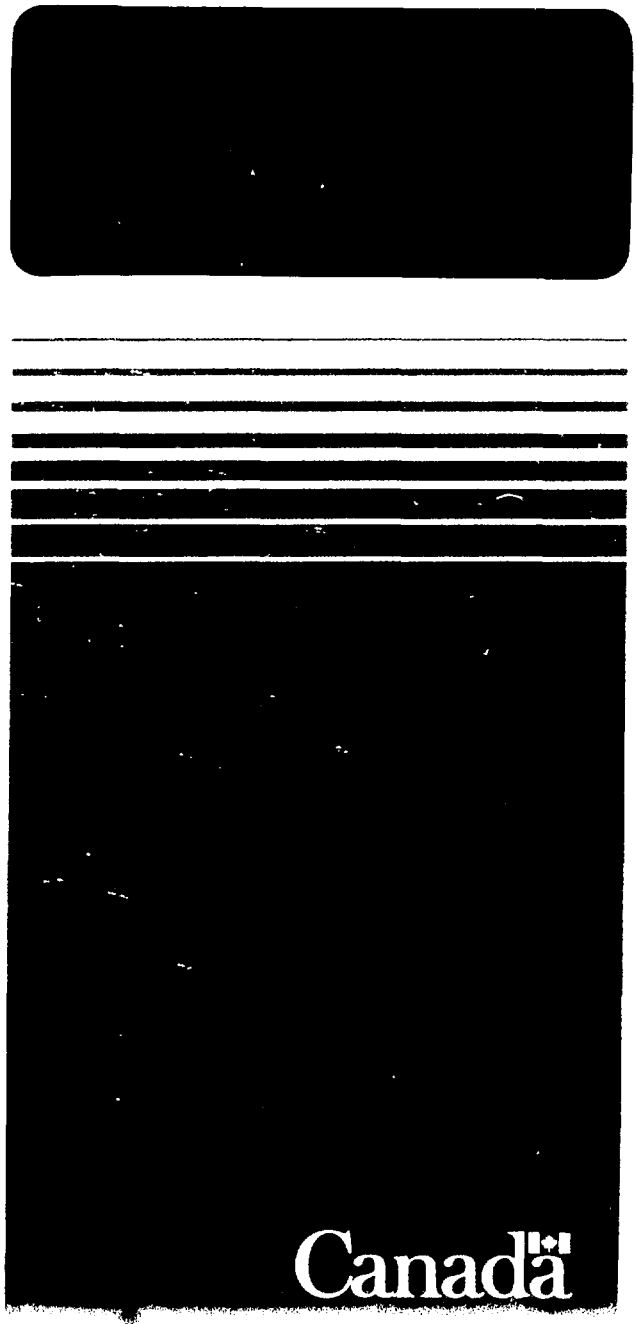
Report Rapport

Atomic Energy Control Board
Commission de contrôle de l'énergie atomique



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INFO-0368

AECB STAFF REVIEW OF BRUCE NGS 'B' OPERATION FOR THE YEAR 1989

June 1990

Canada

Report

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1. Introduction

The operation of the Bruce Nuclear Generating Station "B" is monitored and licensing requirements are enforced by the Atomic Energy Control Board (AECB) Bruce Nuclear Generating Station project staff, in co-operation with AECB staff in Ottawa. The staff observes operation of the reactors, conducts audits, witnesses important activities, reviews station documentation and reports, and issues approvals, where appropriate, in accordance with licence conditions.

As required by a condition of its Operating Licence, Ontario Hydro, each year, submits Technical Reports which summarize aspects of the operation of Bruce NGS"B" during the year. When these reports have been reviewed by AECB staff, a formal Annual Review Meeting is held with the station management to discuss safety-related aspects of the station operation, and to inform Ontario Hydro of AECB staff conclusions with respect to the performance of Ontario Hydro in operating the station during the year.

Objective measures of station performance have been tabulated and may be found as Appendix B. For further detail, the Quarterly Technical Reports, produced by Ontario Hydro, should also be consulted.

The purpose of this report is to record the conclusions of the AECB staff assessment of the operation of Bruce NGS"B" during 1989.

