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**ONE SYSTEM INTEGRATED PROJECT TEAM:  
RETRIEVAL AND DELIVERY OF HANFORD TANK WASTES  
FOR VITRIFICATION IN THE WASTE TREATMENT PLANT**

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## ABSTRACT

The One System Integrated Project Team (IPT) was formed in late 2011 as a way for improving the efficiency of delivery and treatment of highly radioactive waste stored in underground tanks at the U.S. Department of Energy's (DOE's) 586-square-mile Hanford Site in southeastern Washington State. The purpose of the One System IPT is to improve coordination and integration between the Hanford's Waste Treatment Plant (WTP) contractor and the Tank Operations Contractor (TOC). The vision statement is: *One System is a WTP and TOC safety-conscious team that, through integrated management and implementation of risk-informed decision and mission-based solutions, will enable the earliest start of safe and efficient treatment of Hanford's tank waste, to protect the Columbia River, environment and public.* The IPT is a formal collaboration between Bechtel National, Inc. (BNI), which manages design and construction of the WTP for the U.S. Department of Energy's Office of River Protection (DOE-ORP), and Washington River Protection Solutions (WRPS), which manages the TOC for ORP. More than fifty-six (56) million gallons of highly radioactive liquid waste are stored in one hundred seventy-seven (177) aging, underground tanks. Most of Hanford's waste tanks – one hundred forty-nine (149) of them – are of an old single-shell tank (SST) design built between 1944 and 1964. More than sixty (60) of these tanks have leaked in the past, releasing an estimated one million gallons of waste into the soil and threatening the nearby Columbia River. There are another twenty-eight (28) new double-shelled tanks (DSTs), built from 1968 to 1986, that provide greater protection to the environment. In 1989, DOE, the U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology) signed a landmark agreement that required Hanford to comply with federal and state environmental standards. It also paved the way for agreements that set deadlines for retrieving the tank wastes

and for building and operating the WTP. The tank wastes are the result of Hanford's nearly fifty (50) years of plutonium production. In the intervening years, waste characteristics have been increasingly better understood. However, waste characteristics that are uncertain and will remain as such represent a significant technical challenge in terms of retrieval, transport, and treatment, as well as for design and construction of WTP. What also is clear is that the longer the waste remains in the tanks, the greater the risk to the environment and the people of the Pacific Northwest. The goal of both projects – tank operations and waste treatment – is to diminish the risks posed by the waste in the tanks at the earliest possible date. About two hundred (200) WTP and TOC employees comprise the IPT. Individual work groups within One System include Technical, Project Integration & Controls, Front-End Design & Project Definition, Commissioning, Nuclear Safety & Engineering Systems Integration, and Environmental Safety and Health and Quality Assurance (ESH&QA). Additional functions and team members will be added as the WTP approaches the operational phase. The team has undertaken several initiatives since its formation to collaborate on issues: (1) alternate scenarios for delivery of wastes from the tank farms to WTP; (2) improvements in managing Interface Control Documents; (3) coordination on various technical issues, including the Defense Nuclear Facilities Nuclear Safety Board's Recommendation 2010-2; (4) deployment of the SmartPlant® Foundation-Configuration Management System; and (5) preparation of the joint contract deliverable of the Operational Readiness Support Plan.

## **ESTABLISHING THE ONE SYSTEM INTEGRATED PROJECT TEAM**

The IPT was established in late 2011 by the TOC, Washington River Protection Solutions (WRPS); the WTP Project;(BNI); and DOE-ORP. The DOE-ORP directed its contractors to "stand up" the One System organization to perform the integration function between the tank farms and the WTP activities to ensure the safe and successful startup of WTP and the execution of the Hanford tank waste treatment mission. Stakeholder reviews, such as the August 2011 Construction Project Review and the Tank Waste Subcommittee of the Environmental Management Advisory Board, yielded recommendations regarding the need for an integrated forum for the WTP startup and commissioning. The One System IPT and management approach was responsive to many of these recommendations for integrated management of the River Protection Project (RPP) mission.

