cases for sequence development and source term development. This is followed up with the source term analysis, radiological dose analysis and the associated chapter 15 safety analysis.

- Output: Chapter 15 Safety Analysis

2.32. PLD.PRA.04 Risk Analysis (Deliverable)

The risk analysis portion of the PRA considers quantification of the event sequence frequency, the integration and interpretation of the risks and the uncertainty and sensitivity analysis.

- Output: PRA Conceptual Design Report

2.32. PLD.PRA.05 Design and Licensing Support and Interfaces

The PRA requires input from- and co-ordination with the Overall Site and NHSS design. This item covers the work required to ensure that the PRA is supplied with the correct baselines or inputs and structured to support the development of the licensing case. Issues considered here are:

- Initial Design and Site Assumptions for PRA
- Preliminary Design and Site Input to PRA

- Conceptual Design and Site Freeze for Final PRA
- Selection of LBEs
  - Initial LBEs for Conceptual Design
  - LBE update based on partial PRA results
  - Preliminary PRA based LBEs
  - Final PRA based LBEs
- Safety Classification of SSCs
- Regulatory Design Criteria
- SSC Reliability and Capability Requirements
- SSC Special Treatment Requirements
- Risk Confirmation of Defense-in-Depth

- Outputs: Inputs to CD report

2.32. PLD.PRA.06 PRA Management Activities

This item covers the effort involved in the PRA project management, including quality control and independent technical reviews.

2.32.PLD.PRT.00 PIRT Assessment

2.32.PLD.PRT.01 Initial PIRT Assessment

The NGNP PIRT report (NUREG/CR-6944, published March 2008) will be reviewed briefly and any general comments related to reconciliation will be provided. The phenomena to be addressed are those in listed in Tables 7 through 11 of Volume 1 of the NGNP PIRT report. Each "high importance, low or medium knowledge" phenomenon in the PIRT will be reviewed and categorized as to whether it is addressed by the ongoing PBMR program or by the NGNP DDNs, assigning one of the following categories to each phenomena:

Addressed, with reference
Expected to be addressed
Not expected to be addressed, with recommendation for resolution.

Notes: Since many of the phenomena in the NGNP PIRT are being addressed in the ongoing PBMR (Pty) Ltd. design and analysis program, the NGNP PIRT will be reconciled against both the NGNP DDNs and the PBMR design and analysis program. This reconciliation will be done to help frame long-lead development and testing requirements for the NGNP in discussions with NRC during pre-application meetings.

The proposed scope of work is intended to be consistent with a high-level reconciliation assessment. If detailed explanations and bases are needed for the reconciliation categorizations to be provided or if BEA wishes to expand the above work summary, the budget and schedule would be affected.

- Output: Tables 7 through 11 of Volume 1 of NUREG/CR-6944, marked-up using the "add-a-note" feature of Adobe Acrobat.

2.32. PLD.PRT.02 Updated PIRT Assessment

This activity addresses the updating of the PIRT analysis as performed at the start of the Conceptual Design Phase. The purpose of this task is to assess the progress being made in addressing the PIRTs through design and to update them accordingly (see **notes**

under 2.32.PLD.07). It will take into account the updated TDRMs, the evolved design as well as the schedule for the completion of the NGNP design and analysis program.

- Output: Tables 7 through 11 of Volume 1 of NUREG/CR-6944, marked-up using the "add-a-note" feature of Adobe Acrobat.

2.32.PLD.SLC.00 System Life Cycle Process & Development Support Strategies

This work element covers the analysis of a variety of fields that affect the systems to be developed, at all levels of plant. The process involves the analysis of the aspects and the compilation of strategy documents which are to establish the PBMR thinking. These are then assimilated and converted into guides, standards and specifications which will be imposed on the designers for mandatory consideration whilst developing their SSCs. The specific strategies and subsequent guides, standards and specifications to be developed will be determined during the course of the conceptual deign phase. Examples of fields under consideration are:

- Safety
- Environmental
- Life Cycle Cost
- Software Development & Qualification
- Corrosion
- Human Factors Engineering
- Security
- Waste Management
- Constructability & Manufacturability
- Codes and Standards
- Commissioning
- Decommissioning
- Etc.

- Outputs:
  - System Life Cycle Process & Development Support Strategies (as applicable)
  - System Life Cycle Process & Development Support Guides, Standards & Specifications (as applicable)

2.32.PLD.PSC.00 Plant Supervisory Control System

A supervisory and control system needs to be considered from an integrated plant perspective. It is understood that the EPS and HPS will affect the operations of the NHSS and visa versa, thus in addition to the control systems to be developed for each of these elements, an overall PSCS needs to be developed.

2.32.PLD.PSC.01 Operating Analysis

For the CD phase of development, the intended operations of the three plant elements needs to be analyzed and understood. This will form the bases of the requirements to be established for the PSC. [This element is a special case of 2.32.PLD.SLC.00]

- Output: Integrated Plant Operating Analysis Report

2.32.PLD.PI.PSC.02 Operating Philosophy

Following the analysis of the plant operations, an operating philosophy is to be developed which will establish the framework for cascading the requirements which will be developed during the Preliminary design phase.

- Output: Integrated Plant Operating Philosophy

2.32. PLD.ILS.00 Integrated Logistics Support System

2.32. PLD.ILS.01 Logistic Support Analysis Requirements (Deliverable)

This activity covers the definition of the aspects of a Logistic Support Analysis to be conducted on the design as it progresses. This is necessary to ensure that the LSA is focused on the factors which most affect the performance of a Nuclear Power Plant and are necessary to manage from the outset.

- Output: Logistic Support Analysis Requirements Report.

2.32. PLD.ILS.02 Logistic Support Analysis (Deliverable)

This activity covers the performance of a Logistic Support Analysis on the design to be delivered. It shall be focused on the areas of logistic support as identified in the Logistic Support Analysis Requirements Document.

- Output: Logistic Support Analysis Report.

2.32. PLD.ILS.03 Logistic Support System Development Specification

This activity covers the compilation of a Logistic Support System Development Specification which will establish and allocate the requirements for Logistic Support to the various logistic elements as derived from the SSCs through the Logistic Support Analysis.

- Output: Logistic Support System Development Specification.

2.32. PLD.TBM.00 Technical Budget Models

2.32. PLD.TBM.01 Economic Life Cycle Model

This activity covers the updating of the economic model for the determination of the life cycle cost of the integrated plant, covering the NGNP Nuclear Heat Supply System, Hydrogen Production System and Electricity Production Systems.

- Output: Economic Life Cycle Model.

2.32. PLD.TBM.02 RAM Model

This activity covers the development of the Reliability, Availability & Maintainability model for the determination of the life cycle capacity factors and managing the reliability allocations in order to balance the Plant and SSC specific reliability to satisfy the requirements of DBE's and LBEs.

- Output: RAM Model.

2.32.PLD.FHA.00 – Fire Hazards Analysis (FHA) Report (Deliverable)

Prepare a preliminary Fire Hazards Analysis to document the specific fire hazards found on the project, the fire protection features proposed to control those hazards, and

the overall adequacy of fire safety for the NGNP project. The FHA consists of a preliminary analysis of the fire hazards, identification of the fire areas, the initial development of design-basis fire scenarios, and anticipated consequences, resulting in a preliminary determination of the adequacy of the facility fire safety features.

3.6 Overall Site & Balance of Plant

2**.32.OSB.FAC.00 - Overall Site and Balance of Plant** (Shaw lead)

2.32.OSB.FAC.00 Studies

2.32.OSB.FAC.01 - Utilities (Deliverable)

This study will identify the utilities needed for the BOP buildings and systems, including water, electricity, sanitary waste, storm water, and fuel. Alternative sources of supply for each utility will be investigated to determine a recommended source of supply. The study will be conducted in conjunction with the utility studies being performed by the other Facilities to ensure consistency of recommendations.

2.32.OSB.FAC.02 - Site Selection

Provide input and technical support for the Site Selection Programmatic activity.

2.32.OSB.FAC.03 - Geotechnical Review

Evaluate the adequacy of available geotechnical data. Collect and develop a data base of available geologic/geotechnical literature and data for the site including: 1991 NPR site investigation, Battelle reports, core logs, laboratory test data, seismic surveys, geologic mapping information, stored rock core, and groundwater studies. Identify data deficiencies..

2.32.OSB.FAC.04 - Geotechnical Site Investigation Data Report (Deliverable)

Develop and implement a conceptual level geotechnical site investigation, to include approximately 20 borings to 200 ft depth, seismic velocity survey, and geotechnical laboratory tests. The investigation is much less extensive than required for a COLA. Prepare a Geotechnical Data Report summarizing the data obtained and the methods that were used to obtain the data. Drill one well approximately 750 ft deep to identify groundwater depth.

Estimated ODCs: Borings, geophysical surveys, geotechnical laboratory testing, groundwater monitoring well : $800,000 not included in section 4 pricing.

2.32.OSB.FAC.05 – Seismicity Review (Deliverable)
Review and evaluate the adequacy of existing seismicity information.

2.32.OSB.FAC.06 - Probabilistic Seismic Hazard Analysis (PSHA) (Deliverable)

If the existing information is not adequate, perform a site-specific seismicity evaluation and prepare a document similar to Section 2.5.2 (vibratory ground motion) and 2.5.3 (surface faulting) of a COLA. The task includes review of LANDSAT and other remote sensing imagery, site trenching/mapping and age dating to document the absence of capable faults at the site.

Estimated ODCs: Trenching/ mapping and age dating: $250, 000 not included in section 4 pricing.

2.32.OSB.FAC.07 – Probabilistic Seismic Hazard Analysis (PSHA)

Review and oversight of contractor performing PSHA.

2.32.OSB.FAC.08 – Water and Waste Water System Study (Deliverable)

Perform a study to optimize the approach to water usage and waste water treatment and disposal based on the plant being zero liquid discharge site, and the large amounts of water needed for the HPS, PCS, and BOP systems.

2.32.OSB.CIV.00 - Civil

2.32.OSB.CIV.01 - CSA Basis of Design (Deliverable)

Prepare an Civil, Structural, Architectural (CSA) Basis of Design (BOD) document that establishes the design requirements for the project CSA activities and systems. The BOD will incorporate regulatory, safety, security, and plant performance requirements into a set of system level of design criteria used to prepare the system calculations, drawings, specifications, and system description documents.

2.32.OSB.CIV.02 - Site Plan (Deliverable)

Prepare a Site Plan showing the topographic data and the general layout of the selected site, access roads, and railroads.

2.32.OSB.CIV.03 - Plot Plan (Deliverable)

Prepare a detailed plot plan of the plant site showing building locations, roads, fences, access control points, and plant boundaries.

2.32.OSB.CIV.04 – Boring Plan (Deliverable)

Prepare a site boring plan detailing the boring information required by the findings of the Geotechnical Report.

2.32.OSB.UTL.00 - Site Utilities

2.32.OSB.UTL.01 – Layouts

Prepare drawings showing utility / building interfaces throughout the plant.

2.32.OSB.UTL.02 - Underground utilities (Deliverable)
Develop drawings for underground utilities, including electric, water, drainage, and fuel piping.

2.32.OSB.UTL.03 - Pipe Racks (Deliverable)

Mechanical/Structural - Prepare drawings of plant pipe rack system showing all piping and structural details.

2.32.OSB.BLD.00 - "BOP Buildings (est. 9-major, 6-minor)"

2.32.OSB.BLD.01 – Building Description Document (Deliverable)

Prepare a description of all of the BOP buildings indicating building function, construction materials, code usage classifications, dimensions, foundation, seismic classification, egress requirements, and other salient features.

2.32.OSB.BLD.02 – Structural

Develop conceptual structural designs for the BOP buildings.

2.32.OSB.BLD.03 - Architectural Arrangement Drawings (Deliverable)

Prepare layout drawings showing all major BOP structures, components, access, egress, and maintenance spaces. Major piping and HVAC equipment will be shown. Updated drawings will be completed at the end of conceptual design to incorporate input from the general arrangement drawings.

2.32.OSB.BLD.04 - Plant arrangement drawings (Deliverable)

Prepare general arrangement drawings showing the layout of the major mechanical equipment and interconnecting piping along with supporting electrical equipment and material handling equipment. Initial studies will be in 2D. Conceptual 3D models will be utilized as needed for study purposes.

2.32.OSB.BLD.05 - Geotechnical / foundations

Develop conceptual designs for BOP building foundations. Includes conceptual excavation support schemes.

2.32.OSB.BLD.06 - Site Utilities

Coordinate individual building utility interfaces with the Utility Site Plan development.

2.32.OSB.ELE.00 - BOP Electrical Systems

2.32.OSB.ELE.01 -Electrical Basis of Design (Deliverable)

Prepare an Electrical Basis of Design (BOD) document that establishes the design requirements for the project electrical systems. The BOD will incorporate regulatory, safety, security, and plant performance requirements into a set of system level of design criteria used to prepare the system calculations, drawings, specifications, and system description documents.

2.32.OSB.ELE.02 System Description Document (SDD)

Prepare the Electrical System Description Document utilizing the input developed in the electrical related subtasks. The SDD will identify the system level functions and requirements as developed in the Electrical Basis of Design and will describe the design features provided to meet those requirements. The SDD will also identify the system's boundary and interface requirements as well as all operating conditions and parameters.

2.32.OSB.ELE.03 – Outline specifications (Deliverable)

Prepare an outline specification for all of the electrical systems and equipment, summarizing the input from the mechanical subtasks. CSI standard specifications will be utilized and augmented by specialties equipment specifications when applicable

2.32.OSB.PWR.00 -Power

2.32.OSB.PWR.01 - Load list

Utilize electrical requirements provided by the process activities and engineering judgment as necessary to create a list of all the electrical loads associated with the BOP, including voltage and amperage required for each item.

2.32.OSB.PWR.02 – Calculations

Using the information in the load list, calculate the size of transformers, substations, switchgear, and MCC's needed for the power distribution system.

2.32.OSB.PWR.03 - One-line (Deliverable)

Prepare a one-line diagram of the power distribution system showing the schematic arrangement of the system and major components.

2.32.OSB.PWR.04 - Equipment selection and layout

Select major equipment based on the results of the calculations, and prepare layout drawings to support the plant arrangement drawings.

2.32.OSB.PWR.05 – SDD input

Summarize the information developed in the calculations, one-line, and equipment selection activities for inclusion in the Electrical SDD.

2.32.OSB.PWR.06 - Distribution schematic / site plan (Deliverable)

Prepare a drawing showing the physical arrangement of the electrical distribution system to support the project site plan.

2.32.OSB.EPS.00 – Essential (stand-by) Power

2.32.OSB.EPS.01 - Load list –

Prepare an Essential Power Load List of those items in the power load list that require essential power.

2.32.OSB.EPS.02 – Calculations *(Typical)*

Calculate the size of the stand-by generator and transfer switch based on the contents of the Essential Power load list.

2.32.OSB.EPS.03 - One-line (Deliverable) *(Typical)*

Prepare a one-line diagram integrating the Essential Power system with the normal power system.

2.32.OSB.EPS.04 - Equipment selection and layout *(Typical)*

Select the stand-by generator and appurtenances and the transfer switch. Develop a layout drawing of this equipment for input to the plan arrangement drawings.

2.32.OSB.EPS.05 - SDD input *(Typical)*

Summarize the information developed in the calculations, one-line, and equipment selection activities for inclusion in the Electrical SDD.

2.32.OSB.COM.00 - Plant Communications

2.32.OSB.COM.01 – Study (Deliverable) *(Typical)*
Perform study to determine preferred plant communication systems.

2.32.OSB.COM.02 – Calculations - (Similar to 2.32.OSB.EPS.02)

2.32.OSB.COM.03 - One-line - (Similar to 2.32.OSB.EPS.03) (Deliverable)

2.32.OSB.COM.04 - Equipment selection and layout – (Similar to 2.32.OSB.EPS.04)

2.32.OSB.COM.05 - SDD input – (Similar to 2.32.OSB.EPS.05)

2.32.OSB.SEC.00 - Security Systems

2.32.OSB.SEC.01 – Study - (Similar to 2.32.OSB.COM.01) (Deliverable)

2.32.OSB.SEC.02 – Calculations - (Similar to 2.32.OSB.EPS.02)

2.32.OSB.SEC.03 - One-line - (Similar to 2.32.OSB.EPS.03) (Deliverable)

2.32.OSB.SEC.04 - Equipment selection and layout - (Similar to 2.32.OSB.EPS.04)

2.32.OSB.SEC.05 - SDD input - (Similar to 2.32.OSB.EPS.05)

2.32.OSB.ICS.00 - Instrumentation & Controls

2.32.OSB.ICS.01 – Studies (Deliverable)
Perform studies to evaluate options for an integrated vs. distributed control system including costs and safety benefits. Determine recommended locations for various system control functions throughout the plant to meet the operational and safety needs of the entire plant

2.32.OSB.ICS.02 - I&C Basis of Design (Deliverable)
Establish design requirements for the I&C systems to be used in system development. (May be incorporated into the electrical BOD document.)

2.32.OSB.ICS.03 - SDD input - (Similar to 2.32.OSB.EPS.05)

2.32.OSB.ICS.04 - Control sequences
Develop several typical control sequences to illustrate detail level of final product.

2.32.OSB.ICS.05 - Logic descriptions
Develop logic descriptions to complement the control sequences developed above.

2.32.OSB.RMS.00 – Radiation Monitoring System

2.32.OSB.RMS.01 – SDD - (Similar to 2.32.OSB.EPS.02) (Deliverable)

2.32.OSB.RMS.02 – Calculations - (Similar to 2.32.OSB.EPS.03)

2.32.OSB.RMS.03 - One-line - (Similar to 2.32.OSB.EPS.04) (Deliverable)

2.32.OSB.RMS.04 – Layout drawings - (Similar to 2.32.OSB.EPS.05)

2.32.OSB.MEC.00 - BOP Mechanical Systems

2.32.OSB.MEC.01 - Mechanical Basis of Design (Deliverable)

Prepare a Mechanical systems Basis of Design (BOD) document that establishes the design requirements for the project BOP mechanical systems. The BOD will incorporate regulatory, safety, security, and plant performance requirements into a set of system level of design criteria used to prepare the system calculations, drawings, specifications, and system description documents.

2.32.OSB.MEC.02 - Outline specifications

Prepare an outline specification for all of the mechanical systems and equipment, summarizing the input from the mechanical subtasks. CSI standard specifications will be utilized and augmented by specialties equipment specifications when applicable.

2.32.OSB.MEC.03 - System Descriptions document (Deliverable)

Prepare the Mechanical System Description Document utilizing the input developed in the mechanical related subtasks. The SDD will identify the system level functions and requirements as developed in the Mechanical Basis of Design and will describe the design features provided to meet those requirements. The SDD will also identify the system's boundary and interface requirements as well as all operating conditions and parameters. A complete list of the major equipment including performance criteria will be included.

2.32.OSB.PWS.00 - Plant Water Systems

2.32.OSB.PWS.01 - Plant Water Balance

Prepare a water balance for the entire plant showing all of the users and demands throughout the plant as well as the disposal points and flows. Include two diagrams showing the normal and maximum demands for each point of use.

2.32.OSB.PWS.02 - System Design Description (Deliverable) *(Typical)*

Prepare the Water System Description Document describing the Well Water, Domestic Water, and Demineralized Water systems. The SDD will identify the system level functions and requirements as developed in the Mechanical Basis of Design and will describe the design features provided to meet those requirements. The SDD will also

identify each subsystem's boundary and interface requirements as well as all operating conditions and parameters. A complete list of the major equipment for each subsystem including performance criteria will be included

2.32.OSB.PWS.03 – Calculations *(Typical)*

Calculations are prepared, reviewed and issued in accordance with project procedures for sizing of all major components to determine flow rates, capacities, temperature and pressure ratings, and major pipe sizes. A single conceptual system level calculation is expected.

2.32.OSB.PWS.04 – UFD (Deliverable) *(Typical)*

Prepare Utility Flow Diagrams showing major components, flow rates, stream temperatures and pressures, capacities, and basic materials of construction.

2.32.OSB.PWS.05 - Equipment selection & layout *(Typical)*

Based on the results of the calculations, select major system components and prepare an arrangement drawing/sketch of the layout for input to the plant arrangement drawings.

2.32.OSB.PWS.06 - Specification input *(Typical)*

Prepare a list of equipment specifications for input to the mechanical outline specification.

2.32.OSB.HVA.00 - BOP HVAC systems

2.32.OSB.HVA.01 - Building systems

Prepare a description of the HVAC systems proposed for each BOP building, including temperature, humidity, ventilation and other design criteria.

2.32.OSB.HVA.02 - Building calculations - (Same as 2.32.OSB.PWS.03)

2.32.OSB.HVA.03 - Equipment select. & layout - (Same as 2.32.OSB.PWS.05)

2.32.OSB.HVA.04 – UFD - (Same as 2.32.OSB.PWS.04) (Deliverable)

2.32.OSB.HVA.05 – SDD - (Same as 2.32.OSB.PWS.02) (Deliverable)

2.32.OSB.CHW.00 - Cooling Water Systems

2.32.OSB.CHW.00 – SDD (Deliverable)

Prepare an SDD for the Cooling Water System including the two subsystems, the Auxiliary Cooling Water System, and the HVAC Chilled Water System

2.32.OSB.CHW.01 – Calculations – (Same as 2.32.OSB.PWS.03)

2.32.OSB.CHW.02 - Equipment select. & layout - (Same as 2.32.OSB.PWS.05)

2.32.OSB.CHW.03 – UFD – (Same as 2.32.OSB.PWS.04) (Deliverable)

2.32.OSB.XST.00 - Aux steam system

2.32.OSB.XST.01 – Calculation - (Same as 2.32.OSB.PWS.03)

2.32.OSB.XST.02 - Equipment selection & layout - (Same as 2.32.OSB.PWS.05)

2.32.OSB.XST.03 – UFD - (Same as 2.32.OSB.PWS.04) (Deliverable)

2.32.OSB.XST.04 – SDD - (Same as 2.32.OSB.PWS.02) (Deliverable)

2.32.OSB.CAG.00 - Compressed Air and Gas systems

2.32.OSB.CAG.01 – SDD (Deliverable)
Prepare a system description document describing the Breathing Air, Plant Air, Instrument Air, and Plant Gas Systems.

2.32.OSB.CAG.02 - Specification list - (Same as 2.32.OSB.PWS.06)

2.32.OSB.CAG.03 – Calculations - (Same as 2.32.OSB.PWS.03)

2.32.OSB.CAG.04 - Equipment selection & layout - (Same as 2.32.OSB.PWS.05)

2.32.OSB.CAG.05- UFD - (Same as 2.32.OSB.PWS.04) (Deliverable)

2.32.OSB.WWS.00 - Wastewater Systems

2.32.OSB.SWS.01 – SDD (Deliverable)
Prepare a system description document describing the Storm Water, Sanitary Sewer, and Process Wastewater systems. (Similar to 2.32.OSB-PWS.02)

2.32.OSB.SWS.02 – Calculation - (Same as 2.32.OSB.PWS.03)

2.32.OSB.SWS.03 - Site piping layout - (Same as 2.32.OSB.PWS.05) (Deliverable)

2.32.OSP.EHS.00 - Equipment Handling

2.32.OSP.EHS.01 – Studies (Deliverable)
Prepare a document detailing the criteria used to select the equipment handling equipment, as well as the specific functional requirements.

