DIV 1 PAR 41/06

HEALTH AND SAFETY EXECUTIVE
NUCLEAR INSTALLATIONS INSPECTORATE

PROJECT : **MODIFICATION TO THE GRAPHITE SLEEVE MANUFACTURING ROUTE.**

SITE : **GENERIC.**

TITLE : **THE SAFETY CASE FOR THE USE OF FUEL ELEMENTS AND STRINGER COMPONENTS HAVING SLEEVES AND RETAINING RINGS MADE FROM GRAPHITE PRODUCED WITH BILBAINA BINDER PITCH.**

Station	Licence Instrument No	Licence No	Licence Condition
Hartlepool	510	59	22 (1)
Heysham 1	517	60	22 (1)
Torness	503	Sc14	22 (1)
Hinkley Point B	509	62A	22 (1)
Hunterston B	506	Sc13	22 (1)
Dungeness B	509	61	22 (1)
Heysham 2	Not Yet Requested	60	Unknown

AUTHOR [redacted] SIGNED DATE
Author

ACCEPTED [redacted] SIGNED DATE
Superintending Inspector (Unit 1A)

Distribution

[redacted]

File NUC 455/70/22 P11 E39
File NUC 454/70/22 P15 E33
File NUC 458/70/22 P3 E12
File NUC 452/70/22 P5 E14
File NUC 453/70/22 P5 E39
File NUC 451/70/22 P6 E9
File NUC 133/13/4 P1 E41

Health & Safety Executive
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SUMMARY

British Energy Generation Ltd has been forced to change the binder pitch used in the manufacture of fuel element sleeves and other graphite components. The alternative binder pitch is produced by Bilbaina de Alquitranes in Bilbao, Spain. For convenience the graphite produced using it is henceforward simply referred to as Bilbaina graphite. No other changes are proposed to the manufacturing route.

The modification has been presented as a Category 1 submission. NII assessment of the proposal concluded that BEGL had provided an adequate justification for the change.

The licensee has applied for agreement from the Health & Safety Executive to:

- the proposal to receive, handle, load and discharge fuel element and stringer component sleeves and retaining rings made from graphite containing binder pitch produced by Bilbaina de Alquitranes in Bilbao, Spain, at Hartlepool, Heysham 1, Torness, Hinkley Point B and Hunterston B Power Stations, and

- to implement NP/SC 7428 Rev 000 at Dungeness B Power Station.

The agreement is a "routine" Licence Instrument and does not require HSE solicitor agreement.

It is concluded that there is no technical or regulatory impediment to the use of the modified graphite at these stations. It is recommended that The SI of Unit 1A, or a suitable deputy, should accept this PAR, and that the Licence Instruments should be signed to provide NII's agreement to the use of Bilbaina graphite.

Heysham 2 has not yet applied for agreement and will be dealt with separately at a later date.

1. INTRODUCTION

1. British Energy Generation Ltd (BEGL) has been forced to change the binder pitch used in the manufacture of fuel element sleeves and other graphite stringer components. The alternative binder pitch is produced by Bilbaina de Alquitranes in Bilbao, Spain. The pitch, and for convenience the graphite produced using it, are henceforward simply referred to as Bilbaina graphite.

2. The modification has been presented by BEGL as a Category 1 submission [1]. No other changes are proposed to the manufacturing route, and all of the current AGR feedstock specifications and existing limits are retained. The proposal has been assessed by NII [2].

3. BEGL intends to load Bilbaina graphite into every AGR within the next few months. A separate Licence Instrument will be required by each station, and to date six stations have requested agreement:

Station	EC Nos	Request
Hartlepool	EC319793	Ref 3
Heysham 1	EC319969	Ref 4
Torness	EC 319099	Ref 5
Hinkley Point B	EC 319951	Ref 6
Hunterston B	EC319706	Ref 7
Dungeness B	EC 319699	Ref 8
Heysham 2	EC 319972	Not yet received

4. This PAR considers the requests that have been made and notes that the outstanding application from Heysham 2 will be dealt with separately at a later date.

2. BACKGROUND

5. Graphite sleeves are the main structural components of the AGR fuel stringer and are required to:

- Support and locate the element cage and fuel pins.
- Support the overlying stringer components and the lower plug unit.
- Provide a thermal and pressure barrier between re-entrant and fuel channel gas flow.
- Maintain envelope and interface geometries.
- Absorb energy during a dropped fuel incident.

6. The sleeves are made from graphite feedstock whose principal ingredients are coke, binder pitch and impregnation pitch. The manufacturing plant that supplied the pitches was closed at short notice, thereby necessitating the qualification of alternative products. BEGL has worked with the graphite manufacturer (Southern Graphite Ltd (SGL), Germany), to select

an appropriate replacement binder pitch that satisfied all of the specified requirements.

3. BASIS FOR DECISION

7. The basis of the licensee's proposals is that the change to the graphite-manufacturing route is well controlled, well understood and has little impact on the as manufactured properties. As a result BEGL claims that the properties of Bilbaina graphite will be at least as good as those of current graphite, so that the safety cases addressing the key nuclear safety issues are not adversely affected.

8. The NII assessment noted that:

- This will be the fifth change of binder pitch since 1983. There is no evidence to suggest that any of the previous changes had any effect on the unirradiated or irradiated graphite properties.

- The results of physical, mechanical and chemical tests on a trial batch of Bilbaina graphite have shown that all specification requirements were met, and that the unirradiated properties were within the range of variability demonstrated by the current material.

