APPENDIX D

PLANT STATUS

A. OBJECTIVES AND PHILOSOPHY OF PLANT STATUS ACTIVITIES

The Reactor Oversight Process recognizes that resident inspectors have a specific responsibility, outside of inspection activities, to be aware of plant conditions on a routine basis. This appendix provides guidance regarding these plant status activities at pressurized water reactors (PWRs) and boiling water reactors (BWRs).

Resident inspectors' knowledge of plant activities and status is important in the risk-informed inspection process for determining how to select and implement the appropriate baseline inspection procedures. Plant status activities will focus on being aware of emergent plant issues, potential adverse trends, current equipment problems, and ongoing activities, including their impact on plant risk. Based on the knowledge gained through the plant status review, the inspectors are expected to make adjustments to their inspections so that they can inspect activities which are of higher risk-significance.

The resident inspector should transition into the appropriate inspection procedure whenever their effort shifts from collecting status information to evaluating a potential inspection issue. The inspector should transition into the appropriate inspection procedure if the information collection activity will exceed about ½ hour for any single issue.

The frequency of the plant status review effort will be determined by the inspector based on current plant conditions and activities. Inspectors should use plant specific risk information to determine what systems and activities are of higher risk significance given the present plant configuration.

B. CONTROL ROOM WALKDOWN

The purpose of the control room walkdown is to help enable the inspector to stay current of plant status as well as to identify unexpected plant conditions that warrant additional inspection under the baseline inspection program. Evaluate the status of the safety or risk important systems by observing the indicated parameters and equipment configuration indications on the control boards. This walkdown is intended to be general (not detailed) in nature. See IP 71153, Event Followup, Appendix B. It provides guidance on NRC inspector conduct while in the control room during events in order to preclude NRC intrusion in licensee response activities.

Look for system components that are in unexpected configurations or parameters that are at unexpected values based on the operational mode of the plant. In addition, note whether any adverse plant parameter trends exist and whether the licensee is aware of the trends. Identify whether the plant is in any technical specification (TS) limiting conditions for operation (LCOs), whether the TS action statements are being met, and that TS requirements and license conditions are being met. Determine if the licensee is operating with multiple or repetitive, or unplanned TS action statement entries caused by degraded equipment conditions; that they are assessing and managing the risk associated with this

condition in accordance with licensees' procedures (ref. IP 71111.13); and that the issue associated with the degraded equipment conditions is entered into the corrective action process in accordance with section F of this appendix. Verify that the licensee is operating within licensed power levels. Guidance for evaluating brief power level fluctuations above 100% is given in IP 61706 "Core Thermal Power Evaluation." Any radiation dose implications associated with repetitive tasks should be reviewed by applicable radiation safety baseline inspection procedures. In the control room or other appropriate locations, review visible portions of radiation monitors or other indications that could provide indication of an apparent uncontrolled release.

Review control room logs, equipment out-of-service or clearance logs, TS logs, chemistry logs, standing orders, and night orders several times each week to become aware of potential risk-related problems that occurred since the previous review. Determine whether the logs appropriately reflect the plant status observed during the control board walkdown and whether TS requirements are being met. A review of the operator shift logs and standing orders may provide insights regarding equipment operability. Pursue any operability concerns using Inspection Procedure (IP) 71111.15, "Operability Evaluations." Report primary-to-secondary leakage in steam generators which are greater than 3 gpd to NRC headquarters staff. For additional information on the reporting requirements, see IP 71111.08, "Inservice Inspection Activities."

To ensure that the licensee properly monitors for RCS pressure boundary leakage or potential unidentified leakage exceeding TS limit, the inspector should routinely verify that the licensee:

1. Monitors leak detection systems such as the containment atmosphere particulate radioactivity instruments, the containment sump flow/level instruments, the containment atmosphere gaseous radioactivity instruments, the containment humidity instruments, and/or any plant-specific instrumentation to indicate potential RCS leakage. Also, trends these parameters for potential adverse trends.

2. Takes appropriate actions for degraded or inoperable leak detection instrumentation or alarms in accordance with TS, and responds to alarms in accordance with alarm response procedures. Also, periodically verifies that the alarm response procedure actions are consistent with plant licensing documents.

3. Periodically performs the inventory balance check (PWR only) and attempts to confirm RCS unidentified leakage with alternate and diverse means, such as, changes in containment sump level or sump pumping frequency and volume.

