DOCKETED

Docket Number:	15-IEPR-12
Project Title:	Nuclear Power Plants
TN #:	204602-8
Document Title:	Attachment 8
Description:	N/A
Filer:	Sabrina Savala
Organization:	Pacific Gas & Electric Company
Submitter Role:	Public Agency
Submission Date:	5/12/2015 12:37:04 PM
Docketed Date:	5/12/2015

Attachment 8

Humboldt Bay Power Plant Decommissioning Transition to Civil Works – 15039

*Kerry Rod and ** Dr. John Kristofzski and *** Matt King
* *PG&E Utility, Humboldt Bay Power Plant, 1000 King Salmon Ave. Eureka, CA 95503*
** CH2MHILL, 295 Bradley Blvd. Suite 300, Richland WA 99353
*** Whitchurch Engineering, Inc. 610 9th Street, Fortuna, CA 95540

ABSTRACT

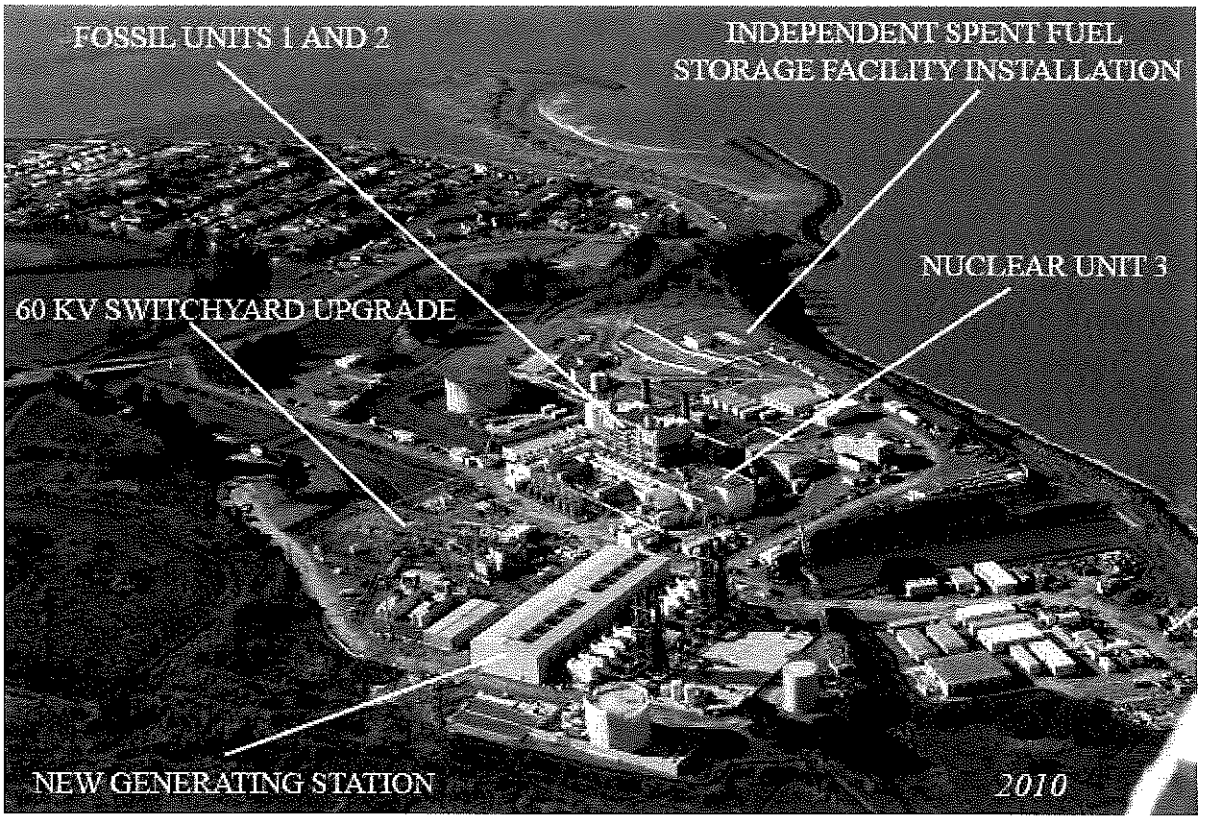
Decommissioning of the Pacific Gas and Electric (PG&E) Company Humboldt Bay Power Plant (HBPP) Unit 3 nuclear facility achieved a significant milestone in June 2014. The Plant Systems Removal Phase resulting in removal of all radiologically significant plant systems from the buildings was completed after more than three decades in SAFSTOR. The HBPP historical design and construction, close proximity to the bay and associated tidal interactions poses unique challenges to an effective decommissioning effort as the Site transitions to a major earthwork project – designated as Civil Works. PG&E still maintains its Part 50 license and in May 2013, PG&E submitted its License Termination Plan (LTP) to the U.S. Nuclear Regulatory Commission.

The last significant large component removal project remaining is segmentation and disposal of the reactor pressure vessel shell. The reactor pressure vessel project is integrated and executed under Civil Works with PG&E performing solely in an oversight role across the site beginning in 2015. The value from run-up and mock-up testing of tooling to segment the HBPP reactor vessel will be discussed. Experience obtained, especially at error prone interfaces, during start-up, systemization and operating phases for the First of a Kind (FOAK) tooling will be discussed.

Implementation of the civil scope of work commenced July 2013. Its status and experience applicable to other decommissioning efforts will be provided from an owner's perspective. Implementation of the civil work scope includes development and implementation of oversight capability including policy, procedures and deployment of skilled, experienced and trained oversight staff in the field. Challenges encountered and solutions implemented during mobilization and ramp up of the civil contractor commensurate with demobilization of the self-perform staff will be covered.

