CHALLENGES AND OPPORTUNITIES – INTEGRATED LIFE-CYCLE OPTIMIZATION INITIATIVES FOR THE HANFORD RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

K.D. Auclair
Bechtel National, Inc.
3000 George Washington Way, MS4-C1, Richland, WA 99352

ABSTRACT

This paper describes the ongoing integrated life-cycle optimization efforts to achieve both design flexibility and design stability for activities associated with the Waste Treatment Plant at Hanford. Design flexibility is required to support the Department of Energy Office of River Protection Balance of Mission objectives, and design stability to meet the Waste Treatment Plant construction and commissioning requirements in order to produce first glass in 2007.

The Waste Treatment Plant is a large complex project that is driven by both technology and contractual requirements. It is also part of a larger overall mission, as a component of the River Protection Project, which is driven by programmatic requirements and regulatory, legal, and fiscal constraints. These issues are further complicated by the fact that both of the major contractors involved have a different contract type with DOE, and neither has a contract with the other. This combination of technical and programmatic drivers, constraints, and requirements will continue to provide challenges and opportunities for improvement and optimization.

The Bechtel National, Inc. team is under contract to engineer, procure, construct, commission and test the Waste Treatment Plant on or ahead of schedule, at or under cost, and with a throughput capacity equal to or better than specified. The Department of Energy is tasked with the long term mission of waste retrieval, treatment, and disposal. While each mission is a compliment and inextricably linked to one another, they are also at opposite ends of the spectrum, in terms of expectations of one another. These mission requirements, that are seemingly in opposition to one another, pose the single largest challenge and opportunity for optimization: one of balance.

While it is recognized that design maturation and optimization are the normal responsibility of any engineering firm responsible for any given project, the aspects of integrating requirements and the management of issues across contract boundaries is a more difficult matter. This aspect, one of a seamless systems approach to the treatment of tank wastes at the Hanford site, is the focus of the Optimization Studies. This "big 'O'" Optimization of Life-Cycle operations is what is meant when the term 'optimization' is used on the River Protection Project and initiatives cited in this paper. From the early contractor centric methods and processes used to move toward an integrated solution, through extensive partnering approaches, to the current quality initiatives with multi-organizational participation, significant progress is being made towards achieving the goal of truly integrated life-cycle optimization for the Department of Energy's River Protection Project and Waste Treatment Plant.

INTRODUCTION

The current technical baseline for the River Protection Project (RPP) calls for essentially complete retrieval of all wastes stored in Single-Shell and Double-Shell Tanks. That waste will be separated into high-level and low-activity fractions and each fraction will be vitrified in the Waste Treatment and Immobilization Plant (WTP) facilities. The vitrified low-activity waste will be disposed on-site at Hanford and the vitrified high-level waste would be stored at Hanford pending disposal at an NRC licensed geologic repository. Ten percent by mass (25% by radioactivity) of this waste will be vitrified during Phase I. The remainder will be processed during the balance of the RPP mission (1).

The contract to design, build, and commission the WTP was awarded by Office of River Protection (ORP) to Bechtel National, Inc. (BNI) in December 2000. During the proposal process for the contract, BNI identified a number of issues, risks, and opportunities associated with the project. Due diligence reviews were initiated immediately following contract mobilization. The purpose of these reviews was to assess the project with a focus on

identifying opportunities to improve the life-cycle performance of the plant, reduce WTP costs, and minimize technical, project execution, and schedule risks. Areas within the WTP with opportunities for optimization include process design, facility design, and technology basis. Likewise, the Tank Farm Contractor (TFC), CH2M HILL Hanford Group, Inc. (CHG) recognized there were similar opportunities, particularly relative to interfaces and overall support of the feed delivery schedules that would support WTP operations.

It is recognized that considerable research and development in High Level Waste (HLW) processing has occurred both in the US and abroad over the last 30 years. The successful startup and operation of vitrification facilities at the West Valley Demonstration Project and the Defense Waste Processing Facility at the Savannah River Site are evidence of this, and have direct relevance to the Waste Treatment Plant. Bechtel National, Inc.'s WTP Optimization Study Plan provides process approaches and basis for resolution of both technical and programmatic issues. The approach used to address these issues reflects this experience, building on, while not repeating work that was previously successfully completed.

CHALLENGES

Project Background

WTP design optimization has occurred throughout the life of the project. Under an earlier contract for the WTP design, utilizing the concept of "Privatization", the privatization contractor conducted optimization studies during both the proposal and concept stages (WTP part A). During the follow-on stage, the US Department of Energy (DOE) Office of River Protection (ORP) required several additional optimization studies to be conducted and the contractor conducted a series of "breakthrough" studies (WTP part B-1). One such study lead to the development of the locally-shielded melter design concept for the low-activity waste (LAW) vitrification facility. Results from these past studies have been documented and can be found in WTP project document control. In addition, ORP indicated that many of these subjects did not require further review, as decisions in many areas had already been made.

Following termination of the Privatization contract, CHG was awarded the responsibility of interim design contractor, until successful bid and award for a post Privatization contractor was in place. CHG's Statement of Work (2) contained seven studies that the ORP directed to be done as a result of DOE's review of the April 24, 2000 Privatization contractor design deliverables. In addition to these directed studies, CHG proposed a series of studies for further review and consideration by ORP (3). Figure 1 provides an overview of the CHG directed and proposed optimization studies, and the facilities they would most affect. References (3) and (4) contain additional details on the nature of the study, recommendations, and ORP comments and recommendations.

