
Watts Bar Nuclear Plant Unit 2 Completion Project

Tenth Quarterly Update to the Estimate to Complete August - October 2014

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Nuclear
Construction

Table of Contents

Section 1 - Executive Summary 3

Section 2 - Background..... 4

Section 3 - Quarterly Performance 4

 Safety 5

 Quality 6

 Cost..... 6

 Schedule 7

Section 4 - Reserve Management 8

Section 5 - Known Risks 8

Section 6 - Project Oversight.....10

Section 7 - Project Organizational Health.....11

Section 8 - Going Forward12

Section 1 - Executive Summary

The tenth quarterly update of TVA's Estimate to Complete (ETC) for Watts Bar Nuclear Plant Unit 2 focuses primarily on the activities between August and October, 2014.

Performance during the quarter continued to be consistent with the ETC, and project targets continued to be met for safety, quality, cost, and schedule.

The project successfully completed the cold hydrostatic testing of the Reactor Coolant System (RCS) and progressed toward hydro testing of secondary systems. These tests demonstrate the integrity of the piping and major components and that they will withstand system operating pressures.

Project focus has shifted toward completing the remaining construction and testing required for hot functional testing (HFT) in 2015. This test will bring the unit to normal operating temperature and pressure to simulate plant operations and demonstrate that the major systems will perform their intended functions.

Challenges mentioned in the previous quarterly report remain. The project team continues to focus attention and resources to look ahead, to anticipate issues and plan contingencies, and to collaborate with the plant operating staff to continue safely progressing toward unit operations. Primary challenges include:

- Testing Unit 2 systems that share components with Unit 1 without jeopardizing the safe and reliable operations of Unit 1;
- Completing the release of plant systems for pre-operational startup testing during a compressed time period while maintaining safety and quality standards;
- Constructing and testing systems in shared spaces, higher than expected equipment failures and repairs, and productivity issues during startup testing;
- Preparing for and transitioning to dual-unit operations; and
- Addressing regulatory and licensing issues.

Quarterly Summary Points

No lost time incidents for the quarter - since July 2010, over 29 million work hours have been achieved

Performed activities in a manner that resulted in a Quality Control acceptance rate of 97.5 percent

Met cost and schedule expectations set forth in the ETC

Released four more plant systems for pre-operational startup testing

Turned three systems over to Operations – Condenser Circulating Water, Raw Cooling Water, and Condenser Tube Cleaning

Identified no new risks that would affect project completion

Watts Bar Unit 2 Completion Project Quarterly Update to the Estimate to Complete, August - October 2014

Section 2 - Background

In August 2007, TVA's Board of Directors approved resuming construction to complete Watts Bar Unit 2. However, the project did not fully meet expectations for schedule or budget.

In August 2011, a new management team performed a root cause analysis of the issues responsible for the schedule and budget problems and developed a revised ETC for the project.

The revised ETC is based on a range of values for both schedule and budget. As part of its effort to develop the ranges, the team considered risks and obstacles that could hinder meeting project expectations.

On April 26, 2012, the TVA Board of Directors approved the budget and schedule shown below to complete Unit 2.

Watts Bar 2	Aggressive	Most Likely	Upper Range
Completion Cost	\$4.0 Billion	\$4.2 Billion	\$4.5 Billion
Commercial Operation	September 2015	December 2015	June 2016

Note: More information and additional details about the cause analysis, as well as the process that was used to develop the revised ETC, can be found in the Executive Final Report on the ETC posted on this link: http://www.tva.com/power/nuclear/pdf/wattsbar2_executive_etc.pdf

Section 3 - Quarterly Performance

The project continued to meet overall targets for safety, quality, cost, and schedule in the three months from August to October 2014.

A significant accomplishment during the quarter was the successful completion of cold hydrostatic testing of the RCS, which required the assembly of the reactor vessel and other major system components.

The team also completed construction on control rod drive mechanism coolers, containment purge, the Reactor Building space heaters, and radwaste systems.