Partnering with the contractor to establish a good Client/Contractor relationship and tips on where to invest owner/client resources will be shared. Development of a solid baseline project schedule that incorporates regulatory constraints, client expectations and contract constraints and its importance to safe, compliant project execution will be shared.

INTRODUCTION



Background

The site on which HBPP Unit 3 is located was initially developed around 1950 by PG&E as a fossil based electrical generating station. HBPP Unit 3 generating unit, a Boiling Water nuclear reactor, had a rated core thermal power of 220 MWth (thermal) with a corresponding net electrical output of 65 MWe (electric). It began commercial operation in 1963 and was taken off-line in 1976 to refuel and perform seismic modifications, but was never restarted.

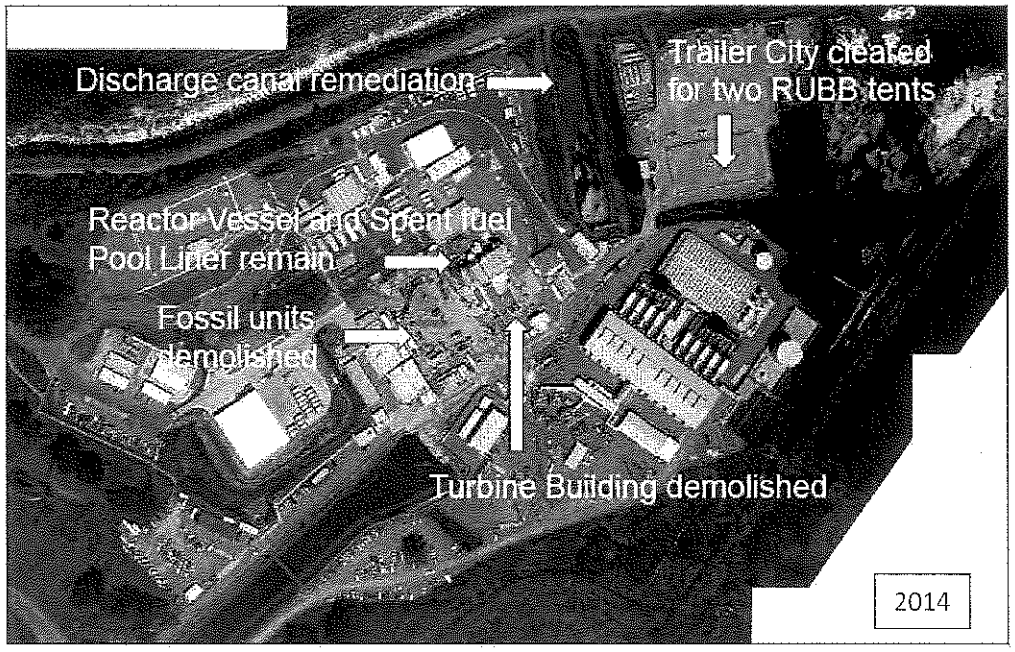
The PG&E HBPP Decommissioning Organization was formed in 2008 and initiated a pre-planning process and initiated self-performed work scope in early 2009 with staff training; stakeholder conferences; structure modifications to allow better access for personnel and activities; large component removal; and commodity removal. In May 2011 the PG&E HBPP Decommissioning Organization began a planning process to transition from self-performed to competitively bid work scope contracts with independent contractors performing work under the supervision of a PG&E Oversight Team. The Contract was awarded in July 2013, thus from initiation of the development of the specifications to contract award the planning and transition effort took approximately two years to complete.

Transitioning to Civil Works Oversight

After 30 years of SAFSTOR operations the HBPP decommissioning project has made significant progress over a period of five years (2009 – 2013) including the removal of the majority of alpha contaminated systems. The plant systems removal phase of the project has been "self-performed" by specialty contractors managed by PG&E as opposed to hiring a single large decommissioning contractor. During these past five years the decommissioning project has successfully completed fossil plant decommissioning, numerous site infrastructure improvements, removal of all large nuclear components, and safely transporting these oversized, overweight shipments to their disposal sites. Now, after two years of highly-focused planning for transition to the civil works phase - in conjunction with the years of pre-planning accomplished during the plants systems removal phase - Humboldt Bay Power Plant has transitioned into its Civil Works Projects phase.

It is the mission of the HBPP Oversight Team to ensure that the Civil Works Contract - the final major Contract to take the Decommissioning Project to completion - supports the vision, and does it safely, on schedule within budget, and in compliance with all regulatory requirements, while maintaining local community support. This represents a significant transition point of the project after five years of self-performing and directing the decommissioning.

PG&E's oversight of the contract work is to (1) assure that Contract Requirements and Specifications are met; and (2) facilitate the Contractor's understanding of and compliance with site specific procedures, regulations, HBPP work scheduling, and site safety and quality expectations.