2. Station Operation

Units 5 and 7 have a maximum continuous rating of 915 MWe. Modifications were completed on Unit 6 during 1989 to uprate it from 890 MWe to 915 MWe but until testing is complete, it is still rated at 890 MWe. Unit 8 is still rated at 890 MWe (it will be uprated in 1990).

The overall station capacity factor for 1989 was 88.4%. The lifetime capacity factor for the station at the end of 1989 was 85.0%. Unit 6 had the lowest capacity factor in 1989 due to a maintenance outage to repair a boiler tube leak and a planned maintenance outage in the fall.

The following outages occurred during the year:

Unit 5

89-07-26 to 89-07-31 (7.5 days)	- Forced outage due to boiler chemistry action levels being exceeded when acid was inadvertently carried over into the condensate make-up system from the water treatment plant

Unit 6

89-02-17 to 89-05-05 (15.9 days)	- Maintenance outage to repair a boiler tube leak
89-10-04 to 89-11-24 (50.3 days)	- Turbine/Generator inspection outage

Unit 7

89-07-25 to 89-07-31 (5.3 days) - Forced outage due to boiler chemistry problems (see unit 5)

Unit 8

89-07-25 89-07-29 (3.5 days) - Forced outage due to boiler chemistry problems (see unit 5)

3. AECB Staff Review Of Operational Safety Aspects

3.1 Station Compliance

The operation of the station must comply with various regulations, the principal of these for nuclear stations being the Atomic Energy Control Regulations and the Physical Security Regulations. The Atomic Energy Control Regulations state that the operation of the station must be in accordance with the Operating Licence, to which the AECB can attach such conditions as deemed necessary. Some licence conditions stipulate further documents which must be adhered to in the operation of the station. Examples of these can be found in the first licence condition which states that the operation of the nuclear facility shall be governed by and be in accordance with the document entitled "Operating Policies and Principles" (OP&P's) and the document entitled "Radiation Protection Regulations Part 1".

Following is a brief description of those events which occurred during 1989 which AECB staff consider to be in non-compliance with the Atomic Energy Control Regulations, the Physical Security Regulations or one of the licence conditions. The sub-headings refer to the significant event number assigned by Ontario Hydro to the events.

3.1.1 Compliance With The Atomic Energy Control Regulations

AECB staff considers that Ontario Hydro's Bruce NGS"B" station and staff complied with the relevant regulations during 1989.

3.1.2 Compliance With The Physical Security Regulations

Security Events B89-01 and B89-05

There were two cases of unauthorized entry into the protected area of the station (see section 3.14).

Section 13(1) of the Physical Security Regulations states that no person shall enter a protected area unless he has an authorization in writing from the licensee who operates the protected area.

In the opinion of AECB staff Ontario Hydro responded appropriately to these events.

3.1.3 Compliance With The Licence

Event B89-10

On 89-03-15, AECB staff was informed by Ontario Hydro that large discrepancies existed between the computer code which is used to monitor reactor fuel powers (SORO) and the instrumented power readings on Unit 6. AECB staff was not informed of the problem for about nine days. Further, because initially the discrepancies were thought to be transient in nature, Ontario Hydro did not conservatively adjust neutron overpower trip setpoints until just prior to informing the AECB of the problem.

Condition A.A.19 iii) of the Operating Licence states that reports shall be made promptly to the Board of a hazard different in nature or greater in probability or magnitude than previously represented to the Board to be associated with the operation of the nuclear facility.

Condition A.A.19 vii) of the Operating Licence states that reports shall be made promptly to the Board of any failure of Shutdown System No. 1, Shutdown System No. 2, the containment system or the emergency core cooling system which did or could prevent the system from performing in accordance with the Safety Report and the documents listed in the application.

The discrepancy between the computer program (SORO) results and the instrument readings turned out to be due to the improper installation of six out of the twenty-four cobalt adjusters, which are reactor control devices. Follow-up checks on the other units revealed that units 5 and 7 also had mis-positioned adjusters. Analysis showed that reactor protection was not compromised during the time that Ontario Hydro did not act on the SORO/channel reading discrepancies, however, Ontario Hydro's initial response to this problem was very poor.

It is AECB staff opinion that the reason Ontario Hydro responded slowly was due to a lack of procedures/guidelines on how to interpret and respond to errors between SORO and instruments. AECB staff advised Ontario Hydro of this view and commented on the number of repeated errors on this system. Since then, Bruce NGS"B" staff has written procedures for the fuel and physics section and these will be incorporated into a Ontario Hydro Nuclear Generation Division formal procedure.

