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. Included in these activities is the awareness of how licensees are managing fatigue due to the impact this can have on the protection of public health and safety and common defense and security. Additionally, resident inspectors should periodically (once a quarter) conduct tours of security related areas in order to identify any security-related issues which may warrant follow-up by region-based security inspectors.

The resident inspector should transition into the appropriate inspection procedure whenever their effort shifts from collecting status information to evaluating a potential inspection issue. Security-related issues identified during tours of the licensee facility shall be referred to security specialists in the region for follow-up inspection(s) as appropriate. The inspector should transition into the appropriate inspection procedure if the information collection activity will exceed about ½ hour for any single issue. Scope of activities conducted under the Plant Status procedure does not require documentation in inspection reports.

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 Follow-up, 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 those 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." It is important that inspectors maintain awareness of situations that may result in increased fatigue (i.e., unit outages, short duration LCOs, staff shortages, etc.). When evidence of fatigue is identified, inspectors should immediately notify licensee management of any observed condition that indicates signs of fatigue so they can evaluate the need for a fatigue assessment per 10 CFR 26.211, Fatigue Assessments.

If the licensee documents waivers of work-hour controls in the control room logs or shift manager logs then periodically review the waiver(s) to determine that the granting of the waiver(s) addressed circumstances that could not have been reasonably controlled. If further inspection guidance is needed then IP 93002, "Managing Fatigue," may be referenced on an "as needed" basis.

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. Additionally, the inspector should be aware that work hour controls may change with a unit in an outage and an increase in the use of waivers, self-declarations or fatigue assessments may occur.

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.

Inspectors shall coordinate with the licensee to tour areas which become accessible on an infrequent basis and for short periods of time to assess the material condition and status of safety systems, structures and components. While some normally inaccessible areas might be obvious such as heater bays in BWRs, other areas may take additional effort to identify and plan for a tour (such as essential service water or radwaste vaults). The inspectors should review and discuss normally inaccessible areas with the licensee to ensure the inspectors are aware of their existence (some areas may not be obvious) and plan logistics such as ensuring advance notification of when they will be accessible, if appropriate, and any special arrangements needed for entry (i.e. special training for fall protection or confined space entry).

Inspectors shall plan to tour all areas not normally accessible at a minimum of once every 4 years and these inspections should coincide with the licensee's schedule for accessing the area. Inspectors should place the highest priority on areas that contain risk significant or safety related equipment, but may take into account areas which contain equipment that could cause a transient or initiate a radioactive release. The inspectors can also review the results of licensee's direct observations (video movies, and digital photographs) when direct inspections by inspectors were not possible or if other factors such as personnel safety or the radiation levels in the area to be inspected warrant use of licensee's direct observations. It is not the intent of this guidance to force licensees to make every inaccessible area of the plant accessible for NRC inspection.

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 material condition and 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 evaluation 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 taking place that may affect the operability of the required SSCs and/or increase plant risk including on-line (pre-outage) maintenance activities, such as the erection of temporary scaffolding and/or placement of other structures or material that may interfere with the safety-related function of SSC.

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 71111.18, "Plant Modifications."

A degraded condition is one in which the qualification of an SSC or its functional capability is reduced. Examples of degraded conditions are failures, malfunctions, deficiencies, deviations, and defective material and equipment. Examples of conditions that can reduce the capability of a system are aging, erosion, improper operation, and inadequate maintenance.

Obvious signs of degraded material condition of piping or other components such as substantial corrosion, loose anchor bolts, or other conditions that may call into question operability or design margins of the equipment. Inspectors shall ensure that identified material condition deficiencies are captured in the licensee's corrective action program. Inspectors should consult with appropriate regional and headquarters specialists if there are any questions regarding the operability or adequate design margin associated with degraded safety systems, structures, or components. Inspectors should attempt to obtain video movies and/or digital photographs of the degraded equipment (either on their own or through the licensee) to assist the specialists in evaluating the degraded material condition.

Inspectors should consider the potential for long-term degradation of SSCs or acceptance of long-standing degraded SSCs, as indicated by multiple similar entries in the licensee's corrective action program. The licensee's evaluation and resolution of such degraded SSCs should be considered for further inspection utilizing the appropriate baseline inspection procedure. For example, "use-as-is" determinations, revision of engineering or operational acceptance criteria, reductions in design or operational margin, and repetitive work orders could be indicative of licensee acceptance of a long-standing degraded condition.

3. Any identified deficient condition which may be indicative of equipment tampering. Inspectors should also evaluate whether licensees actively consider potential for tampering when equipment deficiencies are identified.

