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Hinkley Point B – Reactor 3 2016 Outage – Extension to Operating Period

Nuclear Site Licence No. 62C – Licence Condition 30(2) Extension of Hinkley Point B Operating Period

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EXECUTIVE SUMMARY

Title

EDF Energy Nuclear Generation Ltd – Hinkley Point B Power Station - Licence Instrument LI 549 - Agreement to an extension of the operating period of Reactor 3.

Permission Requested

EDF Energy Nuclear Generation Limited (NGL), the operator (known as the licensee) of Hinkley Point B power station, has requested an agreement from the Office for Nuclear Regulation (ONR) to extend the operating period of Reactor 3, delaying the start of the periodic outage from 6 December 2015 up to 26 February 2016. NGL has identified a target date of 22 January 2016 to commence Reactor 3 shutdown, but has added a contingency of 35 days against any unforeseen circumstances.

This Agreement is required by Licence Condition 30(2) of its nuclear site licence.

Background

The periodic shutdown (also known as a statutory outage) of nuclear reactors operated by NGL is a requirement of Licence Condition 30. At Hinkley Point B, statutory outages are undertaken at three-year intervals in accordance with the approved maintenance schedule preface. One purpose of these shutdowns is to inspect and maintain systems, structures and components, particularly when these activities cannot be carried out when the reactor is at power.

ONR consent for Reactor 3 start-up following its last periodic shutdown was given on 6 December 2012 (Licence Instrument 542). NGL has submitted a request for ONR agreement to an extension of the operating period of Reactor 3 from 6 December 2015 up to 26 February 2016. The licensee has presented a safety submission that provides the nuclear safety justification for the extension on the basis of a number of claims:

- The operational history of Reactor 3 is satisfactory.
- The inspection reports at the last periodic shutdown in 2012 are satisfactory.
- The constraints imposed by the safety case do not affect the deferment of the periodic shutdown.
- The proposed changes to the inspection period are consistent with maintaining an overall risk that is ALARP (as low as reasonably practicable).

The licensee's request includes examples of the nuclear safety benefits of deferring the outage.

Assessment and inspection work carried out by ONR in consideration of this request

ONR specialist inspectors in electrical systems, control and instrumentation, structural integrity, civil engineering, graphite, mechanical engineering, radioactive waste management and conventional safety assessed the safety justification provided by the licensee. Views were also sought from the ONR nominated site inspector. There were no issues that would prevent agreement by the ONR to the requested extension of the Reactor 3 operating period. No inspector objected to an extension of the operating period.

The Environment Agency was consulted and did not object to ONR issuing a Licence Instrument giving agreement to the requested operating period extension. Civil Nuclear Security was also consulted and had no security concerns regarding the proposed extension.

Matters arising from ONR's work

No matters preventing issue of this Licence Instrument arose from the assessment of the Licensee's safety justification by ONR inspectors.

Conclusions

ONR's assessment of the licensee's safety justification, together with the work of the ONR nominated site inspector, provides confidence that it is safe to operate Hinkley Point B Reactor 3 up to 26 February 2016.

Recommendation

This Project Assessment Report recommends that the ONR Superintending Inspector:

- Signs this Project Assessment Report to confirm acceptance for the technical and regulatory arguments that justify issuing of Hinkley Point B Licence Instrument 549.
- Signs Hinkley Point B Licence Instrument 549, an Agreement under Licence Condition 30(2) to extend the operating period of Reactor 3 from 6 December 2015 up to 26 February 2016.
- Signs this Project Assessment Report approving its release for publication, after redaction where appropriate.

LIST OF ABBREVIATIONS

AGR	Advanced Gas-cooled Reactor
ALARP	As low as reasonably practicable
HPB	Hinkley Point B Power Station
C&I	Control and Instrumentation
CNS	Civil Nuclear Security (ONR)
DMG	Delivery Management Group
EC	Engineering Change
HOW2	(Office for Nuclear Regulation) Business Management System
HSE	Health and Safety Executive
INSA	Independent Nuclear Safety Assessment
KRC	Keyway Root Crack
LC	Licence Condition
LI	Licence Instrument
LOLER	Lifting Operations and Lifting Equipment Regulations 1998
MS	Maintenance Schedule
NGL	EdF Energy Nuclear Generation Limited
ONR	Office for Nuclear Regulation
PSSR	Pressure System Safety Regulations 2000
SACR	Super Articulated Control Rod
SQEP	Suitably Qualified and Experienced Person

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1 PERMISSION REQUESTED

1. EdF Energy Nuclear Generation Limited (NGL), the operator and Licensee of Hinkley Point B nuclear power station, has written to the Office for Nuclear Regulation (ONR) requesting an Agreement for an extension of the Reactor 3 operating period up to 26th February 2016. NGL has identified a target date of 22nd January 2016 to commence Reactor 3 shutdown, but has added a contingency of 35 days against any unforeseen circumstances.
2. This Project Assessment Report considers this request and recommends issuing Licence Instrument (LI) 549 under Licence Condition (LC) 30(2) giving Agreement for an extension of the operating period.