Implementation of the One System IPT was accomplished due to a requirement to integrate activities between the tank farms and WTP that previously existed in each of their contracts. This was achieved with a zero-dollar change to these contracts. The One System IPT established a dedicated management approach for effectively performing integration activities and functions. Responsibility for performing existing TOC and WTP contract scope was assigned to the One System IPT. This work is executed by a co-located team of TOC and WTP managers, engineers, and other functional specialists. Approximately two hundred (200) personnel were initially identified as IPT members. The size and makeup of the IPT is designed to ebb and flow based on the work scope being conducted. In the future, new project or other work scope may be added to the WTP or TOC contracts and assigned to One System.

From DOE's perspective, the WTP project was shifting from a design construction phase to a construction start-up phase for the Low-Activity Waste (LAW) Facility, Balance of Facilities,

and Laboratory (LBL). During this phase of the project, it was critical to ensure the TOC scope of work, which included Waste Feed Delivery Systems, Waste Disposition and Disposal, Environmental Permitting, and Site Infrastructure were aligned with the WTP Project. The WTP Contract and TOC provided the contract vehicles to create a “one system” model for delivery of WTP and elements of the Tank Farms (TF) Project. The integration of the WTP Contract and the TOC work scopes was executed to ensure that BNI will successfully complete cold and hot commissioning, operability testing, and any post-commissioning services (i.e., additional waste treatment) for the WTP in the most effective manner. Since inception of the One System IPT in 2011, DOE has seen increased collaboration between the two contracts in resolving interface technical issues.

## **ONE SYSTEM IPT ORGANIZATIONAL AND MANAGEMENT APPROACH**

The One System IPT organization is guided by an IPT Manager assigned from WRPS and a Deputy Manager assigned from WTP. These individuals have a dual reporting relationship to the contractors’ Integrated Waste Treatment Mission Leadership Team, made up of the WRPS President, the General Manager, and the WTP Project Director. The One System IPT’s primary DOE-ORP customer interface is the WTP Start-up and Commissioning Integration Manager. The One System IPT work scope is executed by six (6) functions: Commissioning; Technical; Front End Design and Project Definition; Nuclear Safety and Engineering System Integration; Environment, Safety, and Health, and Quality Assurance; and Project Integration and Controls. Each of these One System IPT functions is led by two (2) co-managers, one each from TOC and WTP. The IPT is also supported by the “home” WRPS and WTP organizations in other functional areas such as Human Resources, Public Relations and Stakeholder Management, and Facilities/Infrastructure/Information Technology (IT).

Significant IPT interface and coordination with the “home” organizations are necessary and are accomplished through formal and informal means to effectively execute its integration objectives. Several working councils, such as the One System Program Integration Council and the One System Business Council, were established and are made up of managers and functional experts from WRPS, WTP, and One System personnel. A One System Risk and Opportunity Management Team is also in place to evaluate risks of common interest to TOC and WTP. Establishing this team has served to improve the mitigation strategies for risks of common interest, as well as serve as a platform for the identification of new opportunities. This team is led by the respective contractors’ Risk Managers.

The One System IPT executes its work in accordance with existing TOC and WTP programs and procedures. This streamlines the work processes, minimizes the potential for confusion, and reduces administrative burden. A One System IPT Charter was issued which defines the responsibilities and scopes of work that is assigned to and conducted within the IPT. Several other IPT documents were developed, such as a Change Management Plan, a Communications Plan, and an Annual Execution Plan—all of which help foster a safety conscience work environment, as well guide the operations of this unique, collaborative, multi-contractor, organizational and management approach.

Early in the formative stages of the IPT, a teambuilding session was held to establish trust amongst the members of the management team. They jointly charted the course for the IPT and established norms and expectations for the collaborative organizational culture. As part of that session, the following One System Vision was developed:

*“One System is a WTP and TOC safety-conscience team that, through integrated management and implementation of risk-informed decisions and mission-based solutions, will enable the earliest start of safe and efficient treatment of Hanford’s tank waste, to protect the Columbia River, environment, and public.”*

The focus and distinguishing characteristics of the One System IPT are evident in this Vision Statement. In all work conducted by the IPT, the outcomes and recommendations are designed to promote the optimal approach in delivering the overall Hanford Waste Treatment System mission, rather than what may be optimal for either the WTP project or the TOC operations individually. Risk-informed decisions in this context recognize the existing danger of the hazardous waste in Hanford’s aging tanks and mitigate risk across the enterprise from that starting point.