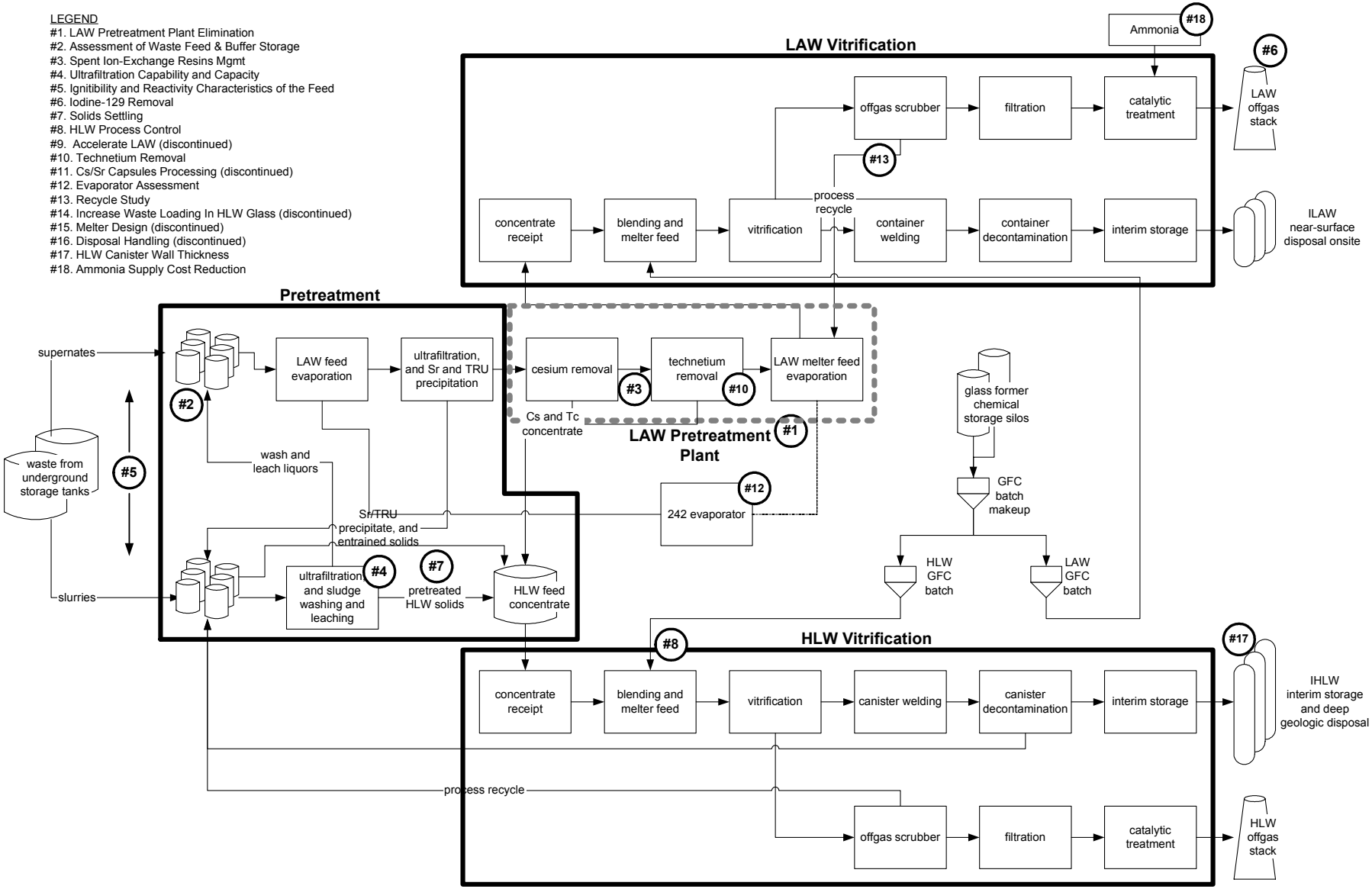

Fig. 1. Overview of CH2MHILL Hanford Group, Inc. Optimization Studies

Issues and Opportunity Identification

In addition to dispositioning the earlier CHG led optimization studies, BNI's initial effort to identify the minimum subset of proposed optimization studies included identifying the maximum possible list of opportunities available. A list of more than 150 risk and opportunity items, including the WTP risk list, and BNI's proposal items, was identified from the due diligence processes. The due diligence process incorporated (but was not limited to):

- Technical review of the WTP design (including drawings, databases, Interface Control Documents, and other technical and programmatic documents) and associated WTP project processes
- Information exchange between DOE, CHG and BNI during the project transition
- Direct inquiries of WTP engineering, operations, construction, and design staff
- Review of the optimization studies performed by CHG

In general, the process consisted of identifying all items which may be considered for optimization, and then reducing that set through selective evaluation. This work included generating a list of risk and opportunity items resulting from the proposal, transition, and due diligence processes. The evaluation process included comprehensive binning, challenge team review and assessment, screening, consolidation of items with like subject matter, and final management decisions. The list of opportunities included many items which were generally not considered appropriate for inclusion as optimization studies, pursuant to the definition of such studies in the contract. The list was reviewed by the area project managers and engineering discipline leads, to group items into manageable common-mode sub-lists which would be most likely to satisfy the contract definition of "optimization".

BNI's contract has a requirement to address optimization studies from the perspective of "*The Contractor shall prepare for DOE review and concurrence (Table C.5-1.1, Deliverable 3.8) a proposed set of optimization studies that improve life-cycle performance, cost, and schedule of the WTP, including process design (such as, improved radiochemical separations), facility design (such as, improved space utilization), and technologies (such as, second generation treatment and immobilization technologies that are ready for demonstration and application), and affect the Contract requirements. Optimization studies that do not affect the contract requirements are the Contractor's responsibility and are separate from this activity. The Contractor shall seek input from DOE and the Tank Farm Contractor in developing the list of proposed studies. DOE and the Contractor shall jointly agree upon which studies shall be performed*." The BNI contract goes on further to say "*The Contractor shall involve all affected parties to ensure a balanced and complete picture. DOE will evaluate the studies and consider changes to the Contract requirements if they are found to be in the best interest of the Government*." These facets, the contract requirements, and the early realization that a systems based approach would result in the best path forward, resulted in an agreement by which to proceed and by which Optimization Studies were to be performed (5).

Issues assigned to each category group were then reviewed by a multi-discipline team to confirm that it was in the most appropriate category. In some cases, duplicate issues (that is, the same issue by a different description) were eliminated. The next step was to group the items within each category by WTP facility. This process reduced the list to about 100 items.

One-day facilitated workshops were then conducted for each of the (then) three WTP major facilities – Pretreatment, LAW Vitrification, and HLW Vitrification. In these workshops they reviewed the original binning decisions and further evaluated the list of issues in each category using a series of fast qualitative analysis and evaluation (using pro/con and criteria ranking) techniques. These workshops were conducted in accordance with guidelines contained in DOE's Guidebook for Decision Support Methods (6). Figure 2 illustrates the general decision support process that was undertaken.