2.32.OSP.EHS.02 – SDD (Deliverable)
Prepare a description of the equipment handling equipment and the specific duties performed by each.

2.32.OSB.WHS.00 - Waste Handling

2.32.OSB.WHS.01 – Studies (Deliverable)

Identify the various waste streams in the BOP Facility, and the preferred method of treatment / handling and the ultimate disposition of each.

2.32.OSB.WHS.02 – SDD(Deliverable)

Prepare a description of the methods and equipment used for handling each waste stream

2.32.OSB.MNT.00 - Maintenance

2.32.OSB.MNT.01 – Studies – Site Maintenance Plan (Deliverable)

This document will serve as a basis for detailed design of hot and cold maintenance shops, and for spare parts inventories.

2.32.OSB.MNT.01 – Equipment List

Develop a list of major maintenance equipment

2.32.OSB.LAB.00 - Laboratories

2.32.OSB.LAB.01 – Studies (Deliverable)

Prepare a document that identifies the need and functional requirement for all laboratories in the plant. Include a layout and equipment required for each.

2.32.OSB.LAB.02 – SDD (Deliverable)

Prepare an SDD for the Laboratories identifying the function of each lab, the equipment required, and a layout to be used in developing the architectural drawings. Identify all utility and building interfaces for each lab.

3.7 Nuclear Heat Supply Facility

2.32.NHS.FAC.00 **Nuclear Heat Supply Facility** (PBMR Lead)

2.32.NHS.FAC.01 Analyses & Calculations *(Typical)*

This activity covers the following:

- Requirements analysis – the analysis & decomposition of requirements into tangible technical and functional requirements which includes the measures of performance and system boundaries.
- Functional analysis – the translation of allocated requirements into system functions required to satisfy the higher level requirements and the decomposition of the system functions to lower-level functions that should be satisfied by elements of the system design. As part of this activity, the analysis and trade-studies required in support of this level of design as well as predictions for the next lower level of design are identified.
- Analysis & Trade Studies - A set of analysis and trade studies are performed as necessary in support of the design activities to follow.

2.32.NHS.FAC.02 Design and Layout *(Typical)*

Design - In order to ensure that a satisfactory design from an operational perspective can be derived, the following specific design activities are performed:

- Design for Performance – ensuring that the performance and functional parameters, interfaces are fully embodied for the anticipated life cycle of the SSC. This design work is supported by neutronic, thermal-hydraulic & mechanical analysis.
- Design for Investment Protection – ensuring that the design is able to survive and operate without undue degradation in performance throughout the full spectrum of anticipated operational occurrences. This design work is supported by neutronic, thermal hydraulic & mechanical analysis of anticipated operational occurrences and off-normal events.
- Design for Safety – ensuring that the design is able to satisfy the statutory & regulatory requirements for public and worker safety in the case of a design bases event. This element of the design is supported by neutronic, thermal hydraulic & mechanical analysis of accident conditions.

Layout – the physical arrangement of the SSC and its interfaces is determined, such that the SSC and its next higher assembly can be constructed, operated, maintained and decommissioned while still satisfying the design requirements.

- These activities are performed in the stated order and subsequently iterated to ensure that all three aspects are satisfied before proceeding to the next lower level of decomposition.
- This activity continues in parallel with the development of the lower-level systems to ensure that feedback and guidance is provided to the lower-level systems engineers during their conceptual design activities.
- Outputs:
  - NHSS Functional Breakdown
  - NHSS Functional Flow Block Diagram

- NHSS System Breakdown Structure
- NHSS Layout

2.32.NHS.FAC.03 Draft System Specification *(Typical)*

The compilation of a design specification, appropriate to the level of development, to document the design solution and interfaces. The design specification includes the requirements traceability and allocation matrices, which capture the allocation of functional and performance requirements among the system elements.

- Output: Draft NHSS Development Specification

2.32.NHS.FAC.04 Verified System Specification (Deliverable) *(Typical)*

When the specifications for all the major components and identified with this specification have been developed and are found to be reasonable and achievable, the system specification is adjusted to ensure alignment between the next higher assembly specification and the next lower assembly specifications. When there is alignment, the specification is considered to be verified. The roll-up of DDNs from the various sub-systems is consolidated at this stage.

- Outputs:
  - NHSS Development Specification
  - Updated NHSS DDNs

2.22.NHS.TDC.00 NHSS Technology Development Co-ordination

This activity covers the engineering co-ordination between the evolution of the Nuclear Heat Supply System and the ongoing technology development effort as identified during the CTF Initial Concept Design Special Study, which generates the technology development roadmaps for the SSCs considered to be critical in accordance with the definition provided in section 3 of the PBMR PCDR.

2.32.NHS.RUS.00 Reactor Unit System

2.32.NHS.RUS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 for the task description.

2.32.NHS.RUS.02 Design and Layout

Refer to 2.32.NHS.FAC.02 for the task description.

- Outputs:
  - RU Functional Breakdown
  - RU Functional Flow Block Diagram
  - RU System Breakdown Structure
  - RU Layout

2.32.NHS.RUS.03 Draft System Specification

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Draft RU Development Specification

2.32.NHS.RUS.04 Verified System Specification (Deliverable)

Refer to 2.32.NHS.FAC.04 for the task description.

- Outputs: RU Development Specification

2.32.NHS.RUS.RPV.00 Reactor Pressure Vessel Assembly

2.32.NHS.RUS.RPV.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.RUS.RPV.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Reactor Pressure Vessel Assembly Development Specification

2.32.NHS.RUS.CBA.00 Core Barrel Assembly

2.32.NHS.RUS.CBA.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.RUS.CBA.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Core Barrel Assembly Development Specification

2.32.NHS.RUS.CSC.00 Core Structure Ceramics

2.32.NHS.RUS.CSC.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.RUS.CSC.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Core Structure Ceramics Development Specification

2.32.NHS.RUS.RCS.00 Reactivity Control System

2.32.NHS.RUS.RCS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.RUS.RCS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Reactivity Control System Development Specification

2.32.NHS.RUS.RSS.00 Reserve Shutdown System

2.32.NHS.RUS.RSS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.RUS.RSS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: RSS Development Specification

2.32.NHS.RUS.IDS.00 In-core Delivery System

2.32.NHS.RUS.IDS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.RUS.IDS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: In-core Delivery System Development Specification

2.32.NHS.RUS.RUI.00 RU Instrumentation

2.32.NHS.RUS.RUI.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.RUS.RUI.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: RU Instrumentation Development Specification

2.32.NHS.HTS.00 Heat Transport System (HTS)

2.32.NHS.HTS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 for the task description.

2.32.NHS.HTS.02 Design and Layout

Refer to 2.32.NHS.FAC.02 for the task description.

- Outputs:
  - HTS Functional Breakdown

- HTS Functional Flow Block Diagram
- HTS System Breakdown Structure
- HTS Layout

2.32.NHS.HTS.03 Draft System Specification

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Draft HTS Development Specification

2.32.NHS.HTS.04 Verified System Specification (Deliverable)

Refer to 2.32.NHS.FAC.04 for the task description.

- Output: HTS Development Specification

2.32.NHS.HTS.PPD.00 PHTS Pipes/Ducts

2.32.NHS.HTS.PPD.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.HTS.PPD.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: PHTS Pipes/Ducts Development Specification

2.32.NHS.HTS.PCR.00 PHTS Circulator

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.HTS.PCR.01 Analyses & Calculations

2.32.NHS.HTS.PCR.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: PHTS Circulator Development Specification

2.32.NHS.HTS.HXA.00 HT Intermediate Heat Exchanger (IHX A)

2.32.NHS.HTS.HXA.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.HTS.HXA.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: IHX A Development Specification

2.32.NHS.HTS.HXB.00 IT Intermediate Heat Exchanger (IHX B)

2.32.NHS.HTS.HXB.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.HTS.HXB.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: IHX B Development Specification

2.32.NHS.HTS.POP.00 PHTS Over-Pressure System

2.32.NHS.HTS.POP.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.HTS.POP.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: PHTS Over-Pressure System Development Specification

2.32.NHS.HTS.SPD.00 SHTS Pipes/Ducts

2.32.NHS.HTS.SPD.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.HTS.SPD.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: SHTS Pipes/Ducts Development Specification

2.32.NHS.HTS.SCR.00 SHTS Circulator

2.32.NHS.HTS.SCR.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.HTS.SCR.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: SHTS Circulator Development Specification

2.32.NHS.HTS.SOP.00 SHTS Over-Pressure System

2.32.NHS.HTS.SOP.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.HTS.SOP.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: SHTS Over-Pressure System Development Specification

2.32.NHS.CCS.00 Core Conditioning System (CCS)

2.32.NHS.CCS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 for the task description.

2.32.NHS.CCS.02 Design and Layout

Refer to 2.32.NHS.FAC.02 for the task description.

- Outputs:
  - CCS Functional Breakdown
  - CCS Functional Flow Block Diagram
  - CCS System Breakdown Structure
  - CCS Layout

2.32.NHS.CCS.03 Draft System Specification

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Draft CCS Development Specification

2.32.NHS.CCS.04 Verified System Specification (Deliverable)

Refer to 2.32.NHS.FAC.04 for the task description.

- Outputs: CCS Development Specification

2.32.NHS.CCS.CIR.00 CCS Circulator

2.32.NHS.CCS.CIR.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.CCS.CIR.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: CCS Circulator Development Specification

2.32.NHS.CCS.CHX.00 CCS HX

2.32.NHS.CCS.CHX.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.CCS.CHX.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: CCS HX Development Specification

2.32.NHS.CCS.HGD.00 CCS Hot Gas Pipes/Ducts

2.32.NHS.CCS.HGD.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.CCS.HGD.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: CCS Hot Gas Pipes/Ducts Development Specification

2.32.NHS.HSS.00 Helium Services System (HSS)

2.32.NHS.HSS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 for the task description.

2.32.NHS.HSS.02 Design and Layout

Refer to 2.32.NHS.FAC.02 for the task description.

- Outputs:
  - HSS Functional Breakdown
  - HSS Functional Flow Block Diagram
  - HSS System Breakdown Structure
  - HSS Layout

2.32.NHS.HSS.03 Draft System Specification

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Draft HSS Development Specification

2.32.NHS.HSS.04 Verified System Specification (Deliverable)

Refer to 2.32.NHS.FAC.04 for the task description.

- Outputs: HSS Development Specification

2.32.NHS.HSS.PIC.00 Primary Inventory Control System

2.32.NHS.HSS.PIC.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.HSS.PIC.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Primary Inventory Control System Development Specification

2.32.NHS.HSS.PHP.00 Primary Helium Purification System

2.32.NHS.HSS.PHP.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.HSS.PHP.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Primary Helium Purification System Development Specification

2.32.NHS.HSS.SIC.00 Secondary Inventory Control System

2.32.NHS.HSS.SIC.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.HSS.SIC.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Secondary Inventory Control System Development Specification

2.32.NHS.HSS.PHP.00 Secondary Helium Purification System

2.32.NHS.HSS.SHP.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.HSS.SHP.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Secondary Helium Purification System Development Specification

2.32.NHS.HSS.HMS.00 Helium Make-Up System

2.32.NHS.HSS.HMS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.HSS.HMS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Helium Make-Up System Development Specification

2.32.NHS.FHS.00 Fuel Handling & Storage System (FHSS)

2.32.NHS.FHS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 for the task description.

2.32.NHS.FHS.02 Design and Layout

Refer to 2.32.NHS.FAC.02 for the task description.

- Outputs:
  - FHSS Functional Breakdown
  - FHSS Functional Flow Block Diagram
  - FHSS System Breakdown Structure
  - FHSS Layout

2.32.NHS.FHS.03 Draft System Specification

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Draft FHSS Development Specification

2.32.NHS.FHS.04 Verified System Specification (Deliverable)

Refer to 2.32.NHS.FAC.04 for the task description.

- Outputs: FHSS Verified System Specification

2.32.NHS.FHS.AGS.00 Auxiliary Gas Subsystem

2.32.NHS.FHS.AGS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.FHS.AGS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Auxiliary Gas Subsystem Development Specification

2.32.NHS.FHS.SCS.00 Sphere Conveying Subsystem

2.32.NHS.FHS.SCS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.FHS.SCS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Sphere Conveying Subsystem Development Specification

2.32.NHS.FHS.SDS.00 Sphere Decommissioning Subsystem

2.32.NHS.FHS.SDS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.FHS.SDS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Sphere Decommissioning Subsystem Development Specification

2.32.NHS.FHS.CGS.00 Conveying Gas Subsystem

2.32.NHS.FHS.CGS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.FHS.CGS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Conveying Gas Subsystem Development Specification

2.32.NHS.FHS.FHC.00 Fuel Handling Control System

2.32.NHS.FHS.FHC.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.FHS.FHC.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Fuel Handling Control System Development Specification

2.32.NHS.FHS.BMS.00 Burn-up Measurement System

2.32.NHS.FHS.BMS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.FHS.BMS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Burn-up Measurement System Development Specification

2.32.NHS.FHS.AMS.00 Activity Measurement System

2.32.NHS.FHS.AMS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.FHS.AMS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Activity Measurement System Development Specification

2.32.NHS.FHS.SRS.00 Sphere Replenishment Subsystem

2.32.NHS.FHS.SRS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.FHS.SRS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Sphere Replenishment Subsystem Development Specification

2.32.NHS.FHS.WHS.00 High Level Waste Handling & Storage Subsystem

2.32.NHS.FHS.WHS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.FHS.WHS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: High Level Waste Handling & Storage Subsystem Development Specification

2.32.NHS.FHS.FSS.00 Fuel Storage System

2.32.NHS.FHS.FSS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.FHS.FSS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Fuel Storage System Development Specification

2.32.NHS.FHS.GSS.00 Graphite Spheres Storage Tank

2.32.NHS.FHS.GSS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.FHS.GSS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Graphite Spheres Storage Tank Development Specification

2.32.NHS.FHS.SFS.00 Spent Fuel Storage Tanks

2.32.NHS.FHS.SFS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.FHS.SFS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Spent Fuel Storage Tanks Development Specification

2.32.NHS.FHS.UFS.00 Used Fuel Storage Tank

2.32.NHS.FHS.UFS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.FHS.UFS.02 System Specification(Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Used Fuel Storage Tank Development Specification

2.32.NHS.PBS.00 Pressure Boundary Support Systems

2.32.NHS.PBS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.PBS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Pressure Boundary Support Systems Development Specification

2.32.NHS.RCC.00 Reactor Cavity Cooling System (RCCS)

2.32.NHS.RCC.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.RCC.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: RCCS Development Specification

2.32.NHS.ACS.00 Auxiliary Cooling System (ACS)

2.32.NHS.ACS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.ACS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: ACS Development Specification

2.32.NHS.EPC.00 Equipment Protection Cooling System (EPCS)

2.32.NHS.EPC.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.EPC.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: EPCS Development Specification

2.32.NHS.RBS.00 Reactor Building (RB) System

2.32.NHS.RBS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 for the task description.

2.32.NHS.RUS.02 Design and Layout

Refer to 2.32.NHS.FAC.02 for the task description.

- Outputs:
  - RB Functional Breakdown
  - RB Functional Flow Block Diagram
  - RB System Breakdown Structure
  - RB Layout

2.32.NHS.RBS.02 Draft System Specification

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Draft RB Development Specification

2.32.NHS.RBS.03 Verified System Specification (Deliverable)

Refer to 2.32.NHS.FAC.04 for the task description.

- Outputs:
  - RB Development Specification

2.32.NHS.RBS.CIT.00 Citadel

2.32.NHS.RBS.CIT.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.RBS.CIT.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Citadel Development Specification

2.32.NHS.RBS.RRB.00 Remainder of Reactor Building (RRB)

2.32.NHS.RBS.RRB.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.RBS.RRB.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: RRB Development Specification

2.32.NHS.RBS.PRS.00 Pressure Relief System (PRS)

2.32.NHS.RBS.PRS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.
Refer to 2.32.NHS.FAC.03 for the task description.

- Output: PRS Development Specification

2.32.NHS.RBS.PRS.02 System Specification (Deliverable)

2.32.NHS.RBS.HRB.00 HVAC Reactor Building

2.32.NHS.RBS.HRB.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.RBS.HRB.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: RB HVAC Development Specification

2.32.NHS.EPS.00 NHSF Electric Power Systems (EPS)

2.32.NHS.EPS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.EPS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: NHSF EPS Development Specification

2.32.NHS.AUS.00 Automation System (AS)

2.32.NHS.AUS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 for the task description.

2.32.NHS.AUS.02 Design and Layout

Refer to 2.32.NHS.FAC.02 for the task description.

- Outputs:
  - AS Functional Breakdown
  - AS Functional Flow Block Diagram
  - AS System Breakdown Structure
  - AS Layout

2.32.NHS.AUS.03 Draft System Specification

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Draft AS Development Specification

2.32.NHS.AUS.04 Verified System Specification (Deliverable)

Refer to 2.32.NHS.FAC.04 for the task description.

- Outputs:
  - AS Development Specification

2.32.NHS.AUS.OCS.00 Operational Control System

2.32.NHS.AUS.OCS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.AUS.OCS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: OCS Development Specification

2.32.NHS.AUS.EPS.00 Equipment Protection System

2.32.NHS.AUS.EPS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.AUS.EPS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: EPS Development Specification

2.32.NHS.AUS.RPS.00 Reactor Protection System

2.32.NHS.AUS.RPS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.AUS.RPS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: RPS Development Specification

2.32.NHS.ISD.00 Independent Shut-Down Cabinet (ISDC)

2.32.NHS.ISD.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.ISD.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: ISDC Development Specification

2.32.NHS.WHS.00 Waste Handling System

2.32.NHS.WHS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.WHS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: WHS Development Specification

2.32.NHS.EHS.00 Equipment Handling System (EHS)

2.32.NHS.EHS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.EHS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: EHS Development Specification

2.32.NHS.PLI.00 Primary Loop Initial Clean-Up System (PLICS)

2.32.NHS.PLI.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.PLI.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: PLICS Development Specification

2.32.NHS.PEM.00 Post Event Monitoring & Recovery Room (PEMRR)

2.32.NHS.PEM.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.PEM.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: PEMRR Development Specification

2.32.NHS.SSN.00 Security Systems (Nuclear)

2.32.NHS.SSN.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.SSN.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Security Systems (Nuclear) Development Specification

2.32.NHS.ISS.00 IAEA Safeguard System

2.32.NHS.ISS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.ISS.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: IAEA Safeguard System Development Specification

2.32.NHS.NFS.00 Fuel System

2.32.NHS.NFS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.NFS.02 Draft System Specification

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Draft Fuel System Specification

2.32.NHS.NFS.03 Verified System Specification (Deliverable)

Refer to 2.32.NHS.FAC.04 for the task description.

- Outputs:
  - Fuel System Specification

2.32.NHS.NFS.MGS.00 Machined Graphite Spheres

2.32.NHS.NFS.MGS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.NFS.MGS.02 Item Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: MGS Item Specification

2.32.NHS.NFS.SFS.00 Start-Up Fuel Spheres

2.32.NHS.NFS.SFS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.NFS.SFS.02 Item Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Start-Up Fuel Spheres Item Specification

2.32.NHS.NFS.EFS.00 Equilibrium Fuel Spheres

2.32.NHS.NFS.EFS.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.NFS.EFS.02 Item Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Equilibrium Fuel Spheres Item Specification

2.32.NHS.NFS.FFT.00 Fresh Fuel Transport System

2.32.NHS.NFS.FFT.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.NFS.FFT.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Fresh Fuel Transport System Development Specification

2.32.NHS.NFS.IFT.00 Irradiated Fuel Off-Site Transport System

2.32.NHS.NFS.IFT.01 Analyses & Calculations

Refer to 2.32.NHS.FAC.01 and 2.32.NHS.FAC.02 for the task description.

2.32.NHS.NFS.IFT.02 System Specification (Deliverable)

Refer to 2.32.NHS.FAC.03 for the task description.

- Output: Irradiated Fuel Off-Site Transport System Development Specification

3.8 Power Conversion System Facility

2.32.PCS.FAC.00 Power Conversion System Facility (Shaw Lead)

2.32.PCS.FAC.01 Power Cycle Alternative Selection Study (Deliverable)

Further engineering studies are recommended to optimize the Rankine Cycle configuration and performance in conceptual design. The study will assess costs and performance benefits of more efficient cycles with steam reheat vs. more simple and less costly but less efficient systems. Several alternative PCS variations will also be modeled utilizing Thermoflex ® software and evaluated utilizing Kepner-Tregoe methodology. The objectives of the study are to:

- Confirm and advance the recommendation in the NGNP Pre-Conceptual Design Report for the configuration of the Power Conversion System
- Refine the estimates of performance and cost for the updated and optimized PCS configuration recommended for NGNP
- Identify configurations of the PCS that should be considered for commercial applications including, as a minimum, electric power production, co-generation and support of hydrogen production.

2.32.PCS.FAC.02 Steam Generator Selection Study (Deliverable)

This study will evaluate alternative approaches for the steam generator including more conventional designs (e.g., refractory lined, U tube) compared to the once through helical type SG proposed in the pre-conceptual design. Single vs. multiple trains will be evaluated. The results of the study will establish a path forward for design development of the steam generator. Vessel suppliers such Doosan will be utilized to provide input to this study. The results the trade study will be used prepare the conceptual SG design data package to include updated cost estimate and updated R&D requirements with design data needs (DDNs).

2.32.PCS.FAC.03 PCS Design Basis Transient Study (Deliverable)

An engineering study to identify and analyze transient cases that could effect the design requirements of the PCS with respect to ensuring safety of the Nuclear Heat Supply System (NHSS) and Heat Transport System (HTS). Demonstration cases and commercial configurations will be assessed, to ensure that the NHSS, HTS, and HPS function within the design basis envelopes through the assumed transient conditions.

2.32.PCS.FAC.04 Building Layout Drawings (Deliverable)

Conceptual layout drawings will show all major PCS structures, components, access, egress, and maintenance spaces, based initially on similar facilities typically found in conventional power facilities. Major piping and HVAC equipment will be shown. Initial studies will be in 2D. Conceptual 3D models will be utilized as needed for

study purposes. Updated drawings will be completed at the end of conceptual design to incorporate sized equipment.

2.32.PCS.FAC.05 Cost Estimate Support

This activity is provided to account for estimators and engineering effort to develop a conceptual design cost estimate.

2.32.PCS.FAC.06 Optimized Heat Balance Calculation

A formal calculation will document the optimized power cycle heat balance using Thermoflex ® software. An update will be provided at the end of conceptual design to capture system component attributes obtained from interface with equipment suppliers, and interfaces with NHSS.