Additional project accomplishments for the quarter included:

- A Pre-Startup Review (PSUR) by the World Association of Nuclear Operators (WANO) was completed. WANO is affiliated with the Institute of Nuclear Power Operations (INPO) in the U.S. and is a collaboration of international nuclear plant operators providing peer reviews, communications, and models of excellence in all aspects of nuclear operations. The results of the review found satisfactory readiness for two-unit operation.
- Ten systems previously released for pre-operational testing were verified.
- Three systems – Condenser Circulating Water, Raw Cooling Water, and Condenser Tube Cleaning – were turned over to the site's operating organization.
- Numerous briefings and tours were provided to stakeholders such as federal, state, and local officials; TVA customers; and media representatives.

For the cold hydrostatic testing of the RCS, the reactor vessel core barrel and upper internals were installed and the reactor head was put in place and tensioned. The reactor coolant pumps were operated to bring the system to the test temperature, and the system was pressurized to over 3,100 pounds per square inch to ensure system integrity.

Watts Bar Unit 2 Completion Project Quarterly Update to the Estimate to Complete, August - October 2014

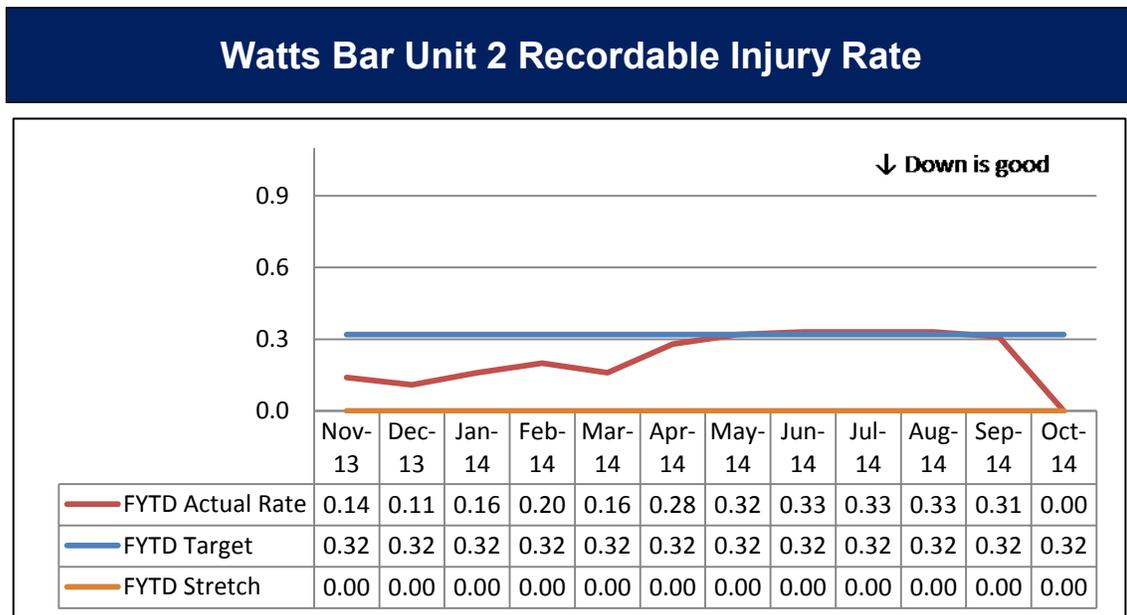
- A key licensing milestone was met when Commissioners with the Nuclear Regulatory Commission (NRC) were provided a public status update of the Watts Bar Unit 2 operating license review and path forward.

Through the judicious use of structured daily review meetings, and in close coordination with a dedicated response team, new issues are being assessed promptly and corrective actions are being planned and executed.

More information illustrating project performance is provided in the following sections.