## **ONE SYSTEM IPT COLLABORATIVE INITIATIVES**

During the brief period of existence of this IPT, numerous collaborative initiatives were undertaken and deliverables have been accomplished. Several of the key work functions that demonstrate the value associated with the integrated TOC / WTP One System approach are described in the following paragraphs.

### **Commissioning**

Prior to the formation of the One System IPT, the TOC contract contained provisions for independent oversight of WTP startup readiness and plant operability. Two annual WTP Operational Support Reports were prepared for FY2010 and FY2011. By design, these evaluations were fully independent of the ongoing WTP engineering, design, construction, and startup activities. The evaluations identified vulnerabilities with the design and operability of the WTP facilities that are being tracked and addressed by WTP as the design activities complete, and the startup and readiness activities further develop and mature. The WTP project was also the subject of numerous other independent reviews in addition to operations reviews performed internally within the WTP project.

With the formation of the One System IPT, DOE-ORP took advantage of the new integrated organization, and refined the approach for preparation and review of startup readiness and operability. The new approach considers not only WTP’s readiness to accept and process tank waste, but also TOC’s readiness to deliver that waste in conformance with the Waste Acceptance Criteria. ORP directed the TOC and WTP contractors to work together to define integrated startup and readiness plans and assessments, ensure that the waste-treatment system will approach, and achieve readiness for operations in a coordinated and effective manner. The WTP and TOC line management retains full responsibility for achieving and assessing readiness of their respective facilities.

The One System IPT ensures that readiness plans and schedules are integrated, and consistent readiness approaches are utilized. One System performs assessments of the implementation and readiness of the interfaces between TOC and WTP, as well as with other Hanford contractors who will support WTP's operations. In addition, the One System IPT tracks and ensures closure of the vulnerabilities identified in two published annual operational support reports.

Through a One System collaborative management approach, identifying readiness issues, as well as the optimal approaches to address them from a mission perspective, results in the most timely and effective startup and operations of WTP and the TOC waste-delivery systems. In summary, an improved outcome is realized with a lesser resource expenditure.

## **Technical**

As part of the WTP rebaseline direction, BNI was required to prepare what was referred to as WTP Rebaseline Deliverable 7. This deliverable was to consider options to the baseline given the significant technical issues associated with the design of the Pretreatment Facility and the potential for the delay in its start-up. DOE wanted BNI to consider operational approaches that would produce glass at the earliest possible time, provide flexibility in operations of the WTP system, mitigate the technical risks associated with mixing and blending by providing a more reliable means to process the waste, and minimize costs, especially in the next several years.

A collaborative approach was utilized to develop the WTP Rebaseline Deliverable 7. The One System IPT led a workshop in May 2012 where alternative approaches for operating WTP and achieving the desired flexibility and risk mitigation were presented in detail and discussed. The workshop was attended by a broad group of stakeholders, including Department of Energy Office of Environmental Management (DOE-EM); DOE-ORP; Ecology; the Pacific Northwest National Laboratory (PNNL); and the Savannah River National Laboratory. Emphasis was placed on diversity of perspectives when formulating the agenda, as various WTP and WRPS employees prepared and presented options and alternatives to improve WTP's operational strategies and flow sheets. During this workshop, six distinct options were presented. Subsequently, an additional hybrid option was developed to reflect some of the best features of all the options. An option to feed the LAW Vitrification facility directly from the tank farms was also included.

This information was subsequently presented to the Secretary of Energy (S-1) Team that reviewed the WTP facility and associated technical issues in September 2012. The One System IPT played a prominent role in presenting the mission alternatives to the S-1 Team, responding to questions, and further refining the original work. The IPT was involved in several teams within the S-1 Team structure, such as the core, technical, and mission teams, that further addressed the issues and developed optimal solutions for a reliable path forward to complete the WTP project and execute the tank waste mission.