2.32.PCS.FAC.07 PCS Basis of Design Document (Deliverable)

The Basis of Design (BOD) document establishes the design requirements for the major PCS systems. The BOD will incorporate regulatory, safety, security, and top level plant performance requirements into a set of system level design criteria used to prepare the system calculations, drawings, specifications, and system description documents. Reference will be made to discipline BODs identified in overall site and balance of plant when applicable.

2.32.PCS.FAC.08 PCS Specification Outline (Deliverable)

A list of specifications for all disciplines will be tabulated. CSI standard specifications will be utilized and augmented by specialties equipment specifications when applicable.

2.32.PCS.FAC.08 PCS Equipment List

A database to capture all equipment attributes identified during Conceptual design including tag numbers in accordance with project procedures.

2.32.PCS.TDC.00 Steam Generator Technology Development Coordination

The steam generator is the only portion of the PCS requiring R&D. This activity covers the engineering co-ordination between the evolution of the Power Conversion System and the ongoing technology development effort as identified during the CTF Initial Concept Design Special Study, which generates the technology development roadmaps for the SSCs considered to be critical in accordance with the definition provided in section 3 of the PBMR PCDR.

2.32.PCS.STG.00 Steam Turbine Generator System

2.32.PCS.STG.01 Calculations *(Typical)*

Calculations are prepared, reviewed and issued in accordance with project procedures for sizing of all major components to determine flow rates, capacities, temperature and pressure ratings, and major pipe sizes. A single conceptual system level calculation is expected for most systems.

2.32.PCS.STG.02 PFDs (Deliverable) *(Typical)*

PFDs are prepared to show major components, flow rates, stream temperatures and pressures, capacities, and basic materials of construction.

2.32.PCS.STG.03 System Description Document (Deliverable) *(Typical)*

The System Description Document utilizes the input developed in other system related subtasks. The SDD identifies the system level requirements and functions as developed in the Basis of Design and describes the systems, structures and components and design features provided to meet those requirements. The SDD will also identify the system's boundary and interface requirements as well as quality assurance levels and all operating conditions and parameters.

2.32.PCS.STG.04 Interface with STG suppliers

Effort to identify and hold initial discussion with potential STG set suppliers, establish scope of supply, obtain operating data and cost data to input to the conceptual design phase cost estimate.

2.32.PCS.STG.05 STG Performance Specification (Deliverable)

The conceptual STG performance specification will capture all technical and quality requirements to enable procurement of STG engineering needed to support preliminary design, and form the initial basis for competitive bidding for long lead components as required to meet the project schedule.

2.32.PCS.STG.06 Air Cooled Condenser Performance Specification (Deliverable)

The conceptual ACC performance specification will capture all technical and quality requirements to enable procurement of ACC engineering needed to support preliminary design, and form the initial basis for competitive bidding for long lead components as required to meet the project schedule.

2.32.PCS.MSS.00 Main Steam System

2.32.PCS.MSS.01 Calculations (Same as 2.32.PCS.STG.01)

2.32.PCS.MSS.02 PFDs (Same as 2.32.PCS.STG.02) (Deliverable)

2.32.PCS.MSS.03 System Description Document (Same as 2.32.PCS.STG.03) (Deliverable)

2.32.PCS.MSS.SG.00 Steam Generator

2.32.PCS.MSS.SG.01 Calculations

Calculations performed to SG set operating and design conditions to support conceptual design. The activity will be support by WEC and a qualified vessel supplier.

2.32.PCS.MSS.SG.02 SG Conceptual Design Package

This will be a SG conceptual design package prepared with support from a qualified vessel supplier focusing on elements required to support advancing of R&D elements.

2.32.PCS.MSS.05 Steam Generator Performance Specification (Deliverable)

The conceptual SG performance specification will capture all technical and quality requirements to enable procurement of SG engineering needed to support preliminary design, and R&D activities and form the initial basis for competitive bidding for long lead components as required to meet the project schedule.

2.32.PCS.FWC.00 Feedwater and Condensate System

2.32.PCS.FWC.01 Calculations (Same as 2.32.PCS.STG.01)

2.32.PCS.FWC.02 PFDs (Same as 2.32.PCS.STG.02) (Deliverable)

2.32.PCS.FWC.03 System Description Document (Same as 2.32.PCS.STG.03) (Deliverable)

2.32.PCS.ICS.00 PCS Instrumentation and Control System

2.32.PCS.STG.01 Block Diagram (Deliverable)

A schematic that shows the architecture of the PCS control system

2.32.PCS.STG.02 PCS Instrument and Equipment List

A database that captures all instruments and major I&C equipment identified during conceptual design.

2.32.PCS.STG.03 System Description Document (Same as 2.32.PCS.STG.03) (Deliverable)

2.32.PCS.EDS.00 Electrical Distribution System

2.32.PCS.EDS.01 Load List

Utilize horsepower requirements provided by the PCS mechanical activities and engineering judgment as necessary to create a list of all the electrical loads including power, voltage and amperage required for each item.

2.32.PCS.EDS.02 Calculations

Using the information in the load list, calculate the size of transformers, substations, switchgear, and MCC's needed for the power distribution system.

2.32.PCS.EDS.03 PCS One Line (Deliverable)

A one-line diagram of the power distribution system showing the schematic arrangement of the system and major components in the PCS and interfaces to the BOP and other facilities if required.

2.32.PCS.EDS.04 System Description Document (Same as 2.32.PCS.STG.03) (Deliverable)

2.32.PCS.WST.00 PCS Water Supply and Treatment System (Condensate Polishing)

2.32.PCS.WST.01 Calculations (Same as 2.32.PCS.STG.01)

2.32.PCS.WST.02 PFDs (Same as 2.32.PCS.STG.02) (Deliverable)

2.32.PCS.WST.03 System Description Document (Same as 2.32.PCS.STG.03) (Deliverable)

2.32.PCS.CCW.00 PCS Component Cooling Water System

2.32.PCS.CCW.01 Calculations (Same as 2.32.PCS.STG.01)

2.32.PCS.CCW.02 PFDs (Same as 2.32.PCS.STG.02) (Deliverable)

2.32.PCS.CCW.03 System Description Document (Same as 2.32.PCS.STG.03) (Deliverable)

2.32.PCS.HVC.00 Turbine Building HVAC

2.32.PCS.HVC.01 Calculations (Same as 2.32.PCS.STG.01)

2.32.PCS.HVC.02 HVAC Schematic (Deliverable)

Schematics are prepared to show major components, flow rates, room temperatures and pressures, and equipment capacities.

2.32.PCS.HVC.03 System Description Document (Same as 2.32.PCS.STG.03) (Deliverable)

2.32.PCS.BLD.00 Turbine Building

2.32.PCS.BLD.01 TB Architectural Drawings (Deliverable)

Architectural drawings based on conceptual layouts showing basic appearance of the buildings.

2.32.PCS.BLD.02 TB Building Description Document (Deliverable)

The Building Description document will describe building functions and requirements, based in input from the basis of design on a room by room basis. It will include occupancy requirements, building classification, access and egress and other life safety features.

3.9 Hydrogen Production System Facility

2.32.HPS.FAC.00 Hydrogen Production System (Shaw Lead)

The Hydrogen Production System Facility conceptual design schedule included here is based upon receiving information in a timely fashion from the affected research organizations. Our current estimates indicate that meeting the conceptual design schedule by the R&D organizations may not be achievable. An alternative approach is to proceed with conceptual design according to this schedule based on the best available information at the time. This will require a modest amount of rework when the confirmed input information becomes available. Otherwise, the Hydrogen Production System Facility conceptual design schedule could be extended by 8 months or more.

2.32.HPS.FAC.01 Basis of Design (Deliverable)

This is the first task to be completed as part of the conceptual design. The purpose of the Basis of Design (BOD) task is to identify and document relevant level requirements that will affect or directly determine or influence the conceptual design effort. These high level requirements will include not only high level project requirements and predetermined plant boundary conditions, but will also include relevant design methodologies, applicable industry codes and standards, safety requirements or other design standards and guidelines to be used. The deliverable developed during this task is a BOD document. Presentation of information in the BOD document shall be organized to mirror subsystem structure of the HPS. This document will be used by the HPS project team as the cornerstone of the design effort.

2.32.HPS.FAC.02 Calculations

The development of calculations will be common to all facets of the HPS design, but the largest effort will be associated with developing the subsystem and component descriptions. It has therefore been identified as a common task occurring throughout the conceptual design effort, with a concentration occurring prior to developing subsystem descriptions. Calculations developed during the project will not be project deliverables and therefore specific calculations have not been identified. Rather the completed calculations will be retained as part of the project record.

2.32.HPS.FAC.03 Block Flow Diagram (Deliverable)

A block flow diagram will be developed for the overall HPS identifying major subsystem equipment and/or components, major process streams, as well as the interrelation and process connections between the various HPS subsystems. The block flow diagram is the precursor to the development of the overall HPS mass and energy balance and the individual subsystem process flow diagrams. The project deliverable associated with this task is an overall block flow diagram for the HPS.

2.32.HPS.FAC.04 Overall Mass and Energy Balance

An overall mass and energy balance will be developed for the HPS. The overall mass and energy balance is a precursor to the individual subsystem mass and energy balances and will be used as the basis for each. The overall mass and energy balance will be revised and updated after completion of the subsystem balances. The mass and energy balance will be developed using Aspen Plus ® software. This task will not produce any project deliverable as such, but rather will be retained as part of the project record. Results of the overall mass and energy balance will be incorporated on the Block Flow Diagram

2.32.HPS.FAC.05 Conceptual Process Hazard Assessment (Deliverable)

A conceptual hazard assessment (PHA) will be carried out by gathering and reviewing the Material Safety Data Sheets (MSDS) of all chemicals expected to be present in the plant as well as the conceptual Block Flow Diagram and Overall Mass and Energy Balance. This study will identify in a general way potential process hazards that ought to be taken into account during the execution of the conceptual design.

2.32.HPS.FAC.06 Utility, Catalyst and Chemical Summary (Deliverable)

In this task the utility, catalyst and chemical initial inventories and usage rates are summarized for use in estimating operating costs. In this brief report information gathered from mass and energy balances, equipment descriptions and equipment lists are gathered into one document for convenience. The Utility, Catalyst and Chemical Summary is a project deliverable.

2.32.HPS.FAC.07 Effluent Summary (Deliverable)

In this task the non-product plant effluents are summarized for use in obtaining environmental permits. The effluent summary at the conceptual design stage is a report that will be used as a guide in subsequent phases. It is not a project deliverable, but will be retained as part of the project record.

2.32.HPS.FAC.08 Safety Interlocks

The safety interlocks constitute the logic incorporated in the Safety Instrumented System (SIS), if required. This task includes a conceptual determination whether an SIS is required, and if so, what the overall logic of such a system might be. This task will not generate a deliverable except for a section in the conceptual design report explaining why an SIS is or is not required. Any logic will be incorporated into the conceptual P&IDs

2.32.HPS.FAC.09 Operating Guidelines

Operating guidelines will be developed in conjunction with the conceptual P&IDs. These outline the logic of startup, shutdown, emergency shutdown and normal operation of the plant. Developing this logic determines whether the design successfully accommodates the expected transitions and points out areas where further development is required. Results are incorporated into the conceptual P&IDs. These guidelines are conceptual in nature and are not expected to be a project deliverable. They will be retained as part of the project record and developed further during Preliminary and Final Design phases.

2.32.HPS.FAC.10 Process Hazards Analysis

After development of the conceptual P&IDs, a hazards analysis based on a "What-if?" methodology is carried out. At later stages (Preliminary, Final, and post-construction) in the design, full HAZOPs analyses can be performed. This analysis may uncover parts of the plant that warrant a more detailed analysis using failure modes and effects analysis (FMEA) methodology. If the initial findings suggest it, these analyses will be carried out. These studies will become part of the project record and will be used as guides for future design and safety analyses. They are not intended to be project deliverables at the conceptual design stage.

The hazards analysis will identify scenarios for hydrogen and other chemical leaks. Based on the conceptual design information and these scenarios, dispersion, deflagration, and detonation studies will be performed employing methods that are consistent with the precision and level of detail of the information available. The results will be reported in a section of the conceptual design report and will be incorporated into the equipment arrangements and plot plan studies

2.32.HPS.FAC.11 Process Supervision

Process supervision includes management of the personnel assigned to the process design team, as well as managing the schedule and budget for the HPS task. It includes reporting to both discipline management and to project management on the progress of the task. In general, review functions are not included in this task, but are included in the individual design tasks.

2.22.HPS.TDC.00 - Technology Development Coordination

This activity covers the engineering co-ordination between the evolution of the Hydrogen Production System and the ongoing technology development effort as identified during the CTF Initial Concept Design Special Study, which generates the technology development roadmaps for the SSCs considered to be critical in accordance with the definition provided in section 3 of the PBMR PCDR.

2.32.HPS.ELE.00 Electrolysis Subsystem

2.32.HPS.ELE.01 Mass and Energy Balance *(Typical)*

An overall mass and energy balance will be developed for the ELE. The mass and energy balance shall be used to size and select proper materials of construction for associated equipment, piping and valves etc... The mass and energy balance will be developed using Aspen Plus ® software. This task will not produce any project deliverable per se, but rather it will be retained as part of the project record. Results of the mass and energy balance will be incorporated on the Process Flow Diagram and P&ID project deliverables, as well as the individual System Design Descriptions for each subsystem, as described below.

2.32.HPS.ELE.02 PFDs & Material/Design Conditions Flow Sheet (Deliverable) *(Typical)*

This task includes the development of a process flow diagram (PFD) and material/design conditions flow sheet for the Electrolysis Subsystem. The PFD shall be based on the project deliverable for the BFD and show a higher level of detail and complexity. The PFD will show process flow streams between system equipment and components, operating temperatures and pressures and major controls, but will not include the level of detail of showing all valves, instruments and control monitoring devices. The material/design conditions flow sheet replaces operating conditions shown on the PFDs with design conditions and indicates the materials of construction for all piping and equipment. The project deliverable associated with this task is a multiple sheet drawing set consisting of a PFD and Material Design Conditions Flow Sheet.

2.32.HPS.ELE.03 System Design Description (Deliverable) *(Typical)*

This task is the development of a System Design Description (SDD) document, a project deliverable. The SDD document will in essence be the engineering and design repository and knowledge base for the design logic and information developed or calculated during the course of the conceptual design effort. Content of the SDD will include descriptions of system level and functional requirements, boundary and interface requirements, quality assurance levels, operational descriptions, conceptual description of instrumentation and control, specific requirements or design bases for major equipment components. For the purposes of the schedule, the overall SDD development effort is broken down into the following subtasks that are considered to be fundamental aspects of the SDD document

Process Descriptions

Major Equipment Descriptions

Equipment List

2.32.HPS.ELE.04 Process & Instrumentation Diagrams (Deliverable) *(Typical)*

This task is the development of conceptual Process and Instrumentation Diagrams (P&IDs). The PFD project deliverables developed during the previous PFD task will be used as a basis for the P&ID development. Further development and refinement of the process flows etc…will occur during this task. Each P&ID shall show process equipment, process valves, control valves and monitoring devices, safety instrument system control and monitoring devices and system interlock matrices, if required. Piping material classes and sizes shall be shown for each line. The project deliverable will be a multiple drawing set of P&IDs.

2.32.HPS.SAD.00 Sulfuric Acid Decomposition Subsystem

2.32.HPS.SAD.01 Mass and Energy Balance

Refer to 2.32.HPS.ELE.01 for the task description.

2.32.HPS.SAD.02 PFDs & Material/Design Conditions Flow Sheet (Deliverable)

Refer to 2.32.HPS.ELE.02 for the task description.

2.32.HPS.SAD.03 System Design Descriptions (Deliverable)
Refer to 2.32.HPS.ELE.03 for the task description.

2.32.HPS.SAD.04 Process & Instrumentation Diagrams (Deliverable)
Refer to 2.32.HPS.ELE.04 for the task description.

2.32.HPS.FUS.00 Feed and Utility Supply Subsystem

2.32.HPS.FUS.01 Mass and Energy Balance
Refer to 2.32.HPS.ELE.01 for the task description.

2.32.HPS.FUS.02 PFDs & Material/Design Conditions Flow Sheet (Deliverable)
Refer to 2.32.HPS.ELE.02 for the task description.

2.32.HPS.FUS.03 System Design Descriptions (Deliverable)
Refer to 2.32.HPS.ELE.03 for the task description.

2.32.HPS.FUS.04 Process & Instrumentation Diagrams (Deliverable)
Refer to 2.32.HPS.ELE.04 for the task description.

2.32.HPS.WTD.00 Waste Treatment and Disposal Subsystem

2.32.HPS.WTD.01 Mass and Energy Balance
Refer to 2.32.HPS.ELE.01 for the task description.

2.32.HPS.WTD.02 PFDs & Material/Design Conditions Flow Sheet (Deliverable)
Refer to 2.32.HPS.ELE.02 for the task description.

2.32.HPS.WTD.03 System Design Descriptions (Deliverable)
Refer to 2.32.HPS.ELE.03 for the task description.

2.32.HPS.WTD.04 Process & Instrumentation Diagrams (Deliverable)
Refer to 2.32.HPS.ELE.04 for the task description.

2.32.HPS.PPS.00 Product Purification Subsystem

2.32.HPS.PPS.01 Mass and Energy Balance
Refer to 2.32.HPS.ELE.01 for the task description.

2.32.HPS.PPS.02 PFDs & Material/Design Conditions Flow Sheet (Deliverable)
Refer to 2.32.HPS.ELE.02 for the task description.

2.32.HPS.PPS.03 System Design Descriptions (Deliverable)
Refer to 2.32.HPS.ELE.03 for the task description.

2.32.HPS.PPS.04 Process & Instrumentation Diagrams (Deliverable)
Refer to 2.32.HPS.ELE.04 for the task description.

2.32.HPS.PDS.00 Product Delivery Subsystem

2.32.HPS.PDS.01 Mass and Energy Balance
Refer to 2.32.HPS.ELE.01 for the task description.

2.32.HPS.PDS.02 PFDs & Material/Design Conditions Flow Sheet (Deliverable)
Refer to 2.32.HPS.ELE.02 for the task description.

2.32.HPS.PDS.03 System Design Descriptions (Deliverable)
Refer to 2.32.HPS.ELE.03 for the task description.

2.32.HPS.PDS.04 Process & Instrumentation Diagrams (Deliverable)
Refer to 2.32.HPS.ELE.04 for the task description.

2.32.HPS.ICS.00 Instrumentation & Controls

2.32.HPS.ICS.01 Instrument Index

Design development associated with instrumentation and controls will be an ongoing task throughout the P&ID development task, albeit an intermittent one, and will be reflected in the final P&ID task deliverables. The primary project deliverable for instrumentation and controls shall be an instrument index listing and cross referencing all instruments and control devices to the final conceptual design P&IDs. For each device on the index, the service, instrument type, location, I/O type, interlock and quantity shall be identified.

2.32.HPS.PMS.00 Piping and Mechanical Studies

2.32.HPS.PMS.01 Conceptual Line Table
This task is concurrent with the P&ID development and includes the compilation of a conceptual line table cross referenced to the P&ID. The line table will contain line number, service or material handled, line size, design pressure, design temperature, maximum temperature for thermal stress, and conceptual line class.

2.32.HPS.PMS.02 Plot Layout (Deliverable)
Conceptual layout drawings will show all major HPS vessels, components, access, egress, and maintenance spaces, based initially on similar facilities typically

found in conventional industrial facilities. Major piping will be shown. Initial studies will be in 2D. Updated drawings will be completed at the end of conceptual design to incorporate sized equipment.

2.32.HPS.PMS.03 Equipment Arrangements

Conceptual arrangements including plot and elevation sketches will be prepared for selected high-temperature or exceptionally large equipment, including auxiliaries. As a minimum, arrangement sketches will be prepared for the sulfuric acid decomposer and the vessel(s) immediately downstream as well as a typical arrangement for the electrolyzers and associated equipment. These conceptual sketches will be a project deliverable.

2.32.HPS.PMS.04 Selected Piping Studies

Piping studies will be carried out as necessary to support the equipment arrangement. The studies will not be a project deliverable, but will become part of the project record for reference in future design work.

2.32.HPS.PMS.05 Conceptual Piping Classifications Index

Based on the material and design conditions determined for each subsystem, this task develops a conceptual piping classifications index for all of the process piping of the various subsystems. The index includes a piping class designation, service description, temperature and pressure service limits, piping material, corrosion allowance and gasket material. Flange rating and facing, valve trim and welding requirements are left for subsequent phases of design. The project deliverable for this task will be a table containing the above information.

3.10 Licensing and Permitting

The WEC team is currently proceeding with a task to develop strategies, specifications and a detailed schedule for the licensing and permitting process, including interactions with the NRC and major milestones that will occur during the preliminary design phase. This schedule will be available for review during the Planning Workshop (2.00.PRG.GEN.02) and development of a conceptual integrated project schedule in the first few months of the conceptual design period. At that time detailed links between the conceptual design effort and the Licensing and permitting process and resource requirements can be established.

Activities expected in the two year conceptual design period are as follows.

2.41.LIC.GEN.00	**Licensing and Permitting(WEC Lead)**
2.41.LIC.GEN.01	Licensing Planning and PM
2.41.LIC.GEN.02	Engineering Topical Reports
2.41.LIC.GEN.03	Engineering Support Meetings
2.41.LIC.GEN.04	Preparation of ESP/LWA Application
2.41.LIC.GEN.05	Preparation of COL Application
2.41.LIC.GEN.06	Legal Support

4.0 Task and activity cost estimates

Task No.	Task Title	Total Hours
3.1	Assumptions	NA
3.2		NA
3.3	Programmatic Activities	52150
3.4	Technology Development	6212
3.5	Plant Level Design and Integration	41930
3.6	Overall Site & Balance of Plant	30966
3.7	Nuclear Heat Supply System Facility	117166
3.8	Hydrogen production System Facility	16694
3.9	Power Conversion System Facility	23100
3.10	Licensing and Permitting	76650
Total Hours		364868

Total Dollars (including allowance for travel): Approximately $

4.1 Cost Estimate Basis

Back up for estimate: resource loaded schedule.

