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Produced and edited by
Iberia News Ltd. © Iberia
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Tuesday, February 6, 2001

The Full Progress Report On Hms Tireless Repairs

Dear Chief Minister

This report is adjunct to the 6th Progress Report of 22 January, 2001.

1 Progress of *Torbay/Tireless* Welds

Welding on *Torbay* is moving from two-thirds to complete fill stages, for which the NDE should be completed by 3 February.

Commencement of the root-fill weld on *Tireless* has been delayed from about 24 January through to 30 January. This delay was incurred, first, because of difficulties in maintaining the required relative humidity, arising because of the higher ambient conditions in Gibraltar and that the reactor plant on *Tireless* is somewhat warmer than its counterpart *Torbay*, which did not experience any difficulty at the root-fill weld preparation stage. Second, the humidity delay meant that, once started, the root-fill welding would have run over the scheduled start time for chemical treatment of the reactor coolant. So the chemical treatment operation was brought forward (about 2 days for this operation) before the root-fill welding commenced.

Root-fill is presently underway (1 February) and its NDE is now expected to be completed by late evening of 1 February. The one-third fill weld will commence in the morning of 2 February and carry through to completion of its NDE by the evening of 4 February (Sunday), thereafter the weld will continue through to two-thirds fill and full fill stages subject to the respective non destructive examination (NDE) and Primary Weld Acceptance Group (PWAG) approvals. To enable the weld to progress over the weekend of 3-4 February, a member of the Panel will be forwarded the weld certificates and notified of any changes as the welding to *Tireless* progresses.

2 Conditional Issues from the 6th Progress Report

The Panel has had further discussions and correspondence with CNNRP and is now able to report on the issues that remained unresolved at the time of the 6th Progress Report. Referring to items a) to d) of the 6th Progress Report, these have been addressed as follows:-

a) Residual Stress in Welds

The panel has received separate papers from CNNRP and the Design Authority, Rolls Royce Naval Marine (RRNM), and an extract provided from the AEA (Technology) Submarine Reliability Department's (SRD) review of the Design Authority's Safety Justification case (acting in its role as independent assessor).

The Panel's specialist consultant, Mr Murgatroyd, has further examined and reported upon the weld residual stress situation and the Panel itself has tabled a guidance paper to CNNRP on this issue.

CNNRP have now set an additional requirement that the residual stress in a *Workshop Standard* swept branch connector (SBC) weld be measured using state of the art techniques.

The Panel is satisfied that the issue of residual stress in the weld has been properly addressed, that residual stress levels will be practically confirmed, and that a sufficient understanding of the weld stressing has been demonstrated for the first use of the SBC in this application.

b) Coplanarity of the Swept Branch Connector

The Panel raised a number of concerns relating to uncertainties that might arise if the SBC was misaligned in its fit to the main coolant and surge line pipes. CNNRP have now given sufficient assurance that, providing the SBC coplanarity remains within the specified spatial tolerancing for each of the three directions of possible misalignment, there will not arise any detrimental aspect that would significantly affect the capacity of the repair to withstand hydro testing and in-service loads.

c) Validation of the Underside Weld Surface Finishing

The surface finish achieved for the underside of the weld has now been approved by PWAG from the trials undertaken on the *Workshop Standard*. Also, CNNRP now propose to complete the weld on *Torbay* without further delay to full fill and that this will include underside surface finishing.

The Panel notes that no aspect of the *Tireless* weld repair will be unique now that *Torbay* is to remain the lead boat through all stages of welding, NDE and surface finishing.

d) NDE Records of Torbay and Tireless Welds

The Panel has received copies of the first batches of the weld acceptance certificates up to one-third fill for *Torbay* and is awaiting certificates for the root-fill of *Tireless* when that weld has completed to that stage.