Safety

Safety is the highest value and the overriding priority for TVA and Watts Bar. During the quarter, Unit 2 personnel continued to work safely. Since July 2010, Unit 2 employees have exceeded over 29.5 million work hours without a lost-time incident, a significant accomplishment. As the chart below shows, the current Recordable Injury Rate is lower than target.



Unit 2 workers identify potential risks and stay safe by:

- Maintaining awareness of changing plant conditions as systems are turned over to the operating unit;
- Using the Tri-lateral Safety Alliance intervention process when necessary to prevent teammates from engaging in behaviors that put themselves and others at risk; and
- Closely monitoring low-level safety incidents and communicating those among project personnel, along with safety experiences from across TVA and the industry.

Between August and October 2014 . . .

- Over 727 interventions were performed by craft safety teams and the Tri-lateral Safety Alliance which is made up of TVA, represented crafts and contract partners.
- Over 3,000 management observations were documented, of which over 1,600 focused on error-prevention tools and their use by the employees.

Watts Bar Unit 2 Completion Project
Quarterly Update to the Estimate to Complete, August - October 2014

Quality

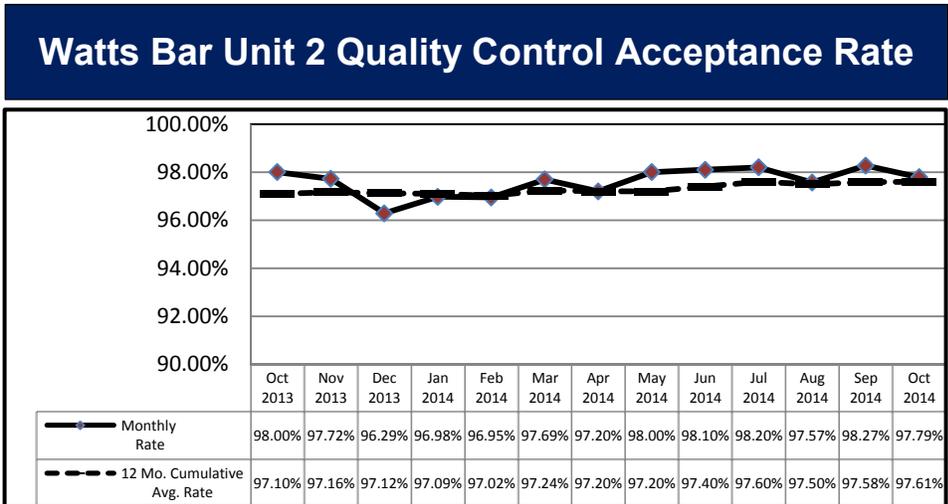
The quality of Watts Bar Unit 2 work remains above goal as measured by the Quality Control (QC) acceptance rate and shown on the chart at right. Each month, this rate measures the percentage of work that passes the QC inspection process on the first inspection.

For the past 12 months, the cumulative average acceptance rate is 97.61 percent.

The project continues to provide oversight of the system turnover process, testing program, and engineering and construction document closure with a focus on the conduct of pre-operational testing.

Also during this report period:

- The project successfully completed cold hydrostatic testing of the RCS - the second of three major milestones planned for 2014. The first major milestone was open vessel testing which was completed during the summer; the third major milestone - secondary hydrostatic testing - is planned for late 2014. Cold hydrostatic testing of the RCS was the first primary hydrostatic test performed at a commercial nuclear plant in over 20 years and involved five companies (Bechtel Construction Operations, Inc.; Bechtel Power, Inc.; Westinghouse; PCI Energy Services, and Curtiss Wright Electro-Mechanical Corporation) to certify the piping system and major components in accordance with American Society of Mechanical Engineers Section III.
- Significant progress was achieved in the reduction of the project Corrective Action Program backlog. In April 2011, the project had a backlog exceeding 2,700 Problem Evaluation Reports (PERs), and at the end of this report period, the backlog had been reduced to less than 200.



Cost

The project is trending to a total cost of \$4.3 billion, slightly above the most likely target established in the ETC.