2 BACKGROUND

3. The nuclear site licence requires the Licensee to periodically shutdown plant under Licence Condition (LC) 30 to enable examination, inspection, maintenance and testing to take place in accordance with the requirements of its plant maintenance schedule under LC28. At Hinkley Point B, reactor periodic shutdowns are undertaken triennially, as specified in the Maintenance Schedule Preface, which is an approved document under LC28 (5). Without an ONR Agreement to an extension, Reactor 3 would have to be shut down on or before the third anniversary of the last ONR statutory outage start-up Consent date. As the previous re-start Consent (LI 542 Ref 1) was dated 6th December 2012, Reactor 3 would need to be shut down on or before 6th December 2015.
4. On 7th July 2015, NGL wrote to ONR (HPB 51338R, Ref 2) requesting an Agreement to extend the Hinkley Point B Reactor 3 operating period up to 26th February 2016, an extension of 82 days from 6th December 2015. Attached to the letter was a safety justification supporting the continued operation of Reactor 3 during the deferred period. This Engineering Change (EC) proposal, EC353881, was a Category 2 modification.
5. EC353881 underwent independent nuclear safety assessment (INSA) and the approval statement was provided as an attachment to the request letter. No caveats were raised during this assessment.
6. NGL's company strategy for Advanced Gas-cooled Reactor (AGR) periodic shutdown management has led to shutdowns across the fleet converging to the autumn/winter seasons. The company asserts that commencing the Reactor 3 shutdown on 6th December 2015 would coincide with poor availability of key staff and resources during the Christmas to New Year period. NGL has identified a target date of 22nd January 2016 to commence Reactor 3 shutdown, but has added a contingency of 35 days against any unforeseen circumstances. The EC proposal therefore justifies deferring the shutdown up to 26th February 2016.

3 ASSESSMENT AND INSPECTION WORK CARRIED OUT BY ONR IN CONSIDERATION OF THIS REQUEST

7. I have considered NGL's request for ONR Agreement to the extension of the Hinkley Point B Reactor 3 operating period. I have:
 - Followed ONR procedures for delivering a permissioning project, as detailed in HOW2 (Ref 3).
 - Utilised the services of ONR specialist inspectors, whom the Delivery Management Group (DMG) Leads identified and which they considered covered the disciplines necessary to make an informed, proportionate judgement.

- Determined the views of the ONR nominated site inspector.
 - Discussed the proposal with station staff and reviewed supporting information (Ref 4).
8. Requests for extensions to reactor operating periods are not novel and similar requests have been submitted to ONR for Agreement in the past using similar arguments.
9. ONR has undertaken a high level review of NGL's proposal as detailed within Reference 2 to identify any significant change to the assessed nuclear safety risk. The review identified that the following areas should be subject to a limited assessment:
- Electrical systems.
 - Control and Instrumentation (C&I).
 - Structural integrity.
 - Civil engineering.
 - Graphite.
 - Mechanical Engineering.
 - Radioactive waste management.
 - Conventional safety.
 - Site inspection.
10. The decision to proceed using a scoping ONR assessment was agreed within CNRP on the basis that it had been used in the past for similar requests and was in line with guidance provided in HOW2 (the ONR Business Management System).
11. In addition to the nuclear safety assessments identified, I sought the opinion from ONR's Civil Nuclear Security site inspector to ascertain whether there were any aspects of the extension to the Reactor 3 operating period that may have an impact on ONR's decision. The CNS site inspector confirmed that there were no issues from a security perspective that would impact on the decision to agree to the extension of the operating period of Reactor 3 (Ref 5).
12. I have also taken note of the findings of NGL's internal regulator's assessment of the safety case made in the INSA approval statement (Ref 2). The INA Engineer considered the justification for extending the period of operation for each technical area and did not identify any issues that could prevent operation up to the proposed shutdown up to 26th February 2016. This statement within the approval was consistent with the dates stated within the EC as well as the letter requesting the agreement to ONR. No caveats were raised and no commitments requiring INA review were identified.
13. The primary safety claims within the EC were:
- The operational history of Reactor 3 is satisfactory.
 - The inspection reports at the last periodic shutdown in 2012 are satisfactory.
 - The constraints imposed by the safety case do not affect the deferment of the periodic shutdown.
 - The proposed changes to the inspection period are consistent with maintaining an overall risk that is ALARP (as low as reasonably practicable).

