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Implementation of New Operations Standards

at Darlington Nuclear Generating Station

by
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Ontario Power Generation (formerly Ontario Hydro Nuclear) performed an assessment of plant Operations at the Pickering Generating Station, Bruce Generating Station and Darlington Generating Station in 1997 and realized the need for an overall improvement program. The program developed is called the Integrated Improvements Program (IIP). There are improvements being planned and underway in a wide scope including Training, Station Engineering, Regulatory Affairs, Performance Assurance, and Operations and Maintenance. In Operations the improvement areas are: Operating Documentation, Operator Skills and Knowledge, Worker Protection Code, Plant Status Control and Conduct of Operations.

This paper will introduce the overall Conduct of Operations Improvements that are in progress and planned at Darlington Nuclear Generating Station. It will also discuss in more detail the following two specific Conduct of Operations Improvement Standards, the expected benefits and the methods used for implementing the new standards to the staff at Darlington:

- Reactivity Management Standard
- Conservative Decision-Making Standard

Conduct of Operations New Standards and Procedures Developed and Issued in 1998

In the Conduct Of Operations Improvements, one of the major thrusts has been to develop and communicate new Operations Standards and Procedures, then hold Operations staff accountable to follow these Standards and Procedures. The first group that was developed and issued in 1998 included:

Main Control Room (MCR) Panel Monitoring and Alarm Response Standard

This standard provides instructions to ensure that Main Control Room panels are monitored and alarms are responded to in a manner that supports safe operation.

Self Check Program

This is an observable work practice consciously and deliberately initiated by an individual and is intended to focus the person's attention on the performance of specific tasks and the expected outcome. This is intended to become a habit that prevents personnel from operating or maintaining incorrect devices due to mental lapses, inattention or distractions.

Conduct of Main Control Room Turnover Standard

This is to establish the instructions to be followed during shift relief and turnover to ensure the incoming person is provided with an overall and detailed understanding of unit status. The common standard ensures consistency of information from turnover to turnover, unit to unit and crew to crew and this prevents a loss of important operating information through shift change.

Narrative Logging Standard

This provides a standard for the preparation and maintenance of Operations Narrative logs to ensure that day to day evolutions are properly documented. By clearly stating the logging requirements there will be consistency of information being reported. Well documented logs and turnovers can reduce operating errors. Later in 1999 the station logs will be available on the LAN for information retrieval by the station staff.

Communications Standard

This provides the methods for communicating during normal and abnormal conditions to ensure these communications are clear, concise and complete so as to reduce operating errors. The use of the phonetic alphabet and three way communication which includes repeat backs is mandatory for verbal operating instructions. This will reduce errors due to miscommunication.

Supervised Control Panel Operator Standard

This provides the standards that govern the qualification and use of Supervised Control Panel Operators to monitor and perform limited panel operations. This ensures there are appropriate operating limitations on this non-authorized Operator qualification. The long term goal is to only use Authorized Nuclear Operators to monitor and operate generating unit control panels.

Conduct of Operations New Standards and Procedures Being Developed and Issued in 1999

Pre-Job Briefings and Post-Job Briefings Procedure

This procedure provides controls for conducting pre-job briefings and post-job debriefings to ensure safe and efficient execution of activities that directly operate, maintain or modify the generating facility. The pre-job briefing is led by the supervisor using a check sheet. The specific job is discussed, including the working boundaries, hazards and actions to reduce the hazards, procedures, contingencies and lessons learned from previous jobs. The post-job debriefing captures lessons learned from the job that will be incorporated in the station documentation to improve the job safety or efficiency.

Required Reading Procedure for Authorized Staff and Specifically Qualified Staff

The purpose of this procedure is to provide direction for determining which documents are to be identified as required reading material and the process to be followed for the review by Authorized and Specially Qualified Operations Staff. Documents such as Operating Memo and Operating Manual revisions that may impact on nuclear safety if the information is not known by the operating crew are read at time of issuance by the duty crew and prior to turnover by all incoming crews. If information is important, but can be read at a later date with out impact, then it is on a thirty day reading list. All reading requirements are tracked for each main control room individual.