4. Takes appropriate actions in accordance with plant-specific leak rate impact or leakage investigation procedures (leakage source identification, quantification, classification, etc.) when RCS leakages are suspected. Also, considers unidentified leakage as identified leakage only when the leak rate has been actually measured and identified.

5. Conducts activities to identify sources of RCS unidentified leakage. Documents actions taken to identify sources of unidentified RCS leakage in the control room logs or in the corrective action program, as specified in plant administrative

procedures. The licensee's leak identification plan includes actions such as system walkdowns; system surveillance and re-alignment; containment entry (PWR only) and visual inspections for boric acid deposits (PWR only); verification of pumps and valves for possible seal and packing leakages; inspection of pipe flanges and major welds, including instrument lines and connections; and sampling/ performing isotopic analysis of atmospheres, filter elements and sumps.

6. Trends unidentified leak rates and pays particular attention to changes in unidentified leakages and takes appropriate corrective action for adverse trends. Also, trends other containment parameters such as containment sump inleakage rates, the containment air/gaseous radiation monitor indication, the containment particulate radiation monitor indication, and the containment humidity indication to validate potential RCS unidentified or pressure boundary leakages.

If the inspector observes significant adverse trends, engage licensee and regional management and the appropriate NRR technical branches for prompt corrective actions. As applicable, the inspectors should also verify the licensee enters the appropriate procedure for responding to adverse RCS leakage trends. Review licensee procedures for action steps, as unidentified leakage approaches licensee administrative limits or technical specifications allowed values. The inspector should use IP 71111.22, "Surveillance Test," to verify licensee's surveillance activities and IP 71111.04, "Equipment Alignment," to conduct any plant walkdown. Review any operational and technical decision making activities and pursue any operability concerns using IP 71111.15, "Operability Evaluations."

In addition, Attachment 1 provides a technique to aid inspectors in independently determining whether an adverse trend exists with licensees' RCS unidentified leakage rate data obtained during steady state power operation. This guidance also provides action level criteria to assess the significance of the trend and licensee's actions in response to increasing levels of unidentified RCS leakage that could indicate RCPB degradation. This guidance is provided in response to Davis Besse Lessons Learned Task Force (DBLLTF) recommendation 3.2.1(2).

C. STATUS MEETINGS

Select and attend licensee meetings, on a routine basis, that provide an overall status of the plant and pertinent ongoing activities. These meetings could include the licensee's plan of the day meeting, shift turnover meeting, emergent work meeting, equipment prioritization meeting, and corrective action document review meeting. Note that during or in preparation phases of the plant refueling or maintenance outages, licensees may conduct additional meetings. Inspectors should attend these meetings to understand the scope, schedule, and risk-significant activities of these outages. This will enable the inspectors to plan and implement applicable baseline inspection procedures that needed an outage.

The purpose of attending the status meetings is to gather information about overall site activities in order to determine what activities will be or are being conducted so that inspection resources can be appropriately focused on those activities with the higher safety significance.

D. PLANT TOURS

On a weekly basis, tour accessible areas of the plant containing safety significant structures, systems, and components (SSCs) within the scope of the maintenance rule, areas that contain significant radiological hazards, and areas with important physical security equipment. Focus on areas of the plant that inspectors have not entered while performing other inspections on a weekly basis.

During changing plant conditions (plant refueling or maintenance outages), the frequency and scope of plant status tours may be increased to tour areas not normally accessible and to observe equipment in an abnormal lineup.

Plant tours should occasionally include off-site and on-site emergency response facilities, and independent spent fuel storage facilities. In addition, the inspector may accompany a plant operator performing equipment rounds to gain insights regarding undocumented plant deficiencies, work arounds, or temporary modifications.

The purpose of the tours is to provide an independent perspective of ongoing plant activities that may affect plant performance in the cornerstones. In performing the tours the inspector should keep in mind the integrated effect of plant problems on plant safety. Areas to note include:

1. Plant activities are taking place that may affect the operability of the required SSCs and/or increase plant risk.

2. The overall status of plant SSCs, including general material condition or the installation of unauthorized modifications that could affect the SSC's function. Pursue any unauthorized or temporary modification deficiencies using IP 71111.23, "Temporary Plant Modifications."

3. Fire hazards that could increase risk, and overall status of fire protection equipment.

4. Status of on-site and off-site emergency response facilities.

5. Status of physical security equipment (additional guidance for reactor safety/plant security interface is available in section E of this Appendix).