(Pricing Details Later)

5.0 Key Milestones from attached Schedule

Notice to Proceed	Oct 1, 2008
Kick-off Meeting	Oct 6, 2008
35 Percent review meeting	April 1, 2009
50 Percent review meeting	September 29, 2009
90 Percent review meeting	July 21, 2010
Final report issue	September 15, 2010

6.0 Risks:

(Later)

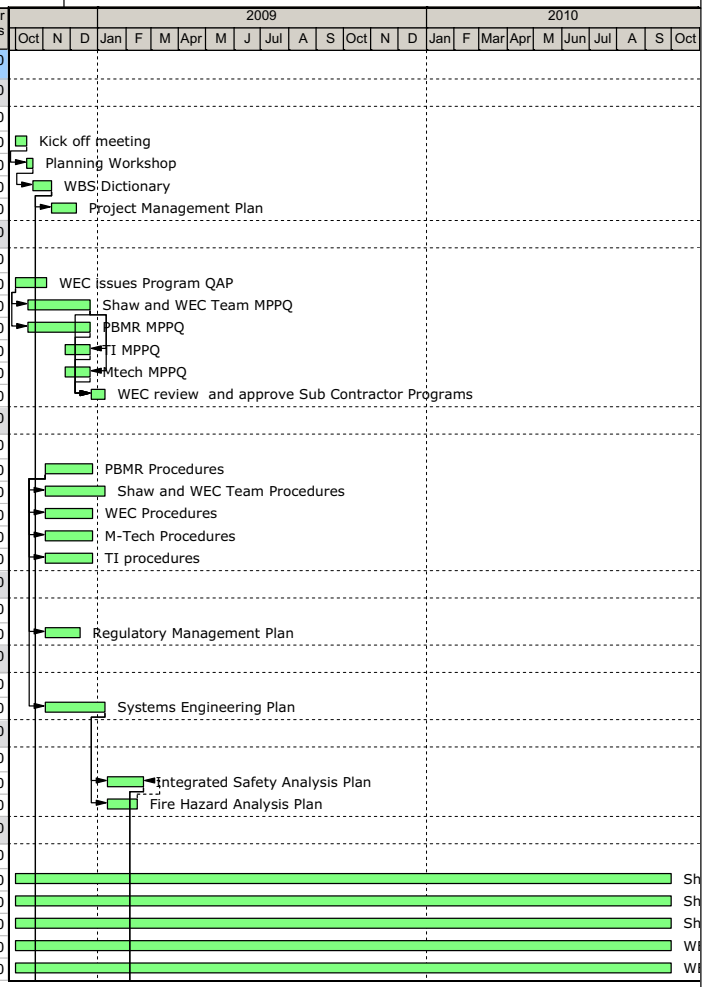
7.0 Value in Kind

(Later)

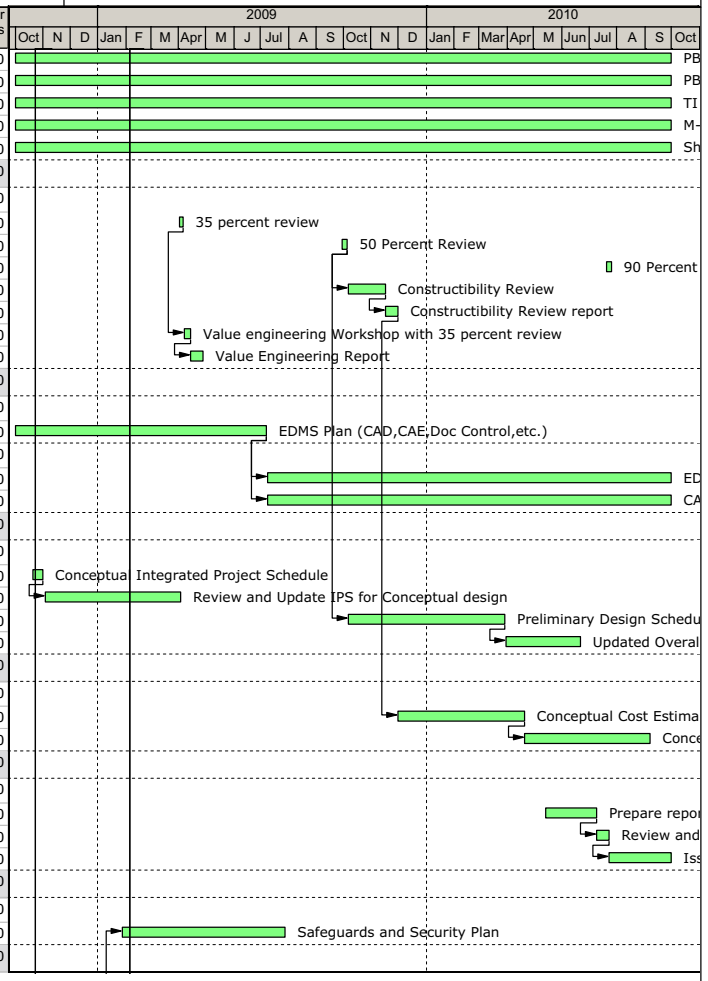
9.0 Primavera resource loaded Schedule showing key Milestones and Reviews

(See attached printable PDF file, with Primavera® native format file)

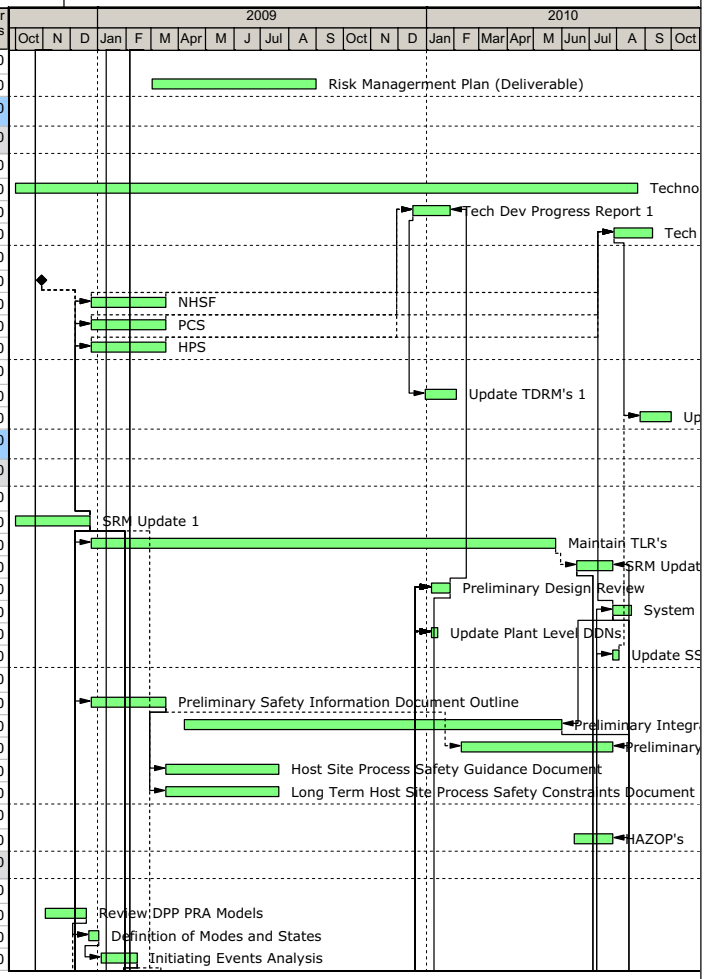
NGNP-PO1 SHAW-CDWP		Conceptual Design Work Plan					October 2008 Revision 0
WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units	
2.00.PRG Programmatic Activities		522	01-Oct-08	30-Sep-10		52750.00	
2.00.PRG.GEN.00 General		49	01-Oct-08	08-Dec-08		1430.00	
General		49	01-Oct-08	08-Dec-08		1430.00	
2.00.PRG.GEN.01	Kick off meeting	9	01-Oct-08	13-Oct-08		150.00	
2.00.PRG.GEN.02	Planning Workshop	5	13-Oct-08	20-Oct-08		400.00	
2.00.PRG.GEN.03	WBS Dictionary	15	20-Oct-08	10-Nov-08		480.00	
2.00.PRG.GEN.04	Project Management Plan	20	10-Nov-08	08-Dec-08		400.00	
2.00.PRG.QAP.00 Quality Assurance Plan and Program		73	01-Oct-08	09-Jan-09		1800.00	
General		73	01-Oct-08	09-Jan-09		1800.00	
2.00.PRG.QAP.01	WEC issues Program QAP	25	01-Oct-08	04-Nov-08		200.00	
2.00.PRG.QAP.02	Shaw and WEC Team MPPQ	50	15-Oct-08	23-Dec-08		400.00	
2.00.PRG.QAP.03	PBMR MPPQ	50	15-Oct-08	23-Dec-08		400.00	
2.00.PRG.QAP.04	TI MPPQ	20	26-Nov-08	23-Dec-08		200.00	
2.00.PRG.QAP.05	Mtech MPPQ	20	26-Nov-08	23-Dec-08		400.00	
2.00.PRG.QAP.06	WEC review and approve Sub Contractor Programs	13	24-Dec-08	09-Jan-09		200.00	
2.00.PRG.EPP.00 Engineering Procedures		50	03-Nov-08	09-Jan-09		1300.00	
General		50	03-Nov-08	09-Jan-09		1300.00	
2.00.PRG.EPP.01	PBMR Procedures	40	03-Nov-08*	26-Dec-08		300.00	
2.00.PRG.EPP.02	Shaw and WEC Team Procedures	50	03-Nov-08	09-Jan-09		400.00	
2.00.PRG.EPP.03	WEC Procedures	40	03-Nov-08	26-Dec-08		200.00	
2.00.PRG.EPP.04	M-Tech Procedures	40	03-Nov-08	26-Dec-08		200.00	
2.00.PRG.EPP.05	TI procedures	40	03-Nov-08	26-Dec-08		200.00	
2.00.PRG.RMP.01 Regulatory Management Plan		30	03-Nov-08	12-Dec-08		336.00	
General		30	03-Nov-08	12-Dec-08		336.00	
2.00.PRG.RMP.01	Regulatory Management Plan	30	03-Nov-08	12-Dec-08		336.00	
2.00.PRG.SEP.01 Systems Engineering Plan		50	03-Nov-08	09-Jan-09		560.00	
General		50	03-Nov-08	09-Jan-09		560.00	
2.00.PRG.SEP.01	Systems Engineering Plan	50	03-Nov-08	09-Jan-09		560.00	
2.00.PRG.ISP.01 Integrated Safety Analysis Plan		30	12-Jan-09	20-Feb-09		1026.00	
General		30	12-Jan-09	20-Feb-09		1026.00	
2.00.PRG.ISP.01	Integrated Safety Analysis Plan	30	12-Jan-09	20-Feb-09		576.00	
2.00.PRG.FHP.01	Fire Hazard Analysis Plan	25	12-Jan-09	13-Feb-09		450.00	
2.00.PRG.LOE.00 Project Management (LOE)		522	01-Oct-08	30-Sep-10		23000.00	
General		522	01-Oct-08	30-Sep-10		23000.00	
2.00.PRG.LOE.01	Shaw and WEC Team Project Manager (FT)	522	01-Oct-08	30-Sep-10		4000.00	
2.00.PRG.LOE.02	Shaw and WEC Team Project Controls (50%)	522	01-Oct-08	30-Sep-10		2000.00	
2.00.PRG.LOE.03	Shaw and WEC Team Document Control (50%)	522	01-Oct-08	30-Sep-10		2000.00	
2.00.PRG.LOE.04	WEC Project Manager(50%)	522	01-Oct-08	30-Sep-10		2000.00	
2.00.PRG.LOE.05	WEC Project Controls/ Contracts/Document Control(50%)	522	01-Oct-08	30-Sep-10		2000.00	



WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.00.PRG.LOE.06	PBMR Project Manager(FT)	522	01-Oct-08	30-Sep-10		4000.00
2.00.PRG.LOE.07	PBMR Project Controls/Document Control(FT)	522	01-Oct-08	30-Sep-10		4000.00
2.00.PRG.LOE.08	TI Project Manager/ Project Controls/ Document Control(25...	522	01-Oct-08	30-Sep-10		1000.00
2.00.PRG.LOE.09	M-Tech Project Manager/ Project Controls/ Document Contr...	522	01-Oct-08	30-Sep-10		1000.00
2.00.PRG.LOE.10	Shaw Construction Manager(25%)	522	01-Oct-08	30-Sep-10		1000.00
2.00.PRG.REV.00 Client and Specialty Reviews		344	01-Apr-09	26-Jul-10		2076.00
General		344	01-Apr-09	26-Jul-10		2076.00
2.00.PRG.REV.01	35 percent review	4	01-Apr-09*	06-Apr-09		352.00
2.00.PRG.REV.02	50 Percent Review	4	30-Sep-09*	05-Oct-09		352.00
2.00.PRG.REV.03	90 Percent Review	5	20-Jul-10*	26-Jul-10		512.00
2.00.PRG.REV.04	Constructibility Review	30	06-Oct-09	16-Nov-09		240.00
2.00.PRG.REV.05	Constructibility Review report	10	17-Nov-09	01-Dec-09		100.00
2.00.PRG.REV.06	Value engineering Workshop with 35 percent review	5	07-Apr-09	13-Apr-09		320.00
2.00.PRG.REV.07	Value Engineering Report	10	14-Apr-09	27-Apr-09		200.00
2.00.PRG.EDM.00 EDMS		522	01-Oct-08	30-Sep-10		10000.00
General		200	01-Oct-08	07-Jul-09		1000.00
2.00.PRG.EDM.01	EDMS Plan (CAD,CAE,Doc Control,etc.)	200	01-Oct-08	07-Jul-09		1000.00
2.00PRG.EDM.02 EDMS Implementation (CAD, CAE, Doc Control, etc.)		322	08-Jul-09	30-Sep-10		9000.00
2.00.PRG.EDM.02.01	EDMS Document Control Implementation	322	08-Jul-09	30-Sep-10		2000.00
2.00.PRG.EDM.02.02	CAD,CAE Implementation	322	08-Jul-09	30-Sep-10		7000.00
2.00.PRG.SCH.00 Project Schedule		436	20-Oct-08	21-Jun-10		2252.00
General		436	20-Oct-08	21-Jun-10		2252.00
2.00.PRG.SCH.01	Conceptual Integrated Project Schedule	10	20-Oct-08*	31-Oct-08		300.00
2.00.PRG.SCH.01	Review and Update IPS for Conceptual design	110	03-Nov-08	03-Apr-09		352.00
2.00.PRG.SCH.02	Preliminary Design Schedule	125	06-Oct-09	29-Mar-10		1000.00
2.00.PRG.SCH.03	Updated Overall Project Schedule	60	30-Mar-10	21-Jun-10		600.00
2.00.PRG.ECO.00 Update Project Economics		200	01-Dec-09	07-Sep-10		1600.00
General		200	01-Dec-09	07-Sep-10		1600.00
2.00.PRG.ECO.01	Conceptual Cost Estimate	100	01-Dec-09	20-Apr-10		800.00
2.00.PRG.ECO.02	Conceptual Life Cycle Economic Analysis	100	20-Apr-10	07-Sep-10		800.00
2.00.PRG.CDR.00 Conceptual Design Report		99	14-May-10	30-Sep-10		5770.00
General		99	14-May-10	30-Sep-10		5770.00
2.00.PRG.CDR.00	Prepare report	40	14-May-10*	09-Jul-10		3110.00
2.00.PRG.CDR.00	Review and comment Issue for 90 review	10	09-Jul-10	23-Jul-10		660.00
2.00.PRG.CDR.00	Issue Final	49	23-Jul-10	30-Sep-10		2000.00
2.00.PRG.SSP.01 Safeguards and Security Plan		129	28-Jan-09	27-Jul-09		1000.00
General		129	28-Jan-09	27-Jul-09		1000.00
2.00.PRG.SSP.01	Safeguards and Security Plan	129	28-Jan-09	27-Jul-09		1000.00
2.00.PRG.RSK.01 Risk Managment Plan (Deliverable)		131	02-Mar-09	31-Aug-09		600.00

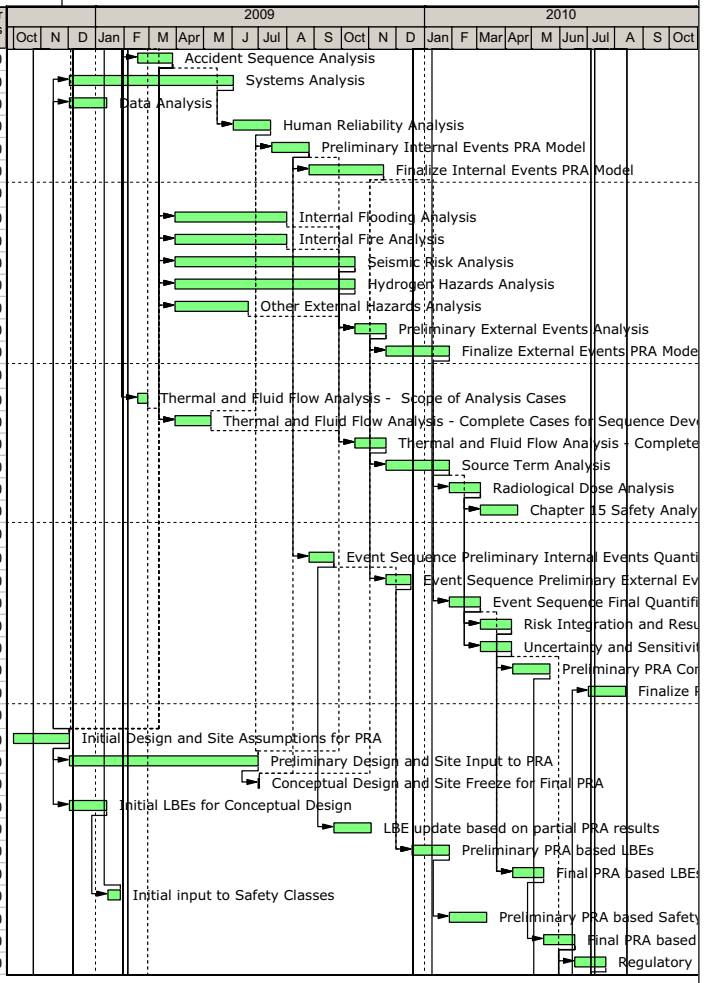


WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
General		131	02-Mar-09	31-Aug-09		600.00
2.00.PRG.RSK.01	Risk Managerment Plan (Deliverable)	131	02-Mar-09*	31-Aug-09		600.00
2.22.00 Technology Development		521	01-Oct-08	30-Sep-10		6212.00
2.22.PM2.00 Technology Development Management		521	01-Oct-08	30-Sep-10		6212.00
General		506	01-Oct-08	09-Sep-10		4432.00
2.22.PM2.01	Technology Development Project Management	494	01-Oct-08	23-Aug-10		3952.00
2.22.PM2.02	Tech Dev Progress Report 1	30	17-Dec-09	28-Jan-10		240.00
2.22.PM2.03	Tech Dev Progress Report 2	30	29-Jul-10	09-Sep-10		240.00
2.22.TMP.00 Execution of Technology Maturation Plans for Critical SSC's		98	31-Oct-08	17-Mar-09		180.00
2.22.TMP.00	NGNP ICD Report Phase 1 Complete	0	31-Oct-08*			0.00
2.22.TMP.01	NHSF	60	24-Dec-08	17-Mar-09		60.00
2.22.TMP.02	PCS	60	24-Dec-08	17-Mar-09		60.00
2.22.TMP.03	HPS	60	24-Dec-08	17-Mar-09		60.00
Update TDRM's		195	31-Dec-09	30-Sep-10		1600.00
2.22.TRM.01	Update TDRM's 1	25	31-Dec-09	04-Feb-10		800.00
2.22.TRM.02	Update TDRM's 2	25	26-Aug-10	30-Sep-10		800.00
2.32.PLD.00 Plant Level Design and Integration		522	01-Oct-08	30-Sep-10		41930.00
General		489	01-Oct-08	17-Aug-10		12414.00
General		489	01-Oct-08	17-Aug-10		8320.00
2.32.PLD.01	SRM Update 1	60	01-Oct-08	23-Dec-08		1200.00
2.32.PLD.02	Maintain TLR's	370	24-Dec-08	25-May-10		5920.00
2.32.PLD.03	SRM Update 2	28	17-Jun-10	27-Jul-10		160.00
2.32.PLD.04	Preliminary Design Review	15	07-Jan-10	28-Jan-10		360.00
2.32.PLD.05	System Design Review	15	27-Jul-10	17-Aug-10		600.00
2.32.PLD.06	Update Plant Level DDNs	5	07-Jan-10	14-Jan-10		40.00
2.32.PLD.07	Update SSC Level DDNs	5	27-Jul-10	03-Aug-10		40.00
2.32.PLD.PSI.00 Preliminary Safety Information		414	24-Dec-08	27-Jul-10		3360.00
2.32.PLD.PSI.01	Preliminary Safety Information Document Outline	60	24-Dec-08	17-Mar-09		120.00
2.32.PLD.PSI.02	Preliminary Integrated Safety Assessment	300	07-Apr-09	01-Jun-10		1500.00
2.32.PLD.PSI.03	Preliminary Safety Information Document	120	09-Feb-10	27-Jul-10		300.00
2.32.PLD.PSI.04	Host Site Process Safety Guidance Document	90	18-Mar-09	21-Jul-09		720.00
2.32.PLD.PSI.04	Long Term Host Site Process Safety Constraints Document	90	18-Mar-09	21-Jul-09		720.00
2.32.PLD.06 HAZOP's		31	14-Jun-10	27-Jul-10		734.00
2.32.PLD.06	HAZOP's	31	14-Jun-10	27-Jul-10		734.00
2.32.PLD.PRA.00 Probabilistic Risk Assessment		522	01-Oct-08	30-Sep-10		18312.00
2.32.PLD.PRA.01 Internal Events PRA Model		272	03-Nov-08	17-Nov-09		3520.00
2.32.PLD.PRA.01	Review DPP PRA Models	35	03-Nov-08*	19-Dec-08		360.00
2.32.PLD.PRA.01	Definition of Modes and States	10	22-Dec-08	02-Jan-09		80.00
2.32.PLD.PRA.01	Initiating Events Analysis	30	05-Jan-09	13-Feb-09		240.00