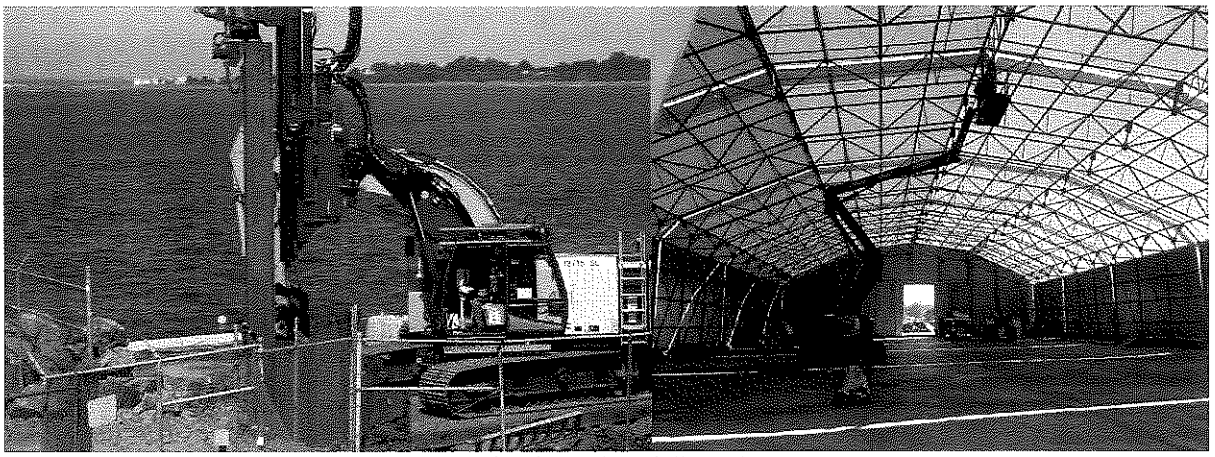
UNDERSTANDING OUR SAFETY CULTURE

PRINCIPALS	DEMONSTRATE
▪ Everyone is responsible ▪ Making the work place a safe place ▪ Embracing a safety conscious work environment ▪ Preemptive and defense in depth ▪ Stop work authority	▪ Management briefing prior to badging ▪ Weekly senior leadership walk downs ▪ Posters of our children throughout site ▪ Quarterly all hands meeting ▪ Walk the talk
EXPERIENCE	**ASSESSMENT**
▪ Bring right resources at right time ▪ Continuity across successful projects ▪ Planning the work is essential ▪ Supervision and Oversight	▪ Benchmarking ▪ Field Observations ▪ Adverse Trending ▪ Continually Evaluate Risk

The HBPP Safety culture is defined through four program elements: (1) how we work to our core principals; (2) how we demonstrate the right safety practices and behaviors; (3) bringing to bear the right experience; and (4) continual assessment.

HBPP fosters a safety culture and expectation of exemplary safety performance and we expect our contract partners to embrace our vision and culture. Protection of personnel and the environment while providing a safe workplace is PG&E's the number one priority. Discovery or identification of safety issues and concerns, injuries, accidents, or near misses are to be reported immediately to HBPP. All personnel are given stop work authority for any activity they believe is unsafe or poses a risk to meeting regulatory requirements. HBPP requires all PG&E contractor personnel and all sub-tier contract personnel to adopt and implement this safety culture in all aspects of work performance, behaviors, and personnel interactions. This philosophy and the continued emphasis on safety, environment, and regulatory compliance shall form the foundation of all activities planned and performed at HBPP.

FIRST YEAR IN TRANSITION



Preparing for Major Civil Works
Installation of coffer dam at discharge canal and tents to manage wet canal sediment

The first year in transitioning to Civil Works Oversight were focused in the following areas:

- Approval of prime contractor baseline schedule;
- Revamped key programmatic programs and plans;
- Major civil works field activities started May 2014; and
- Efforts to segment the reactor pressure vessel.

Approval of Prime Contractor Baseline Schedule

HBPP approved prime contractor Baseline Schedule which included effective technical approaches to remove structural elements such as the dry well and suppression chamber liners during caisson excavation. Detail logic network checks and other important metrics were developed to ensure that the submitted schedule adheres to accepted industry standards and the contract specifications. The constructability and critical path of the schedule was reviewed by HBPP and its Owners' Group to ensure that that the Contractor was in compliance with any agreed upon activities, milestones, etc. that may have been established in between the Owner and the Contractor.

Reaching an early consensus on a Work Breakdown Structure (WBS) that decomposes authorized work into appropriate elements for planning, budgeting, scheduling, cost accounting, work authorization, measuring progress and management control was an important first step. PG&E expects the WBS to display the following attributes:

- Contain all contract line items and end items
- Identify all WBS elements specified for external reporting

- Extend at a minimum to the level at which control accounts are established
- Provide a complete definition of work scope

An important element of HBPP oversight was to ensure expectations that a product-oriented division of project tasks depicting the breakdown of work scope for work authorization, tracking, and reporting purposes that facilitates traceability and provides a control framework was in place. The approved WBS ensured that the Statement of Work was entirely covered and allowed for the integration of technical, schedule and cost information.

Revamp Key Programmatic Programs and Plans

Oversight Plan

The HBPP Oversight Plan was developed over a period of six months through a collaborative effort by the management team and it describes the framework for oversight of all work activities associated with the HBPP Decommissioning. Oversight is intended to support the safe, compliant, and effective decommissioning through all stages of the Project, including contracting, work planning, field work and any necessary owner support, management and ultimate final disposition of waste materials, demobilization from the site, and implementing the end state configuration through a site restoration program.

This plan allows HBPP to institute administrative controls to effectively identify, manage and communicate potential impacts in such a way that the HBPP Management Team can execute pre-emptive and mitigative corrective action strategies to achieve success in meeting HBPP's Decommissioning Goals and Objectives.

The organizational structure at HBPP provides for an extremely effective oversight structure that, when taken as a whole, represents a strong Owner culture that will support work execution by asking the right questions, at the right time, to keep the project on track.