3.1.4 Compliance With The Operating Policies and Principles (Condition A.A.1 Of The Operating Licence)

Event B89-02

On 89-01-13 a Shift Supervisor In Training (SSIT) allowed work to continue on a valve even though the work was causing a small breach of containment. The breach lasted a total of about five minutes. Afterwards, the Shift Supervisor (SS) and the SSIT determined that the work need not have caused a breach of containment if some other valves had been closed prior to the repair work.

Section 21.1 of the OP&P's states that the Negative Pressure Containment System shall be operated and maintained to maximize availability. For maintenance work it cross-references section 3.1 which states that the SS shall be aware of maintenance activities as necessary to ensure that the ability to control reactor power, cool the fuel, or contain radioactivity under all conditions is not impaired by the maintenance.

In the above case the breach of containment was small but it is the opinion of AECB staff that the SSIT showed poor judgment in allowing work to continue which was causing the breach. The SS is responsible for the actions of the SSIT.

Events B89-08 and B89-31

There were two other breaches of containment during 1989 caused by human errors in the operation of an airlock. These happened once on 89-02-27 and once on 89-07-22.

Event B89-04

On 89-01-17 moderator calandria outlet temperature exceeded the limit specified in OP&P for about 40 seconds.

Section 32.3 of the OP&P's state that to ensure an effective ultimate heat sink for reactor fuel under certain accident conditions, the moderator system shall be operated such that the design degree of moderator subcooling margin is maintained.

It is AECB staff opinion that Ontario Hydro needs better control of moderator temperature or should use a lower control setpoint so that the moderator temperature limit is not exceeded.

Event B89-20

On 89-05-26 unit 6 steam generator chemistry conditions went above the limits, which are stated in the operating manual as requiring a unit shutdown within four hours. The unit was not shutdown until six hours had passed.

Section 2.4 of the OP&P's state that appropriate chemistry control shall be maintained to minimize conditions such as reduction of heat transfer coefficients, corrosion of components, radiolytic decomposition, activation product formation, and unplanned changes in reactivity.

AECB staff is of the opinion that Ontario Hydro cannot claim proper chemistry control if action limits are not strictly followed.

Event B89-56

On 89-11-13 the SS authorized a temporary change to Shutdown System One without first obtaining Station Manager approval.

Section 1.6 A (b) ii) of the OP&P's state that prior approval of the Station Manager shall be required for temporary changes to the special safety systems and the reactor regulating system. Approval shall be

required on a case-by-case basis unless the temporary change is addressed in procedures which have been approved by the Station Manager and concurred with by the AECB.

The purpose of the temporary change was to repair a single shutoff rod which was impaired. The temporary change did not decrease the redundancy of shutoff rods further, nor did it increase the level of impairment. The SS made an error when he did not obtain Station Manager approval for the temporary change.

It is AECB staff opinion that Ontario Hydro responded appropriately to this event.

3.2 Quarterly Reports

Quarterly technical reports for 1989 have been submitted by Ontario Hydro in a timely manner. These reports have been reviewed by AECB staff and were the main source of data for the table of Objective Measures in Appendix B.

AECB staff concludes that the Bruce NGS"B" 1989 quarterly reports comprehensively and accurately record the 1989 station performance.

3.3 Radiation Protection

No station personnel received doses in excess of regulatory limits during 1989, although there was one case of an unplanned tritium uptake. A chemical technician was attempting to change a moderator system sample septum when, due to passing isolation, he was wetted by moderator D_2O. He received a dose of 1.92 mSv.

There were three cases of administrative problems with dosimetry. In one case it was reported that dosimetry badges previously exposed for a test were then issued for regular dosimetry. Thus, after the badges were turned in after use, it appeared that the persons who used the badges were exposed. In another case some personnel had to be restricted from radioactive work when up-to-date radiation exposure records were not readily available. In the last case dosimetry badge cases were issued empty (i.e. without the radiation absorbing medium on the inside).