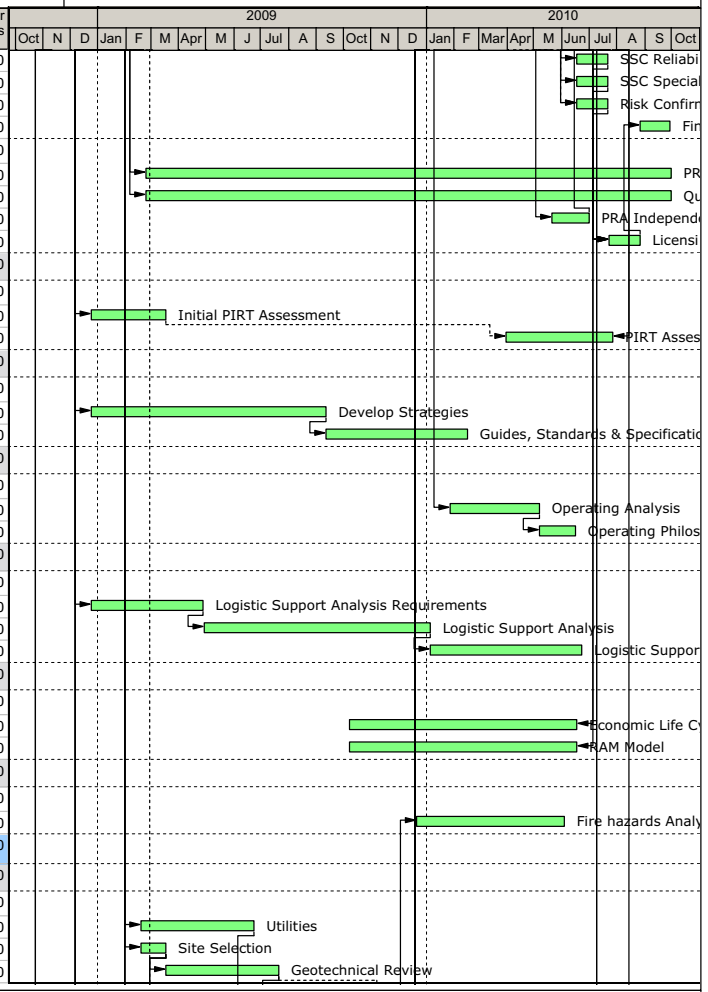
Actual Work ◆ Milestone
Remaining Work

WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.PLD.PRA.01	Accident Sequence Analysis	30	16-Feb-09	27-Mar-09		360.00
2.32.PLD.PRA.01	Systems Analysis	130	03-Dec-08	02-Jun-09		1280.00
2.32.PLD.PRA.01	Data Analysis	30	03-Dec-08	13-Jan-09		240.00
2.32.PLD.PRA.01	Human Reliability Analysis	30	03-Jun-09	14-Jul-09		240.00
2.32.PLD.PRA.01	Preliminary Internal Events PRA Model	30	15-Jul-09	25-Aug-09		240.00
2.32.PLD.PRA.01	Finalize Internal Events PRA Model	60	26-Aug-09	17-Nov-09		480.00
2.32.PLD.PRA.02	**External Events PRA Model**	219	30-Mar-09	28-Jan-10		5040.00
2.32.PLD.PRA.02	Internal Flooding Analysis	90	30-Mar-09	31-Jul-09		720.00
2.32.PLD.PRA.02	Internal Fire Analysis	90	30-Mar-09	31-Jul-09		720.00
2.32.PLD.PRA.02	Seismic Risk Analysis	144	30-Mar-09	15-Oct-09		1200.00
2.32.PLD.PRA.02	Hydrogen Hazards Analysis	144	30-Mar-09	15-Oct-09		1200.00
2.32.PLD.PRA.02	Other External Hazards Analysis	60	30-Mar-09	19-Jun-09		480.00
2.32.PLD.PRA.02	Preliminary External Events Analysis	25	16-Oct-09	19-Nov-09		240.00
2.32.PLD.PRA.02	Finalize External Events PRA Model	50	20-Nov-09	28-Jan-10		480.00
2.32.PLD.PRA.03	**Event Consequence Analysis**	304	16-Feb-09	15-Apr-10		1520.00
2.32.PLD.PRA.03	Thermal and Fluid Flow Analysis - Scope of Analysis Cases	10	16-Feb-09	27-Feb-09		80.00
2.32.PLD.PRA.03	Thermal and Fluid Flow Analysis - Complete Cases for Sequ...	30	30-Mar-09	08-May-09		240.00
2.32.PLD.PRA.03	Thermal and Fluid Flow Analysis - Complete Cases for Sour...	25	16-Oct-09	19-Nov-09		240.00
2.32.PLD.PRA.03	Source Term Analysis	50	20-Nov-09	28-Jan-10		480.00
2.32.PLD.PRA.03	Radiological Dose Analysis	25	29-Jan-10	04-Mar-10		240.00
2.32.PLD.PRA.03	Chapter 15 Safety Analysis	30	05-Mar-10	15-Apr-10		240.00
2.32.PLD.PRA.04	**Risk Analysis**	252	26-Aug-09	12-Aug-10		1520.00
2.32.PLD.PRA.04	Event Sequence Preliminary Internal Events Quantification	20	26-Aug-09	22-Sep-09		160.00
2.32.PLD.PRA.04	Event Sequence Preliminary External Events Quantification	20	20-Nov-09	17-Dec-09		160.00
2.32.PLD.PRA.04	Event Sequence Final Quantification	25	29-Jan-10	04-Mar-10		240.00
2.32.PLD.PRA.04	Risk Integration and Results Interpretation	25	05-Mar-10	08-Apr-10		240.00
2.32.PLD.PRA.04	Uncertainty and Sensitivity Analysis	25	05-Mar-10	08-Apr-10		240.00
2.32.PLD.PRA.04	Preliminary PRA Conceptual Design Report for Peer Review	30	09-Apr-10	20-May-10		240.00
2.32.PLD.PRA.04	Finalize PRA Conceptual Design Report	30	02-Jul-10	12-Aug-10		240.00
2.32.PLD.PRA.05	**Design and Licensing Support and Interfaces**	520	01-Oct-08	28-Sep-10		4232.00
2.32.PLD.PRA.05	Initial Design and Site Assumptions for PRA	45	01-Oct-08*	02-Dec-08		360.00
2.32.PLD.PRA.05	Preliminary Design and Site Input to PRA	150	03-Dec-08*	30-Jun-09		1200.00
2.32.PLD.PRA.05	Conceptual Design and Site Freeze for Final PRA	1	01-Jul-09	01-Jul-09*		8.00
2.32.PLD.PRA.05	Initial LBEs for Conceptual Design	30	03-Dec-08	13-Jan-09		240.00
2.32.PLD.PRA.05	LBE update based on partial PRA results	30	23-Sep-09*	03-Nov-09		240.00
2.32.PLD.PRA.05	Preliminary PRA based LBEs	30	18-Dec-09	28-Jan-10		240.00
2.32.PLD.PRA.05	Final PRA based LBEs	25	09-Apr-10	13-May-10		240.00
2.32.PLD.PRA.05	Initial input to Safety Classes	10	14-Jan-09	27-Jan-09		80.00
2.32.PLD.PRA.05	Preliminary PRA based Safety Classes	30	29-Jan-10	11-Mar-10		240.00
2.32.PLD.PRA.05	Final PRA based Safety Classes	25	14-May-10	17-Jun-10		240.00
2.32.PLD.PRA.05	Regulatory Design Criteria	25	18-Jun-10	22-Jul-10		240.00



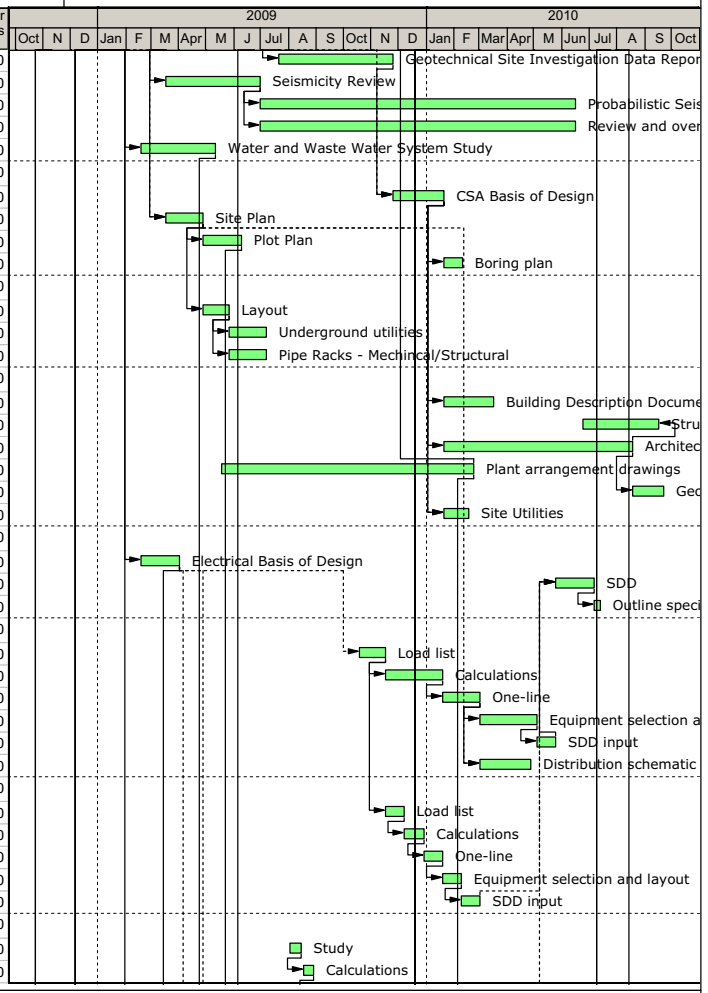
Actual Work ◆ Milestone
Remaining Work

WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.PLD.PRA.05	SSC Reliability and Capability Requirements	25	18-Jun-10	22-Jul-10		240.00
2.32.PLD.PRA.05	SSC Special Treatment Requirements	25	18-Jun-10	22-Jul-10		240.00
2.32.PLD.PRA.05	Risk Confirmation of Defense-in-Depth	25	18-Jun-10	22-Jul-10		240.00
2.32.PLD.PRA.05	Finalize Inputs to DCD	23	27-Aug-10	28-Sep-10		184.00
2.32.PLD.PRA.06 PRA Management Activities		419	23-Feb-09	30-Sep-10		2480.00
2.32.PLD.PRA.06	PRA Project Management	419	23-Feb-09	30-Sep-10		1120.00
2.32.PLD.PRA.06	Quality Control	419	23-Feb-09	30-Sep-10		1120.00
2.32.PLD.PRA.06	PRA Independent Review	30	21-May-10	01-Jul-10		120.00
2.32.PLD.PRA.06	Licensing Applications PRA Review	25	23-Jul-10	26-Aug-10		120.00
General		414	24-Dec-08	27-Jul-10		700.00
2.32.PLD.PRT.00 PIRT Assessment		414	24-Dec-08	27-Jul-10		700.00
2.32.PLD.PRT.00	Initial PIRT Assessment	60	24-Dec-08	17-Mar-09		500.00
2.32.PLD.PRT.00	PIRT Assessment	85	30-Mar-10	27-Jul-10		200.00
2.32.PLD.SLC.00 System Life Cycle Process & Development Support		299	24-Dec-08	15-Feb-10		1560.00
General		299	24-Dec-08	15-Feb-10		1560.00
2.32.PLD.SLC.00	Develop Strategies	188	24-Dec-08	11-Sep-09		960.00
2.32.PLD.SLC.00	Guides, Standards & Specifications	111	11-Sep-09	15-Feb-10		600.00
2.32.PLD.PSC.00 Plant Supervisory Control System		100	28-Jan-10	16-Jun-10		544.00
General		100	28-Jan-10	16-Jun-10		544.00
2.32.PLD.PSC.01	Operating Analysis	72	28-Jan-10	07-May-10		400.00
2.32.PLD.PSC.02	Operating Philosophy	28	07-May-10	16-Jun-10		144.00
2.32.PLD.ILS.00 Integrated Logisitics Support System		390	24-Dec-08	22-Jun-10		5640.00
General		390	24-Dec-08	22-Jun-10		5640.00
2.32.PLD.ILS.01	Logistic Support Analysis Requirements	90	24-Dec-08	28-Apr-09		360.00
2.32.PLD.ILS.02	Logistic Support Analysis	180	29-Apr-09	05-Jan-10		4320.00
2.32.PLD.ILS.03	Logistic Support System Development Specification	120	06-Jan-10	22-Jun-10		960.00
2.32.PLD.TBM.00 Technical Budget Models		180	08-Oct-09	17-Jun-10		2160.00
General		180	08-Oct-09	17-Jun-10		2160.00
2.32.PLD.TBM.01	Economic Life Cycle Model	180	08-Oct-09	17-Jun-10		1440.00
2.32.PLD.TBM.02	RAM Model	180	08-Oct-09	17-Jun-10		720.00
2.32.PLD.FHA.00 Fire Hazards Analysis (FHA) Report		119	21-Dec-09	04-Jun-10		600.00
General		119	21-Dec-09	04-Jun-10		600.00
2.32.PLD.FHA.00	Fire hazards Analysis Report	119	21-Dec-09*	04-Jun-10		600.00
2.32.OSB.FAC.00 Overall Site and Balance of Plant		415	18-Feb-09	22-Sep-10		30966.00
General		415	18-Feb-09	22-Sep-10		30966.00
2.32.OSB.FAC.00 Studies		345	18-Feb-09	15-Jun-10		12140.00
2.32.OSB.FAC.01	Utilities	90	18-Feb-09	23-Jun-09		720.00
2.32.OSB.FAC.02	Site Selection	20	18-Feb-09	17-Mar-09		100.00
2.32.OSB.FAC.03	Geotechnical Review	90	17-Mar-09	21-Jul-09		720.00

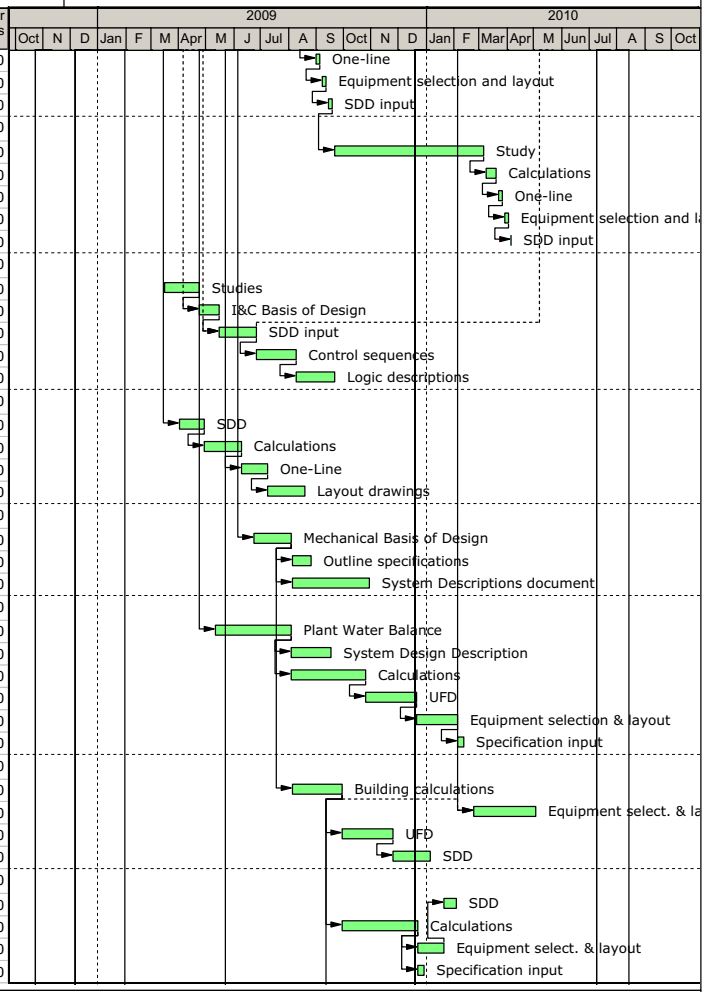


NGNP-PO1 SHAW-CDWP | **Conceptual Design Work Plan** | **October 2008 Revision 0**

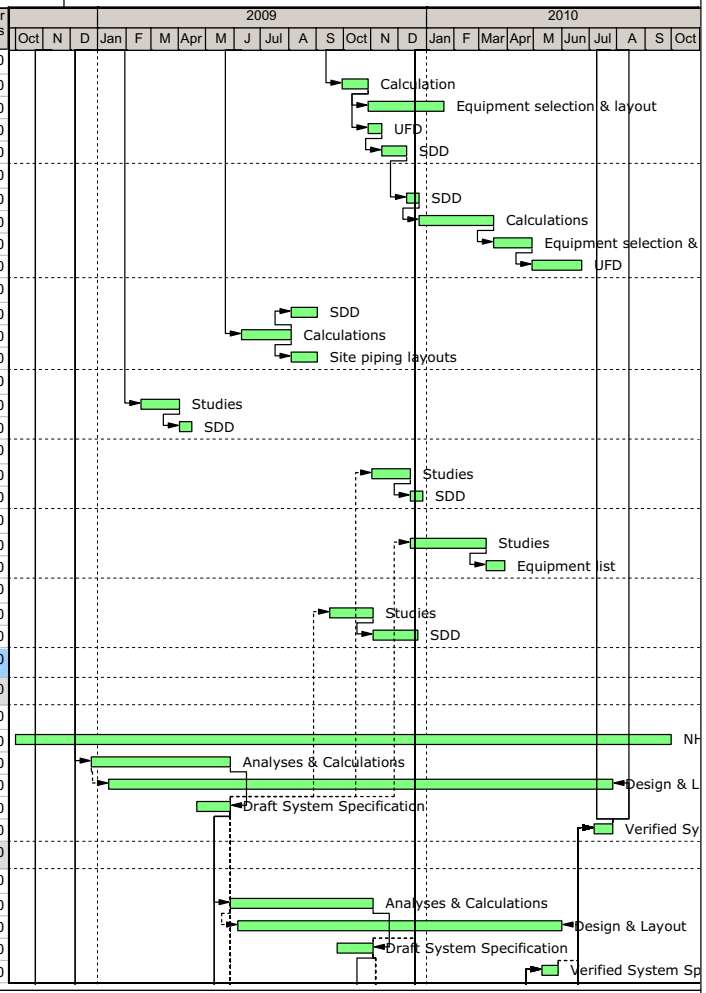
WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.OSB.FAC.04	Geotechnical Site Investigation Data Report	91	21-Jul-09	25-Nov-09		1500.00
2.32.OSB.FAC.05	Seismicity Review	75	17-Mar-09*	30-Jun-09		400.00
2.32.OSB.FAC.06	Probabilistic Seismic Hazard Analysis (PSHA)	250	30-Jun-09	15-Jun-10		8000.00
2.32.OSB.FAC.07	Review and oversight of contractor performing PSHA	250	30-Jun-09	15-Jun-10		400.00
2.32.OSB.FAC.09	Water and Waste Water System Study	60	18-Feb-09	12-May-09		300.00
2.32.OSB.CIV.00 Civil		236	17-Mar-09	10-Feb-10		880.00
2.32.OSB.CIV.01	CSA Basis of Design	40	25-Nov-09	20-Jan-10		300.00
2.32.OSB.CIV.02	Site Plan	30	17-Mar-09	28-Apr-09		240.00
2.32.OSB.CIV.03	Plot Plan	30	28-Apr-09	09-Jun-09		240.00
2.32.OSB.CIV.04	Boring plan	15	20-Jan-10	10-Feb-10		100.00
2.32.OSB.UTL.00 Site Utilities		50	28-Apr-09	07-Jul-09		650.00
2.32.OSB.UTL.01	Layout	20	28-Apr-09	26-May-09		150.00
2.32.OSB.UTL.02	Underground utilities	30	26-May-09	07-Jul-09		200.00
2.32.OSB.UTL.03	Pipe Racks - Mechincal/Structural	30	26-May-09	07-Jul-09		300.00
2.32.OSB.BLD.00 BOP Buildings (est. 9-major, 6-minor)		351	19-May-09	22-Sep-10		4400.00
2.32.OSB.BLD.01	Building Description Document	40	20-Jan-10	17-Mar-10		240.00
2.32.OSB.BLD.02	Structural	60	24-Jun-10	16-Sep-10		400.00
2.32.OSB.BLD.03	Architectural Arrangement Drawings	150	20-Jan-10	18-Aug-10		1200.00
2.32.OSB.BLD.04	Plant arrangement drawings	199	19-May-09*	22-Feb-10		1500.00
2.32.OSB.BLD.05	Geotechnical / Foundations	25	18-Aug-10	22-Sep-10		960.00
2.32.OSB.BLD.06	Site Utilities	20	20-Jan-10	17-Feb-10		100.00
2.32.OSB.ELE.00 BOP Electrical System		364	18-Feb-09	13-Jul-10		440.00
2.32.OSB.ELE.01	Electrical Basis of Design	30	18-Feb-09*	01-Apr-09		200.00
2.32.OSB.ELE.02	SDD	30	25-May-10*	06-Jul-10		200.00
2.32.OSB.ELE.03	Outline specifications	5	06-Jul-10	13-Jul-10		40.00
2.32.OSB.PWR.00 Power		156	19-Oct-09	25-May-10		1450.00
2.32.OSB.PWR.01	Load list	21	19-Oct-09*	17-Nov-09		150.00
2.32.OSB.PWR.02	Calculations	45	17-Nov-09	19-Jan-10		350.00
2.32.OSB.PWR.03	One-line	30	19-Jan-10	02-Mar-10		200.00
2.32.OSB.PWR.04	Equipment selection and layout	45	02-Mar-10	04-May-10		350.00
2.32.OSB.PWR.05	SDD input	15	04-May-10	25-May-10		100.00
2.32.OSB.PWR.06	Distribution schematic / site plan	40	02-Mar-10	27-Apr-10		300.00
2.32.OSB.EPS.00 Essential (stand-by) Power		75	17-Nov-09	02-Mar-10		500.00
2.32.OSB.EPS.01	Load list	15	17-Nov-09	08-Dec-09		100.00
2.32.OSB.EPS.02	Calculations	15	08-Dec-09	29-Dec-09		100.00
2.32.OSB.EPS.03	One-line	15	29-Dec-09	19-Jan-10		100.00
2.32.OSB.EPS.04	Equipment selection and layout	15	19-Jan-10	09-Feb-10		100.00
2.32.OSB.EPS.05	SDD input	15	09-Feb-10	02-Mar-10		100.00
2.32.OSB.COM.00 Plant Communications		35	03-Aug-09	18-Sep-09		280.00
2.32.OSB.COM.01	Study	10	03-Aug-09*	14-Aug-09		80.00
2.32.OSB.COM.02	Calculations	10	17-Aug-09	28-Aug-09		80.00