The technical function of the One System IPT has demonstrated the value of a collaborative approach to numerous other activities and initiatives. Included in this is the reinvigoration of the Interface Control Documents (ICDs) which define interface requirements and commitments

between WTP and other Hanford contractors. During FY2012, five (5) ICDs were revised and approved by the WTP and TOC contractors. This IPT function is also responsible for system planning and flow sheet modeling for the tank waste mission. The previous independent functions within TOC and WTP have been combined into a single One System organization. This enables consistent modeling and assumptions to be employed, and resources to be more effectively deployed.

Another technical function is the integration of the DNFSB 2010-2 Implementation Plan testing and analysis work scope that is assigned to WTP and TOC. One System ensures consistency in approaches where required and facilitates the development of integrated schedules and plans.

### **Environmental Safety, and Health, and Quality Assurance (ESH&QA)**

The One System ESH&QA function leads several key initiatives to promote institutional program alignment and coordination of permits with projects and program requirements. This will aid in the preparation by DOE to ultimately combine the two contracts (WTP and TOC) as a single operating contractor in the future. Two key initiatives are the Integrated Permitting Strategy and Schedule and the creation of the One System Program Integration Council.

Permits will be necessary for air, water, and hazardous waste operations. At Hanford, these permits are issued to DOE and are currently managed by multiple contractors for their specific Ebaseline scope and schedule. However, an overall integrated permit strategy and schedule—one that illustrates the required timing and necessity for modifying existing permits and developing new permits and offers significant advantage to all parties—does not presently exist. Permit integration for the involved contractors is necessary to ensure reasonable timing and alignment to support waste-feed mixing and delivery, WTP commissioning and operations, and waste disposal. Candid engagement of the regulatory agencies in developing an overall permit schedule allows for early identification of gaps and issues, and strengthens understanding of permit scope and durations. This also provides insight for the regulatory agencies to determine the resources needed to support required technical reviews, public and stakeholder reviews, and permit approval. Permits are expected to be on or near critical path activities for WTP commissioning and operation. A key to this venture's success is integrated permit strategy and coordinated interface, including negotiations, with the regulators and other contractors. Initial meetings on the concept were facilitated by One System ESH&QA staff with the primary regulator, Ecology. Reviews of the concept were favorable and established a solid foundation for future discussions.

The second initiative is the formation and sponsorship of OSPIC, which serves as the driving force and catalyst for ensuring consistency and integration of institutional programs between TOC and WTP. The OSPIC enables the safe and efficient commissioning and transition to operations for the WTP. This effort is critical to assist DOE in aligning the two contracts in preparation for a future single operations contractor, while realizing some upfront sharing opportunities to build integrated programs early in the process for WTP commissioning. The effort identifies and resolves any misalignment in program or contractual drivers. This OSPIC also determines cost savings to the contractors, and ultimately DOE, by utilizing common programs and eliminating duplication of program development work scope. The OSPIC

members include One System IPT Managers, Functional Managers from the TOC and WTP contracts, as well as Operations Management from each contractor that is responsible for implementing institutional programs. DOE also participates in the OSPIC meetings. Initially, approximately two dozen (24) programs, ranging from Conduct of Operations to Worker Safety, will be addressed by the council.

### **Nuclear Safety and Engineering System Integration**

The Nuclear Safety and Engineering System Integration function has accomplished several significant activities that will improve the alignment of the TOC and WTP Nuclear Safety programs, Documented Safety Analysis (DSA), engineering programs/processes, and configuration management tools.

A comparison of the existing TOC and WTP safety basis programs, procedures, and documents was performed by a cross-functional team chartered by One System, which included independent as well as BNI and WRPS membership. Frank McCoy served as the team leader. The team reviewed assumptions, methods, and analyses, and offered consensus-based recommendations for achieving consistency in the DSA's between the two projects where it was appropriate to do so. As a follow-up to those recommendations, a Nuclear Safety Steering Committee was established under the sponsorship of One System to facilitate the implementation and disposition of those recommendations using a cost/benefit approach for the TOC and WTP. This effort will bring alignment in the DSA assumptions and analyses between the two projects' safety-basis documents.