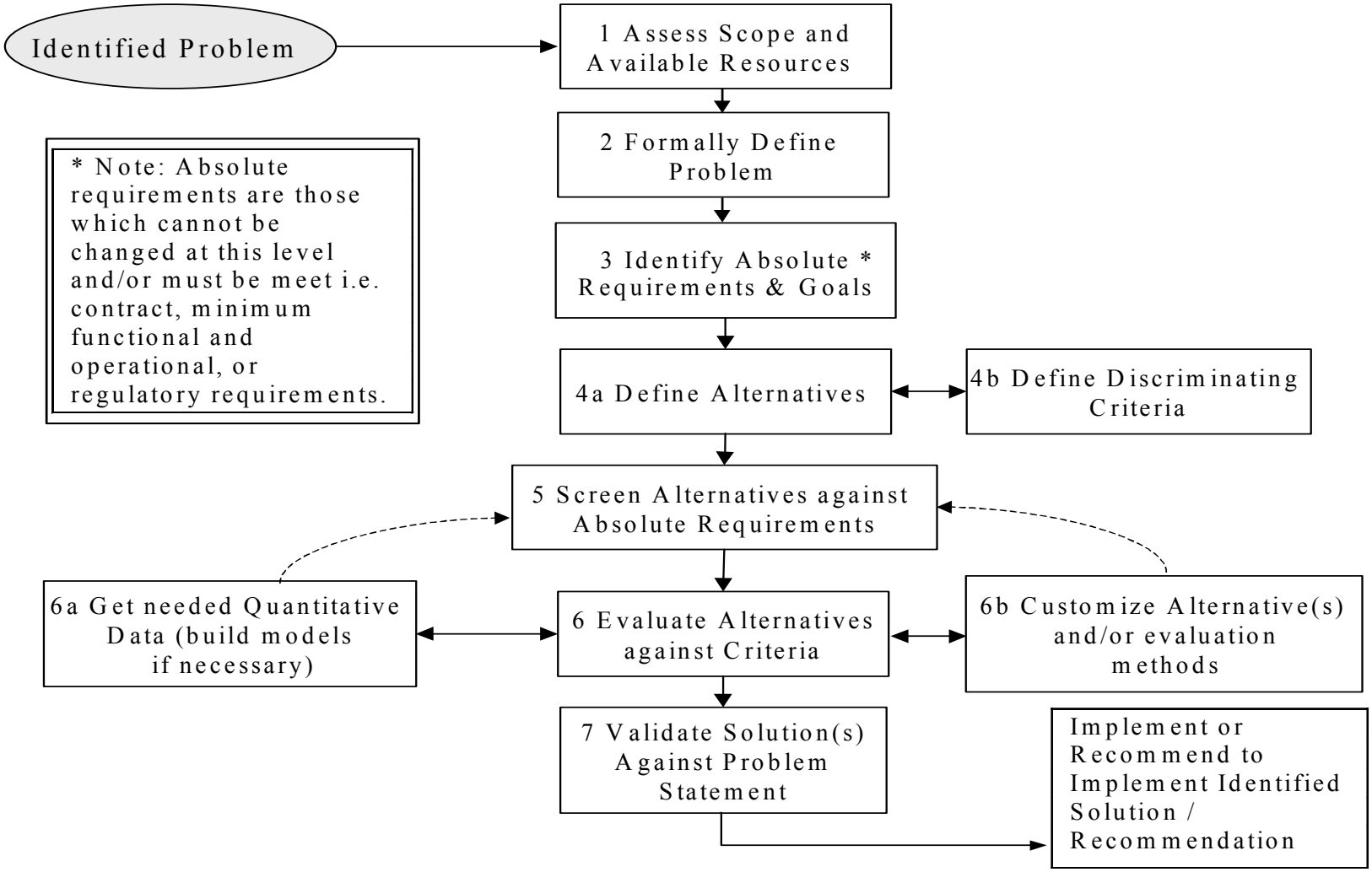

Fig. 2. General Decision Support Process

Workshops were attended by the area project manager or engineer, and technical staff representing various engineering disciplines, research and technology, WTP laboratory, maintenance, environmental, safety, operations, CHG optimization study participants, interface control documents representatives, and the ORP (including a representative from the Office of Safety Regulation). At this stage, the list of candidate optimization studies contained about 70 items.

BNI established independent challenge teams (made up of senior corporate experts in processing and vitrification technologies, outside industry experts, and experts from international companies) to revisit design assumptions and basis. The challenge teams reviewed the risks and opportunities identified by BNI, and further identified risks and opportunities in addition to those identified by the due diligence process. Their recommendations were factored into the final candidate list.

The list of optimization study candidates compiled through execution of the above process, was then reviewed by a multi-disciplinary team of WTP project staff. This refining process reduced the list to fewer than 20 items, which were further consolidated to a "semi-final" set of candidates based on common scope and subject matter. A meeting was then held with ORP representatives to present this "semi-final" set and obtain their input. It was through these discussions that the original set of 15 proposed optimization studies were identified (7).

ORP subsequently independently reviewed the list of proposed optimization studies generated by the above cited process. They recognized the merit of all of the studies cited but chose to authorize proceeding forward under the contract definition of optimization study with eight of the proposed fifteen studies (8). The eight studies BNI was directed to proceed with were:

Optimization Study 1, ILAW Product Specification
Optimization Study 3, ILAW Delisting
Optimization Study 4, LDR Strategy for Melter Disposal
Optimization Study 5, LDR Compliance Strategies for Solid Waste Disposal
Optimization Study 6, Alternative Melter Technologies for Future Replacement and Facility Upgrades
Optimization Study 8, Waste Treatment Plant Laboratory Optimization Study
Optimization Study 13, Impacts to the WTP from Incorporation if Ignitability and Reactivity Standards
Optimization Study 15, HLW Canister Thin Wall Design Alternative

In addition, the DOE also directed two additional studies to be undertaken (ibid). These were:

Optimization Study 16, Introduction of Sodium Permanganate Into the HLW Ultrafilter Circuit
Optimization Study 17, Relaxation of Maximum Solids Content Requirement for LAW Feed

Figure 3 provides an overview of the BNI Waste Treatment Plant directed and proposed optimization studies, and the facilities they would most affect. Additional details can be found on the overall process, the nature of the study, and preliminary recommendations in references (9) through (18).