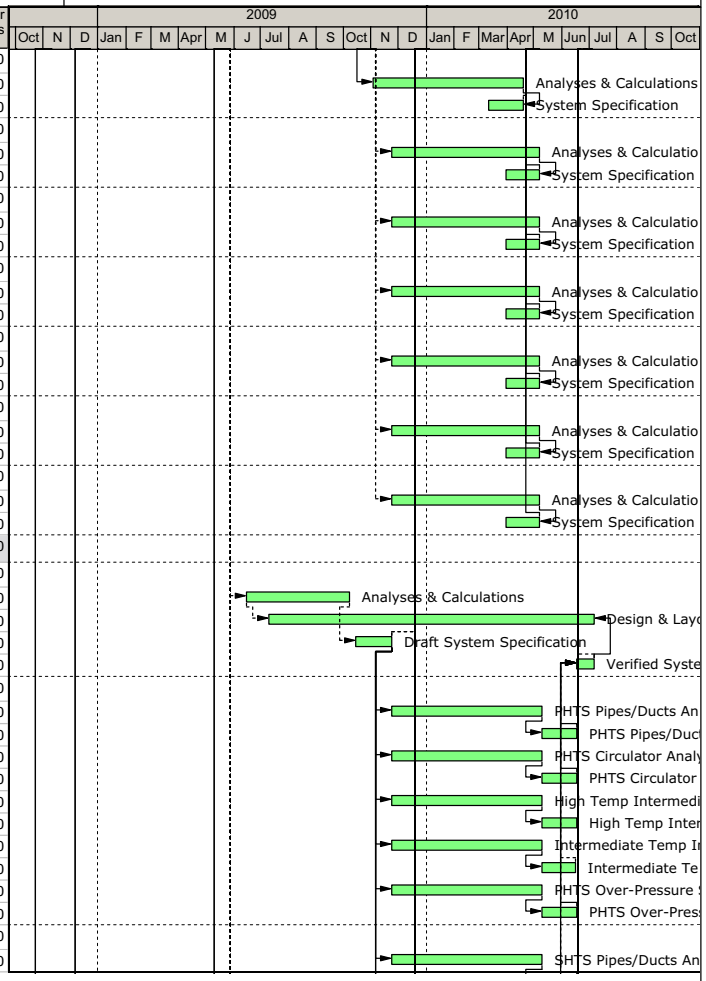
WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.OSB.COM.03	One-line	5	31-Aug-09	04-Sep-09		40.00
2.32.OSB.COM.04	Equipment selection and layout	5	07-Sep-09	11-Sep-09		40.00
2.32.OSB.COM.05	SDD input	5	14-Sep-09	18-Sep-09		40.00
2.32.OSB.SEC.00 Security Systems		141	21-Sep-09	05-Apr-10		1168.00
2.32.OSB.SEC.01	Study	120	21-Sep-09	05-Mar-10		1000.00
2.32.OSB.SEC.02	Calculations	10	08-Mar-10	19-Mar-10		80.00
2.32.OSB.SEC.03	One-line	5	22-Mar-10	26-Mar-10		40.00
2.32.OSB.SEC.04	Equipment selection and layout	5	29-Mar-10	02-Apr-10		40.00
2.32.OSB.SEC.05	SDD input	1	05-Apr-10	05-Apr-10		8.00
2.32.OSB.ICS.00 Instrumentation & Controls		135	16-Mar-09	21-Sep-09		850.00
2.32.OSB.ICS.01	Studies	30	16-Mar-09*	24-Apr-09		150.00
2.32.OSB.ICS.02	I&C Basis of Design	15	24-Apr-09	15-May-09		100.00
2.32.OSB.ICS.03	SDD input	30	15-May-09*	26-Jun-09		200.00
2.32.OSB.ICS.04	Control sequences	30	26-Jun-09	10-Aug-09		200.00
2.32.OSB.ICS.05	Logic descriptions	30	10-Aug-09	21-Sep-09		200.00
2.32.OSB.RMS.00 Radiation Monitoring System		100	01-Apr-09	19-Aug-09		710.00
2.32.OSB.RMS.01	SDD	20	01-Apr-09	29-Apr-09		150.00
2.32.OSB.RMS.02	Calculations	30	29-Apr-09	10-Jun-09		240.00
2.32.OSB.RMS.03	One-Line	20	10-Jun-09	08-Jul-09		80.00
2.32.OSB.RMS.04	Layout drawings	30	08-Jul-09	19-Aug-09		240.00
2.32.OSB.MEC.00 BOP Mechanical Systems		93	24-Jun-09	30-Oct-09		840.00
2.32.OSB.MEC.01	Mechanical Basis of Design	30	24-Jun-09	04-Aug-09		240.00
2.32.OSB.MEC.02	Outline specifications	15	05-Aug-09	26-Aug-09		100.00
2.32.OSB.MEC.03	System Descriptions document	63	05-Aug-09	30-Oct-09		500.00
2.32.OSB.PWS.00 Plant Water Systems		198	12-May-09	12-Feb-10		1208.00
2.32.OSB.PWS.01	Plant Water Balance	60	12-May-09*	04-Aug-09		200.00
2.32.OSB.PWS.02	System Design Description	32	04-Aug-09	17-Sep-09		128.00
2.32.OSB.PWS.03	Calculations	60	04-Aug-09	26-Oct-09		320.00
2.32.OSB.PWS.04	UFD	40	26-Oct-09	21-Dec-09		260.00
2.32.OSB.PWS.05	Equipment selection & layout	34	21-Dec-09	05-Feb-10		260.00
2.32.OSB.PWS.06	Specification input	5	05-Feb-10	12-Feb-10		40.00
2.32.OSB.HVA.00 BOP HVAC Systems		193	05-Aug-09	03-May-10		1200.00
2.32.OSB.HVA.02	Building calculations	40	05-Aug-09	29-Sep-09		320.00
2.32.OSB.HVA.03	Equipment select. & layout	50	22-Feb-10	03-May-10		600.00
2.32.OSB.HVA.04	UFD	40	30-Sep-09	24-Nov-09		160.00
2.32.OSB.HVA.05	SDD	30	25-Nov-09	05-Jan-10		120.00
2.32.OSB.CHW.00 Cooling Water Systems		90	30-Sep-09	03-Feb-10		650.00
2.32.OSB.CHW.01	SDD	10	20-Jan-10	03-Feb-10		80.00
2.32.OSB.CHW.02	Calculations	60	30-Sep-09	23-Dec-09		400.00
2.32.OSB.CHW.03	Equipment select. & layout	20	23-Dec-09	20-Jan-10		140.00
2.32.OSB.CHW.04	Specification input	5	23-Dec-09	30-Dec-09		30.00



WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.OSB.XST.00 Aux Steam System		81	30-Sep-09	20-Jan-10		700.00
2.32.OSB.XST.01	Calculation	21	30-Sep-09	29-Oct-09		200.00
2.32.OSB.XST.02	Equipment selection & layout	60	29-Oct-09	20-Jan-10		300.00
2.32.OSB.XST.03	UFD	10	29-Oct-09	12-Nov-09		120.00
2.32.OSB.XST.04	SDD	20	12-Nov-09	10-Dec-09		80.00
2.32.OSB.CAG.00 Compressed Air and Gas Systems		140	10-Dec-09	23-Jun-10		1040.00
2.32.OSB.CAG.01	SDD	10	10-Dec-09	24-Dec-09		80.00
2.32.OSB.CAG.03	Calculations	60	24-Dec-09	17-Mar-10		420.00
2.32.OSB.CAG.04	Equipment selection & layout	30	17-Mar-10	28-Apr-10		240.00
2.32.OSB.CAG.05	UFD	40	28-Apr-10	23-Jun-10		300.00
2.32.OSB.WWS.00 Wastewater Systems		60	09-Jun-09	01-Sep-09		540.00
2.32.OSB.WWS.01	SDD	20	04-Aug-09	01-Sep-09		120.00
2.32.OSB.WWS.02	Calculations	40	09-Jun-09	04-Aug-09		300.00
2.32.OSB.WWS.03	Site piping layouts	20	04-Aug-09	01-Sep-09		120.00
2.32.OSB.EHS.00 Equipment Handling		40	18-Feb-09	15-Apr-09		240.00
2.32.OSB.EHS.01	Studies	30	18-Feb-09	01-Apr-09		200.00
2.32.OSB.EHS.02	SDD	10	01-Apr-09	15-Apr-09		40.00
2.32.OSB.WHS.00 Waste Handling		40	02-Nov-09	28-Dec-09		280.00
2.32.OSB.WHS.01	Studies	30	02-Nov-09*	14-Dec-09		200.00
2.32.OSB.WHS.02	SDD	10	14-Dec-09	28-Dec-09		80.00
2.32.OSB.MNT.00 Maintenance		75	15-Dec-09	29-Mar-10		300.00
2.32.OSB.MNT.01	Studies	60	15-Dec-09*	08-Mar-10		200.00
2.32.OSB.MNT.02	Equipment list	15	08-Mar-10	29-Mar-10		100.00
2.32.OSB.LAB.00 Laboratories		70	15-Sep-09	22-Dec-09		500.00
2.32.OSB.LAB.01	Studies	35	15-Sep-09*	03-Nov-09		250.00
2.32.OSB.LAB.02	SDD	35	03-Nov-09	22-Dec-09		250.00
2.32.NHS.FAC.00 Nuclear Heat Supply Facility		522	01-Oct-08	30-Sep-10		117166.00
General		522	01-Oct-08	30-Sep-10		17792.00
General		522	01-Oct-08	30-Sep-10		17792.00
2.32.NHS.FAC.00	NHSS Technology Development Coordination	522	01-Oct-08	30-Sep-10		7904.00
2.32.NHS.FAC.01	Analyses & Calculations	112	24-Dec-08	28-May-09		2688.00
2.32.NHS.FAC.02	Design & Layout	400	13-Jan-09	27-Jul-10*		6400.00
2.32.NHS.FAC.03	Draft System Specification	28	20-Apr-09	28-May-09		600.00
2.32.NHS.FAC.04	Verified System Specifcation	14	07-Jul-10	27-Jul-10		200.00
2.32.NHS.RUS.00 Reactor Unit System		263	28-May-09	01-Jun-10		31984.00
General		263	28-May-09	01-Jun-10		11344.00
2.32.NHS.RUS.01	Analyses & Calculations	112	28-May-09	02-Nov-09		9000.00
2.32.NHS.RUS.02	Design & Layout	258	05-Jun-09	01-Jun-10*		2064.00
2.32.NHS.RUS.03	Draft System Specification	28	23-Sep-09	02-Nov-09		200.00
2.32.NHS.RUS.04	Verified System Specification	14	10-May-10	28-May-10		80.00

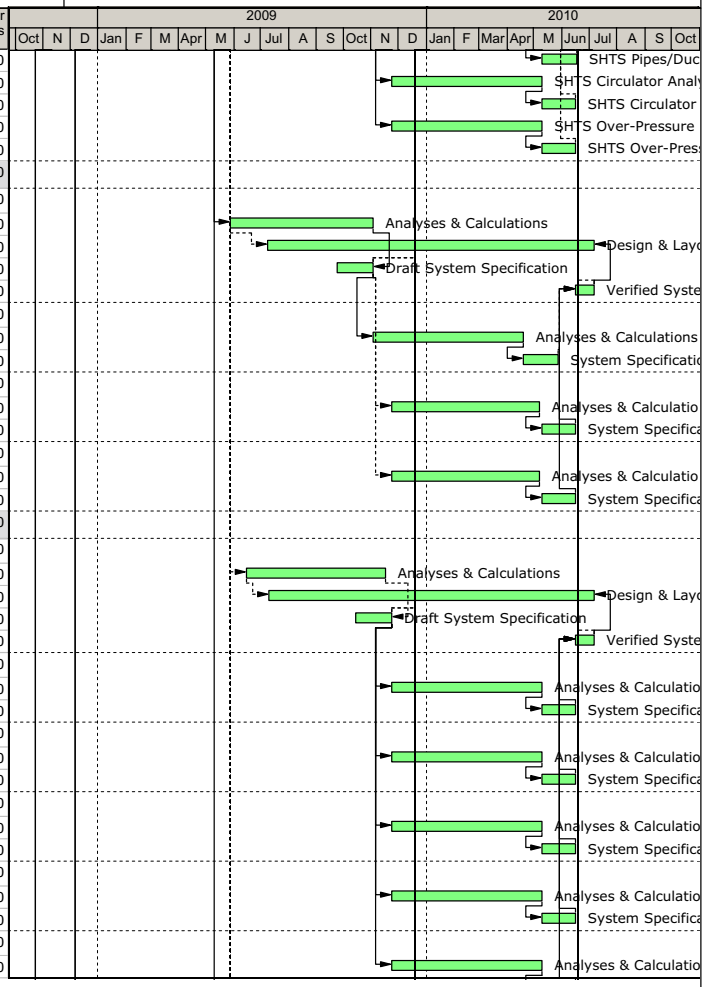


WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.NHS.RUS.RPV.00 Reactor Pressure Vessel Assembly		120	02-Nov-09	19-Apr-10		2960.00
2.32.NHS.RUS.RPV.01	Analyses & Calculations	120	02-Nov-09	19-Apr-10		2880.00
2.32.NHS.RUS.RPV.02	System Specification	28	11-Mar-10	19-Apr-10		80.00
2.32.NHS.RUS.CBA.00 Core Barrel Assembly		120	23-Nov-09	07-May-10		2960.00
2.32.NHS.RUS.CBA.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		2880.00
2.32.NHS.RUS.CBA.02	System Specification	28	31-Mar-10*	07-May-10		80.00
2.32.NHS.RUS.CSC.00 Core Structure Ceramics		120	23-Nov-09	07-May-10		2960.00
2.32.NHS.RUS.CSC.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		2880.00
2.32.NHS.RUS.CSC.02	System Specification	28	31-Mar-10*	07-May-10		80.00
2.32.NHS.RUS.RCS.00 Reactivity Control System		120	23-Nov-09	07-May-10		2960.00
2.32.NHS.RUS.RCS.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		2880.00
2.32.NHS.RUS.RCS.02	System Specification	28	31-Mar-10*	07-May-10		80.00
2.32.NHS.RUS.RSS.00 Reserve Shutdown System		120	23-Nov-09	07-May-10		2920.00
2.32.NHS.RUS.RSS.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		2880.00
2.32.NHS.RUS.RSS.02	System Specification	28	31-Mar-10*	07-May-10		40.00
2.32.NHS.RUS.IDS.00 In-Core Delivery System		120	23-Nov-09	07-May-10		2920.00
2.32.NHS.RUS.IDS.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		2880.00
2.32.NHS.RUS.IDS.02	System Specification	28	31-Mar-10*	07-May-10		40.00
2.32.NHS.RUS.RUI.00 RU Instrumentation		120	23-Nov-09	07-May-10		2960.00
2.32.NHS.RUS.RUI.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		2880.00
2.32.NHS.RUS.RUI.02	System Specification	28	31-Mar-10*	07-May-10		80.00
2.32.NHS.HTS.00 Heat Transport System (HTS)		277	15-Jun-09	07-Jul-10		15889.00
General		277	15-Jun-09	07-Jul-10		3768.00
2.32.NHS.HTS.01	Analyses & Calculations	84	15-Jun-09*	08-Oct-09		1344.00
2.32.NHS.HTS.02	Design & Layout	258	10-Jul-09	07-Jul-10*		2064.00
2.32.NHS.HTS.03	Draft System Specification	28	14-Oct-09*	23-Nov-09		240.00
2.32.NHS.HTS.04	Verified System Specification	14	17-Jun-10*	07-Jul-10		120.00
Primary Heat Transport System (PHTS)		148	23-Nov-09	17-Jun-10		9926.00
2.32.NHS.HTS.PPD.01	PHTS Pipes/Ducts Analyses & Calculations	120	23-Nov-09*	10-May-10		960.00
2.32.NHS.HTS.PPD.02	PHTS Pipes/Ducts System Specification	28	10-May-10*	17-Jun-10		240.00
2.32.NHS.HTS.PCR.01	PHTS Circulator Analyses & Calculations	120	23-Nov-09*	10-May-10		2880.00
2.32.NHS.HTS.PCR.02	PHTS Circulator System Specification	28	10-May-10*	17-Jun-10		480.00
2.32.NHS.HTS.HXA.01	High Temp Intermediate Heat Exchanger (IHX A) Analyses ...	120	23-Nov-09*	10-May-10		2400.00
2.32.NHS.HTS.HXA.02	High Temp Intermediate Heat Exchanger (IHX A) System S...	28	10-May-10*	17-Jun-10		480.00
2.32.NHS.HTS.HXB.01	Intermediate Temp Intermediate Heat Exchanger (IHX B) A...	120	23-Nov-09*	10-May-10		1440.00
2.32.NHS.HTS.HXB.02	Intermediate Temp Intermediate Heat Exchanger (IHX B) S...	28	10-May-10*	16-Jun-10		120.00
2.32.NHS.HTS.POP.01	PHTS Over-Pressure System Analyses & Calculations	120	23-Nov-09*	10-May-10		686.00
2.32.NHS.HTS.POP.02	PHTS Over-Pressure System System Specification	28	10-May-10*	17-Jun-10		240.00
Secondary Heat Transport System (SHTS)		148	23-Nov-09	17-Jun-10		2195.00
2.32.NHS.HTS.SPD.01	SHTS Pipes/Ducts Analyses & Calculations	120	23-Nov-09*	10-May-10		686.00

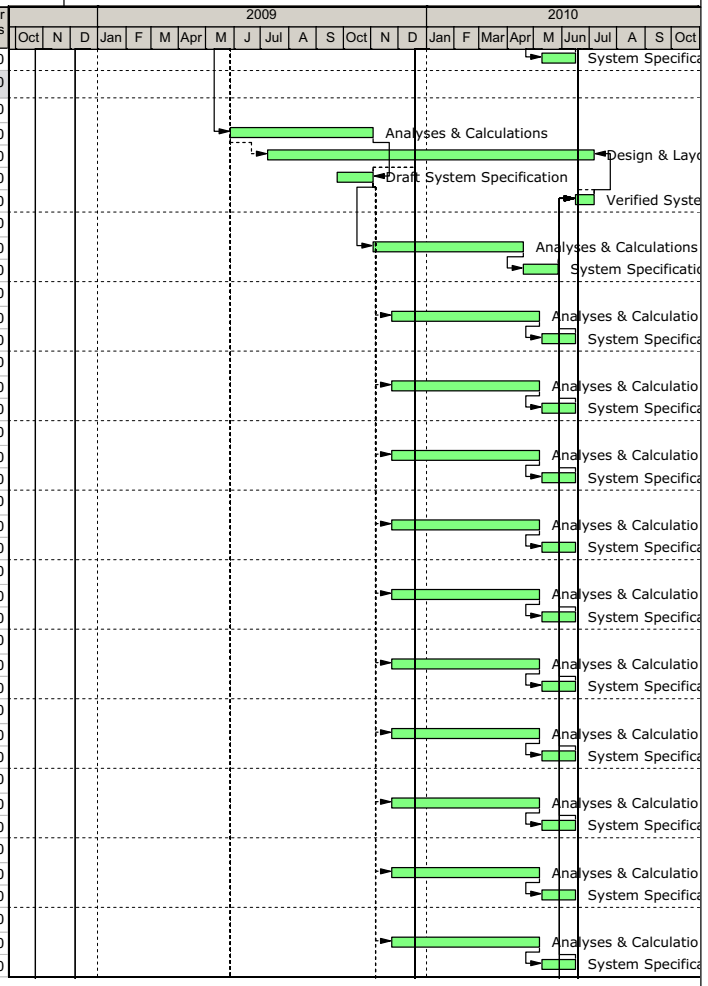


Actual Work ◆ Milestone
Remaining Work

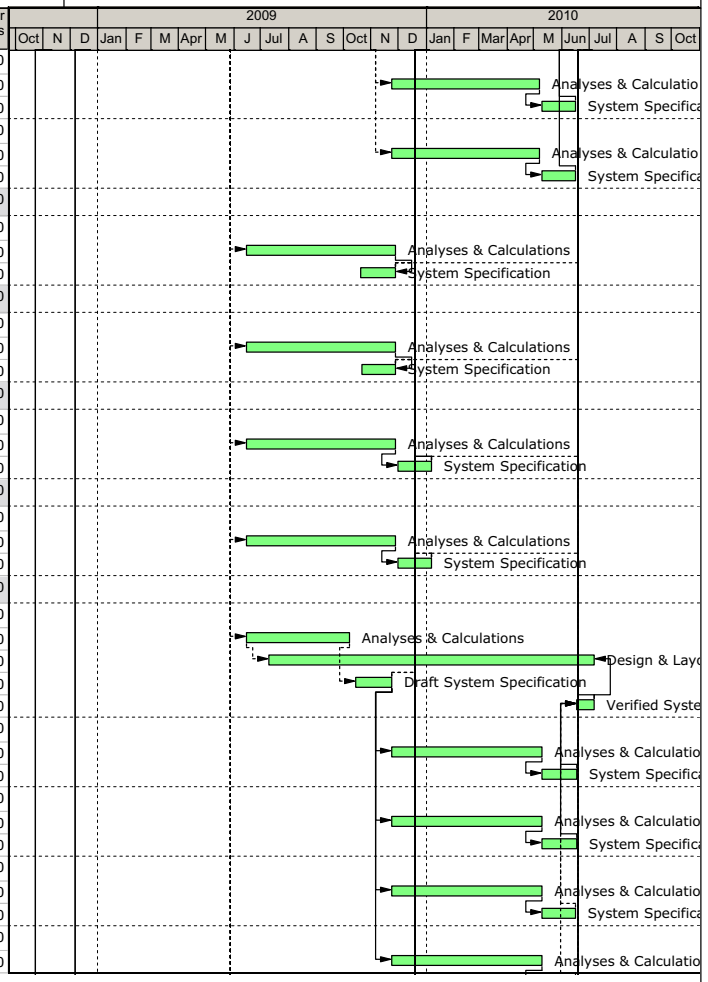
WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.NHS.HTS.SPD.02	SHTS Pipes/Ducts System Specification	28	10-May-10*	17-Jun-10		240.00
2.32.NHS.HTS.SCR.01	SHTS Circulator Analyses & Calculations	120	23-Nov-09*	10-May-10		686.00
2.32.NHS.HTS.SCR.02	SHTS Circulator System Specification	28	10-May-10*	16-Jun-10		120.00
2.32.NHS.HTS.SOP.01	SHTS Over-Pressure System Analyses & Calculations	120	23-Nov-09*	10-May-10		343.00
2.32.NHS.HTS.SOP.02	SHTS Over-Pressure System System Specification	28	10-May-10*	16-Jun-10		120.00
2.32.NHS.CCS.00 Core Conditioning System (CCS)		288	28-May-09	06-Jul-10		6478.00
2.32.NHS.CCS.00 Core Conditioning System		288	28-May-09	06-Jul-10		3976.00
2.32.NHS.HTS.CCS.01	Analyses & Calculations	112	28-May-09	02-Nov-09		1792.00
2.32.NHS.HTS.CCS.02	Design & Layout	258	09-Jul-09	06-Jul-10*		2064.00
2.32.NHS.HTS.CCS.03	Draft System Specification	28	23-Sep-09	02-Nov-09		80.00
2.32.NHS.HTS.CCS.04	Verified System Specification	14	16-Jun-10	06-Jul-10		40.00
2.32.NHS.CCS.CIR.00 CCS Circulator		148	02-Nov-09	27-May-10		251.00
2.32.NHS.HTS.CCS.CIR.01	Analyses & Calculations	120	02-Nov-09*	19-Apr-10		171.00
2.32.NHS.HTS.CCS.CIR.02	System Specification	28	19-Apr-10*	27-May-10		80.00
2.32.NHS.CCS.CHX.00 CCS HX		148	23-Nov-09	16-Jun-10		2040.00
2.32.NHS.HTS.CCS.CHX.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		1920.00
2.32.NHS.HTS.CCS.CHX.02	System Specification	28	10-May-10*	16-Jun-10		120.00
2.32.NHS.CCS.HGD.00 CCS Hot Gas Pipes/Ducts		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.HTS.CCS.HGD.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		171.00
2.32.NHS.HTS.CCS.HGD.02	System Specification	28	10-May-10*	16-Jun-10		40.00
2.32.NHS.HSS.00 Helium Services System (HSS)		277	15-Jun-09	06-Jul-10		5367.00
General		277	15-Jun-09	06-Jul-10		3768.00
2.32.NHS.HSS.01	Analyses & Calculations	112	15-Jun-09*	17-Nov-09		1344.00
2.32.NHS.HSS.02	Design & Layout	258	09-Jul-09	06-Jul-10*		2064.00
2.32.NHS.HSS.03	Draft System Specification	28	14-Oct-09*	23-Nov-09		240.00
2.32.NHS.HSS.04	Verified System Specification	14	16-Jun-10*	06-Jul-10		120.00
2.32.NHS.HSS.PIC.00 Primary Inventory Control System		148	23-Nov-09	16-Jun-10		251.00
2.32.NHS.HSS.PIC.01	Analyses & Calculations	120	23-Nov-09	10-May-10		171.00
2.32.NHS.HSS.PIC.02	System Specification	28	10-May-10	16-Jun-10		80.00
2.32.NHS.HSS.PHP.00 Primary Helium Purification System		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.HSS.PHP.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		171.00
2.32.NHS.HSS.PHP.02	System Specification	28	10-May-10*	16-Jun-10		40.00
2.32.NHS.HSS.SIC.00 Secondary Inventory Control System		148	23-Nov-09	16-Jun-10		463.00
2.32.NHS.HSS.SIC.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		343.00
2.32.NHS.HSS.SIC.02	System Specification	28	10-May-10*	16-Jun-10		120.00
2.32.NHS.HSS.PHP.00 Secondary Helium Purification System		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.HSS.SHP.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		171.00
2.32.NHS.HSS.SHP.02	System Specification	28	10-May-10*	16-Jun-10		40.00
2.32.NHS.HSS.HMS.00 Helium Make-Up System		148	23-Nov-09	16-Jun-10		463.00
2.32.NHS.HSS.HMS.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		343.00