Although, as indicated in Section 1 of Appendix B, radiation protection standards at the station have been acceptable, a concern is the apparent complacency of station personnel. Bioassay samples have not been submitted with the required frequency in some cases and the extra precaution of wearing direct-reading-dosimeters while in areas zoned as being more likely to have significant radiation fields has not always been observed. In terms of housekeeping, rubber stations (the area where people put on and take off protective clothing prior to entering or leaving a contaminated area) have been left set up longer than required and equipment used has been left in these areas.

During 1989, station management decided to improve station performance in this area. AECB staff has seen the initiation of programs which demonstrate a new resolve to improve radiation protection practices.

Examples include commitments to reduce the number of contaminated areas in the station, including the reactor vaults. A survey of the unit 6 vault was performed during a 1989 outage with the intent of obtaining information useful for planning decontamination of unit 8 vault during a 1990 outage. There has been a commitment made for radiation protection refresher training for all station personnel. Rules about the regular submission of bioassy samples are now being strictly enforced. Finally, new whole body monitors were tested during 1989 and a decision was made to purchase 21 of the selected model. These will arrive in 1990.

AECB staff is of the opinion that Ontario Hydro is responding appropriately in an area that needed attention. In early 1990 improvements had already been observed.

3.4 Station Effluents and Environmental Monitoring

Airborne and waterborne emissions from the station were all well below one percent of the derived emission limits during 1989. The Ontario Hydro Assessment of Environmental Radiological Data for 1989 concludes that the dose to the critical group due to the operation of the Bruce reactors was 0.2% of the legal limit.

AECB staff review of the availability of the Bruce NGS"B" stack compliance monitors found that it was unsatisfactory during 1989. The Operating Manual states that the maximum acceptable unavailability is seven hours per month. During 1989 there were four months during which this was exceeded. AECB project staff requested increased attention to these monitors.

In 1989 station management made some positive decisions which should decrease the amount of active waste leaving the station. These include the decision to filter liquid waste originating from the fuel handling areas and from resin handling, and the purchase of a waste bag monitor to help segregate active from inactive waste.

In the opinion of AECB staff, the above decisions were prudent and Ontario Hydro should continue to seek further ways of reducing radioactive waste to the environment.

3.5 Process Systems

See section 3.1 concerning the mis-positioned cobalt adjusters.

Steam generators contributed to a number of problems at Bruce NGS"B" in 1989.

Problems with loose plugs on boiler level control valves on two occasions caused level control upsets, leading to reactor trips when a valve plug became detached from the valve stem.

In February, unit 6 had to be shut down to repair a steam generator tube leak. During the shutdown a piece of what appears to be welding rod was found lying on the steam generator tubesheet. The welding rod is suspected to have caused the leak. Attempts to remove this rod failed.

During the unit 6 fall outage, periodic inspection of the boiler tubes revealed that many of them are fretting against the support bar near the top of the tube bundle which positions and spaces the tubes. Ontario Hydro has committed a large inspection program in order to provide assurance that the risk of a multiple boiler tube rupture remains acceptably low. If the inspections reveal increasing numbers of tubes fretted, Ontario Hydro may have to inspect the tubes in all the reactor units boilers and plug or replace the ones that are damaged. It is the opinion of AECB staff that the boiler tube fretting problem should be treated as a significant safety issue.

During the February unit 6 outage an observant maintainer noticed that a reactor fuelling machine bridge ballscrew had been scored. Ontario Hydro responded well to this, replacing the screw before returning the unit to service.

Ten fuel channels were inspected in unit 6 between November 2 and 10 of 1989. The channels were inspected for flaws, garter spring locations, sag and ovality. The results of the inspection showed some minor garter spring movement and several reportable indications, four of which required AECB dispositioning as their signals exceeded that from the standard reference notch.

3.6 Performance of Special Safety Systems

Because Ontario Hydro was slow to respond to the discovered discrepancy between a reactor behaviour simulation and instrument readings, the potential for inadequate neutron overpower protection existed for several days. An unavailability of 7.3 days duration was assigned to shutdown systems one and two on unit 6. These systems did not, therefore, meet their unavailability targets of 1×10^{-3} years/year for 1989 on unit 6. The other special safety systems met the unavailability target.

The emergency filtered air discharge system (EFADs) was declared in service on 89-01-03. The EFADs is part of the containment system.

It is the opinion of AECB staff that, aside from Ontario Hydro's poor response to the SORO/instrument discrepancies, which resulted in unit 6 shutdown system one not meeting its unavailability target, performance of the special safety systems was satisfactory during 1989.

