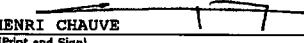


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NHC's Contribution to Cleanup of the Hanford Site

H. D. Chauve
T. A. Flament
Numatec Hanford Corporation

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FLUOR DANIEL HANFORD, INC.



P.O. Box 1000
Richland, Washington

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NHC's CONTRIBUTION TO CLEANUP OF THE HANFORD SITE

H.D. CHAUVE and T. FLAMENT

Numatec Hanford Corporation, 2420 Stevens Center, Richland, Washington 99352 - U.S.A.

ABSTRACT

The \$1 billion per year Project Hanford Management Contract (PHMC) managed by Fluor Daniel Hanford calls for cleanup of the Hanford Site, the largest in the U.S. weapons complex, for the Department of Energy. Project Hanford comprises four major subprojects, each managed by a different major subcontractor. Numatec Hanford Corporation (NHC) is a fifth major subcontractor which provides engineering and technology to each of the Hanford projects. NHC draws on the experience and capabilities of its parent companies, COGEMA and SGN, and relies on local support from its sister company in Richland, COGEMA Engineering Corporation, to bring best commercial practices to first-of-a-kind projects and new technology implementation.

1. Hanford Cleanup

The Hanford Site in southeastern Washington State opened in 1943 as a cornerstone of the Manhattan Project and produced the majority of plutonium for the U.S. nuclear arsenal. By the end of the cold war, most of the production facilities at the site had been shut down. The U.S. government, through the Department of Energy (DOE), made a commitment to cleaning up the legacy of more than forty years of production operations at Hanford. The legacy is commensurate with the size of the site: nine production reactors, two reprocessing plants, large spent fuel storage pools, numerous large storage tanks filled with high-level liquid waste from reprocessing, several plutonium-contaminated facilities and contaminated soils. The Hanford cleanup mission is guided by the Tri-Party Agreement (TPA) signed in 1989 by the DOE, the U.S. Environmental Protection Agency and the Washington State Department of Ecology. The TPA is a legal commitment to clean up the Hanford Site which establishes cleanup milestones and influences the budget process. The cleanup budget of close to \$1 billion annually is expected to remain at that level for at least the next ten years, with all activities to be complete in 2043. Four major cleanup projects are being conducted at the site:

- the Tank Waste Remediation System Project (TWRS), which involves the retrieval, treatment and storage of high-level waste currently held in 177 underground storage tanks;
- the Spent Nuclear Fuel Project, which involves the removal, conditioning and dry storage of 2,100 tons of fuel currently held in two storage pools;
- the Facility Stabilization Project, which involves the stabilization of plutonium-contaminated facilities and the cleanup of a total of six facilities and several laboratories; and
- the Waste Management Project, which involves the treatment, storage and disposal of low-level radioactive waste, toxic waste and mixed radioactive/toxic waste.

2. Project Hanford Management Contract

To achieve cleanup milestones in a timely and cost-effective manner, DOE opted for a performance-based "Management and Integration" (M&I) contract. In August 1996, DOE's Richland Operations Office (RL) awarded an M&I contract known as the Project Hanford Management Contract (PHMC) to a team of companies led by Fluor Daniel Hanford, Inc. (FDH). According to the Source Selection Official, the Fluor Daniel team was ranked much higher than its competitors because it offered the best work approach, it proposed to base 100% of its fee on performance, and it presented a superior economic transition plan.

2.1 Projectization of Cleanup

The PHMC is structured as a single M&I contractor with five “best-in-class” major subcontractors. Four of those subcontractors manage the four major projects listed earlier. The fifth major subcontractor provides engineering and technology to all four projects. The PHMC is illustrated below.