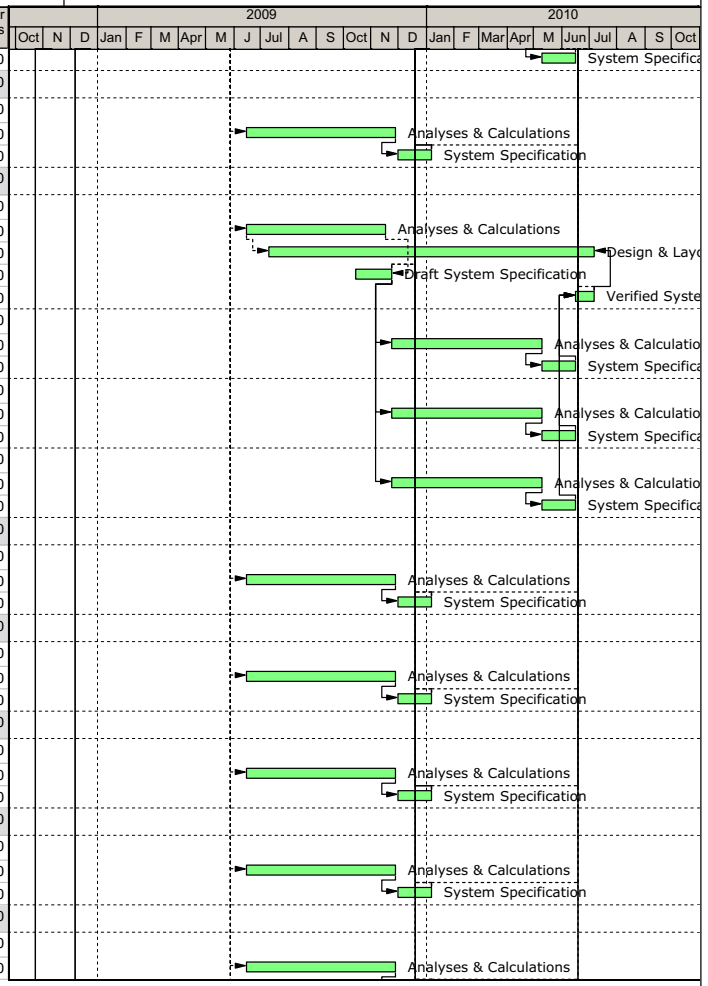
WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.NHS.HSS.HMS.02	System Specification	28	10-May-10*	16-Jun-10		120.00
2.32.NHS.FHS.00 Fuel Handling & Storage System (FHSS)		288	28-May-09	06-Jul-10		8264.00
General		288	28-May-09	06-Jul-10		4016.00
2.32.NHS.FHS.01	Analyses & Calculations	112	28-May-09	02-Nov-09		1792.00
2.32.NHS.FHS.02	Design & Layout	258	09-Jul-09	06-Jul-10*		2064.00
2.32.NHS.FHS.03	Draft System Specification	28	23-Sep-09	02-Nov-09		120.00
2.32.NHS.FHS.04	Verified System Specification	14	16-Jun-10	06-Jul-10		40.00
2.32.NHS.FHS.AGS.00 Auxiliary Gas Subsystem		148	02-Nov-09	27-May-10		211.00
2.32.NHS.FHS.AGS.01	Analyses & Calculations	120	02-Nov-09	19-Apr-10		171.00
2.32.NHS.FHS.AGS.02	System Specification	28	19-Apr-10	27-May-10		40.00
2.32.NHS.FHS.SCS.00 Sphere Conveying Subsystem		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.FHS.SCS.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		171.00
2.32.NHS.FHS.SCS.02	System Specification	28	10-May-10*	16-Jun-10		40.00
2.32.NHS.FHS.SDS.00 Sphere Decommissioning Subsystem		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.FHS.SDS.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		171.00
2.32.NHS.FHS.SDS.02	System Specification	28	10-May-10*	16-Jun-10		40.00
2.32.NHS.FHS.CGS.00 Convering Gas Subsystem		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.FHS.CGS.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		171.00
2.32.NHS.FHS.CGS.02	System Specification	28	10-May-10*	16-Jun-10		40.00
2.32.NHS.FHS.FHC.00 Fuel Handling Control System		148	23-Nov-09	16-Jun-10		423.00
2.32.NHS.FHS.FHC.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		343.00
2.32.NHS.FHS.FHC.02	System Specification	28	10-May-10*	16-Jun-10		80.00
2.32.NHS.FHS.BMS.00 Burn-up Measurement System		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.FHS.BMS.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		171.00
2.32.NHS.FHS.BMS.02	System Specification	28	10-May-10*	16-Jun-10		40.00
2.32.NHS.FHS.AMS.00 Activity Measurement System		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.FHS.AMS.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		171.00
2.32.NHS.FHS.AMS.02	System Specification	28	10-May-10*	16-Jun-10		40.00
2.32.NHS.FHS.SRS.00 Sphere Replenishment Subsystem		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.FHS.SRS.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		171.00
2.32.NHS.FHS.SRS.02	System Specification	28	10-May-10*	16-Jun-10		40.00
2.32.NHS.FHS.WHS.00 High Level Waste Handling & Storage Subsystem		148	23-Nov-09	16-Jun-10		423.00
2.32.NHS.FHS.WHS.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		343.00
2.32.NHS.FHS.WHS.02	System Specification	28	10-May-10*	16-Jun-10		80.00
2.32.NHS.FHS.FSS.00 Fuel Storage System		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.FHS.FSS.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		171.00
2.32.NHS.FHS.FSS.02	System Specification	28	10-May-10*	16-Jun-10		40.00
2.32.NHS.FHS.GSS.00 Graphite Spheres Storage Tank		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.FHS.GSS.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		171.00
2.32.NHS.FHS.GSS.02	System Specification	28	10-May-10*	16-Jun-10		40.00



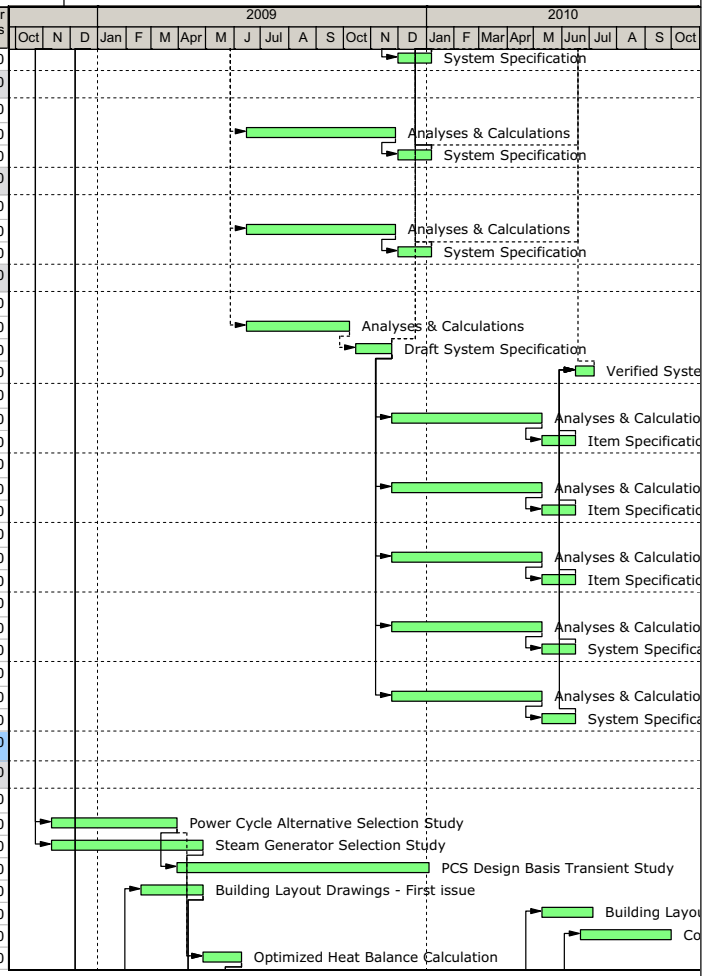
WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.NHS.FHS.SFS.00 Spent Fuel Storage Tanks		148	23-Nov-09	16-Jun-10		1040.00
2.32.NHS.FHS.SFS.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		960.00
2.32.NHS.FHS.SFS.02	System Specification	28	10-May-10*	16-Jun-10		80.00
2.32.NHS.FHS.UFS.00 Used Fuel Storage Tank		148	23-Nov-09	16-Jun-10		463.00
2.32.NHS.FHS.UFS.01	Analyses & Calculations	120	23-Nov-09*	07-May-10		343.00
2.32.NHS.FHS.UFS.02	System Specification	28	10-May-10*	16-Jun-10		120.00
2.32.NHS.PBS.00 Pressure Boundary Support Systems		120	15-Jun-09	27-Nov-09		1200.00
General		120	15-Jun-09	27-Nov-09		1200.00
2.32.NHS.PBS.01	Analyses & Calculations	120	15-Jun-09*	27-Nov-09		960.00
2.32.NHS.PBS.02	System Specification	28	20-Oct-09*	27-Nov-09		240.00
2.32.NHS.RCC.00 Reactor Cavity Cooling System (RCCS)		120	15-Jun-09	27-Nov-09		1000.00
General		120	15-Jun-09	27-Nov-09		1000.00
2.32.NHS.RCC.01	Analyses & Calculations	120	15-Jun-09*	27-Nov-09		960.00
2.32.NHS.RCC.02	System Specification	28	21-Oct-09*	27-Nov-09		40.00
2.32.NHS.ACS.00 Auxiliary Cooling System (ACS)		148	15-Jun-09	07-Jan-10		1200.00
General		148	15-Jun-09	07-Jan-10		1200.00
2.32.NHS.ACS.01	Analyses & Calculations	120	15-Jun-09*	27-Nov-09		960.00
2.32.NHS.ACS.02	System Specification	28	30-Nov-09*	07-Jan-10		240.00
2.32.NHS.EPC.00 Equipment Protection Cooling System (EPCS)		148	15-Jun-09	06-Jan-10		634.00
General		148	15-Jun-09	06-Jan-10		634.00
2.32.NHS.EPC.01	Analyses & Calculations	120	15-Jun-09*	27-Nov-09		514.00
2.32.NHS.EPC.02	System Specification	28	30-Nov-09*	06-Jan-10		120.00
2.32.NHS.RBS.00 Reactor Building (RB) System		277	15-Jun-09	07-Jul-10		12409.00
General		277	15-Jun-09	07-Jul-10		6050.00
2.32.NHS.RBS.01	Analyses & Calculations	84	15-Jun-09*	08-Oct-09		2688.00
2.32.NHS.RBS.02	Design & Layout	258	10-Jul-09	07-Jul-10*		2914.00
2.32.NHS.RBS.03	Draft System Specification	28	14-Oct-09*	23-Nov-09		280.00
2.32.NHS.RBS.04	Verified System Specification	14	17-Jun-10	07-Jul-10		168.00
2.32.NHS.RBS.CIT.00 Citadel		148	23-Nov-09	17-Jun-10		1680.00
2.32.NHS.RBS.CIT.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		1440.00
2.32.NHS.RBS.CIT.02	System Specification	28	10-May-10*	17-Jun-10		240.00
2.32.NHS.RBS.RRB.00 Remainder of Reactor Building (RRB)		148	23-Nov-09	17-Jun-10		1680.00
2.32.NHS.RBS.RRB.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		1440.00
2.32.NHS.RBS.RRB.02	System Specification	28	10-May-10*	17-Jun-10		240.00
2.32.NHS.RBS.PRS.00 Pressure Relief System (PRS)		148	23-Nov-09	16-Jun-10		423.00
2.32.NHS.RBS.PRS.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		343.00
2.32.NHS.RBS.PRS.02	System Specification	28	10-May-10*	16-Jun-10		80.00
2.32.NHS.RBS.HRB.00 HVAC Reactor Building		148	23-Nov-09	16-Jun-10		2576.00
2.32.NHS.RBS.HRB.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		2352.00



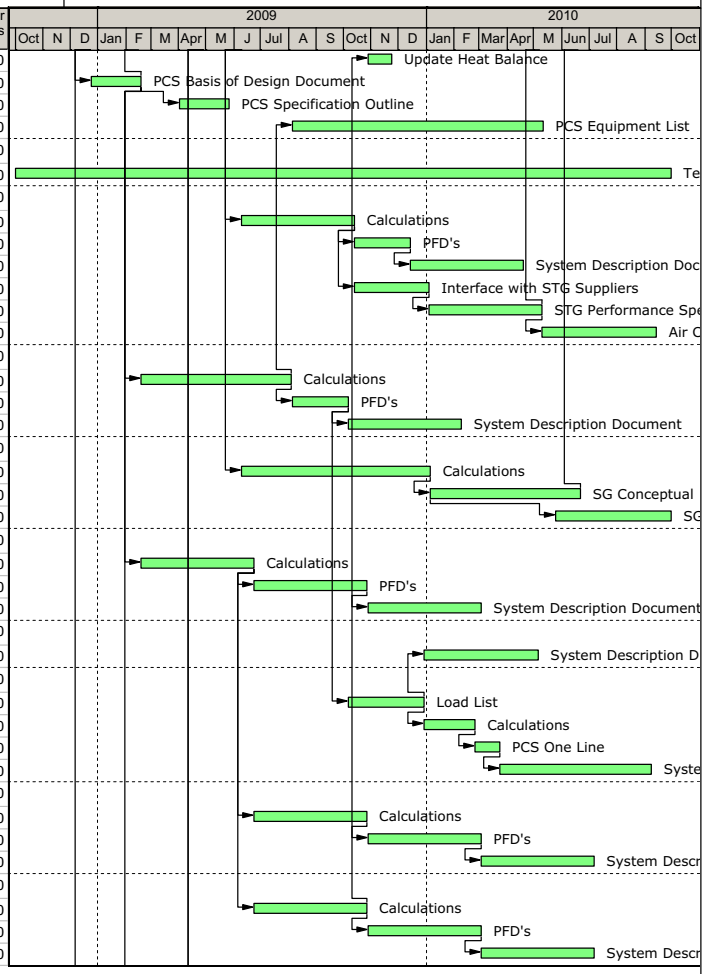
WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.NHS.RBS.HRB.02	System Specification	28	10-May-10*	16-Jun-10		224.00
2.32.NHS.EPS.00 NHSF Electric Power Systems (EPS)		148	15-Jun-09	07-Jan-10		1784.00
General		148	15-Jun-09	07-Jan-10		1784.00
2.32.NHS.EPS.01	Analyses & Calculations	120	15-Jun-09*	27-Nov-09		1392.00
2.32.NHS.EPS.02	System Specification	28	30-Nov-09*	07-Jan-10		392.00
2.32.NHS.AUS.00 Automation System (AS)		277	15-Jun-09	06-Jul-10		5120.00
General		277	15-Jun-09	06-Jul-10		3320.00
2.32.NHS.AUS.01	Analyses & Calculations	112	15-Jun-09*	17-Nov-09		896.00
2.32.NHS.AUS.02	Design & Layout	258	09-Jul-09	06-Jul-10*		2064.00
2.32.NHS.AUS.03	Draft System Specification	28	14-Oct-09*	23-Nov-09		240.00
2.32.NHS.AUS.04	Verified System Specification	14	16-Jun-10	06-Jul-10		120.00
2.32.NHS.AUS.OCS.00 Operational Control System		148	23-Nov-09	16-Jun-10		600.00
2.32.NHS.AUS.OCS.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		480.00
2.32.NHS.AUS.OCS.02	System Specification	28	10-May-10*	16-Jun-10		120.00
2.32.NHS.AUS.EPS.00 Equipment Protection System		148	23-Nov-09	16-Jun-10		600.00
2.32.NHS.AUS.EPS.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		480.00
2.32.NHS.AUS.EPS.02	System Specification	28	10-May-10*	16-Jun-10		120.00
2.32.NHS.AUS.RPS.00 Reactor Protection System		148	23-Nov-09	16-Jun-10		600.00
2.32.NHS.AUS.RPS.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		480.00
2.32.NHS.AUS.RPS.02	System Specification	28	10-May-10*	16-Jun-10		120.00
2.32.NHS.ISD.00 Independent Shut-Down Cabinet (ISDC)		148	15-Jun-09	06-Jan-10		520.00
General		148	15-Jun-09	06-Jan-10		520.00
2.32.NHS.ISD.01	Analyses & Calculations	120	15-Jun-09*	27-Nov-09		480.00
2.32.NHS.ISD.02	System Specification	28	30-Nov-09*	06-Jan-10		40.00
2.32.NHS.WHS.00 Waste Handling System		148	15-Jun-09	06-Jan-10		211.00
General		148	15-Jun-09	06-Jan-10		211.00
2.32.NHS.WHS.01	Analyses & Calculations	120	15-Jun-09*	27-Nov-09		171.00
2.32.NHS.WHS.02	System Specification	28	30-Nov-09*	06-Jan-10		40.00
2.32.NHS.EHS.00 Equipment Handling System (EHS)		148	15-Jun-09	07-Jan-10		926.00
General		148	15-Jun-09	07-Jan-10		926.00
2.32.NHS.EHS.01	Analyses & Calculations	120	15-Jun-09*	27-Nov-09		686.00
2.32.NHS.EHS.02	System Specification	28	30-Nov-09*	07-Jan-10		240.00
2.32.NHS.PLI.00 Primary Loop Initial Clean-Up System (PLICS)		148	15-Jun-09	06-Jan-10		520.00
General		148	15-Jun-09	06-Jan-10		520.00
2.32.NHS.PLI.01	Analyses & Calculations	120	15-Jun-09*	27-Nov-09		480.00
2.32.NHS.PLI.02	System Specification	28	30-Nov-09*	06-Jan-10		40.00
2.32.NHS.PEM.00 Post Event Monitoring & Recovery Room (PEMRR)		148	15-Jun-09	06-Jan-10		520.00
General		148	15-Jun-09	06-Jan-10		520.00
2.32.NHS.PEM.01	Analyses & Calculations	120	15-Jun-09*	27-Nov-09		480.00



WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.NHS.PEM.02	System Specification	28	30-Nov-09*	06-Jan-10		40.00
2.32.NHS.SSN.00 Security Systems (Nuclear)		148	15-Jun-09	07-Jan-10		1200.00
General		148	15-Jun-09	07-Jan-10		1200.00
2.32.NHS.SSN.01	Analyses & Calculations	120	15-Jun-09*	27-Nov-09		960.00
2.32.NHS.SSN.02	System Specification	28	30-Nov-09*	07-Jan-10		240.00
2.32.NHS.ISS.00 IAEA Safeguard System		148	15-Jun-09	06-Jan-10		520.00
General		148	15-Jun-09	06-Jan-10		520.00
2.32.NHS.ISS.01	Analyses & Calculations	120	15-Jun-09*	27-Nov-09		480.00
2.32.NHS.ISS.02	System Specification	28	30-Nov-09*	06-Jan-10		40.00
2.32.NHS.NFS.00 Fuel System		277	15-Jun-09	06-Jul-10		3628.00
General		277	15-Jun-09	06-Jul-10		1704.00
2.32.NHS.NFS.01	Analyses & Calculations	84	15-Jun-09*	08-Oct-09		1344.00
2.32.NHS.NFS.02	Draft System Specification	28	14-Oct-09*	23-Nov-09		240.00
2.32.NHS.NFS.03	Verified System Specification	14	16-Jun-10	06-Jul-10		120.00
2.32.NHS.NFS.MGS.00 Machined Graphite Spheres		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.NFS.MGS.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		171.00
2.32.NHS.NFS.MGS.02	Item Specification	28	10-May-10*	16-Jun-10		40.00
2.32.NHS.NFS.SFS.00 Start-Up Fuel Spheres		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.NFS.SFS.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		171.00
2.32.NHS.NFS.SFS.02	Item Specification	28	10-May-10*	16-Jun-10		40.00
2.32.NHS.NFS.EFS.00 Equilibrium Fuel Spheres		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.NFS.EFS.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		171.00
2.32.NHS.NFS.EFS.02	Item Specification	28	10-May-10*	16-Jun-10		40.00
2.32.NHS.NFS.FFT.00 Fresh Fuel Transport System		148	23-Nov-09	16-Jun-10		211.00
2.32.NHS.NFS.FFT.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		171.00
2.32.NHS.NFS.FFT.02	System Specification	28	10-May-10*	16-Jun-10		40.00
2.32.NHS.NFS.IFT.00 Irradiated Fuel Off-Site Transport System		148	23-Nov-09	16-Jun-10		1080.00
2.32.NHS.NFS.IFT.01	Analyses & Calculations	120	23-Nov-09*	10-May-10		960.00
2.32.NHS.NFS.IFT.02	System Specification	28	10-May-10*	16-Jun-10		120.00
2.32.PCS.FAC.00 Power Conversion Facility		522	01-Oct-08	30-Sep-10		23100.00
General		522	01-Oct-08	30-Sep-10		23100.00
General		493	10-Nov-08	30-Sep-10		9090.00
2.32.PCS.FAC.01	Power Cycle Alternative Selection Study	100	10-Nov-08	30-Mar-09		2160.00
2.32.PCS.FAC.02	Steam Generator Selection Study	120	10-Nov-08	27-Apr-09		3840.00
2.32.PCS.FAC.03	PCS Design Basis Transient Study	200	30-Mar-09	04-Jan-10		1600.00
2.32.PCS.FAC.04	Building Layout Drawings - First issue	50	18-Feb-09	28-Apr-09		400.00
2.32.PCS.FAC.04	Building Layout Drawings - Update layout	40	10-May-10	05-Jul-10		170.00
2.32.PCS.FAC.05	Cost Estimate Support	73	22-Jun-10	30-Sep-10		200.00
2.32.PCS.FAC.06	Optimized Heat Balance Calculation	30	27-Apr-09	09-Jun-09		120.00