A demobilization plan is being implemented as the project progresses through the major milestones. Staffing levels are reviewed periodically against ETC expected levels to ensure deviations are detected and analyzed. Over the quarter, a reduction of office trailers and storage containers began. The effective demobilization of the project is a key factor to meeting cost and schedule targets.

Watts Bar Unit 2 Completion Project

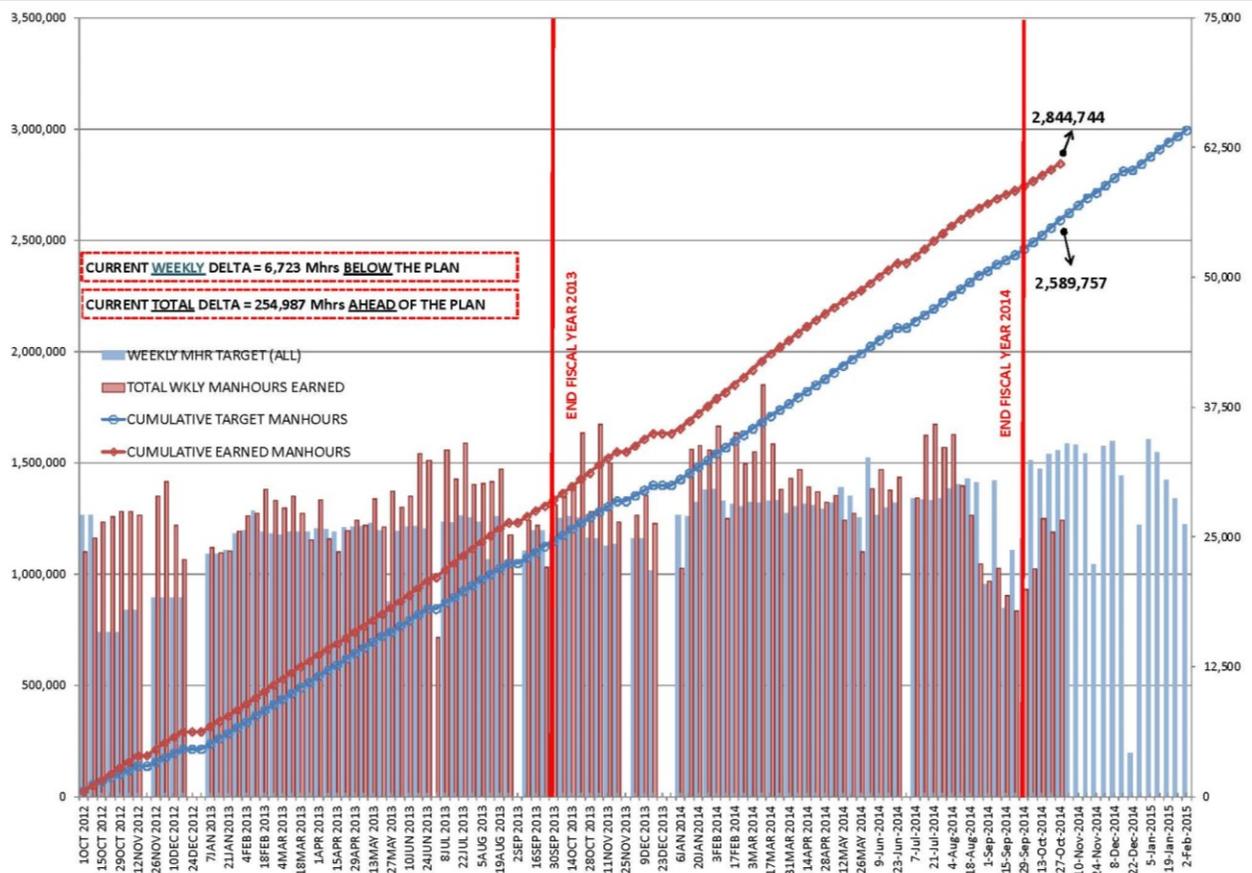
Quarterly Update to the Estimate to Complete, August - October 2014

Schedule

Based on current and targeted schedule performance, the project continues to track to the most likely commercial operation date of December 2015.