Duty Manager Expectations

This provides expectations for Authorized Duty Managers in fulfilling their role. This includes after hours availability, responsibility for Duty Manager decisions and notifications, licensing issues, the need to be cognizant of station status and the turnover between Duty Managers.

Response to Upsets

This standard provides an operating strategy for all operating personnel with respect to their roles and responsibilities during unit transients. The standard uses a team approach and is practiced in the simulator. This uses a tried and proven approach to help ensure a successful handling of the upset. It is also beneficial if there are substitute crew members on shift at the time of the incident. The team members fall into role as practiced and this avoids any team interaction problems during the upset diagnosis and recovery.

Operability Testing

This standard ensures that all portions of Safety Related Systems function in the event of a process failure. It also provides instructions for actions to be taken if testing cannot be completed as specified, and the requirements for documenting test results.

Nuisance Alarms

This procedure specifies the actions required to identify and disposition nuisance alarms in order to minimize distractions to an operator. This is intended to provide a high profile for nuisance alarms to get the cause of the alarm assessed and repaired.

Operator Rounds and Routines

This standard describes the process for conducting frequent operator surveillance activities in a manner that supports safe plant operation. The operator on routines in the field quite often discovers emergent equipment problems and field or main control room actions are taken prior to the problem escalating.

Main Control Room Access

This standard provides rules for controlling access to the main control room. Access is limited to only those persons that absolutely have to be there and to govern the conduct of all personnel in the main control room to ensure there are no distractions for the responsible unit operators. Access is limited to turnover personnel thirty minutes before and after turnover.

Control of Fuelling Operations

This standard establishes the responsibilities for fuelling operations to ensure the reactivity of the reactor core and the handling of nuclear material is conducted in a manner that results in safe and reliable operations. The operating units and fuel handling are typically separate sections reporting to the same Shift Manager. Setting common standards for fuelling operations helps prevent operating errors.

Control Of Operator Work Arounds

This standard provides instructions to identify, document, assess, communicate and resolve Operator Work Arounds. A Work Around is a deficiency that prevents the Operator from performing tasks in the normal manner. This standard will provide station focus on identifying and resolving these work arounds.

Performance Measures

This standard identifies the Operator Crew performance measures and indicators that will facilitate performance improvement. These performance measures will be published monthly and the Shift Manager will be responsible for bringing crew performance on target and Operations Support will provide programs that will assist this process.

Housekeeping Standard

This standard prescribes the housekeeping control requirements. A high Standard of houskeeping supports both a safer operation and a more productive operation. There are examples where liquid leaks in inaccessible areas during full power operation would disappear on shutdown, but could be detected because of the stains left on equipment or floors that were known to be very clean the last time the area was accessed.

Development of New Conduct of Operations Standards and Procedures

The new standards are being prepared as an overall Ontario Power Generation initiative, supported by Bruce Nuclear Generating Station, Pickering Nuclear Generating Station, Darlington Nuclear Generating Station and the Corporate Head Office. The new standards are prepared with a lot of Operator input after reviewing industry best practices, current Ontario Power Generation practices and documentation at each site, and specific needs at each site. A number of the documents are authored by Operators. The document preparation phase includes an extensive review and approval stage to ensure that the specific needs at each site are taken into account.

While some of the above documents are standards, other are procedures. A procedure defines the "who, what, when, why, and how" for performing a defined series of steps. A standard will be more of an expectation document that governs individual performance behaviors. Self Check is a good example of a behavior that is a standard, while Pre-Job and Post-Job Briefing is an example of a procedure.

Each station is accountable for the implementation of new standards and procedures at their site. Implementation of standards is not straight forward since in many cases it requires changing human behavior, breaking past habits and making the new standard habit forming. Implementation of new procedures requires the integration of the processes in the procedure with existing practices.