Key areas for Oversight Team attention include, but are not limited to:

- The HBPP site safety and teamwork culture
- Unique project radiological and environmental issues
- Complex and unique regulatory requirements
- Current best industry practices specific to nuclear facility decommissioning

This Oversight Plan provides functional guidelines to assist HBPP Leadership in assuring the Contractor's compliance with contractual requirements, and facilitate full support of and adherence to over-arching HBPP Values. This document, with existing Site Procedures, ensures an appropriate level of HBPP review, approval, and inspection of all work scope executed.

Effective oversight understands the role of the Contractor to implement work scope effectively and efficiently. Effective oversight understands that Contractor Means, Methods, and Equipment may differ from past HBPP experience, but that the Contractor has been selected for its unique approach and expertise. Through their respective knowledge bases, effective oversight provides a Contractor with the benefit of Owner site understanding, and the Owner benefits with Contractor experience on tasks not previously undertaken at HBPP.

Quality Assurance Plan

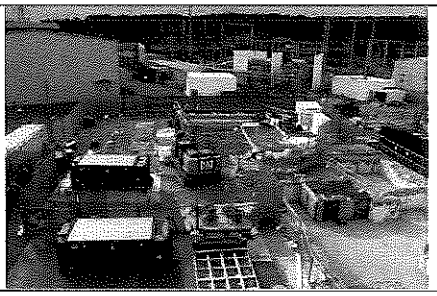
In April 2014, PG&E revised its Humboldt Bay Quality Assurance Plan (HBQAP). The overall intent of revisions were to simplify the HBQAP for HBPP Unit 3 and HBISFSI based on the plant's decommissioning status, remaining decommissioning activities, and long-term passive operational status of the ISFSI. Radiological risk factors on site have been significantly reduced as a result of Unit 3 decommissioning activities; all spent fuel and Greater Than Class C (GTCC) waste have been transferred to the ISFSI, and the last known Class B and Class C have been shipped off site for disposal.

Emergency Plan

In June 2014, PG&E submitted to the NRC a License Amendment Request for Proposed Revision to Humboldt Bay Site Emergency Plan. The proposed changes included changes to the emergency planning function that were commensurate with the ongoing and anticipated reduction in radiological source term at the HBPP site.

Major Civil Works Field Activities started May 2014

The Civil Works project has completed several big accomplishments in the field once it transitioned from a major planning effort to start of field work. Several above grade buildings were abated and demolished including the Hot Machine Shop (HMS) and the former Security Alarm Station (SAS) building (a previously hydrogen re-combiner concrete structure). These demolitions required carefully placed debris curtains and for the SAS building a closure plate to isolate the SAS building from the main plant ventilation system.



First demolition - Hot Machine Shop

Several key infrastructures were completed as well including removal of trailer city and construction of two large RUBB tents to manage soils. The Guardian system was completed which allows ease of soil screening for use.

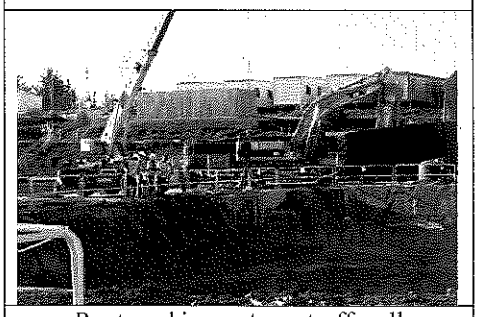
Guardian System to screen reusable soils

Divers were mobilized to isolate the discharge canal discharge piping from the power block using bladders. Once completed, they transitioned to their primary project, a radiological significant activity, to cut the spent fuel pool liner under water.

Divers removing spent fuel pool liner wet

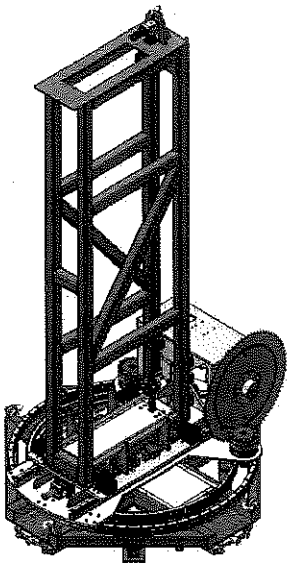
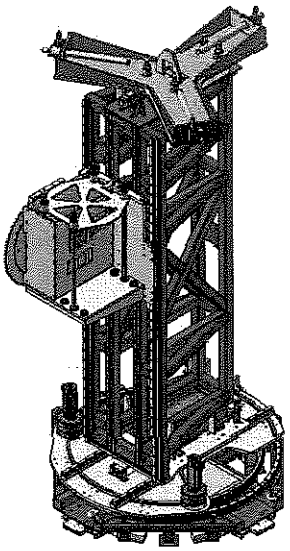
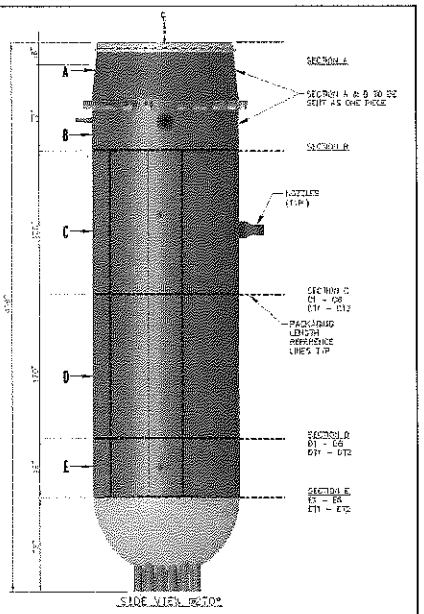
Discharge canal remediation accomplishments included: completion of coffer dam installation; Ground Water Treatment System (GWTS) tightness test complete; and discharge canal seining complete.