3.7 Significant Events

There were a total of 64 significant events in 1989, seven less than in 1988. Sixteen of these (compared with twenty in 1988) were reportable under the Operating Licence. A list of the reportable events is provided in Appendix A.

Significant events most often highlight poor performance rather than good performance and as such they can be viewed as a good vehicle for identifying problems which may exist. Viewed as a whole, trends in performance may be revealed that otherwise may go unnoticed. In past annual reports AECB staff has commented on seemingly high numbers of

events related to such topics as work protection errors or failure to follow procedures. From its review of the 1989 SER's AECB staff believes that a fundamental problem exists with respect to the operating practices used in the management of system transients or upsets on a reactor unit. The response of shift supervisors and unit operators to events of this type has sometimes been contrary to the interests of safety. It appears that due to the absence of a clear station management safety policy on unit operation during recovery from upsets there exists a conflict of priorities between safety and production.

Evidence of this fundamental problem is seen in significant event reports which describe actions taken by the operators to overcome transients that were not fully understood, or deviating from procedures in an attempt to keep the unit at power. An example of extending an action time limit from four hours to six hours before shutting down (in this case on boiler chloride chemistry) has been discussed in a previous section. Other examples are:

1. On 89-08-15, the action of pulling a fuse on a single channel in shutdown system one, for a then unknown reason, caused 16 shutoff rods to drop into the core. Instead of completing the reactor trip, the operator asked for the fuse to be replaced. When the rods began to withdraw the operator then had to act quickly to avoid the possibility of taking the reactor critical on shutoff rod withdrawal. There followed a complicated secondary side transient that required the combined skills of two operators working in tandem to recover the unit. Even at the time of writing of the significant event report, no explanation could be given as to why pulling the fuse caused the 16 rods to drop and certainly, during the recovery there could not have been time for the operators to have been sure that the problem was fully identified and resolved before reactor power was raised.

2. On 89-03-18 the unit 7 turbine failed an overspeed protection trip test. In the event of such a failure, the safety system test emphatically calls for an immediate shutdown of the unit. In this case the turbine was unloaded, but not until approximately one and a half hours had passed.

3. Problems with tripping or forced power reductions due to secondary side control have been more frequent. Examples from 1989 include the transient discussed in 1. above and the previously discussed problems with boiler level control valve plugs. In addition there were power reductions due to another boiler level transient and a deaerator level transient. Secondary side control is complicated and rarely can a transient be immediately explained. Yet, in all these examples the operators strove to recover from the transient and raise the reactor power as quickly as possible.

Station Management must take appropriate action to clarify its safety policy and ensure that operators understand that they are required to operate the units in a conservative manner at all times. It must be clearly understood that return to high power operation following an upset must not be attempted until the cause of the upset is fully understood and it is proven safe to do so.

3 8 Quality Assurance

There was one AECB audit at Bruce NGS"B" during 1989. The auditors found improvements had been made in two previously audited topics: Fuel Handling operating change control, and Work Authorization. There were still a number of problems associated with operating memo control. A Quality Observation Directive was raised because of several non-compliances in the area of safety and relief valve testing. This topic is undergoing a generic review because of similar concerns at the other operating nuclear power plants. Finally, the auditors concluded that although maintenance activities have been given increased attention at Bruce NGS"B", there is still a large backlog of outstanding work to be done. This often impacts on preventative maintenance activities such as callups, which in turn can aggravate the breakdown maintenance situation.

3.9 Station Maintenance

AECB staff has in the past criticized maintenance standards at Bruce NGS"B". The main concern was that Ontario Hydro did not have the resources to properly maintain the Bruce NGS"B" station. This resulted in a poor record in preventative maintenance completion rate and an ever increasing number of deficiencies. Last year it was reported that the situation should be improving with the creation of the maintenance support group and the hiring of more staff. Although there still exists a large backlog of work, AECB staff has seen signs of progress in 1989. Increased manpower is being devoted to preventative maintenance. The number of hours spent on preventative maintenance during an outage is now typically double that of deficiency repair work. Maintenance staff has increased although there is still a significant percentage of staff at the "learner" level.