A major achievement in integration was the development and procurement of a joint site license for the SmartPlant® Foundation. SmartPlant® Foundation is an integrated engineering information management and configuration management system that provides a database system for all technical documents, requirements, and records associated with systems, structures, and components (SSCs). This tool is used in many commercial industries and at the Savannah River Site with proven benefits and cost savings. The TOC had previously decided to adopt the SmartPlant® Foundation and is on schedule to implement it in FY2013. WTP had also conducted an evaluation and recognized a need for an integrated engineering database system. The One System organization facilitated collaboration between TOC and WTP, which resulted in the procurement of a joint site license for SmartPlant® Foundation. The joint license provided immediate cost savings to both projects. However, more importantly, a common database will be utilized in the future for both TOC and WTP SSCs. This will support an efficient and effective consolidation of technical information for an eventual single operating contractor.

The goal of the engineering integration effort is to provide consistent engineering programs between WRPS and WTP, given the organizational, contractual, and facility life-cycle stage constraints. The same or very similar engineering programs and procedures should be developed to foster safe and efficient operations, and cooperation between WRPS and WTP. Engineering program consistency efforts include procedures for configuration management and systems engineering programs (i.e., technical baseline definition; system design descriptions or equivalent documents; system boundary definitions; system assessments; system health reports; system engineer qualifications; ownership and knowledge of the applicable facility Documented

Safety Analysis). Development of training materials and courses for system engineers will be required and will ensure that a graded approach is appropriately applied to the System Engineering program. Processes for system engineering will be integrated with the SmartPlant® Foundation Configuration Management Program for both WTP and TOC.

### **Project Integration and Controls**

In addition to providing general project controls and finance support, this function implemented several initiatives that enhanced the degree of integration and enabled collaboration within the One System IPT.

The One System Business Council was established with membership from WRPS, BNI, URS Corporation, and One System. The purpose of the council is to address administrative/programmatic issues, facilitate the collaborative efforts between WTP and WRPS, and clearly demonstrate that WTP and WRPS are maintaining an equitable split of costs for joint work scope. The council's major accomplishments include establishing an unprecedented Memorandum of Agreement (MOA) and a Non-Disclosure Agreement (NDA) between WRPS and WTP, and developing a joint site license approach for the SmartPlant® Foundation.

During the initial establishment of One System IPT, it was recognized that a number of administrative, business, and information technology systems and processes were not designed to support collaborative work processes among site contractors. Numerous hurdles existed which impeded effective communication and sharing of information and resources between the two contractors. This is understandable given the fundamental distinction between an engineering/procurement/construction (EPC) contract designed to deliver a line-item project and a management and operations contract. These hurdles presented a multidimensional challenge, since they involved long-standing Hanford Site or contractor corporate policies and procedures. The Project Integration and Controls function was instrumental in addressing these issues and enabling personnel in One System and within the “home” organizations to interface and operate as an IPT. Examples of issues include document and information sharing, computer system and database connectivity, proper handling of OUO and other proprietary information, and sharing of resources to effectively perform work assigned to the One System IPT while honoring charging-practice requirements applicable to each contract.

The MOA referenced above represents a mutual desire by WRPS and BNI for a simple and efficient process to perform work for each other that is responsive to unique project requirements and is not readily available from the private sector. The agreement supports an underlying tenet to assure work continuity and good faith effort by assuring that the nature of the identified work is consistent with the companies' respective prime contracts. It minimizes administrative efforts and cost, assures adequate management controls, oversight, and accountability, and encourages routine communication and quick resolution of issues/problems.

A One System Risk Management Team (OSRMT) was established, and members include DOE-ORP, One System, WTP, and the TOC. This group focuses on uncertainties (risks) and opportunities associated with the mission (scope, cost, and schedule) that are of common interest to both the tank farms and WTP, such as early LAW glass, WTP waste feed delivery, and WTP

initial plant operations. OSRMT members and representatives review the risks, opportunities, and technical and safety issues that cross contract boundaries, screening them for inclusion in the WTP or TOC risk program(s) for mitigation. The optimal mitigation strategy, independent of current contract scope boundaries, is considered. The OSRMT Chair considers recommendations, including those provided from WTP, TOC, and DOE-RPP Risk Owners, assigns One System risk sponsors, and provides direction and action items. The One System Secretariat tracks the status of action items to completion, and maintains the status of risks and opportunities in a One System risk register. The OSRMT developed a charter to describe its operation, as well as the One System risk register that contains technical, safety, programmatic, operational, and execution-based risks and opportunities for risk management. Risks that have been approved are migrated into either the existing WTP or TOC risk registers. Five (5) OSRMT meetings were held in CY2012 to screen, evaluate, review, approve, and provide oversight of mitigation strategies and actions, and monitor and close out One System risks.