Pre-trenching for the water cut-off wall and removal of underground substructures beneath and nearby were well underway during this period including removal of unit 2 foundation and timber pilings. To support this excavation effort numerous storm water and firewater design changes and field modifications had to be performed.



Pre-trenching water cut-off wall

Efforts to Segment the Reactor Pressure Vessel

		
Old vertical cutter on CHORCE	New CHORCE and vertical cutter assembly	All precuts complete

The Reactor Pressure Vessel (RPV) removal project at Humboldt Bay Power Plant has proven to be a uniquely challenging project. These challenges range from initial access to the RPV for characterization all the way to physical shell segmentation. The challenges and actions taken by the HBPP during the shell segmentation project, which started field work in February 2014, are discussed.

The current physical condition of the reactor pressure vessel is as follows: all initial vertical, horizontal and rigging hole cuts have been made in Sections C, D and E. From there the first 17 of 24 windows are planned to be removed in early 2015. Once the windows are removed, the reactor pressure vessel's insulation will be removed and abated. Upon completion of insulation removal, the RPV will be severed from its piping systems that are still connected. The remainder of the reactor pressure vessel will then be removed. What's left of the reactor pressure vessel systems located in the dry well will have its insulation removed in preparation for building demolition. The completion of the dry well insulation removal marks the end of the reactor pressure vessel project.

Over the past several months, the team performed dry runs of the work to be performed as it transitioned from cutting of the vessel to removal of its windows. After hours of practice and successful attempts, they are ready to perform the actual work.

The HBPP team went to the contractors testing facility during the initial RUT. The HBPP Design team developed a thorough set of robust design criteria for design and additional testing for the equipment. This criterion included increased factors of safety on equipment components, vibration design limits to prevent equipment from excessive wear and tear, full scale testing of all the equipment as it would be used onsite at HBPP, and training requirements for the contractor technicians who would be operating the equipment onsite.

Throughout the design and testing phase, the HBPP Design team stayed involved with the contractor. During the final RUT and Mock up Testing (MUT) the HBPP design team expanded to include the field supervisors who would be ultimately responsible for the execution of the project at HBPP. The Equipment went through a rigorous RUT and MUT phase before it was accepted by HBPP for use on the site. This proved invaluable to HBPP with the amount of knowledge gained by the staff and allowed for a smooth project transition into the execution onsite.

This process of up front involvement and verification by HBPP ensured that the FOAK equipment would indeed meet the projects expectations for robustness and reliability. Adding the right resources to the project team proved to be a key aspect for ensuring what was needed by the project was delivered by the contractor.

INSIGHTS AND KEY STRATEGIES

- The right period and timing when to plan work packages
- Be flexible – things change – risk materialize and opportunities arise
- Having the right resources and bandwidth
- Understand work control process and oversight
- Do not underestimate site infrastructure needs
- Implementing cold and dark worked well
- Vet your decommissioning cost estimates
- Establish a good regulatory relationship
- Mock-ups and dry runs do work and are a prudent investment
- Good solid community relationships require time and open transparent discussion
- Deliver on promise, communications and alliance

The right period and timing when to plan work packages:

Early in the project there exists a delicate balance on how much pre-planning and planning can reasonably be done effectively prior to start of physical work. Once field work commences there exists an opportunity that the right set of skills in the field and continuing on-site planning can reasonably lead-lag each other such that the work packages have the right constructability input and reviews and right focus and attention by the project team. This is important because the planning team gains a perspective from the field on the lessons learned in the early implementation phase and the project team can provide relevant input based on their expertise and knowledge about the facility. That is, the right level of detail (i.e., step-by-step instructions), appropriate means and methods (versus skill of the craft) and content of the work package (i.e., design changes, permits, etc.) are adequately defined and developed such that the work can be safely executed in the field. The optimal period is three to six months prior to physical work being performed, but this period through experience tends to drift to one to three months and possibly less based on experience gained.

When the project obtains relevant field to planning experience, an assessment should be performed as to whether the remainder of the planning packages could be completed much earlier in the project. This in turn lessens the overhead costs associated with a large contingent of engineers and work control personnel over the remainder of the project.

Be flexible – things change – risks materialize and opportunities arise:

As with any decommissioning and at HBPP things change or they were not what you expected when work is executed and you need to quickly adapt to the changing conditions.

When the risk of radioactive material beyond what was previously understood materialized and the project scope changed to remove the reactor concrete caisson that is below grade, there existed better ways to remove other structural components that were being removed surgically by the craft. Opportunities to use conventional demolition methods during the excavation of the caisson allowed the 3/16 in. steel suppression chamber liner, the 5/8 in. steel drywell liner, the 40 in. diameter suppression chamber ring header and the top half of the 46 equally-spaced 14 in. diameter vent piping to be removed more effectively using safer mechanical means and methods resulting in better ways in performing the work.

Through further characterization of the building surfaces and use of subject matter experts in radiological engineering the development of an open air demolition criteria led to the reduction in the decontamination of many of the building interior surfaces.

Difficulties encountered when removing the reactor vessel internals and segmentation of the reactor vessel shell allowed the project to focus and perform other work such as early demolition of the turbine building. Preparing the turbine building for demolition was a challenging project involving many different systems and components, each presenting different issues. Despite the difficulties, the removal of alpha contaminated plant systems from the turbine building was completed under budget and without incident or unplanned radiation exposure. The systems removed from the building included the main generator, turbine, condenser, four reactor feed pumps, seal-oil switchgear, piping and valves. Dismantlement of the turbine, condenser, and the associated systems and components involved labor-intensive segmentation of highly-contaminated equipment that spanned 34 months and prepared the project team to obtain competitive bids early to demolish the building as the next phase of the work.