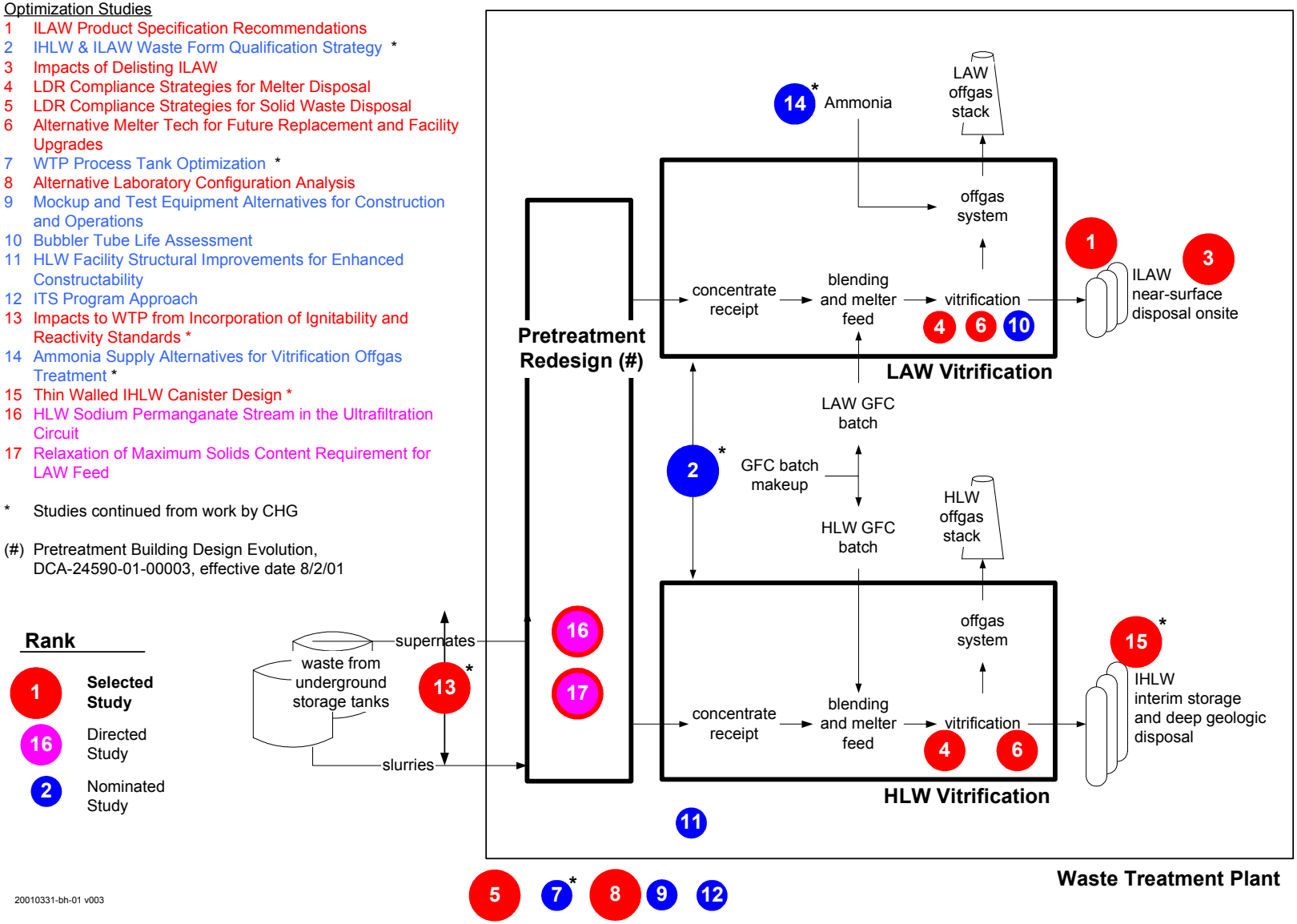

Fig. 3. Overview of BNI Proposed and ORP Directed Optimization Studies

The process by which potential optimization opportunities are being analyzed and dispositioned is shown schematically in Figure 4. It should be noted that as this process is used it is expected that opportunities for process improvement will be identified and implemented through revision of each of the respective companies and agencies procedures and contracts.

The BNI lead activities were focused on identifying potential optimization study candidates from a WTP centric perspective. It was recognized early on that the greatest benefits would be derived from a more collaborative perspective that looked at the RPP mission as a whole. That is a "systems" based approach, taking into account retrieval (Tank Farm Contractor / CHG operation), treatment (WTP / BNI operation), and disposal / interim storage (DOE / CHG / and others operation), at a minimum, would yield the greatest collective benefits to all parties concerned.

Candidate Study Screening

Screening/Concept Development is accomplished through the following six steps in the "RPP Optimization Process":

Candidate studies - Potential opportunities to optimize the RPP may be identified by ORP, RL, BNI, CHG, or as a joint effort. Optimization of the RPP may require changes in either the BNI contract for design, construction and commissioning of the Hanford tank waste treatment and immobilization plant (WTP contract) or the CHG contract for tank farm operations and retrieval (Tank Farm Contractor - TFC).

Potential life-cycle improvement? - Before development of an optimization concept, a management assessment will be made about whether implementation of that optimization candidate has the potential to result in life-cycle improvements to the RPP. This determination will include assessing whether concept development would have an impact on the WTP construction schedule and if this impact would be acceptable. If there is a potential for life-cycle improvements and developing the concept would have an acceptable impact on the WTP construction schedule, optimization concept development would proceed.

The earlier activities initiated by Bechtel for issues screening and optimization study candidate selection, satisfied the above process steps.