6. The status of doors to locked high radiation areas and required radiation postings. Pursue any deficiencies that may impact the Occupational Exposure Control Effectiveness Performance Indicator using IP 71151, "Performance Indicator Verification."

7. Any leakage involving radioactive liquids or gases. Pursue any unmonitored release paths that may impact the Radiological Effluent Occurrence Performance Indicator using IP 71151, "Performance Indicator Verification."

8. Status of remote or alternate shutdown panel areas, including locally required procedures, materials, or communications equipment needed to perform any required actions from these areas.

E. REACTOR SAFETY/PLANT SECURITY INTERFACE

The events of September 11, 2001, led to significant changes in the security programs at nuclear power plants. With the increased attention to security, we have also recognized that the maintenance of both plant security and safety requires coordination of activities. Such coordination is needed to ensure that actions taken to address security concerns do not adversely affect safety, including emergency preparedness, and that maintenance, operations, or engineering activities do not introduce security concerns. Examples include:

- the addition of locks or other barriers to improve security that impedes the ability of operators to take actions included in emergency operating procedures

- maintenance or construction activity that interferes with security barriers or intrusion detection devices

- temporary conditions warranting compensatory measures from either security or operations because the conditions differ significantly from plant or risk profiles assumed in either the operating or security procedures

- changes in site layouts, ingress or egress routes, or security procedures that affect EP in areas such as site assembly or staff augmentation times

In observing security activities and especially the addition or modification of security features, the inspector should consider and, as appropriate, question the licensee regarding possible safety/security interface issues. In particular, the inspector should look for changes that might adversely affect systems, structures, or operator actions credited in:

- Traditional Licensing & Design Bases Functions (e.g., accident analysis, station black out, fire protection programs)

    - Emergency Operating Procedures
    - Severe Accident Management Guidelines
    - Probabilistic Risk Assessments
    - Radiation Protection
    - Emergency Plan & Emergency Plan Implementing Procedures

In observing plant activities such as maintenance, operations, emergency preparedness, and engineering, the inspector should consider and, as appropriate, question the licensee regarding possible safety/security interface issues. In particular, the inspector should look for changes that might adversely affect:

- barriers and fences
- intrusion detection systems
- alarm and communication systems

- security event response
- assumptions for and access to readily available equipment for responding to conditions described in each plant's mitigating strategies table

F. PROBLEM IDENTIFICATION

Periodically observe licensee management's review of plant deficiencies by attending meetings such as the plant operations review committee (PORC) and off-site nuclear review board meetings. The inspector should be knowledgeable of major findings from licensee self-assessment activities.

G. RESOURCE ESTIMATE

The yearly resource expenditures for plant status activities are estimated to be on average**:** 625 hours for a single-unit site; 683 hours for a dual-unit site; and 892 hours for a triple-unit site.

END

Attachment 1

Assessing Reactor Coolant System (RCS) Unidentified Leakage Rate Trend

In order to track and assess the unidentified leak rate trend, the inspector should utilize licensee's RCS leakage rate data. Once each month, the inspector should obtain the mean value (μ) and the standard deviation (σ) of RCS unidentified leakage rate for the past three months, representing a 3-month rolling data set, using the Excel spreadsheet (see ROP Digital City Web link: http://nrr10.nrc.gov/rop-digital-city/pwrleakage08.xls (PWR) and http://nrr10.nrc.gov/rop-digital-city/bwrleakage08.xls (BWR). During the ensuing month, the inspector should use the resulting μ and σ to establish action thresholds as described below.

Note: For licensees who calculate the leak rate more than once per day, ensure that the leak rate value for calculating the mean value is the average for that day. When starting a new operating cycle after refueling, the mean, standard deviation and action levels should be calculated based upon the first three months of steady state leakage data following an outage. The expectation is that the steady state leak rate at the beginning of the new operating cycle should be lower than the average leak rate during the period just prior to the plant shutdown for the refueling, maintenance or forced outage. This is based on the assumption that the licensee has identified and corrected all potential leakage source(s).

The mean value (μ) and the standard deviation (σ) are defined by the following equations:

$$\mu = (x_1 + x_2 + \ldots + x_n)/n; \qquad \sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{n}}$$

assuming the unidentified leakage rate, x, is a random variable which has a mean value, μ, and a known standard deviation, σ.