Experience gained in performing this demolition early allowed the project team to benchmark subcontractor demolition costs, enabled the project to ramp up from 2-4 shipments per week to approximately 12 shipments per week and to demonstrate the ability to ramp to 20 shipments per week while maintaining integrity to the overall project completion date.

Having the right resources and bandwidth:

Having the right resources and bandwidth implies the need to get things done right from the beginning and this need pertains equally to the Contractor and Utility. This applies to all aspects of decommissioning from planning to execution, from accounting to performance reporting and from public safety to environmental management.

Personnel experienced in the various life cycle phases of a project are the right experience to bring to a project. Plants entering decommissioning are either exiting Operations or SAFSTOR wherein the site is typically managed based on an annual cash flow which is focused on operations and maintenance (O&M). Onboarding key personnel with project management capability are essential to keeping the project moving forward because of their instinctive ability to understand and work toward a schedule and budget. These key assets are capable and comfortable working in an environment that is under constant change, and they are experienced when challenged by unforeseen events; thus they are well versed in how to recovering from the unforeseen events.

Decommissioning will require demolition of structures and the right resource and field experience is important to mitigate any potential consequential damage to the environment as well as human life. There is a clear difference between companies that perform demolition as part of their core business versus ones capable of providing a competent equipment operator performing the same task. From the Utility side, the ability have the right subject matter expert available to perform reviews of the work plans as well as be observant in the field during key phases of demolition

ensures proper and adequate oversight are being demonstrated to mitigate potential events from unfolding that typically bring high consequential damages if not performed per plan.

The skill sets within Safety and Environmental will change over the course of decommissioning. Early Environmental expertise in permitting is essential and when field work starts field experience relevant to Storm Water Pollution Prevention Plan (SWPPP) implementation and Best Management Practices (BMPs) are critical to success of supporting field work. Also, assigned responsibility for overall strategic water management onsite is essential to project success. Safety expertise evolves through radiological protection (i.e., contamination control best ALARA practices) to industrial hygiene (i.e., exposure to lead, silica dust, asbestos, etc.) to industrial safety (i.e., heavy lifts, heavy equipment, structural demolition, etc.).

Understand work control process and oversight:

Understanding the work control process was a consistent challenge to most Contractors. Particularly, the time necessary to pre-plan the work, perform walk downs, obtain constructability reviews and the need to allocate sufficient time for review and incorporation of comments required.

Oversight functions also include observing pre-job briefs and tailboards, including those required by the specifications for Contractor compliance with the three-phase quality program (preparatory phase, initial phase, and follow-up phase) as included in the contract specifications. Provide tailboard performance feedback to the Contractor to enhance tailboard quality. Develop lessons learned for planning future work and document and track significant issues that require the Contractor to take corrective actions to avoid non-compliance with federal, state, local, or PG&E permit or procedural requirements.

Do not underestimate site infrastructure needs:

While decommissioning planning is primarily focused on removing equipment and demolishing building, don't lose sight of infrastructure needs during decommissioning. To support full scale-decommissioning a significant number of required plant modifications, site improvements and infrastructure were put in place. In particular, additional office space, including facilities for breaks, restrooms, and storage of records for support personnel as they ramp up on-site. The increased staffing to support the decommissioning activities required the purchase/leasing of additional trailers and installation of services such as telephone, computer, water, and electrical.

At HBPP, the large number of samples needed to adequately assess the extent and concentration of alpha contamination combined with the requirement to achieve very low background radiation levels resulted in the decision to construct a new counting facility rather than attempting to salvage existing facilities. The RUBB tent was constructed to facilitate packaging in inclement weather

and to control potential airborne release during packaging. The access control facility was expanded to more efficiently accommodate large numbers of workers during peak transit times to and from their work areas.

In addition, expect road repairs because of the heavy repetitive traffic from hauling waste off-site. This work included the engineering, surveying, geotechnical, permitting, materials testing, and inspection needed to complete design of the access road and monitor construction. To mitigate the environmental challenges with provisions of the new construction storm water general permit, a significant upgrade and paving project was completed to the main road.

Implementing cold and dark" worked well:

One of the most difficult challenges is decommissioning when live electrical systems may be inadvertently be discovered or cut. For that reason, many decommissioning projects have completely disconnected their original electrical supply systems, (referred to as going "cold and dark"), and used new, temporary, completely separate, and tightly controlled, systems for remaining services.

HBPP ultimately implemented plant wide cold and dark approach because it would reduce potential hazards, increasing safety for employees and contractors doing this project, and it would reduce the time consuming and difficult design development required for all activities related to electrical power using the current processes. Re-powering and implementing cold and dark program was executed on all three units (two fossil and one nuclear). Benefits and design considerations included: (1) avoids the potential electrical hazards hidden within walls, floors, ceilings or the machinery, due to unexpected intra area and "sneak circuit" wiring, along with the inter-area issues addressed in the area by area cold and dark approach; (2) provides the highest level of personnel protection; (3) reducing the time consuming processes and difficult design development otherwise required for all activities related removing electrical and mechanical services from the plant, thus eliminating the need to develop extensive design change packages; (4) reduced clearance coordination and staffing including engineering design changes supporting plant modifications to mechanical and electrical services; (5) separating the plant operating loads from the construction power, thus allowing the construction electrician to have full control of their construction power and use of construction power stands for all construction loads, including temporary lighting; and (6) whenever power cables are routed through the plant, they should be clearly mark to distinguish them from abandoned cables and should not be run in, on or near abandoned raceways.