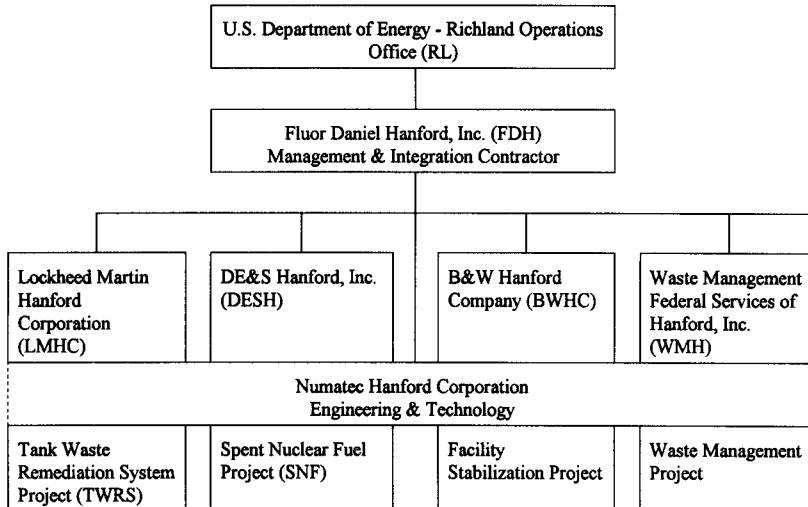


Fig 1. Project Hanford Management Contract Roles and Responsibilities

The “best-in-class” justification may be summarized as follows:

- LMHC is the best company to manage the TWRS Project because it has more Tank Farm experience (at Oak Ridge and Idaho) than any other U.S. company.
- DESH is the best company to manage the Spent Nuclear Fuel Project because it has designed and operates more spent fuel storage facilities than any other U.S. company.
- BWHC is the best company to manage the Facility Stabilization Project because it has more plutonium handling and plutonium-contaminated facility dismantling experience than any other U.S. company.
- WMFSH is the best company to manage the Waste Management Project because it has more experience in the treatment and disposal of low-level radioactive and mixed radioactive/toxic waste than any other company in the world.
- NHC is the best company to provide engineering and technology to the PHMC because it has more experience in the management of high-level waste (especially vitrification), spent fuel, plutonium and low-level waste than any other company in the world.

The M&I contract is a cost plus fee contract. Each year the M&I contractor and its major subcontractors have the opportunity to earn 100% of the available fee based on successful completion of Performance Objectives established by RL. These Performance Objectives are generally related to important milestones, site accomplishments, ES&H performance and cost/schedule variance.

2.2 Economic Transition in the Hanford Community

To counteract the decrease in activities at Hanford, the M&I contractor set up an economic transition plan to generate additional non-Hanford work to the local community. FDH set an ambitious economic transition goal for the PHMC: the creation of 3,000 non-Hanford jobs by the year 2001. To achieve this goal, three actions were undertaken: the creation of six new "enterprise" companies, the formation of Columbia Basin Ventures, and the establishment of an Economic Transition Department inside the PHMC.

Enterprise "Companies

The six PHMC companies created six "enterprise" companies, with most of the workforce coming from former site contractors such as Westinghouse Hanford Company (WHC), ICF Kaiser and Boeing Computer Services. The enterprise companies continue to provide services to the site, but their ultimate objective is to win non-Hanford work in order to diversify and stabilize the local economy.

Columbia Basin Ventures

Columbia Basin Ventures (CBV) is a PHMC venture capital company which looks for local investment opportunities. The PHMC companies have pledged a total of \$10 million in investment funds to CBV. So far, CBV has invested \$800,000 in two companies: a Hanford spin-off (Vivid Concepts, Inc.) which provides computer-based training; and a start-up company (Mundo) which sells telephone calling cards for Spanish speakers.

3. NHC Contributions to Cleanup and Economic Transition

NHC is a subsidiary of COGEMA Services, a wholly-owned U.S. subsidiary of SGN (itself a wholly-owned subsidiary of COGEMA), that was created in 1996 to provide engineering and technology to the PHMC. The Richland, Washington, company currently has 161 employees, some 10% of whom are senior managers and technical specialists from France. The American personnel are project managers, technology development engineers and scientists. More than 50% of NHC's employees are engineers, scientists and managers.