Overall, the project used some margin in September and October while focusing on completing cold hydrostatic testing and addressing testing delays. Some of the delay was associated with the repair of a leaking steam generator tube plug and the extent-of-condition investigation as well as the associated repairs. This is shown on the chart below which compares actual earned hours per week to the number of hours targeted to be earned.

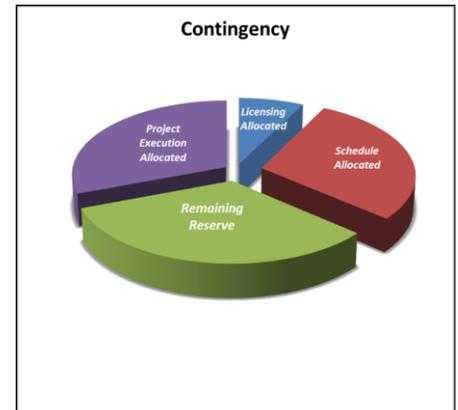
Watts Bar Unit 2 Target Versus Actual Earned Man Hours



Section 4 - Reserve Management

Project reserve money is available to fund risk management and risk occurrence, as well as unforeseen expenditures.

The chart to the right shows that the project continues to expend a moderate portion of the established reserve. The relative sizes of the total allocations from the reserve through the end of this quarter are shown in the chart.



Section 5 - Known Risks

There were no new significant risks identified during the quarter that might compromise project completion. A summary of notable risks is shown in the table below. Additional information on the risks follows.

Waste Confidence

The NRC approved the “Waste Confidence Rule,” now called “Continued Storage of Spent Nuclear Fuel Rule.” As part of the approval, the NRC vacated the outstanding contentions related to the rule and has directed the Atomic Safety and Licensing Board to vacate contentions raised by external stakeholders. On September 29, 2014, members of the Southern Alliance for Clean Energy filed a contention in the Watts Bar Unit 2 licensing proceeding, which had previously been terminated, challenging the NRC’s new rule.

A remaining action related to the Continued Storage Rule is the NRC staff’s comparison of the Generic Environmental Impact Statement to the Watts Bar Unit 2 Final Environmental Statement to ensure that potential environmental impacts are appropriately addressed.

<u>Risk</u>	<u>Risk Trend</u>
Waste Confidence	Decreasing
Dual-Unit Operational Readiness	Stable
Closure of Licensing Issues	Stable
Documenting Completion of Work	Stable
Construction Completion	Stable
Cyber Security	Stable
Emergent Work and Verification	Stable
Startup Testing Delays	Increasing
Fukushima	Decreasing

Dual-Unit Operational Readiness

Actions to prepare for dual-unit operations continue. During this period, a team from WANO performed a PSUR. The team concluded the site’s preparation is on target and satisfactory for two-unit operation.

The Dual-Unit Operational Readiness Team (DUORT) completed the transition of the remaining operational readiness actions and commodity work-offs to the plant staff and assumed new roles in the completion of the project. This has resulted in more ownership by the plant operating organizations, improved communications across the site, and better planning and execution of key Unit 2 testing milestones.

Closure of Licensing Issues

An area that continues to require focused attention is resolving inspection planning and scheduling (IP&S) items with the NRC. The IP&S items must be resolved before fuel may be loaded in Unit 2. The project has developed a concentrated approach to prioritize and streamline IP&S item closure activities and has made progress toward closure of the items. Over 80 percent of the items have been completed, and of the remaining open items, a significant portion of work has been performed.

Documenting Completion of Work

The quantity and complexity of documentation has challenged productivity, efficiency in verifying implementation completeness, and the ability to provide necessary closure documentation. The project has seen improvement as a result of changes made to ensure the quality and ease of completion of the required construction documentation. As the project has moved further into the startup and testing phase, comparable focus has been applied to documentation and closure of startup and testing activities to ensure similar positive results.