Vet your decommissioning cost estimates:

After devoting substantial time and effort to the decommissioning planning and bidding process, further expansion of the scope of decommissioning Humboldt Unit 3 resulted from changes in two

key assumptions: (1) the removal of the reactor caisson and associated structures beyond the generic assumption of leaving all remaining structures three feet and more below grade level; and (2) use of lower values of residual radioactive material associated with unrestricted use of the site following license termination (i.e., a change from Industrial Worker Scenario to Residential Farmer Scenario).

Establish a good regulatory relationship:

One important measure that PG&E senior leadership has conveyed to the HBPP project is the priority and investment of establishing a good regulatory relationship with its key stakeholders. HBPP has done well in being very transparent with its regulators on safety, environmental, project status and early identification of challenges.

Mock-ups and dry runs do work and are a prudent investment:

Known throughout many industries, dry runs offer an invaluable tool to the operators toward developing best work practices. In particular, dry runs of First of the Kind Equipment (FOAKE) in an inhospitable workspace (i.e., the nature of the facility and the work has resulted in a constricted and congested workspace) may present challenges to the crews as they work through alignments, clearances and fit-up details.

The use and investments in mock-ups during decommissioning provide inherent benefits that are well recognized by the crew once they were performed. Supported by Safety, they consistently convey that whenever a team can visualize the task that they plan to execute the more likely they are able understand the complexity of the work they plan to perform (i.e., the ability to break down evolution into meaningful tasks that are well understood by the project team).

HBPP management team continually supported recommendations by the crew and/or developed expectations on high risk evolutions to perform such mock-ups and/or dry runs.

The purpose of the mock-ups and/or dry-runs is to identify and address potential issues and challenges associated with the uniqueness of the equipment interfaces, work environment and conditions (e.g., small footprint, congested work area, coordination between multiple job functions and organizations).

The primary objectives of performing mock-ups and/or dry runs are:

- Allow people to work in an environment that is relatively free of industrial hazards and accumulate no dose. The mock-up and/or dry runs give staff an opportunity to become familiar with hazards and develop mitigation plans under less stressful conditions.

- Allow experimentation with methods and tools prior to the evolution so we know we're undertaking the actual evolution with the most ideal system and tools.
- Allow very accurate time dose estimates to be generated based on actual cut times and overall time of removal evolution.
- Make everyone more comfortable and efficient with the team, processes and procedures.

During exit meetings with the Nuclear Regulatory Commission (NRC) regional inspector, the inspector often recognized the benefits of PG&E performing mock-up during decommissioning and their worthy investment in the task at hand. Examples of key mock-ups that were conducted at HBPP included:

A full mock-up of loading the GTCC cask in the SFP prior to actual loading operations. This resulted in minor modification to the pieces to facilitate a much more efficient loading sequence. A heavy load dry-run with the single failure proof Vertical Cast Transporter (VCT) and HI-STAR cask was also performed.

Removal of the Control Rod Drive Mechanism (CRDM) project led to several successes and improvements. Two key improvements in the removal process were creation of a yoke system versus a planned dual winch that proved problematic and a decision to segment drives below the RPV in lieu of taking them to refueling floor in one piece.

The RPV project team, including subject matter expert consultants, spent considerable time developing robust design criteria for the RPV shell segmentation project. This included additional time and resources at the subcontractor's home office during initial tooling startup and testing to better understand the equipment. The project team then reviewed additional lessons learned from the industry from different tooling supplies and further developed criteria that would enhance the segmentation equipment. The results of this research and testing became the enhanced and extensive robust design acceptance criteria. These criteria were used by the subcontractor to increase the robustness and modification of the equipment.

During the RPV campaign changeover from running cutting equipment to removing RPV windows the RPV crew completed a detail step-by-step safety hazards analysis that was focused on identification of potential hazards and necessary controls to mitigate the hazards. This was a comprehensive effort performed by four groups, consolidated into one and presented to management. The project team updated the work plan to include additional controls for identified hazards and potential error traps (e.g., precautions, hold points, activities that require use of error prevention tools). The first dry run duration was approximately 7 hours and the final dry run observed by Management was approximately 2.5 hours.

To add a margin of radiological safety in the conduct of the work being executed, PG&E applied foaming and fixatives inside piping, and instituted other controls including glove bag operations and oversight by radiation protection personnel. The work was completed with no radiological violations from the NRC, low external exposure of personnel to date, and no uptakes of radioactive material. Prior to performing this campaign, a full mock-up and dry run of the operation was done in the Reactor Feed Pump Room including many dress rehearsals before the first cut was performed including additional cutting iterations to be implemented as a learning tool for other WACHS cutter qualified personnel.

Expectations of the mock up were: (1) provide the pipe cutting team with practical hands on experience with the pipe cutting process prior to performance of pipe cutting activities on radiological significant systems; (2) allow for the performance of a full dress rehearsal of the pipe cutting process to demonstrate readiness to cut pipe on radiological significant systems. The full dress rehearsal included use of a glove bag, PC's, Respirators and full Radiological controls; and (3) to define the task performance assignment responsibilities from start to finish for the pipe cutting process between WACHS/craft and decontamination/radiation protection personnel.

Benefits of performing this operation included: (1) continued testing of alternative fixatives and methods; (2) trial of additional cutting equipment and additional cutting methodologies (i.e. blue line cutting); (3) evaluating different spray systems; (4) developing an acceptance criterion for the various foam products.