Reviews are being conducted of call-ups and deficiency reports. These reviews are finding shortcomings that have been in existence in the past (for example the number of call-ups was insufficient, the tracking of completed call-ups is still deficient, deficiency reports are duplicated and their rectification is often unnecessarily delayed).

The tracking of maintenance activities at Bruce NGS"B" needs improvement. AECB staff expects to see improvement in this area when a computerized work management system comes on-line.

3.10 Chemistry Control

Chemistry control at Bruce NGS"B" for 1989 was generally satisfactory. On average, the reactors were within the chemistry specifications about 90% of the time.

A Fuel Channel Sampling System was installed in unit 6. The system measures the oxygen and deuterium concentration in the coolant from two fuel channels. This will enable closer determination of the chemical conditions in those channels.

As discussed earlier, there was a steam generator chemistry event which required the shutdown of unit 6. There was also an acid excursion event

in July that required the shutdown of three of the four reactors.

3.11 Station Management

AECB staff was pleased to see several management initiatives taken in the area of quality improvement at Bruce NGS"B" during 1989.

In April, the "Performance Objectives and Criteria for Bruce B Nuclear Generating Station" was published. This document provides objectives to be achieved to attain excellent operation of the station. It is also used for in-house audits.

A "Managed Environment Analysis" (MEA) was conducted at the station over a 13-week period of June to September by seven full-time and appropriately qualified Ontario Hydro employees, including union and human resources representatives. A report from the MEA was published in October. It identified a number of problem areas which are being addressed.

A Peer Evaluation, conducted by Ontario Hydro in the fall, also identified problems, some of which are related to management and supervisory activities. In response to this and the MEA, late in 1989 the station manager established a Quality Improvement Program which is managed by a senior level steering committee but is implemented by small working-level groups that are established to solve particular problems or effect particular improvements within their sphere of influence. It is a logical, determined, and well communicated program.

In general AECB staff was satisfied with the manner in which Bruce NGS"B" was managed in 1989. The management is to be commended for initiatives and commitments made in the area of quality improvement. AECB staff impression is that fulfillment of the programs initiated by the station manager will raise the standards of operation of Bruce NGS"B".

As identified in section 3.7(3) station management must provide more training to the operators with respect to safety limits and promote a more conservative attitude about how the units should be run.

3.12 Training

Bruce NGS"B" staff who wrote AECB examinations in 1988 achieved passes at a rate of 82 %. and failures at a rate of 18 %. AECB staff consider that Ontario Hydro staff are passing AECB examinations at an acceptable rate.

3.13 Emergency Exercises and Drills

A summary of drills and exercises performed at Bruce NGS"B during 1989 follows:

42 Off Site Survey Team Practices/Meetings
10 Radiation Emergency Drills
13 Conventional Safety Emergency Drills

In February 1989, Ontario Hydro performed a site-wide fire drill. AECB staff was not satisfied that the drill was an adequate test to demonstrate that Ontario Hydro has the capabilities on site to fight a large fire combined with radiation hazards. AECB staff expressed that opinion to Ontario Hydro and a more appropriate drill is planned for late 1990.

A new revision of the Radiation Emergency Procedures was issued and put into use during 1989.

3.14 Security

There were three security events during 1989.

On 89-01-31 a cable pulling assembly was dropped through the ceiling of the Control Maintenance office, narrowly missing the Shift Maintenance Supervisor. Ontario Hydro Security and the Ontario Provincial Police investigated. As a result of the investigation, an employee had his employment terminated.

On 89-05-18 a summer student let a friend through the security gates by unlocking the gates with her security pass.On 89-11-10 a Bruce NGS"B" employee's wife drove past the raised main Bruce NGS"B" security gates and proceeded to the north exit doors.In the opinion of AECB staff, the above two events were properly dealt with by Ontario Hydro.

AECB staff witnessed a Bruce NGS"B" security drill on 89-11-01 and was generally satisfied with the station performance.

3.15 AECB Staff Inspections

AECB staff visual inspection of equipment in the station found no significant, unaccounted deficiencies during 1989. However, standards of housekeeping were frequently observed to be less than satisfactory.

3.16 Measures of Station Performance

Measures of station performance are tabled in Appendix B. Many of these indicators (including those which are rated as "needing action") have been discussed as parts of other sections. In general the list of measures of station performance show that Bruce NGS"B" was operated satisfactorily during 1989.