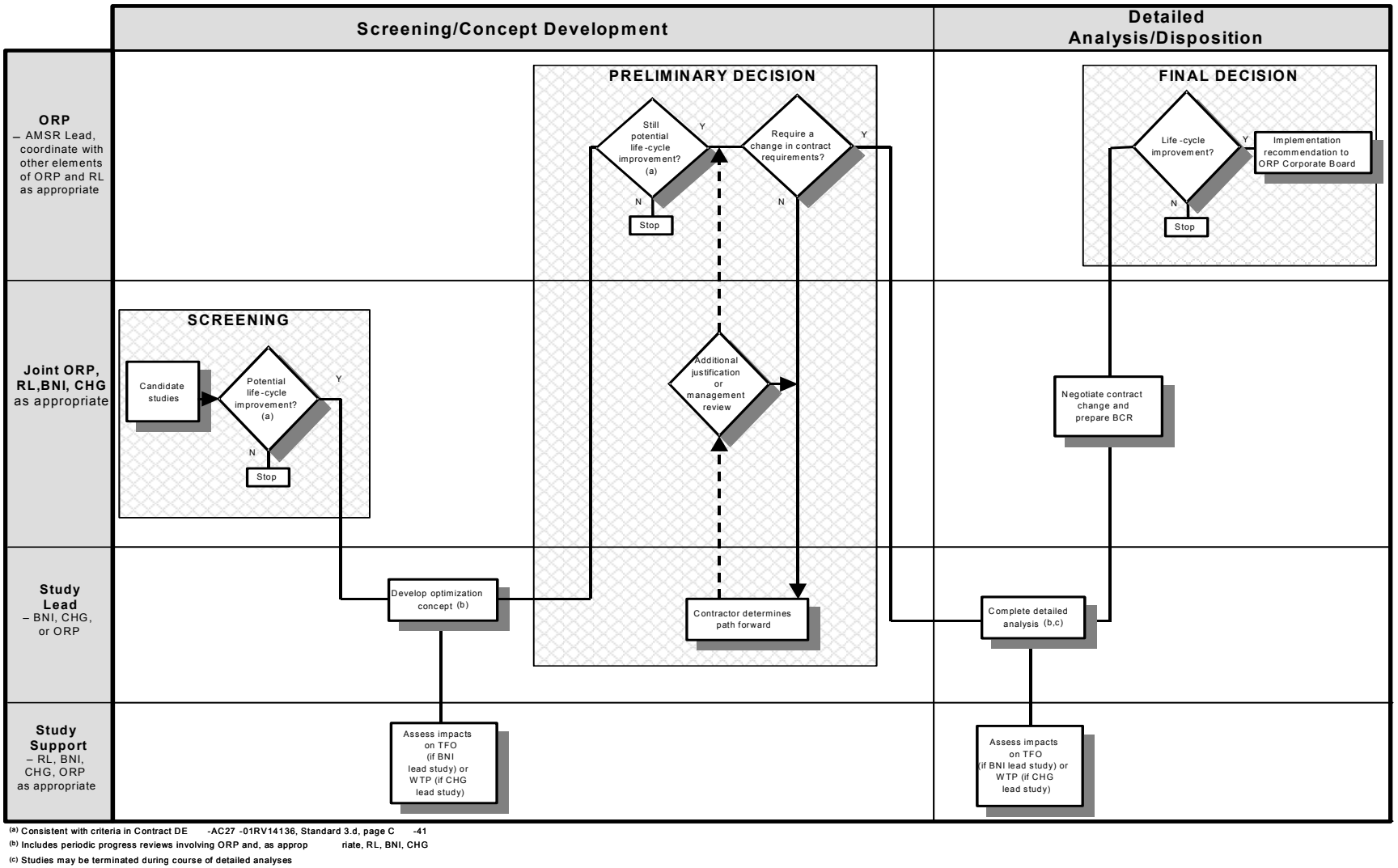

Fig. 4. RPP Optimization Process

Candidate Study Concept Development

Develop optimization concept - The objective of this step is to complete a qualitative evaluation of the benefits and impacts of implementing the optimization candidate, and to determine the scope, schedule and cost of the effort required to complete a detailed analysis. In developing an optimization concept, BNI, CHG, or ORP will have the lead in concept development, depending on the subject of the optimization. As appropriate, BNI, CHG, and ORP will have a support role to ensure that impacts on all relevant aspects of the RPP are considered in this evaluation. If appropriate, DOE – Richland Operations Office (RL) would also support the study, if impacts on RL interfaces are involved. During concept development ORP, RL, BNI, and CHG will meet on an as-needed basis to review progress.

Still potential life-cycle improvement? – Based on the analyses completed in the concept development step, a determination will be made about whether there is still a potential for life-cycle improvements if the optimization concept is implemented. Again, a determination will also be made about whether taking the concept forward to detailed analysis/disposition would have an impact on the WTP construction schedule and if this impact would be acceptable.

Require a change in contract requirements? - The final step in the Screening/Concept Development phase is to determine whether implementation of the optimization candidate would require changes to contract requirements. If such changes would be required, the concept would proceed to the Detailed Analysis/Disposition phase. If not, the contractor would determine the path forward (e.g., whether or not to continue with the study).

Additional justification or management review - If there is not consensus among the participants about whether to proceed with Detailed Analysis/Disposition phase, any of the participants may provide additional justification for their assertion or request management review.

All current BNI lead WTP optimization studies are in the process of / or have completed these last four steps. In all cases the study reports are designed to satisfy form, fit and function thus facilitating review by DOE, BNI, and CHG management teams. This is accomplished through consistent organizational structure and content requirements. Each report consists of the following ten sections:

1. Introduction, including purpose, scope, interaction with other optimization studies and identification of potentially affected interfaces;
2. Summary of study results, including technical, cost and schedule impacts that would result from implementation of the recommendation, identification of any research and technology (R&T) elements that may be required to validate the recommended alternative, and identification of any design changes and contract changes required to implement the recommended alternative;
3. Functional Basis Description and Evaluation Criteria, including such elements as specification compliance, precedence, process robustness, operations and maintenance (preliminary reliability, availability and maintainability) assessment, environmental, safety and health impacts;
4. Definition and Development of Requirements, including identification of potential exception to existing requirements and the basis, identification of current requirements references, and identification of complimentary requirements that may be affected by implementation of the recommendation, as appropriate;
5. Design Assumptions;
6. Design Goals;
7. Options and Alternatives wherein the specific options and alternatives considered are described, including enabling assumptions and relative comparative merit;
8. Cost Estimate and Schedule Impact, including comparative cost benefit analysis of each option or alternative considered;
9. Evaluation and Qualitative Risk and Uncertainty Analysis, including assessments on critical path, technical and programmatic risks, impact assessments on both WTP and CHG's Tank Farm Operation;
10. Conclusions and Recommendations, including a rationale for the selected option, description of any additional R&T or qualification activities to implement the recommended option, a description of any design or facility changes required to incorporate the recommendation, and a suggestion for any contract language changes that may be necessary to implement the recommendation.