Overall process improvements included: (1) a more stable base below the glove bag; (2) extra tools such as side cutters or dykes should be placed in the tool bag inside the glove bag to be available, if needed; (3) research in to and evaluation of different work gloves to identify and purchase the best possible glove for cut and puncture resistance for use in radioactively contaminated work areas; (4) worker ergonomics; (5) purchase of radios for RP to improve communications between the field technicians and foremen/supervision; and (6) development of several capture hoods such as shroud coverings for a saber saw, an online ventilation shroud to support a pipe cutter, catch pans for use inside of glove bags to protect the glove bag from cutting chips and ribbons and a HEPA in line pre-filter housing to use in conjunction with portable HEPA ventilation units.

Similarly, prior to performing work atop the reactor vessel head, radiation protection personnel worked closely with local craft performing dry runs and dress rehearsals to ensure a comfort level was obtained from the craft while working in a radiological controlled work for the first time.

Establish good solid community relationships:

From the beginning with permitting of the Independent Spent Fuel Storage Installation (ISFSI) to present decommissioning spanning more than 10 years the HBPP site and the Community Advisory Board (CAB) has developed an excellent, transparent and productive relationship.

CAB Members were encouraged to provide as much feedback as possible in order for management to consider the concerns and ideas of the community in the decision making process. CAB Members were requested to provide feedback in finalizing the decommissioning schedule and end state.

Insights about what has made the CAB successful during the decommissioning thus far included: (1) ensuring local neighbors and community members as well as elected representatives and officials participate, maintaining transparency with all possible paths to proceed; (2) committing to include as many technical experts from HBPP as possible at every meeting; (3) simplified design illustrations and presentation slides distilling complex technical and regulatory issues to easy concepts to understand; (4) field trips to the plant and inside areas remediated for the CAB members in order to examine the work completed; (5) keeping CAB members informed of events and challenges enabling them to respond back to their constituents first hand when inquiries are made about the site; and (6) an effective liaison for the committee in terms of being approachable and responsive to any questions, concerns or requests for information.

Deliver on promise, communications and alliance:

HBPP desires to establish a positive, cooperative relationship with its Contractors based on openness, fairness, and agreement to work as a mutually productive, project focused team. HBPP believes the work can be performed as a partnership, with both organizations focused on supporting each other to complete the work activities and tasks in a safe, efficient, cost-effective, and compliant manner. HBPP feels that this type of working relationship can be developed through mutual trust, open communications, and establishment and tracking of clear expectations and deliverables, coupled with development and maintenance of a detailed activity-based schedule. This relationship will reflect each organization's good business practices and ethics, and focus on developing fairness to each other.

Similar to establishing a good and transparent relationship with the community, the same type of relationship needs to be well developed between the Utility and site Contractors. Partnering with Contractors to establish a good client/contractor relationship and knowing where to invest your resources are essential to the success of the project. There are many phases that this relationship transitions through from bidding the work to mobilization to execution and when the project is closed out. Upfront investments and constant productive communication on both sides are needed to ensure both teams can deliver on excellence.

One key area to focus on when delivering on promise is the transition from bidding to contract award. There are details in the proposals that convey how work will be performed and an understanding of the work scope from the Contactor. Contractor proposals are developed from a set of specifications developed by the Utility defining the requirements to perform the work.

Once Best and Final Offers (BAFO) are received, the next best step is for the Utility technical team to re-evaluate the proposal statements and BAFOs to ensure that the contract (i.e., technical specifications) are updated reflecting any insights or expectations or any agreed upon work scope expectations. Once the contract is awarded, the contract in lieu of the proposal defines the agreed upon scope of work.

Once this step is complete, it is important that the Contractor's proposal team that developed the proposal spend time with their field execution team conveying its commitments and expectations prior to mobilization and have periodic follow-up through their line of business to ensure services that are to be provided are meeting client expectations. Depending on company size and value of the contract, those that won the bid are not necessarily the ones performing the work. Other possibilities are the proposal team expects to execute the work, but their skill set are more appropriate to business management than project management. For much broader scopes of work with very large companies at higher values, there are inherent advantages to have the project management team responsible for executing the work to be part of the proposal team. Including key project personnel being proposed make commitments to be on the project once the contract is awarded. Once awarded and executed challenges include minimizing the turnover rate of key personnel may become a challenge resulting in a loss of continuity.

Initial mobilization should consider multiple team building efforts offsite to ensure early alliance. Focus should be on development of measurable and practical milestones leading to success of the project. Setting the right work environment should emphasize relevance to the workers. That is, coming to work is a rewarding opportunity.

CONCLUSIONS

The HBPP Site Vision is to "complete the decommissioning of HBPP in a manner that establishes a new benchmark for the nuclear industry". The Vision is aligned with the corporate vision to yield a leading position in the decommissioning realm for HBPP and to promote the corporate position of a leading utility.

PG&E views the HBPP Decommissioning Project as a long-term opportunity to develop a cohesive team that will accomplish many things. As one of the county's prominent employers, maintaining the company's standing in the local community is critical. In developing a close Partnering relationship that accomplishes our Decommissioning goals, PG&E and the Contractor teams will represent both of our business interests, relationships, and most importantly, reputation. As we move forward together, PG&E and the Contractor will develop and share mutual values that address the corporate Vision, Goals, and Strategies.

Developing a strong alliance with its Contractors at the onset of work will reap many benefits and return on investments for both the Utility and its Contractors. Both teams need to work in unison to meet its objectives to safely complete its decommissioning.

Insights and key strategies conveyed throughout this paper focus on having the right resources and right bandwidth to execute decommissioning. That is, a competent and capable team able to work through challenges. As with any decommissioning things change or they were not what you expected when work is executed and you need to quickly adapt to the changing conditions. Having the right team, assets and right attitude is essential through these challenges.