Implementing the Standards and Procedures at Darlington Generating Station

The implementation of the initial Conduct of Operations Standards and Procedures in 1998 was in competition with the introduction of new Radiation procedures, a complete new Work Control Process and other new administrative procedures. These initial Conduct of Operations requirements were field audited and found not fully implemented in some cases. This is currently being addressed. Implementation of the 1999 Conduct of Operation Standards and Procedures is being done using the following approach to ensure a better introduction:

- Operations Standards and Procedures workshops, introduced by the Director of Operations, and led by the Shift Superintendent,
- reinforcement of the Standards by using a "Standard of the Month" focus approach,
- use of Conduct of Operations pocket calendars for Operations staff,
- distribution of employee pocket reminder cards that have information reminders,
- re-enforcement of new standards at simulator training,
- re-enforcement of the new standards and procedures with Operators re-deployed from other sites,
- issuance of supervisor's briefing cards, summarizing new standards and procedures,
- supervisory coaching and discussion of the topics in the briefing cards,
- support for new standards and procedures from line management,
- the use of a supervisor's observation and coaching (self assessment) program.

Workshops organized by Operations Support were used to introduce the Reactivity Management and Conservative Decision Making Standards. These workshops used a participative format with the help of a facilitator from the Training Division. There were five workshops, one for each shift crew of Operators and Supervision, which involved over three hundred staff members. The format included an introduction and context setting session from the Director of Operations and Maintenance and then the crew was split into four break out groups to review and summarize four new standards and procedures. One member of the group summarized the main points of the new document and the Roles and Accountabilities that Operators have with respect to the new document. After the break out session a member of the group presented the summary of the document to the whole crew. There was a question and answer period to gain clarification of the details of the documents and how they would be implemented. The crew was split into four new break out groups and were given a different Significant Event Report and requested to summarize the event, and list how the new standards and procedures applied to this event. The results were then presented by an Operator to the whole crew. There were further questions from Operators and clarifications from Operations Support and Line Management.

Implementation of the Reactivity Management Standard at Darlington

The purpose of the standard is to implement reactivity management practices consistent with nuclear safety targets such that reactivity of the Reactor Core is always respected and controlled to ensure the safety of the public, the environment, plant personnel, and plant equipment. The standard has both a philosophical approach and the requirement for managed controls to be integrated into all operating and maintenance activities to ensure that no unplanned reactivity changes occur.

All plant operations affecting reactivity shall be performed in a safe, controlled, conservative manner and be implemented in accordance with approved procedures. The following are some of the important highlights of the expectations in the Standard.

- Planned reactivity changes shall be performed in accordance with approved procedures and monitored with vigilance (during and following the maneuver) using redundant instrumentation.

- The Shift Manager shall approve the resetting of trips, unit recovery, and subsequent increases in reactor power following upset conditions terminated by a non-neutronic trip.

- Immediate recovery from neutronic trips is not permitted.

- The Control Room Shift Supervisor shall review and concur with all planned reactor power maneuvers and reactivity changes. The intended change shall be independently verified to ensure adequate margin to trip and availability of heat sinks exist prior to initiating the change.

- The ANO has the authority to reduce reactor power without concurrence of the CRSS when the ANO deems the action necessary for safe reliable operation.

- The ANO shall be dedicated to the task of reactivity manipulations and not have any other activities ongoing that could cause distractions.

- The ANO shall avoid hasty decisions and hurried actions during reactivity manipulations.

- Only the ANO shall perform reactor power maneuvers or direct activities that can cause reactivity changes. The only exception is when an Operator in Training approved by the Shift Manager is at the controls and being trained with “over the shoulder” supervision by the ANO.

- Operations staff shall use good operating practices (three way communication, self checking, procedural adherence, etc.) when performing any operations that could affect core reactivity. Examples are: refuelling activities, approach to critical and reactor power changes.

Operations managed controls are such things as not permitting immediate recovery from neutronic trips, allowing only the Authorized Nuclear Operator to perform reactor power maneuvers or reactivity changes and requiring the Shift Supervisor to review and concur with all planned reactor power maneuvers. Philosophical aspects of the Standard include requiring the Authorized Nuclear Operator to avoid hasty decisions and hurried actions during reactivity manipulations, and to operate the reactor in a conservative manner when confronted with unexpected or unexplained core conditions.