As the welds progress on both *Torbay* and *Tireless* the Panel will receive endorsed certificates at each stage of the weld and its NDE. The extent of the Panel's access to the radiographs and to the endorsement by PWAG is nearing resolution, with the Panel confident that it will be permitted to view this information during its proposed visit to *Tireless* of 19 February, which is well ahead of the hydro test *Hold Point C*.

e) Maximum Credible Size of Weld Defect

In addition to these previously identified issues, the Panel has raised with CNNRP a further requirement that the maximum defect (crack) sizes assumed in the RRNM crack growth assessment should be substantiated in terms of either their ability to be detected by NDE, or that they are the maximum credible defects that could be produced by the weld/manufacturing process. This provides further confirmation of item 3) of the 1st page of the Panel's 6th Progress Report, which the Panel considers to be fundamental to the reliability of performance of the repair during the hydro test and when in-service for the shorter term appropriate to the Gibraltar case.

Accordingly, the Panel is awaiting confirmation from CNNRP that this additional requirement will have to be satisfied before the primary circuit proceeds to and beyond the hydro test *Hold Point C*.

3 Progress of the CNNRP Regulatory Process

The regulatory process feeding through to final assessment and agreement by CNNRP to the repair process comprises the stages of review shown by **Figure 1** attached.

Referring to **Figure 1**, the decision to replace the pintle connection with the SBC was the responsibility of the Design Authority (RRNM). Since the introduction of the SBC is novel and would not restore the original configuration of the plant, RRNM was required to substantiate this change with a **Safety Justification (S1)**

Safety Justification (SJ).

The Panel has examined the final Safety Justification documentation, reporting on this in the 6th Progress Report.

The process review also includes three other assessments of the SJ. The first two of these, SRD and SWP have reported that the SJ is adequately supported for 2 years of plant in-service operation, and the third, the RPSC, endorses the SWP findings.

The Panel considers that the 2 year in-service operation adequately covers all of *shorter term* plant powered-up operations associated with reactor start-up, commissioning and sailing away from Gibraltar.

The Panel has received a copy of CNNRP's overall review of the assessment of the SJ. The Panel is satisfied that the regulatory review processes put in place by CNNRP are appropriate and that the three assessments by SRD, SWP and RPSC have endorsed the SJ, particularly, in terms of the following key issues:-

- the original defect mechanism is now sufficiently understood to ensure that, so far as is practicable, the installation of the SBC will not be susceptible to this cause in the shorter term
- the design approach to and the strength of the SBC and its welds to the primary circuit pipework, including the residual stresses in the weld, are satisfactory for the hydro test and plant in-service loads
- the maximum credible crack size assured by the NDE will provide sufficient safeguard that crack propagation will not be an issue for the hydro test and plant in-service operation in the shorter term

4 Conclusions

With the further assurances to be provided by the additional requirements for residual stress measurement and further substantiation of NDE crack detection (see **Section 2**), the Panel is satisfied that the Safety Justification for the design and fitting of the swept branch connector is now sufficiently developed to cover the hydro test and plant in-service loads for the shorter term (2 years).

The Panel's recommendations are that:

i) Safety Justification Documentation

The Government of Gibraltar notes that, other than to review and report upon any future modifications to the

upon any future modifications to the Safety Justification, the Panel considers the SJ case to be complete as it applies to the hydro test and short term in-service operation of the nuclear plant applicable to start up, commissioning and sail-away from Gibraltar. However, the Panel will reassess the nuclear safety of the overall repair scheme, which will include consideration of the quality of the finished weld, etc., and advise the Government of Gibraltar on this before the planned hydro test, that is prior to the repair scheme proceeding beyond the hydro test at Hold Point C.

ii) Weld Progressing up to Completion

Since the Panel is now satisfied that the outstanding issues cited in the 6th Progress Report have been resolved and that it will have adequate access to the records of each stage of weld completion, it will not be necessary to interject Hold Points at the completion of the root, one-third, two-third and full fill stages of the welding activity.

iii) Present and Further Delays to the Repair Activity

The Government of Gibraltar notes that the delays encountered in starting the root weld, about 5 days in total if the coolant treatment is excluded, should not have a significant impact on the overall repair programme and put back the sail-away date, although the margin for further delays is narrowing.

The Panel expects to issue a further Progress Report shortly following its visit to Gibraltar, which is tentatively scheduled for 19 February, 2001

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