In addition, each study contains appendices that contain a matrix that cross-walks the evaluation criteria cited in BNI's contract with the study report section containing the requisite answers to the questions posed by the criteria, and any additional pertinent and relevant technical data that may aid each management team.

Detailed Analysis/Disposition is accomplished through the following three steps in the "RPP Optimization Process":

Candidate Study Detailed Analysis and Disposition

Complete detailed analysis - The objective of this step is to complete a quantitative evaluation of the benefits and impacts of implementing the optimization candidate. The Study Lead during concept development (BNI, CHG, or ORP) would also lead the detailed analysis. As is the case during concept development, ORP, RL, BNI, and CHG will meet on an as-needed basis to review progress. If, during detailed analysis, it is determined that an optimization candidate will not be feasible or will not result in RPP life cycle improvements, further analysis of that candidate will be terminated.

Negotiate contract change and prepare Baseline Change Request (BCR) - If, based on detailed analysis, the determination is made that the optimization candidate should be implemented, draft changes to the WTP and TFC contracts required to implement the optimization would be negotiated at the staff level. Also, if appropriate, an integrated RPP BCR would be prepared jointly by BNI and CHG.

Life-cycle improvement? – The draft contract changes, BCR, and supporting documentation developed during the detailed analysis would be reviewed by the ORP Change Control Board. A determination would be made about whether the RPP life-cycle improvements resulting from execution of the optimization warrant an implementation recommendation to the ORP Corporate Board.

It should be noted that the first point of departure, or maturation of the RPP Optimization Process, has transpired as associated with the three detailed analysis steps cited above.

During the course of execution of the BNI lead studies, it soon became apparent that critical windows of opportunity for implementing any changes that may be recommended from the study efforts were quickly diminishing. This was due to the close-coupled nature of the WTP project between the design team and the procurement and construction organizations. As the design is progressing for below grade elements of the facilities, construction and procurement are driving stabilization of the design deliverables in order to accelerate permitting, early procurement, and construction activities. This close-coupled approach to design and construction acceleration is necessary in order to meet the Glass in 2007 target. In order to maximize the potential to implement any recommendations coming out of the studies, many aspects of the detailed analysis steps have been incorporated into the early study efforts. This has facilitated incorporation of several recommendations, but has also resulted in perturbations of planned resource loading of the study efforts and modification of management review and approval processes for both DOE and its contractors.

Optimization Study Evaluation Criteria and Decision Analysis

BNI's contract required that each study address the following twelve requirements:

- A description of the item, process, system, or facility to be optimized and the basis for such optimization
- A description of the research and technology program elements that are required to validate the required performance prior to incorporating the change into the baseline
- A description of the design changes that are required to incorporate the change into the baseline
- The effect on the tank farm operator authorization basis and authorization basis interfaces between the WTP and CHG
- The effects on project cost, schedule (including a critical path impact analysis), plant capacity and waste loading
- Near-term impacts for CHG

- Estimated life-cycle cost impacts to the ORP
- An evaluation of potential impacts on long-term interfaces with CHG
- Technical risks which are eliminated, changed, or amplified by the proposed change
- Regulatory issues which are eliminated, changed, or amplified by the proposed change
- Potential changes in secondary waste and on returnable material volume and type
- An evaluation of the potential changes in energy needs and other ORP supplies, material, and quantities

Once the optimization study results have been determined to provide information that is adequate to make a decision on changing the baseline, the recommended alternative from the study is compared to the current baseline. Criteria used to guide this comparison are shown below. The focus of the comparison is on cost, schedule, and risk. That is, the alternative is preferred only if it is better than the baseline on one or more of these criteria, and that improvement more than compensates for any criteria on which the alternative is worse than the baseline.

- Cost
  - Life-cycle cost
  - Cost profile (annual and cumulative)
    - Total cost
    - WTP contract
    - TFC contract
  - Funding shifts between contractors
- Schedule
  - Key milestone dates
    - Start of WTP construction
    - Start of WTP cold commissioning
    - Completion of WTP acceptance testing
    - Start of WTP hot commissioning
    - Completion of WTP hot commissioning
    - Completion of processing of initial quantity of waste
  - Other schedule changes
- Risk
  - Cost risk – any differences in risk/uncertainty of costs identified in 1 above
  - Schedule risk - any differences in risk/uncertainty of milestone dates identified in 2 above
  - Technical risk – any differences in risk/uncertainty of ability to meet technical requirements of defined workscope.

OPPORTUNITIES

Preliminary Study Results

To date BNI has led ten optimization studies for the River Protection Project, Waste Treatment Plant. Of these, one has been completed [Study #8, Laboratory Optimization Study], submitted to DOE for approval, and approved for implementation. By the time of these proceedings, one more will have been completed and submitted to DOE [Study #3, ILAW Delisting] for consideration and approval. In addition, two will have been cancelled / slated for wrap up in their current state, in accordance with the screening criteria previously cited [Study #16, HLW Permanganate Stream Injection, and #17, Assessment for Potential to Receive Increased Solids Loading in the LAW Feed Stream].

In the case of Study #8, Laboratory Optimization Study, the preferred option was selected and approved by DOE. In addition to the recommendation, DOE has provided additional guidance and requirements to be incorporated for the preferred solution. Our current efforts are a more detailed assessment of design, permit, construction, and cost impacts for these changes. Events and other integrated optimization initiatives have overtaken the original request from DOE relative to Study #16, HLW Permanganate Stream Injection. Based on modifications to the design of the

WTP pretreatment facility proposed by BNI and accepted by DOE, the capability associated with this study topic will become an integral part of the current facility and process design. Study #17, Assessment for Potential to Receive Increased Solids Loading in the LAW Feed Stream did not meet the litmus test for Optimization Studies as it is really a feasibility assessment for extended capability. As such, the report and study effort will be wrapped up to provide a useful data point for future consideration, but will not be subject to the rigor of analysis and assessment associated with the contract required evaluation criteria. Table I, BNI Waste Treatment Plant Optimization Study Status, summarizes each of the studies that were authorized and/or directed to be undertaken.