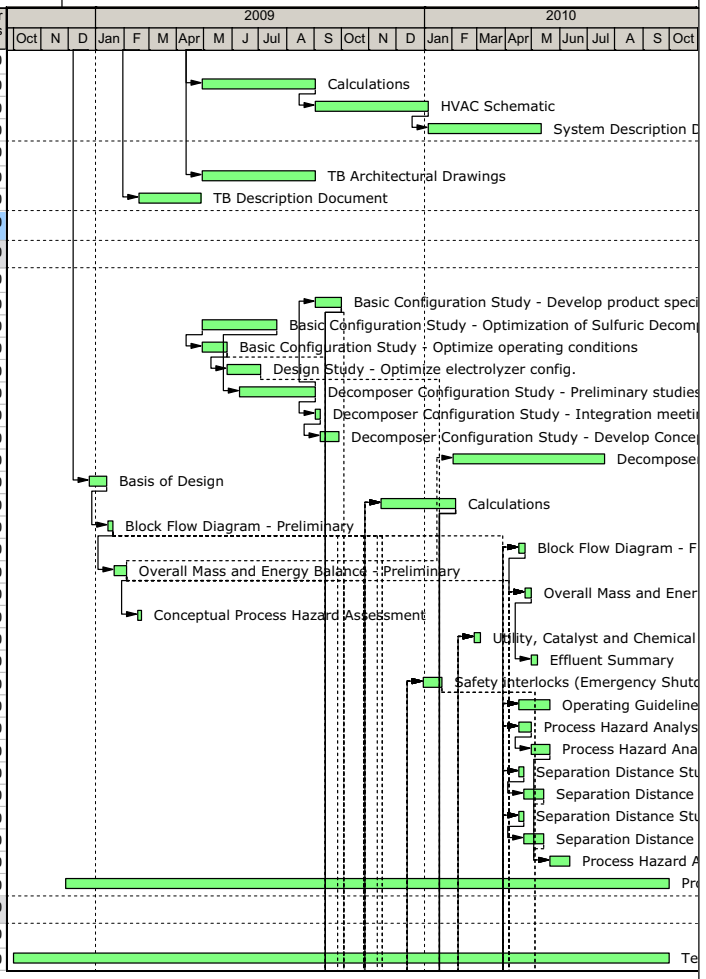


WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.PCS.FAC.06	Update Heat Balance	20	28-Oct-09	24-Nov-09		100.00
2.32.PCS.FAC.07	PCS Basis of Design Document	40	24-Dec-08	17-Feb-09		200.00
2.32.PCS.FAC.08	PCS Specification Outline	40	01-Apr-09	26-May-09		100.00
2.32.PCS.FAC.09	PCS Equipment List	200	05-Aug-09	11-May-10		200.00
2.32.PCS.TDC.00 Steam Generator Technology Development Coordination		522	01-Oct-08	30-Sep-10		2000.00
2.32.PCS.TDC.00	Technology Development Coordination	522	01-Oct-08	30-Sep-10		2000.00
2.32.PCS.STG.00 Steam Turbine Generator System		330	09-Jun-09	13-Sep-10		1570.00
2.32.PCS.STG.01	Calculations	90	09-Jun-09	13-Oct-09		200.00
2.32.PCS.STG.02	PFD's	45	13-Oct-09	14-Dec-09		150.00
2.32.PCS.STG.03	System Description Document	90	14-Dec-09	19-Apr-10		150.00
2.32.PCS.STG.04	Interface with STG Suppliers	60	13-Oct-09	04-Jan-10		200.00
2.32.PCS.STG.05	STG Performance Specification	90	04-Jan-10	10-May-10		720.00
2.32.PCS.STG.06	Air Cooled Condenser Performance Specification	90	10-May-10	13-Sep-10		150.00
2.32.PCS.MSS.00 Main Steam System		255	18-Feb-09	09-Feb-10		450.00
2.32.PCS.MSS.01	Calculations	120	18-Feb-09	04-Aug-09		200.00
2.32.PCS.MSS.02	PFD's	45	05-Aug-09	06-Oct-09		100.00
2.32.PCS.MSS.03	System Description Document	90	06-Oct-09	09-Feb-10		150.00
2.32.PCS.MSS.SG.00 Steam Generator		343	09-Jun-09	30-Sep-10		6440.00
2.32.PCS.MSS.SG.01	Calculations	150	09-Jun-09	05-Jan-10		2280.00
2.32.PCS.MSS.SG.02	SG Conceptual Design Package	120	05-Jan-10	22-Jun-10		3360.00
2.32.PCS.MSS.SG.03	SG Performance Specification	93	25-May-10	30-Sep-10		800.00
2.32.PCS.FWC.00 Feedwater Condensate System		270	18-Feb-09	02-Mar-10		800.00
2.32.PCS.FWC.01	Calculations	90	18-Feb-09	23-Jun-09		500.00
2.32.PCS.FWC.02	PFD's	90	24-Jun-09	27-Oct-09		150.00
2.32.PCS.FWC.03	System Description Document	90	28-Oct-09	02-Mar-10		150.00
2.32.PCS.ICS.00 PCS Instrumentation and Control System		90	30-Dec-09	05-May-10		150.00
2.32.PCS.ICS.03	System Description Document	90	30-Dec-09	05-May-10		150.00
2.32.PCS.EDS.00 Electrical Distribution System		241	06-Oct-09	08-Sep-10		550.00
2.32.PCS.EDS.01	Load List	60	06-Oct-09	30-Dec-09		150.00
2.32.PCS.EDS.02	Calculations	40	30-Dec-09	24-Feb-10		100.00
2.32.PCS.EDS.03	PCS One Line	20	24-Feb-10	24-Mar-10		100.00
2.32.PCS.EDS.04	System Description Document	120	24-Mar-10	08-Sep-10		200.00
2.32.PCS.WST.00 Water Supply and Treatment System		270	24-Jun-09	06-Jul-10		450.00
2.32.PCS.WST.01	Calculations	90	24-Jun-09	27-Oct-09		150.00
2.32.PCS.WST.02	PFD's	90	28-Oct-09	02-Mar-10		150.00
2.32.PCS.WST.03	System Description Document	90	03-Mar-10	06-Jul-10		150.00
2.32.PCS.CCW.00 PCS Component Cooling Water System		270	24-Jun-09	06-Jul-10		550.00
2.32.PCS.CCW.01	Calculations	90	24-Jun-09	27-Oct-09		200.00
2.32.PCS.CCW.02	PFD's	90	28-Oct-09	02-Mar-10		200.00
2.32.PCS.CCW.03	System Description Document	90	03-Mar-10	06-Jul-10		150.00

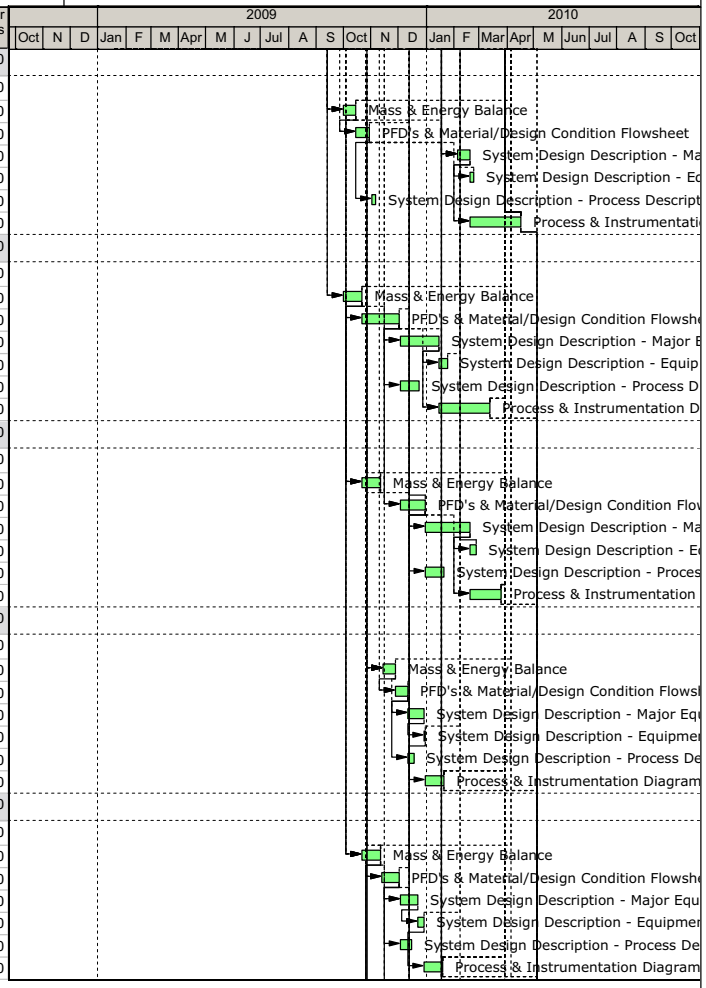


Actual Work ◆ Milestone
Remaining Work

WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.PCS.HVC.00 Turbine Building HVAC		270	29-Apr-09	11-May-10		550.00
2.32.PCS.HVC.01	Calculations	90	29-Apr-09	01-Sep-09		200.00
2.32.PCS.HVC.02	HVAC Schematic	90	02-Sep-09	05-Jan-10		200.00
2.32.PCS.HVC.03	System Description Document	90	06-Jan-10	11-May-10		150.00
2.32.PCS.BLD.00 Turbine Building		140	18-Feb-09	01-Sep-09		500.00
2.32.PCS.BLD.01	TB Architectural Drawings	90	29-Apr-09	01-Sep-09		300.00
2.32.PCS.BLD.02	TB Description Document	50	18-Feb-09	28-Apr-09		200.00
2.32.HPS.FAC.00 Hydrogen Production Facility		522	01-Oct-08	30-Sep-10		16694.00
General		480	28-Nov-08	30-Sep-10		8338.00
General		480	28-Nov-08	30-Sep-10		8338.00
2.32.HPS.FAC.00	Basic Configuration Study - Develop product specifications	21	02-Sep-09*	30-Sep-09		84.00
2.32.HPS.FAC.00	Basic Configuration Study - Optimization of Sulfuric Decom...	60	29-Apr-09*	21-Jul-09		816.00
2.32.HPS.FAC.00	Basic Configuration Study - Optimize operating conditions	20	29-Apr-09	26-May-09		160.00
2.32.HPS.FAC.00	Design Study - Optimize electrolyzer config.	28	27-May-09	03-Jul-09		240.00
2.32.HPS.FAC.00	Decomposer Configuration Study - Preliminary studies	60	10-Jun-09	01-Sep-09		864.00
2.32.HPS.FAC.00	Decomposer Configuration Study - Integration meeting	4	02-Sep-09	07-Sep-09		120.00
2.32.HPS.FAC.00	Decomposer Configuration Study - Develop Conceptual Con...	15	08-Sep-09	28-Sep-09		480.00
2.32.HPS.FAC.00	Decomposer Study - Develop feed and recycle purification ...	120	02-Feb-10*	20-Jul-10		1632.00
2.32.HPS.FAC.01	Basis of Design	15	24-Dec-08*	13-Jan-09		200.00
2.32.HPS.FAC.02	Calculations	60	13-Nov-09	05-Feb-10		1200.00
2.32.HPS.FAC.03	Block Flow Diagram - Preliminary	5	14-Jan-09	20-Jan-09		48.00
2.32.HPS.FAC.03	Block Flow Diagram - Final	5	16-Apr-10	23-Apr-10		40.00
2.32.HPS.FAC.04	Overall Mass and Energy Balance - Preliminary	10	21-Jan-09	03-Feb-09		88.00
2.32.HPS.FAC.04	Overall Mass and Energy Balance - Final	5	23-Apr-10	30-Apr-10		20.00
2.32.HPS.FAC.05	Conceptual Process Hazard Assessment	5	16-Feb-09	20-Feb-09		40.00
2.32.HPS.FAC.06	Utility, Catalyst and Chemical Summary	5	25-Feb-10	04-Mar-10		24.00
2.32.HPS.FAC.07	Effluent Summary	5	30-Apr-10	07-May-10		24.00
2.32.HPS.FAC.08	Safety interlocks (Emergency Shutdown matrix)	15	31-Dec-09	20-Jan-10		250.00
2.32.HPS.FAC.09	Operating Guidelines (Startup & Operating Instr)	25	16-Apr-10	21-May-10		220.00
2.32.HPS.FAC.10	Process Hazard Analysis - Preliminary HAZOPS	10	16-Apr-10	30-Apr-10		400.00
2.32.HPS.FAC.10	Process Hazard Analysis - Selected FMEA	15	30-Apr-10	21-May-10		120.00
2.32.HPS.FAC.10	Separation Distance Study - Hydrogen leak scenario develo...	4	16-Apr-10	22-Apr-10		20.00
2.32.HPS.FAC.10	Separation Distance Study - Hydrogen cloud dispersion, def...	15	22-Apr-10	13-May-10		120.00
2.32.HPS.FAC.10	Separation Distance Study - Chemical leak scenario	4	16-Apr-10	22-Apr-10		20.00
2.32.HPS.FAC.10	Separation Distance Study - Chemical cloud dispersion study	15	22-Apr-10	13-May-10		120.00
2.32.HPS.FAC.10	Process Hazard Analysis - Safety Revisions	15	21-May-10	11-Jun-10		220.00
2.32.HPS.FAC.11	Process Supervision	480	28-Nov-08	30-Sep-10*		768.00
2.32.HPS.TDC.00 Technology Development Coordination		522	01-Oct-08	30-Sep-10		1026.00
General		522	01-Oct-08	30-Sep-10		1026.00
2.32.HPS.TDC.00	Technology Development Coordination	522	01-Oct-08	30-Sep-10		1026.00

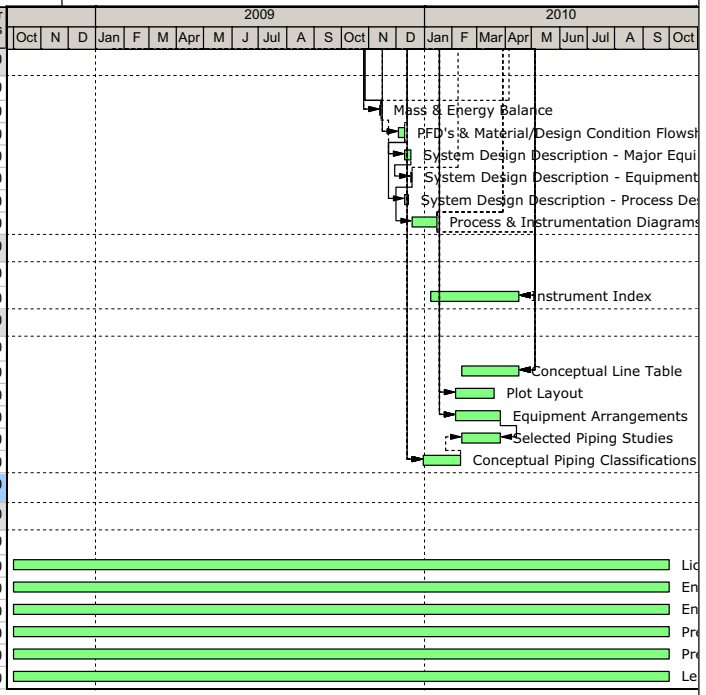


WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.HPS.ELE.00 Electrolysis Subsystem		142	01-Oct-09	16-Apr-10		377.00
General		142	01-Oct-09	16-Apr-10		377.00
2.32.HPS.ELE.01	Mass & Energy Balance	10	01-Oct-09	14-Oct-09		40.00
2.32.HPS.ELE.02	PFD's & Material/Design Condition Flowsheet	12	15-Oct-09	30-Oct-09		60.00
2.32.HPS.ELE.03	System Design Description - Major Equipment Descriptions	10	05-Feb-10	19-Feb-10		60.00
2.32.HPS.ELE.03	System Design Description - Equipment List	1	19-Feb-10	22-Feb-10		8.00
2.32.HPS.ELE.03	System Design Description - Process Descriptions	4	02-Nov-09	05-Nov-09		20.00
2.32.HPS.ELE.04	Process & Instrumentation Diagrams	40	19-Feb-10	16-Apr-10		189.00
2.32.HPS.SAD.00 Sulfuric Acid Decomposition Subsystem		116	01-Oct-09	12-Mar-10		2008.00
General		116	01-Oct-09	12-Mar-10		2008.00
2.32.HPS.SAD.01	Mass & Energy Balance	15	01-Oct-09	21-Oct-09		120.00
2.32.HPS.SAD.02	PFD's & Material/Design Condition Flowsheet	30	22-Oct-09	02-Dec-09		360.00
2.32.HPS.SAD.03	System Design Description - Major Equipment Descriptions	31	03-Dec-09*	15-Jan-10		480.00
2.32.HPS.SAD.03	System Design Description - Equipment List	6	15-Jan-10	25-Jan-10		48.00
2.32.HPS.SAD.03	System Design Description - Process Descriptions	15	03-Dec-09	23-Dec-09		120.00
2.32.HPS.SAD.04	Process & Instrumentation Diagrams	40	15-Jan-10	12-Mar-10		880.00
2.32.HPS.FUS.00 Feed and Utility Supply Subsystem		111	22-Oct-09	25-Mar-10		1317.00
General		111	22-Oct-09	25-Mar-10		1317.00
2.32.HPS.FUS.01	Mass & Energy Balance	15	22-Oct-09	11-Nov-09		80.00
2.32.HPS.FUS.02	PFD's & Material/Design Condition Flowsheet	20	03-Dec-09	30-Dec-09		240.00
2.32.HPS.FUS.03	System Design Description - Major Equipment Descriptions	36	31-Dec-09	18-Feb-10		288.00
2.32.HPS.FUS.03	System Design Description - Equipment List	5	19-Feb-10	25-Feb-10		29.00
2.32.HPS.FUS.03	System Design Description - Process Descriptions	15	31-Dec-09	20-Jan-10		80.00
2.32.HPS.FUS.04	Process & Instrumentation Diagrams	25	19-Feb-10	25-Mar-10		600.00
2.32.HPS.WTD.00 Waste Treatment and Disposal Subsystem		48	13-Nov-09	21-Jan-10		496.00
General		48	13-Nov-09	21-Jan-10		496.00
2.32.HPS.WTD.01	Mass & Energy Balance	10	13-Nov-09	27-Nov-09		40.00
2.32.HPS.WTD.02	PFD's & Material/Design Condition Flowsheet	10	27-Nov-09	11-Dec-09		120.00
2.32.HPS.WTD.03	System Design Description - Major Equipment Descriptions	12	11-Dec-09	29-Dec-09		96.00
2.32.HPS.WTD.03	System Design Description - Equipment List	1	29-Dec-09	31-Dec-09		10.00
2.32.HPS.WTD.03	System Design Description - Process Descriptions	5	11-Dec-09	18-Dec-09		40.00
2.32.HPS.WTD.04	Process & Instrumentation Diagrams	15	31-Dec-09	21-Jan-10		190.00
2.32.HPS.PPS.00 Product Purification Subsystem		63	22-Oct-09	19-Jan-10		744.00
General		63	22-Oct-09	19-Jan-10		744.00
2.32.HPS.PPS.01	Mass & Energy Balance	15	22-Oct-09	11-Nov-09		60.00
2.32.HPS.PPS.02	PFD's & Material/Design Condition Flowsheet	15	12-Nov-09	02-Dec-09		180.00
2.32.HPS.PPS.03	System Design Description - Major Equipment Descriptions	14	03-Dec-09	22-Dec-09		224.00
2.32.HPS.PPS.03	System Design Description - Equipment List	4	23-Dec-09	29-Dec-09		20.00
2.32.HPS.PPS.03	System Design Description - Process Descriptions	10	03-Dec-09	16-Dec-09		60.00
2.32.HPS.PPS.04	Process & Instrumentation Diagrams	15	29-Dec-09	19-Jan-10		200.00



Actual Work ◆ Milestone
Remaining Work

WBS	Activity Name	Original Duration	Start	Finish	Priority	Budgeted Labor Units
2.32.HPS.PDS.00 Product Delivery Subsystem		47	12-Nov-09	15-Jan-10		358.00
General		47	12-Nov-09	15-Jan-10		358.00
2.32.HPS.PDS.01	Mass & Energy Balance	2	12-Nov-09	13-Nov-09		10.00
2.32.HPS.PDS.02	PFD's & Material/Design Condition Flowsheet	6	03-Dec-09	10-Dec-09		60.00
2.32.HPS.PDS.03	System Design Description - Major Equipment Descriptions	5	10-Dec-09	17-Dec-09		40.00
2.32.HPS.PDS.03	System Design Description - Equipment List	1	17-Dec-09	18-Dec-09		4.00
2.32.HPS.PDS.03	System Design Description - Process Descriptions	2	10-Dec-09	14-Dec-09		4.00
2.32.HPS.PDS.04	Process & Instrumentation Diagrams	20	18-Dec-09	15-Jan-10		240.00
2.32.HPS.ICS.00 Instrumentation & Controls		70	08-Jan-10	16-Apr-10		500.00
General		70	08-Jan-10	16-Apr-10		500.00
2.32.HPS.ICS.01	Instrument Index	70	08-Jan-10	16-Apr-10		500.00
2.32.HPS.PMS.00 Piping and Mechanical Studies		77	31-Dec-09	16-Apr-10		1530.00
General		77	31-Dec-09	16-Apr-10		1530.00
2.32.HPS.PMS.01	Conceptual Line Table	45	12-Feb-10	16-Apr-10		360.00
2.32.HPS.PMS.02	Plot Layout	30	05-Feb-10	19-Mar-10		380.00
2.32.HPS.PMS.03	Equipment Arrangements	35	05-Feb-10	26-Mar-10		350.00
2.32.HPS.PMS.04	Selected Piping Studies	30	12-Feb-10	26-Mar-10		200.00
2.32.HPS.PMS.05	Conceptual Piping Classifications Index	30	31-Dec-09	11-Feb-10		240.00
2.41.LIC.GEN.00 Licensing and Permitting Activities		522	01-Oct-08	30-Sep-10		76650.00
2.41.LIC.GEN.00 Licensing and Permitting		522	01-Oct-08	30-Sep-10		76650.00
General		522	01-Oct-08	30-Sep-10		76650.00
2.41.LIC.GEN.01	Licensing Planning and PM	522	01-Oct-08	30-Sep-10		9340.00
2.41.LIC.GEN.02	Engineering Topical Reports	522	01-Oct-08	30-Sep-10		31410.00
2.41.LIC.GEN.03	Engineering Support Meetings	522	01-Oct-08	30-Sep-10		2560.00
2.41.LIC.GEN.04	Preparation of ESP/LWA Application	522	01-Oct-08	30-Sep-10		7130.00
2.41.LIC.GEN.05	Preparation of COL Application	522	01-Oct-08	30-Sep-10		25450.00
2.41.LIC.GEN.06	Legal Support	522	01-Oct-08	30-Sep-10		760.00



Actual Work ◆ Milestone
Remaining Work