Construction Completion

As the project has moved from bulk construction to system completion, progress has become more challenging due to the precision required for work completion. The Construction organization now is focused on completing the remaining systems required for hot functional testing - primarily main steam, main feedwater, and auxiliary feedwater. Approximately 1,500 work orders (WO) were assigned to these three systems, and over 70 percent were completed during the quarter. Additionally, construction work to support cold hydrostatic testing of the RCS and hydrostatic testing of the steam generators was completed this period.

Cyber Security Requirement Implementation

The NRC has established requirements related to cyber security to help protect Critical Digital Assets (CDAs) – mainly systems and devices involved in the control and monitoring of plant systems – from being damaged or corrupted in a manner that might compromise their functions in support of nuclear safety. This quarter, the project completed its review of CDAs and planned the actions necessary to provide the required protections. Implementation of those actions supports the project licensing schedule.

Fukushima

As a result of the events at the Fukushima Daiichi Nuclear Plant in Japan in March 2011, the NRC now requires U.S. nuclear plants to upgrade their facilities to provide diverse and portable means of supplying cooling water and AC power during an extended period of loss of offsite power and loss of normal access to the ultimate heat sink.

This project at Watts Bar has established a path forward that meets the NRC requirements to date, resulting in a lower risk ranking. As a result, Watts Bar will be much more resilient to a broader range of unexpected environmental events.

Watts Bar Unit 2 Completion Project Quarterly Update to the Estimate to Complete, August - October 2014

The Watts Bar site has made significant progress in completing the required Fukushima additions for both units. Specific accomplishments during the quarter include:

- Completed procurement and delivery of FLEX equipment;
- Completed acceptance testing of FLEX equipment; and
- Completed Unit 2 pipe taps and the 225-kilovolt diesel generator and 3-megawatt diesel generator installations.

Startup Testing Delays

The project continues to experience delays resulting from startup testing activities. These delays are related to construction turnover delays; equipment failures; time needed to make repairs; longer times required for system flushing and cleaning; construction and startup personnel working in the same congested areas; and complications when testing systems common to Unit 1 and Unit 2. The startup group organization was modified during this quarter to provide dedicated component testing groups, a “ready-ready” group to make sure test preparations and support needs have been completed, and a rapid response group to address testing issues.

Emergent Work and Verification of Released Systems

Levels of emergent work added into the schedule continue to be higher than desired. However, actions taken in the previous quarter have been effective in reducing the number of emergent WOs. Analysis indicated that only a small percentage of new WOs represented new scope, while the majority addressed timing, support, or emergent issues with planned work.

Section 6 - Project Oversight

Project Assurance

Project Assurance (PA) observations and assessments performed during this quarter concluded that Watts Bar Unit 2 continues to track within ranges established in the ETC.

Overall, the PA group noted that project performance has been tempered by increases in the scope and durations of project work activities through new and revised WOs that added more than 250,000 work hours to the project schedule since March 2014. Additionally, extended system completion and turnover dates have used some margin that was built into aggressive production schedules. The project has initiated actions to improve production schedule performance, as well as controls to improve the oversight of work scope and duration additions.

The Project Assurance group is independent of the Unit 2 organization. The group is responsible for assessing various facets of project performance and reporting its findings to the Senior Vice President of Watts Bar Operations and Construction.

PA observation reports completed during this quarter focused on the following: efficiency in completing work; scheduled electrical construction activities being ready to work; planning and preparation of pre-operational and acceptance test instructions; and suggestions to improve electrical safety awareness. Observations were shared with project managers and actions to improve performance have been initiated as appropriate.