4. Significant Licensing Matters and Activities

4.1 Equipment Calibration For Compliance With The OP&P's

At the request of the AECB, Ontario Hydro performed a review of equipment calibration for instrumentation that plays a part in operating the reactors within the limits defined by the OP&P's. The review was completed in 1989. It revealed that calibration coverage was not complete. Ontario Hydro is taking corrective action.

4.2 Station Organization

Ontario Hydro and the AECB remained in disagreement over the Quality Assurance staff organization at the station. AECB staff expect this issue to be resolved soon.

4.3 Safety Report Updates

Although Ontario Hydro has updated the Safety Report sections which describe the station in a timely manner, there have been continual delays with the updates to the accident analysis section of the Safety Report. However this is beyond the control of station staff and is being discussed with Ontario Hydro head office staff.

5. Conclusions

In general, Bruce NGS"B" was judged to have been operated within acceptable safety standards during 1989. Quality improvement initiatives started in 1989 give reason to believe that the quality of station maintenance and operation will rise in the coming years.

AECB staff believes that Ontario Hydro still needs to improve the administration of operating memos, deficiency reports and call-ups. This should improve with the implementation of the computerized work management system.

Station Management must ensure that Shift Supervisors and reactor first operators operate the station in a conservative manner at all times and put safety interests first when responding to a unit upset.

Appendix A

Reportable Significant Events

Event No.	Event Title
B89-01	Level 1 Impairment of Emergency Coolant Injection
B89-02	Breaches of Containment - Unit 0
B89-04	Moderator Temperature Excursion
B89-08	Breach of Containment
B89-10	SORO Errors After Unit Restart
B89-15	Incorrect Positioning of Cobalt Adjusters
B89-16	Incorrect Positioning of Cobalt Adjusters
B89-23	Bomb Threat
B89-27	Mis-positioned Adjuster Rod
B89-31	Unannunciated Breach of Containment
B89-34	Possible Level II Impairment of ECI
B89-46	Moderator D_2O Spill and Unplanned Tritium Uptake
B89-48	Bypassing of Double Isolation on Moderator Overpoisoned Condition Guarantee #1
B89-49	TLD Badges Issued Without TLD Plaques
B89-56	Shift Supervisor Fails to Get Station Manager Approval to Jumper SDS1
B89-60	Level II Impairment of Negative Pressure Containment

APPENDIX B

OBJECTIVE MEASURES OF STATION PERFORMANCE

		LAST YEAR'S VALUE	ACCEPTABLE	NEEDS ACTION
1.	**Radiation Control**			
1.1	**Occupational Safety**			
1.1.1	Total Whole Body Dose 1.65 Sv	1.58	[X]	[ ]
1.1.2	Total Extremity Dose 1.28 Sv	2.73	[X]	[ ]
1.1.3	Total F/H Extremity Dose .437 Sv	.683	[X]	[ ]
1.1.4	Total Neutron Dose 2.75 mSv	1.2	[X]	[ ]
1.1.5	Number of Exposures > Regulatory Limits 0	0	[X]	[ ]
1.1.6	Number of Unusual Radiation Occurrences 21	12	[X]	[ ]
1.2	**Public Safety**			
1.2.1	**Releases from the Station**			
	a) **Airborne**			
	Tritium No of weeks >1% DEL 0	0	[X]	[ ]
	Average % DEL for year .12 %	.079	[X]	[ ]
	Noble Gas No of weeks >1% DEL 0	0	[X]	[ ]
	Average % DEL for year .024 %	.038	[X]	[ ]
	Iodine 131 No of weeks >1% DEL 0	0	[X]	[ ]
	Average % DEL for year .003%	.0016	[X]	[ ]
	Particulates No of weeks >1% DEL 0	0	[X]	[ ]
	Average % DEL for year .002%	.0032	[X]	[ ]