Table I, BNI Waste Treatment Plant Optimization Study Status

Study	Report Title, Description, and Anticipated Recommendation.
1	**Optimization Study 1 ILAW Product Specification** • Evaluates potential impacts of changing various aspects of Specification 1. • Anticipate recommending changes to container material, labeling, closure, void space, compression and stacking requirements. Anticipate no changes to container tolerances, QA, retrieval, and degradation requirements.
3	**Optimization Study No. 3: ILAW Delisting** • Evaluates alternative regulatory paths to ILAW RCRA disposal with primary emphasis on delisting to allow for LLW disposal. • Recommendation is to apply for ILAW delisting while maintaining the baselines both WTP and CHG Project W-520 to ensure compliant disposal path exists for initial products.
4	**Optimization Study Number 4: LDR Strategy for Melter Disposal** • Identifies optimal treatment for spent melters to ensure they meet LDR and the optimal treatment location. • Recommendation is pending further data collection and analysis.
5	**LDR Compliance Strategies for Solid Waste Disposal (Study 5)** • Identifies optimal treatment for waste streams to ensure they meet LDR and results in providing top level requirements for the Encapsulation (Treatment) facility. • Recommendation is pending further data collection and analysis.
6	**Alternative Melter Technologies for Future Replacement and Facility Upgrades (Study 6)** • Identifies potential changes that can be made today to the current vitrification facility designs to preclude more expensive changes once the facilities become hot to accommodate potential future alternate melter designs. • Recommendation is to maintain the current baseline.
8	**Waste Treatment Plant Laboratory Optimization Study** • Study optimized basis for laboratory analyses based on Sampling and Analysis Plan and anticipated analytical turnaround requirements • Recommended Rad Only (intermediate) facility with capability provide Tank Farm analytical support.
13	**Optimization Study 13: Impacts to the WTP from Incorporation if Ignitability and Reactivity Standards** • Study evaluates the best location for removal of D001/D003 codes and the impacts to WTP if the codes cannot be removed. • Recommendation is to maintain WTP baseline to remove codes at waste receipt tanks using process knowledge.
15	**Optimization Study of the HLW Canister** • Study evaluates feasibility and potential benefits of reducing the IHLW canister wall thickness. • Preliminary recommendation will be to adopt 10 gage wall thickness as baseline design and resolve CSB canister drop through the ICD process.
16	**Introduction of Sodium Permanganate into the HLW Ultrafilter Circuit** Due to the evolution of the Pretreatment Facility design, there is no longer a need for this optimization study.
17	**Relaxation of Maximum Solids Content Requirement for LAW Feed** Study is no longer needed due to evolution of Pretreatment Facility design. A technical report presents feasibility of LAW feed receipt tanks to greater solids content than defined in the contract. Work included in the Pretreatment reconfiguration effort. No further action anticipated.

Lessons Learned

Efforts to date to improve the interfaces between the different River Protection Project operations, most notably the Tank Farm Operations and the Waste Treatment and Immobilization Plant, have made much progress but are not yet optimal. Two principle factors seem to influence the effectiveness of achieving a seamless and integrated set of facilities to process the tank wastes at the Hanford site: differences in contract type, and contractual relationships.

In the case of contract type, CHG has a Maintain and Operate contract with the ORP; and BNI has an Engineer, Procure, and Construct [similar to a design / build] contract with the ORP. Each has different drivers, mission requirements, incentives and direction control, based on contract type. Note that neither contractor has a contract with the other, but only with the common customer, ORP. These differences contribute to less efficiency than one might hope for under the common mission of the River Protection Project. To address these issues, several initiatives are being undertaken.

Ongoing Efforts

Office of River Protection. ORP has promulgated a strategy to establish an Integrated Technical Baseline for the Waste Treatment Complex (WTC) that will be the basis for a mutually agreed upon integrated baseline design. ORP, Bechtel National, Inc., and CH2M HILL Hanford Group technical staff will develop an integrated technical baseline for the Waste Treatment Complex, including the Waste Treatment and Immobilization Plant (WTP) and Waste Feed Delivery (WFD), for review and approval by ORP Management. The key product will be the integrated technical baseline for the WTC and applicable documentation. Execution of this plan will establish the go-forward basis for construction of the Waste Treatment Complex.

The approach proposed for developing the integrated technical baseline starts with the premise that ORP, CHG, and BNI technical staff will work collaboratively to produce the best products. Selection of technical individuals involved in developing the integrated technical baseline has been based on acknowledged expertise in the applicable subject areas. This group, the Technical Integrated Baseline Development Team (TIBDT), works with the responsible organization accountable for the deliverable to assure that the right piece is provided, on time. This collaboration will be based on realistic technical creativity and not on agenda and direction control based on organizational association

Substantial progress has been made on creating and assembling the individual pieces that will make up the integrated technical baseline. Most of the focus of this technical group will be on assuring that those individual pieces are integrated so the resulting product(s) reflects the benefits (time and cost savings) that are likely from this integration. Building on the excellent individual pieces being pursued today should be the focus. Team members will be assigned individual pieces and be accountable for their completion.

In implementing their role, members of the TIBDT are accountable for addressing specific technical issues or completing required analyses as assigned by the TIBDT leader. In completing these activities each TIBDT member is responsible for leading task teams that they have formed from the reservoir of technical talent within the River Protection Project.

The TIBDT has been meeting approximately weekly as a team to go over progress on each piece and work in a synergistic manner to assure that all the pieces will come together to create the desired Integrated Baseline Design. Oversight of the work of the TIBDT is being provided by the ORP Integrated Baseline Team (IBT), which consists of upper-level ORP managers.

Written products from the TIBDT are the recommendations for configuring the integrated technical baseline with the associated technical backup. The IBT will consider these recommendations and make final recommendations to the ORP manager for his decision.