3.1 NHC's Engineering Role in the PHMC

Project Phase	NHC Role	Project Description
Project Definition	<ul style="list-style-type: none">▶ Define strategy▶ Establish functions and requirements▶ Develop process flowsheet by performing hot cell experiments	<ul style="list-style-type: none">▶ Private vitrification vendor feed delivery (TWRS)▶ Sludge retrieval tool for double shell tank (TWRS)▶ Processing strategy for K-Basin sludge (SNF)▶ Tank waste sludge washing (TWRS)▶ Salt cake dissolution (TWRS)
Conceptual Design	<ul style="list-style-type: none">▶ Develop project baseline▶ Cost / schedule▶ Technical baseline	<ul style="list-style-type: none">▶ Vitrified LLW / HLW storage (TWRS)▶ Utilities to private vitrification vendor (TWRS)
Project Management during Design & Construction	<ul style="list-style-type: none">▶ Develop detailed design▶ Manage construction▶ Perform start-up testing	<ul style="list-style-type: none">▶ Implementation of mixer pump in double shell tank (TWRS)▶ Upgrade Tank Farm facilities (TWRS)▶ Tank Farm ventilation system upgrade (TWRS)▶ Sludge retrieval in high-heat tank (TWRS)▶ Cold Vacuum Drying facility (SNF)

Table 1. Hanford Engineering and Construction Projects Managed by NHC

NHC manages major construction projects for the TWRS and Spent Nuclear Fuel Projects and provides engineering resources for process development and project definition to the TWRS Project. NHC is responsible for managing a budget of \$110 million per year, or approximately 12% of the total PHMC budget.

3.2 NHC's Technology Role in the PHMC

NHC fulfills its technology role in four ways:

- as a member of the PHMC Technology Management group led by FDH;
- through its own Technical Guidance Council;
- through services provided by its Engineering Development Laboratory (305) and Equipment Testing Laboratory (306); and
- through services provided by its Chemistry, Analysis and Technology Support (CATS) group at the 222-S Analytical Laboratory.

The Technology Management group of the PHMC is charged with identifying "breakthrough" technologies that may help clean up the Hanford Site faster, better, cheaper and more safely. NHC has one employee in this FDH-led group who is tasked with helping to identify candidate technologies available from NHC's parent company.

The Technical Guidance Council (TGC) is an informal organization created by NHC to better fulfill the company's mission of implementing technologies that could significantly reduce cost, schedule or risk for Hanford cleanup projects. The TGC looks at technical issues site-wide and identifies areas where technological solutions can improve the site baseline. The Council currently has seven members from NHC and one from Cogema Engineering.

The Engineering Development Laboratory, or 305 Lab, provides technology selection, adaptation, development, proof-of-principle testing, system qualification and operator training for several Hanford cleanup projects. For example, the 305 Lab adapted a commercially available robotic arm for underwater nuclear service for the Spent Nuclear Fuel Project and is currently training operators in its use on a full-scale mock-up.

The Equipment Testing Laboratory, or 306 Lab, has precision machining, welding, fabrication and testing capabilities. The 306 Lab was instrumental in the testing of both the hot conditioning system and the cold vacuum drying system for the Spent Nuclear Fuel Project. The 306 Lab is scheduled to be "privatized" in the near future; this entails transferring the facilities, equipment and personnel to COGEMA Engineering. It is expected that the lab will continue to provide equipment testing services to the Hanford Site for several years.

The CATS group supports the Hanford Analytical Services group of WMH, which provides analytical services to all Hanford programs. CATS is charged with improving analytical tools.

The following tables show examples of NHC technology infusion activities and identification of promising technologies for cleanup of the Hanford Site.

Technology Infusion Phase	NHC Role	Description
Improvement of analytical tools	<ul style="list-style-type: none"> Test new methodology Adapt existing off-the-shelf technologies Develop analytical procedure Transition technology to routine laboratory use 	<ul style="list-style-type: none"> Capillary zone electrophoresis Laser ablation mass spectrometer ICP / MS Raman probe for determination of anions in soils
Development and implementation of field analytical tools	<ul style="list-style-type: none"> Develop field measurements from existing off-the-shelf analytical equipment Provide analytical services 	<ul style="list-style-type: none"> Moss Bauer probe for Fe in soil Vapor phase analysis in waste tanks
Implementation of new technologies	<ul style="list-style-type: none"> Provide facility and skilled personnel to projects for last phase of technology implementation (full-scale prototype validation, operator training, field deployment) 	<ul style="list-style-type: none"> Sorting table and associated robotic arms to sort K-Basin fuels (SNF) Processing modules of Cold Vacuum Drying facility (SNF) Core sampler for waste tanks (TWRS)
Technology management	<ul style="list-style-type: none"> Provide support to Technology Management (FDH) Facilitate access to foreign technologies Participate in Site Technology Coordination Group 	<ul style="list-style-type: none"> Hanford technology needs Visits from CEA, ANDRA, EDF
Identification of technological breakthroughs	<ul style="list-style-type: none"> Review baseline technologies Propose improvements to FDH Develop implementation plan 	<ul style="list-style-type: none"> New arena for NHC