1.2.1 Continued	LAST YEAR'S VALUE	ACCEPTABLE	NEEDS ACTION
b) Waterborne			
Tritium No of months >1% DEL 0 Average % DEL for year .063 %	0 .051	X X	
Gross β No of months >1% DEL 0 Average % DEL for year .030 %	0 .029	X X	
c) Total Heavy Water Loss 19 988 kg (if excessive, should be reflected in higher tritium releases)	19 366	X	
1.2.2 Environmental Measurements			
Average Boundary dose rate 37 nGy/hr (Acceptable if within range of provincial reference sites value and not a significant increase from previous years)	55	X	
Average Boundary Tritium in Air .052 %MPCa (> .1% MPCa would indicate a marked increase and would require investigation)	.044	X	
Average Tritium Concentration in Precipitation 484 Bq/L (average of all measurement sites)	440	X	
Average Gross β in Precipitation 30 $MBq.km^{-2}.months^{-1}$	28	X	
Average Tritium in Milk 32 Bq/l	18	X	

1.2.2 Continued

		LAST YEAR'S VALUE	ACCEPTABLE	NEEDS ACTION
Average C14 in Milk	236 Bq/g	240	[X]	[ ]
Average I131 in Milk	118 Bq/l	141	[X]	[ ]
Average Tritium in drinking water	37.5 kBq/l	26	[X]	[ ]
Average gross ß in drinking water	118 Bq/l	85	[X]	[ ]
Local water and fish samples			[X]	[ ]

Specific items for comment:

No comment

Terrestrial Samples [X] [ ]

Specific items for comment:

No comment

2. Plant Control

		LAST YEAR'S VALUE	ACCEPTABLE	NEEDS ACTION
2.1	Number of Genuine Reactor Trips/Unit 1.75	2	[X]	[ ]
2.2	Number of Serious Process Failures/Unit 0	0	[X]	[ ]

2.3 Special Safety System Unavailability (10^{-3} Years/Year)

	This Year				Last Year					
	U5	U6	U7	U8	U5	U6	U7	U8		
SDS1	0	20	0	0	0	0	6.6	0	[ ]	[X]
SDS2	0	20	0	0	0	0	0.6	0.6	[ ]	[X]
Containment	.09	.09	.09	.09	0	0	0	0	[X]	[ ]
ECI	.01	.01	.01	.01	<0.1	<0.1	<0.1	0	[X]	[ ]

2.4	Number of Reportable Incidents/Unit	4	5	[X]	[ ]
2.5	Number of fires	6	2	[X]	[ ]
2.6	Number of Significant Human errors reported	11	16	[X]	[ ]
2.7	Plant Capacity Factor	68.4%	79.4%	[ ] N/A	[ ]
2.8	% AECB complaince inspections 'unsatisfactory' *	N/A		[ ]	[ ]

* Due to lack of resources, insufficient complaince inspections were completed during 1989 to make a valid comment.

			LAST YEAR'S VALUE	ACCEPTABLE	NEEDS ACTION
3. Plant Maintenance					
3.1 Number of Unplanned Outages/Unit	2.25		N/A	[X]	[ ]
3.2 Number of Call-ups Outstanding at end year	2710		N/A	[ ]	[X]
3.3 Average of Monthly DRs Outstanding/Unit	1049		1200	[ ]	[X]
4. Plant Administration					
4.1 Documentation					
4.1.1 Total No. of Operating Memos force/unit on 31 December	65	262 total	o5	[ ]	[X]
4.1.2 Number of memos in Effect Beyond Procedural Limit	26/unit		30/unit	[ ]	[X]
4.1.3 No. of systems (USI) with >1 Op. Memo Extant	~7/unit		10/unit	[ ]	[X]
4.1.4 No of Operating Memos behind schedule for review	20/unit		7/unit	[ ]	[X]
4.1.5 Total Number of Jumpers	1043		975	[ ]	[X]
4.1.6 Number of Expired Jumper Review Dates	~50		15	[ ]	[X]
4.2 Training					
4.2.1 % Scheduled drills completed	100%		100%	[X]	[ ]
4.2.2 % Candidates passing AECB exams	82%		90%	[X]	[ ]

		LAST YEAR'S VALUE	ACCEPTABLE	NEEDS ACTION
4.3 Security				
4.3.1 Number of reportable security events	3	0	☒	☐

4.4 Quality Assurance

Results of AECB Audits

1) **Date** Oct. 16 - 19, 1989	1 Directive	- Safety Relief Valve Testing	☒	☐
	1 Action Notice	- Maintenance Program	☐	☐
2) **Date** _____	2 Recommendations	- Operating Memos	☐	☐
		- Significant Events		
3) **Date** _____			☐	☐