When the Reactivity Management Standard was introduced to Darlington Operators in the workshop a key question for the breakout groups to answer was: “What are examples of tasks performed by the field Operator that can impact on reactivity management?” Reactivity management could be mistakenly assumed to be the responsibility of only the Main Control Room Staff. The examples given by the Operators illustrated their understanding of the impact they have on reactivity management:

- Manually sampling and pumping out of the moderator collection tank, especially during the Guaranteed Shutdown State,
- Liquid Injection System (SDS 2) tank sampling and repoising,
- Acid addition to the moderator system for chemistry control, especially during the approach to critical,

- Field valving on the liquid zone system when it is controlling reactor power,
- Recharging the Moderator Liquid Addition Systems with boron and gadolinium.

There were two Significant Event Reports used for discussion purposes. One example from another station involved a reactor setback while a shut off rod was being driven manual in the MCR to troubleshoot the position indication. The other example was the handling of a fuel channel outlet temperature that was just marginally inside the alarm limit. Both examples were also discussion points for conservative decision making, thus illustrating how the standards overlap.

Implementation of the Conservative Decision Making Standard at Darlington

The purpose of this standard is to provide expectations and management commitment to the conservative decision making culture. The expectations encourage decisions that take the safe course of action when presented with key process parameters that deviate from expected conditions.

The guidelines for staff when confronted with a safety concern fall under the following four headings, and if the answer to any of the following questions is "No" then a discussion should take place with qualified personnel prior to proceeding:

Plant Conditions:
- Are they as expected, are procedures available to follow?
- Are the indication correct? Believe indications until proven false.
- Is other equipment not affected?

Risk of Continuing with Present Conditions:
- Will Control, Cool and Contain be continued, has the risk been assessed acceptable?
- Is their procedural guidance to remain in the present plant condition?
- Has there been an assessment of the safety to the public, workers and environment?

Risk of Changing Conditions:
- Is the expected plant response, and its affect on Control Cool and Contain understood?
- Are contingency plans in place?

All of the Factors that Led to the Current Decision:
- Has the "big picture" been assessed, and have all necessary people been involved?
- Have the people most familiar with the problem been involved?
- have all the necessary crew members been involved in the decision?
- Has Operations or Plant Management been involved?

The standard requires that there be unconditional management support for persons making conservative decisions that were believed to be conservative at the time. Making a conservative decision can be a tough chore without visible management support. Actions at any level in the organization that do not support conservative decisions should be challenged.

The Conservative Decision Making Standard is written with an operations focus, and it is expected that all operations and maintenance staff will use the standard when making decisions that can affect the reactor core.

The introduction of the Conservative Decision Making Standard also included Significant Event reports to be used for discussion. As mentioned above, the incident of the reactor setback while a shut off rod was being moved, and the fuel channel just marginally below the blockage limit were analyzed, plus incidents involving a Turbine Generator Trip on Low Stator Cooling Water Tank level and an incident on an outage unit and an Emergency Coolant Injection valve alignment problem. The events had examples of both good and poor conservative decision making judgements that have been made in the past and the workshop groups discussed all aspects and then presented these to the whole crew.

Summary

Developing and implementing common standards and procedures for the Conduct of Operations for Ontario Power Generation has been very challenging because the three nuclear sites all had some elements of these processes in place, and changing decade old habits across the board has far reaching implications. But common standards and procedures are very powerful when the three nuclear sites are able to compare each other, talk a common language, perform self assessments, benchmark against each other and help each other to improve.

The follow up audit for some of the initial standards implemented at Darlington found that there was not full compliance and improvement still needed. This was primarily due to an incomplete introduction of these first new standards in 1998. The 1999 implementation of the Reactivity Management and Conservative Decision Making Standards involved: providing a multi-faceted introduction including workshops, employee pocket briefing cards, Conduct of Operations pocket calendars, and visible management support. A follow up audit will be performed later in 1999 to determine the success of the implementation.

The benefits from the introduction of the new Conduct of Operation Standards and Procedures will be realized over a long term in both safety and production. A solid safety culture, resulting in fewer operating errors equals better production. Success measures and a review process are all part of the introduction of the new standards.