Table 2. Technology Infusion Activities of NHC

Application	Need	Objectives	Proposed Technology
Decontamination & dismantling	Robots for D&D work in high radiation hot cells	<ul style="list-style-type: none"> Shorten D&D schedule Decrease worker exposure Decrease cost 	D&D robots used in Cogema and CEA facilities
Decontamination & dismantling	Decontamination technologies for alpha-contaminated glove boxes	<ul style="list-style-type: none"> Improve decontamination factor Decrease amount of waste sent to WIPP Reduce cost 	Ce IV gel and foam developed by CEA and used in Cogema and CEA facilities
Analytical tools	Rapid analysis of PCB's in nuclear waste	<ul style="list-style-type: none"> Reduce turnaround time for analysis Reduce cost 	PCB kit for rapid analysis

Table 3. Examples of Promising Technologies Identified by NHC

3.3 NHC Accomplishments to Date

For NHC, as for its partners in the PHMC, the first year of the contract was devoted to understanding what had been accomplished at the site. In NHC's case, this led to the rebaselining of several engineering projects in terms of safety, technical approach and schedule. During this time, NHC successfully completed several major construction projects--the first to be completed for the TWRS project in a decade--and turned them over to the operator in fulfillment of its engineering role.

NHC Accomplishments for the TWRS Project

- Completion of construction of a new cross-site line to transfer fission products from old single-shell tanks in the West Tank Farm to double-shell tanks in the East Tank Farm, where feed for the future vitrification plant will be staged.
- Modifications to the ventilation systems of several tanks in the East Tank Farm to bring them into compliance with current safety and environmental regulations.
- Completion of construction of a sluicing system to remove high-heat waste from the C106 single shell tank for transfer to a double-shell tank and ultimate vitrification.
- Completion of Phase I conceptual design of low-level vitrified waste storage facilities.
- Significant involvement in tank waste characterization activities via the CATS group.

NHC Accomplishments for the Spent Nuclear Fuel Project

Spent fuel in degraded condition currently stored in the K Basins must be removed, dried, placed in canisters and stored in the new Canister Storage Building.

- NHC resolved safety and process issues relating to the spent fuel conditioning system. In particular, NHC successfully eliminated the originally planned hot conditioning system not really necessary with the current requirements for interim storage.
- NHC is currently in charge of prototype testing of the cold vacuum drying system for the spent fuel and is building the full-scale facility.
- The 305 Engineering Lab developed a robotic arm to remove spent fuel from the pool and place it in canisters. A full-scale pilot facility was built to test the equipment and is now being used for operator training.

NHC Accomplishments for Economic Transition and Community Involvement

Along with FDH and the other major subcontractors, NHC is very active in economic transition. NHC's "enterprise company" affiliate is COGEMA Engineering Corporation (CEC), a Richland-based company with 120 employees which supplies engineering services to NHC and other major subcontractors. At the same time, CEC is actively pursuing non-Hanford business and is already earning 10% of its sales revenue outside the Hanford Site. For example, as a subcontractor to SGN, CEC is teamed with Fluor Daniel for the fabrication of hot cells for Atomic Energy of Canada, Ltd. (AECL) for radioisotope production.

NHC is also a contributing member of the local community, particularly in the arts and education. Several of its engineers teach at the Tri-Cities branch of Washington State University, and NHC has mounted a French school program in partnership with the Kennewick School District. In addition, NHC sponsors the French American Club, a non-profit corporation with 125 members, the majority of them Americans, which promotes inter-cultural understanding through educational, cultural and social activities.