CH2M Hill Hanford Group. In similar fashion to the BNI led efforts for optimization study screening, recommendation, and selection process, CHG has identified eighteen candidate studies. Four of these candidate studies have been selected by ORP for further evaluation to be undertaken by CHG, with support from BNI. The principle focus of these studies is in the area of Waste Feed Delivery. CHG is also an active participant in the Office of River Protection's TIBDT in support of the Integrated Technical Foundation initiative.

Bechtel National, Inc. BNI continues to work with CHG and ORP in the development of integrated solutions and paths forward in the completion of the Optimization Studies that it is currently leading. The principle focus of these studies has been that of risk management and capital and/or life-cycle operations cost reduction. BNI is also an active participant in the Office of River Protection's TIBDT in support of the Integrated Technical Foundation initiative.

Two strategic initiatives are being implemented, Six Sigma and Total Installed and Operating Cost (TIOC), with the purpose of process improvement and maximum return on investment, respectively, in order to optimize total installed cost. The Six Sigma process will be used to reduce capital and programmatic costs through work process and plant operations process improvements. The TIOC initiative will be used, in conjunction with "Close Coupled Execution" – real time and in parallel engineering and construction – to evolve design, reduce overall project risk, balance programmatic, technical cost and schedule risks, and evolve the design to reduce overall capital costs.

CONCLUSIONS

WTP is a large complex project that is driven by both technology and contractual requirements. It is also part of a larger overall mission, as a component of the RPP, which is driven by programmatic requirements and regulatory, legal, and fiscal constraints. This combination of technical and programmatic drivers, constraints, and requirements will continue to provide challenges and opportunities for improvement and optimization.

The Bechtel team is under contract to engineer, procure, construct, commission and test the WTP on or ahead of schedule, at or under cost, and with a throughput capacity equal to or better than specified. The DOE is tasked with the long term mission of waste retrieval, treatment, and disposal. While each mission is a compliment and inextricably linked to one another, they are also at opposite ends of the spectrum, in terms of expectations of one another.

Substantial progress has been made on creating and assembling the individual pieces that will make up an integrated baseline. There are several areas, both technically and programmatically, where improvements can be made to meet seemingly contradictory mission requirements and drivers. In addition, as a result of the recently published "Top to Bottom Review Team Report" (19) by the Assistant Secretary for Environmental Management, and the response from Secretary of Energy Abraham (20), other potential opportunities will no doubt be forthcoming. However, the single largest challenge and opportunity for optimization still remains to be one of balance and collaboration.

REFERENCES

1. *Bechtel National, Inc. Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant,* Contract Number: DE-AC27-01RV14136. US Department of Energy, Office of River Protection, Richland, Washington, USA.

2. *Contract Number DE-AC27-99RL14047, Statement of Work from U.S. Department of Energy to CH2M Hill Hanford Group, Inc.*, CCN 016843/CHG-0006887, December 22, 2000. US Department of Energy, Office of River Protection, Richland, Washington, USA.

3. Letter from MA Payne, CHG, to WJ. Taylor, ORP, *Proposed List of System Analysis and Optimization Studies*, CHG-01525C, September 14, 2000. CH2MHILL Hanford Group, Inc., Richland, Washington, USA.

4. Letter from WJ Taylor, ORP to MP DeLozzier, CHG, *Contract Number DE-AC27-99RL14047, Final List of System Optimization*, October 6, 2000. US Department of Energy, Office of River Protection, Richland, Washington, USA.

5. *Draft, ORP Instruction Document, River Protection Project Optimization, Manual ORP M 121.1,* AMSR, US Department of Energy, Office of River Protection, Richland, Washington, USA.

6. *Final Review Draft, INMM Program Decision Support Guidebook,* dated January 8, 2001. U.S. Department of Energy, Idaho National Environmental Engineering Laboratory, Idaho Falls, Idaho, USA.

7. CCN 019090, Letter from AR Veirup, BNI, to MK Barrett, ORP, *Contract No. DE-AC27-01RV14136 – Deliverable Item 3.8, Optimization Study*, dated March 15, 2001. Bechtel National, Inc., Richland, Washington, USA.

8. CCN 019686; letter from W.J. Taylor, ORP; to R.F. Naventi, BNI; "Review of Supplemental Information Related to Deliverable Item 3.8, Optimization Study", 01-SIO-009; and dated April 13, 2001.

9. PL-W375-EG00011, Rev C, Waste Treatment Plant Optimization Studies Plan, Contract Deliverable Item 3.8, Contract Number DE-AC27-01RV14136

10. 24590-LAW-RPT-M-01-00, Optimization Study 1, ILAW Product Specification [draft]

11. 24590-LAW-RPT-ENV-01-001, Optimization Study 3, ILAW Delisting [draft]

12. 24590-WTP-RPT-ENG-01-010, Optimization Study 4, LDR Strategy for Melter Disposal [draft]

13. 24590-BOF-RPT-M-01-002, Optimization Study 5, LDR Compliance Strategies for Solid Waste Disposal [draft]

14. 24590-WTP-RPT-G-01-003, Optimization Study 6, Alternative Melter Technologies for Future Replacement and Facility Upgrades [draft]

15. 24590-WTP-RPT-PR-01-005, Rev. 0, Optimization Study 8, Waste Treatment Plant Laboratory Optimization Study

16. 24590-WTP-RPT-ENG-01-008, Optimization Study 13, Impacts to the WTP from Incorporation if Ignitability and Reactivity Standards [draft]

17. 24590-HLW-RPT-M-01-003, Optimization Study 15, HLW Canister Thin Wall Design Alternative [draft]

18. 24950-WTP-RPT-M-01-003, Optimization Study 17, Relaxation of Maximum Solids Content Requirement for LAW Feed [draft]

19. Memorandum for the Secretary, from Jessie Roberson, Assistant Secretary for Environmental Management, thru Robert Card, Undersecretary Energy, Science, and Environment, February 4, 2002. US Department of Energy, Headquarters, Washington D.C., USA.

20. Memorandum for Jessie Roberson, Assistant Secretary, Environmental Management, from Spencer Abraham, Secretary of Energy, February 4, 2002. US Department of Energy, Headquarters, Washington D.C., USA.