- The irradiated properties of Bilbaina graphite are also likely to be as good as current graphite, based on understanding of graphite behavior and previous PIE evidence.

- There is no data on the radiolytic oxidation rate of Bilbaina graphite. Whilst there are no reasons to believe that the change of binder pitch will have a significant effect, data on previous graphite types is ambiguous, and might imply a worst-case increase of 50%. The BEGL claim that this would not seriously erode the margins within the existing safety cases is judged to be acceptable.

- Information on the radiolytic oxidation of Bilbaina graphite will be obtained by PIE of an early discharge stringer (or an equivalent MTR irradiation). This will provide information before any increase in the oxidation rate can significantly increase the nuclear safety risk.

- The BEGL view that use of Bilbaina graphite and the monitoring programme that has been developed is consistent with the ALARP principle is judged to be acceptable.

4. REGULATORY CONSIDERATIONS

9. The licensee has justified the use of Bilbaina graphite in all AGRs, under the case presented in NP/SC 7428 [1]. The Nuclear Safety Committee (NSC) considered the proposal at their meeting on 24 January 2006 [9], and subject to the completion of INSA the NSC:

- NOTED the proposed use of Bilbaina binder pitch in the manufacture of AGR feedstock for fuel element and stringer component graphite sleeves and retaining rings.

- ENDORSED the unrestricted loading of fuel elements and stringer components made from Bilbaina pitch graphite (subject to existing Operating Rule/Technical Specification limits).

- NOTED that no change to the Operating Rule/Technical Specifications are proposed.

- NOTED the proposed strategy for confirmatory Post Irradiation Examination.

10. The INSA for NP/SC 7428 was completed in accordance with BEGL's arrangements and the INSA certificate was issued on 9 February 2006 [10]; this recommended approval subject to SRD agreeing a programme of Post Irradiation Examination within 6 months of loading the first Bilbaina graphite into an AGR. This work is in progress.

11. The licensee intends to seek agreement under LC22 (1) to utilize Bilbaina graphite in all AGRs, under the case presented in NP/SC 7428 [1] via separate applications for each station.

12. The BEGL process for implementing the modification has been appropriately completed. NII considers the case to be adequate, but notes the INSA requirement for SRD to agree a PIE programme within 6 months of first loading Bilbaina graphite into the first AGR. This commitment will be monitored in normal regulatory business.

4. CONCLUSIONS

13. BEGL has provided an adequate justification for the use of fuel elements and stringer components containing graphite components produced from Bilbaina graphite. There is therefore no technical impediment to the use of Bilbaina graphite.

14. The licensee has applied for agreement from the Health & Safety Executive to:

- the proposal to receive, handle, load and discharge fuel element and stringer component sleeves and retaining rings made from graphite containing binder pitch produced by Bilbaina de Alquitranes in Bilbao, Spain, at Hartlepool, Heysham 1, Torness, Hinkley Point B and Hunterston B Power Stations, and

- to implement NP/SC 7428 Rev 000 at Dungeness B Power Station.

15. The licensee has complied with the necessary regulatory requirements. The agreement is a "routine" Licence Instrument and does not require HSE solicitor agreement.

16. There is no technical or regulatory impediment to the use of Bilbaina graphite at these Reactors.

5. RECOMMENDATIONS

17. The SI of Unit 1A, or a suitable deputy, should accept this PAR

18. The Licence Instruments at:

NUC 455/70/22 P11 E38 (Hartlepool)
NUC 454/70/22 P15 E32 (Heysham 1)
NUC 458/70/22 P3 E11 (Torness)
NUC 452/70/22 P5 E13 (Hinkley Point B)
NUC 453/70/22 P5 E40 (Hunterston B)
NUC 451/70/22 P6 E8 (Dungeness B

should be signed to provide NII's agreement to the use of Bilbaina graphite.

REFERENCES

1. Generic AGR. The Safety Case for the Use of Fuel Elements and Stringer Components having Sleeves and Retaining Rings made from Graphite Produced with Bilbaina Binder Pitch. NP/SC 7428 Rev 000 Proposal Version 4. Jan 2006. NUC 450/2 P8 E17.

2. NSD Assessment Report. The Safety Case for the Use of Fuel Elements and Stringer Components having Sleeves and Retaining Rings made from Graphite Produced with Bilbaina Pitch. February 2006. Assessment Report File NUC 133/13/4 P1 E26.

3. Hartlepool Power Station. BEGL Letter SC/DW/HRA 50662. NUC 455/70/22 P11 E35. February 2006.

4. Heysham 1 Power Station. BEGL Letter 197/HYA/50470/CRW/CAI. NUC 454/70/22 P15 E17. February 2006.

5. Torness Power Station. BEGL Letter TOR/12942R. NUC 458/70/22 P3 E10. February 2006.

6. Hinkley Point B Power Station. BEGL Letter HPB 50668R. NUC 452/70/22 P5 E7. February 2006.

7. Hunterston B Power Station. BEGL Letter HNB12643R. NUC 453/70/22 P5 E37. February 2006.

8. Dungeness B Power Station. BEGL Letter DNB/50556/R. NUC 451/70/22 P6 E7. March 2006.

9. Nuclear Safety Minutes. Meeting January 2004. NUC 450/2 P8 E20.

10. Final Statement of Independent Nuclear Safety Assessment. The safety case for the Use of Fuel Elements and Stringer Components having Sleeves and Retaining Rings made from Graphite Produced with Bilbaina Pitch. February 2006. NUC 450/2 P8 E19.