### **Front-End Design and Project Definition**

This One System division is responsible for developing project pre-conceptual design activities and technical studies through the development, preparation, and submittal of Critical Decision 1 and Critical Decision 2 documents to the DOE. As part of the One System IPT, this function is performed with close coordination and integration between the TOC and WTP operations and construction activities. In this role, the One System IPT can ensure consistency in assumptions, schedules, and funding across the waste-treatment mission, and can identify any gaps that must be addressed.

The One System IPT served a lead role in the recent development of the Direct Feed Law Option included in the WTP Rebaseline Deliverable 7. The conceptual design parameters, requirements, and functions were developed collaboratively to ensure consistency and integration between the waste-feed delivery capability in the tank farms and the WTP LAW waste receipt and melter operations. The secondary liquid wastes resulting from the LAW melter and the capability to return these wastes to the tank farms were also addressed. The One System IPT enabled the impact of WTP operations alternative scenarios, such as Direct Feed to LAW, to be evaluated in terms of TOC capabilities (e.g., waste tank space and tank management). The One System IPT also provided support to ORP in its development of the Direct Feed LAW Business Case, which was being prepared at the end of CY2012.

One System has implemented schedule recovery plans for the Full Scale Demonstration Test design, utilizing innovative project management and focusing on flexible solutions that can support more than one tank design. This work scope, which was previously delayed due to resolution of pump and tank erosion concerns, changes in tank cooling strategies. The addition of Safety Significant controls is now ahead of schedule and has been recognized as best value for the mission. One System also applied an innovative approach to the AY/AZ Ventilation Upgrade Project Recovery Plan, which utilizes the existing AY/AZ VTP to the maximum extent to provide the Safety Significant system required for mitigating flammable gas hazards. At the same time, tank cooling with a portable general service cooling system was accomplished that operates independently of the AY/AZ VTP. The Independent Cooling Module (ICM) can be utilized at any -shell tank (DST) that requires cooling.

The One System IPT also produced and submitted two major project CD-1 packages in FY2012 to the DOE: the Interim Hanford High Level Waste Storage Project, and the Secondary Liquid Waste Treatment Facility. The teams worked in collaboration with their TOC and WTP counterparts to define project requirements and ensure that the projects were integrated into the overall Hanford flow sheet.

### ***Conclusion***

It is imperative for the success of the Hanford Tank Waste Treatment mission that effective integration exists among the Tank Farms, the WTP project, and Hanford support contractors. It is essential to apply a “mission-based” perspective in addressing the complex and numerous challenges that face the safe, timely, and effective startup of the WTP, treatment of the Hanford tank waste, and achievement of desired risk reduction. The manner in which the TOC and WTP contracts were originally established and managed did not readily enable or drive integration of contractor activities, or support a collaborative approach in addressing issues from a mission perspective. The One System IPT was established to shift the culture to one of open communication, employee involvement, and collaboration between the TOC / WTP contractors as well as the DOE-ORP. In a short period of time, the One System IPT has established infrastructure and systems to support a collaborative approach. It has shifted the culture to one of mutual trust, open communications, and collaboration in a manner to identify solutions that are optimal for the overall Hanford tank waste treatment mission. The One System IPT has also completed substantial scopes of work and delivered products to the DOE that represent integrated solutions reflecting the collective endorsement of the TOC and WTP contractors. The collaborative, mission-based approach modeled by the One System IPT is an opportunity for application more broadly within the “home” WTP and TOC contractor organizations, as further opportunity for improved decisions and cost savings exist in areas beyond the current scope of the One System IPT. In FY2013, the One System IPT will leverage the efforts to date and further capitalize on the collaborative management approach between WTP and TOC that has been achieved.