Once a month, the inspector should use the mean value (μ) and the standard deviation (σ) from the previous three months to calculate the three action level triggers (μ, μ + 2σ, μ + 3σ). The action levels were determined by statistical analysis:

Action Level I:	**Nine (9) consecutive leakage measurements above the mean μ**
Action Level II: `	**Two (2) of three (3) consecutive measurements exceed the μ + 2σ**
Action Level III:	**One (1) measurement of leak rate exceeds the μ +3σ**

During the daily plant status review, the inspector should compare the licensee calculated RCS unidentified leakage rate data to the three action level triggers to determine if there is a potential adverse trend and take appropriate actions, if necessary. If the licensee performs the RCS leakage rate calculations several times a day, the inspector should only

compare the average positive value per day to the action level triggers. If the licensee, following their TS, only performs a RCS leakage rate calculation once per 72 hours, then the inspector should perform this comparison once per 72 hours. For BWRs, if the drywell floor sump is pumped less frequently than daily, then average positive value should only be entered for those days that the sump is actually pumped. Note: Zero or negative values should not be entered into the spreadsheet.

Upon exceeding one of the action level triggers, the inspector should take the following actions to ensure that licensees are monitoring and taking appropriate actions to reduce the leakage when statistically significant leakage trends exist and to ensure that the proper levels of NRC management are informed of potential adverse trends in RCS unidentified leakage.

Action Level I - **Nine (9) consecutive leakage measurements above the mean μ**

Actions: 1. Continue to monitor licensee's actions.

2. Determine if the licensee is increasing awareness of other containment parameters.

Action Level II - **Two (2) of three (3) consecutive measurements exceed the $\mu + 2\sigma$**

Actions: 1. Take the steps in Action Level I, if not already done.

2. Determine if other data such as sump chemistry samples, containment atmosphere radioactivity, and humidity levels indicate no RCS leakage.

3. If there are indications of RCS leakage activity from other data such as sump chemistry samples, containment atmosphere radioactivity, containment temperature, pressure and humidity levels, review licensee's plans for identifying source of unidentified leakage and proposed corrective actions.

3. Discuss licensee's actions with regional branch chief and engage licensee if necessary.

<u>Action Level III</u> - **One (1) measurement of leak rate exceeds the $\mu + 3\sigma$**

Actions: 1.Take the steps in Action Level II, if not already done.

2. If leakage trend continues upward for the next 24 hours with positive identification of RCS leakage from other data, discuss these indications with licensee's operations management and monitor licensee's proposed corrective actions.

3. Ensure regional management at the Director level is informed via the branch chief of the status of licensee's actions.

4. The Region should notify the appropriate NRR technical branches via the NRR project manager if the trend continues to increase from Action Level III over the next 72 hours with confirmation of RCS leakage activity from other data and the licensee has not taken prompt corrective actions. The region should expect additional dialogues with the licensee.

END

Attachment 2

Revision History Sheet for IMC 2515 Appendix D

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
N/A	7/10/03	Revised to add a statement to remind resident inspectors to periodically check Part 9900 of the inspection manual to keep current on reporting requirements.	N/A	N/A	N/A
N/A	9/09/03	Revised to provide improved guidance to an inspector on the requirement to inform the Materials and Chemical Engineering Branch, NRR, of steam generator tube leaks of greater than 3 gallons per day.	N/A	N/A	N/A
N/A	5/11/04	Added guidance for reviewing RCS leakage monitoring. Also, requirement to monitor licensee actions when in multiple TS action statements. New requirement to review licensee corrective action summary reports.	N/A	N/A	N/A
N/A	1/26/05	Added more detail to requirement for RCS leakage monitoring.	N/A	N/A	N/A
N/A	12/2/05	Additional clarification to guidance on RCS unidentified leakage trending. Resource estimate for Plant Status has been increased.	N/A	N/A	N/A

N/A	01/26/07 CN 07-004	Included reference to IP 61706 for evaluating reactor power fluctuations (FF 2515D-945). Revised Plant Status resource estimate. Added guidance to inspectors on being sensitive to licensee's actions taken to address security concerns do not adversely affect reactor safety and emergency preparedness. Likewise, licensee's actions taken to address reactor safety concerns do not adversely affect plant security (FF 2515-D-998).	N/A	N/A	ML063460228
N/A	04/04/07 CN 07-012	This IMC has been revised to update the RCS unidentified leakage rate spreadsheet web page links. Spreadsheets were updated and converted from Quattro Pro to Excel.	N/A	N/A	N/A