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

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

6. Plant activities which are taking place that may affect the security of the facility such as: 1) security shift turnovers; security officers on posts; 2) security equipment testing and/or review of equipment testing results; 3) security force drills or exercises; and 4) security logs for degraded conditions and compensatory measures. Once a quarter conduct tours to observe one of these four activities (about 4 hours per quarter should be expended). Guidance for observing these activities is contained in a memorandum titled "Revised Interim Guidance for Security Inspection by Resident Inspectors," dated October 3, 2008 (ML082100574).

7. 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."

8. 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."

9. 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.

10. Signs of personnel fatigue or impaired individual alertness which could create a reasonable doubt that an individual is fit to safely and competently perform his or her duties. This applies to all personnel that are granted unescorted access to nuclear power reactor protected areas and individuals that are required to physically report to the licensee's Technical Support Center or Emergency Operations Facility by licensee emergency plans and procedures.

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 emergency response facility access, emergency preparedness equipment access, 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
- modification to equipment relied on in the Emergency Action Level scheme
- changes to set points contained in the Emergency Action Level scheme

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**:** 641 hours for a single-unit site; 699 hours for a dual-unit site; and 908 hours for a triple-unit site. These yearly resource expenditures include 16 hours per year for resident inspector observations of security-related activities. Regions should use 16 hours per year as a resource estimate for conducting these observations rather than the four hours per month suggested in the "Revised Interim Guidance for Security Inspection by Resident Inspectors" memorandum. Time spent conducting security-related activities should be charged to the appropriate quarterly resident inspector inspection report number. Additionally, time expended conducting these activities should be charged to code PS (plant status).

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 pull-down menu titled, "Forms, Templates, Sample Reports & More," on ROP Digital City Web link: http://nrr10.nrc.gov/rop-digital-city/index.html). 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, a weekly rolling data set (i.e., most recent 7-day average) of leakage values will be analyzed to determine if the licensee has identified and corrected all potential leakage source(s). Once 3 months of data have been collected, the mean, standard deviation and action levels should be calculated using the Excel spreadsheets listed above.

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

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

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, $\mu + 2\sigma$, $\mu + 3\sigma$). 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 $\mu + 2\sigma$**

Action Level III: **One (1) measurement of leak rate exceeds the $\mu + 3\sigma$**

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. Zero or negative values should be entered into the spreadsheet as "zero."

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. Licensee will remain in the appropriate action level until they are able to isolate/repair the leak. It is acceptable to reset the action levels for plants with 1) very low leakage rates where the standard deviation from the mean is very small and 2) no discernable trend in the leakage. Upon exceeding one of the action level triggers, the inspector will consider the licensee in the appropriate action level until they are able to identify, isolate, or repair the leak.

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.
4. 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 μ +3σ**

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.
5. The resident inspector should provide periodic updates on the RCS leak rate to regional management, and NRR technical branches via the NRR project manager in the event that the licensee does not repair the leak.

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
N/A	05/01/08 CN 08-014	Revised to include checking for online maintenance activities that could interfere with SSCs and added leakage trending for the first 3 months after the start of a refueling cycle. This revision addresses feedback forms 2515-D-1157 and 2515-D-1178.	N/A	N/A	N/A
N/A	09/03/08 CN 08-025	Revised to address lessons learned from severe corrosion of essential service water piping risers at Byron plant (see Operating Experience posting of 10/23/2007) as documented in FF 2515D-1214. Also, incorporated recommendations from FFs 2515D-1156 and 1258 to clarify how to charge for inspection resources used to support facility status reviews for the Security and Safeguards Inspection Program (SSIP) and to make inspectors aware of Plant Status procedure for SSIP (IMC 2201 Appendix D).	N/A	N/A	ML082410742
N/A	11/09/09 CN 09-026	Revised to add guidance for inspectors to look for indications of fatigue when performing plant status reviews. The guidance also provides a reference to new inspection guidance in IP 93002.	Yes	6/17/2009	N/A
N/A	02/02/10 CN 10-004	Added requirement to have resident inspectors conduct quarterly tours of security-related areas as recommended by CY 2009 ROP realignment process (ML092090312). Increased inspection resources allocated to Plant Status procedure by 16 hours per year to conduct these additional tours of security-related areas by resident inspectors.	No	N/A	ML100070084

N/A	ML11279A083 02/24/12 CN 12-003	Provided guidance to be sensitive to deficient equipment conditions which may have resulted from tampering by personnel. Also, made changes to address regional comments associated with feedback forms 1308; 1423; and 1624.	No	N/A	ML12027A113