Section 7 - Project Organizational Health

Nuclear Safety Culture

The number of concerns expressed during this quarter was lower than the previous reporting period. While the Employee Concern Program (ECP) at the site experienced a decrease in concern traffic this reporting period, a notable increase was noted in anonymous PERs received. There was not, however, a corresponding increase in concerns expressed to the NRC, which received one allegation during the quarter.

The increase in anonymous PERs was attributed to personnel management issues, which included the commencement of project demobilization. Efforts continue to address manager/worker relationships and to anticipate issues.

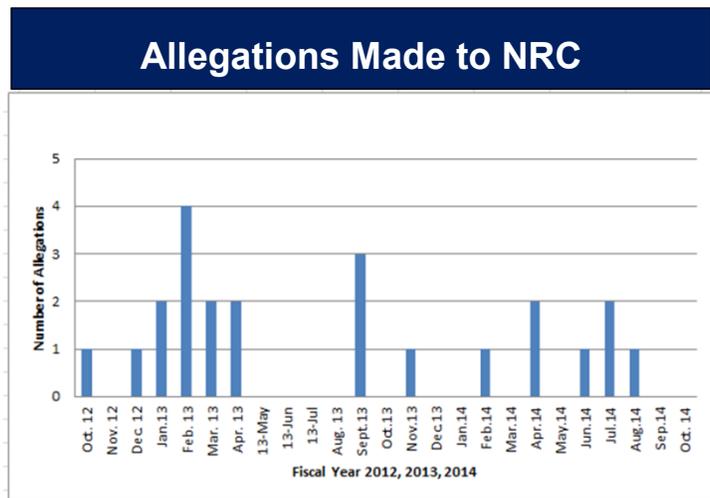
The NRC received one allegation during the quarter, compared to three the previous reporting period. For 2014, the NRC has received a total of 7 Watts Bar Unit 2 allegations, down from 13 in 2013.

ECP completed a pulse survey at Watts Bar Unit 2. Of those who responded – approximately 45 percent of project personnel – 95 percent indicated they would raise a nuclear safety or quality issue if one was identified. Some felt if they raised a nuclear safety or quality issue they would suffer some form of retaliation. Based on this perception, the substantiation rate of those who have raised concerns with regard to retaliation was reviewed. The review determined that a systemic problem of retaliation does not exist. This will continue to be an area of focus for ECP monitoring, and project management will continue to use a variety of methods to communicate with employees and to encourage personnel to bring forward concerns.

Project Completion Incentive Program

Approximately 3,100 workers are eligible for the Watts Bar Unit 2 Project Completion Incentive Program. Of these, approximately 75 have at least 4,000 hours; 1,500 have at least 3,000 hours; 650 have at least 2,000 hours; and 500 have at least 1,000 hours. These individuals have been assigned and dedicated to the project, and provided they remain with the project until their work is completed, they could receive an incentive payout proportional to the hours they have worked. For any incentive payout to be made to eligible participants, commercial operation must be certified by TVA by December 31, 2015, and the project must be completed at or below \$4.4 billion.

The incentive program was implemented in October 2012 to help ensure safety and achieve the construction timeline and budget of the ETC. The incentive program will be funded by savings realized by the project if it is completed in a safe, quality, cost-effective, and timely manner.



Section 8 - Going Forward

During the next quarter, work will continue to release plant systems for cleaning and testing. The primary focus of testing will be on the subsystems, structures, and components required to complete secondary hydrostatic testing and to complete the systems necessary for hot functional testing. This testing will operate the plant at full temperature and pressure to show proper operation of key systems and components.

Licensing focus will be on final preparations for the NRC's Operational Readiness Assessment Team visit in 2015. A team of former NRC, INPO, and industry leaders will perform a mock inspection in December to identify remaining gaps to readiness and provide recommendations for resolution.

The project continues its focus on completing construction activities and the implementation of the project demobilization plan. The plan will ensure that support structures and materials used during construction are removed, that permanent structures and site grounds are restored, and that staffing is reduced in a manner that will ensure effective project completion and successful transition to dual-unit operations.