14. A summary of the findings from each of the technical specialists identified by the DMG Leads during the limited assessment of the EC is provided below.

3.1 ELECTRICAL ASSESSMENT

15. The ONR electrical systems inspector reviewed the electrical engineering aspects of the EC presented by NGL (Ref 6) and the arguments made by NGL that the deferral of the statutory outage would not significantly affect the reliability or functionality of nuclear safety systems and that the overall approach remained ALARP.
16. The electrical inspector assessed and reviewed the proposal and considered that no cliff-edge effects were likely to be revealed through the proposed deferment and that no other electrical system improvements at the station were adversely affected by the proposal.
17. Through the assessment of the EC, together with assessment of a sample of reference documents to the proposal, he considered that the licensee had provided adequate evidence to support the argument that no cliff-edge effects were present. In making the argument, the licensee had appropriately sought technical advice from both the station and its central technical organisation suitably qualified and experienced persons, and considered relevant operational experience from other AGR sites. In addition, he was satisfied that no other electrical system improvements at the station were adversely affected by the proposal.
18. In conclusion, for the electrical engineering aspects he was satisfied with the claims, arguments and evidence laid down within the Licensee's safety case. As a result, he recommended, in respect of the electrical engineering assessment that ONR agrees to the proposed deferral of the statutory outage of Hinkley Point B Reactor 3.

3.2 CONTROL AND INSTRUMENTATION ASSESSMENT

19. The ONR C&I inspector sampled the licensee's submission and the proposed outage intentions document (Ref. 7). He considered that, as far as the C&I safety systems were concerned, most were the subject of non-outage related MS activities. Also, extensions in the period between maintenance had been supported by evidence that indicated the resulting increased uncertainties in C&I systems were tolerable.
20. He noted that the proposed deferral would delay the replacement of degraded neoprene sleeves. However, he was content with the Licensee's commitment to continue to monitor and review the situation. As far as he could identify, delays in other C&I modifications due to the extended operating period could be tolerated.
21. He considered that the Licensee had provided adequate evidence to support the extended operating period from a C&I aspect and was therefore content to support an extension to the operating period.

3.3 STRUCTURAL INTEGRITY ASSESSMENT

22. The ONR structural integrity inspector reviewed the request for deferral of the Hinkley Point B Reactor 3 outage from 6th December 2015 up to 26th February 2016. The components/systems considered in the review included boilers, steam and water pipework, vessels and penetrations (Ref 8).
23. He conducted a high-level review of EC353881 – Reactor 3 Outage 2015 (031) - Extension to the operating period to the next periodic shutdown noting that it also included a full INA approval statement. He noted from the INA statement that a previous safety case change in periodicity from two to three years demonstrated there was no cliff edge at three years. The justification indicated that there had been no

unexpected issues that needed to be resolved during the outage and that the plant had operated in line with expectations since the last periodic shutdown. A review of the maintenance schedule had been completed and no issues had been identified that would challenge the safety case during the extended period of operation. The licensee had identified a number of commitments to be completed within the life of the EC, but these were not related to structural integrity. He judged that the proposal provided a satisfactory case for extension of the operating period based on the sections sampled.

24. From a PSSR point of view, it was noted that at the time of the assessment the competent person on site had not agreed to the extension proposed for the operating period for Reactor 3. This confirmation has now been provided (Ref 9).
25. The specialist reviewed ONR's Structural Integrity Intervention Reports and Start-Up Consent Report from Hinkley Point B Reactor 3 2012 statutory outage to provide details of the results of the previous statutory outage from a structural integrity view point:
 - Ref 10 - This described the on-site intervention inspection activities undertaken by structural integrity specialist inspectors during the 2012 statutory shutdown. It sampled plant which was being inspected, repaired or replaced during the outage, and concentrated on pressurised systems with a significant nuclear safety function with the exception of the boilers. The intervention found no structural integrity problems which, in the opinion of the ONR structural integrity inspectors, would prevent Hinkley Point B Reactor 3 from being allowed to return to service after its statutory shutdown. No issues were identified during this review that would preclude extension of Hinkley Point B Reactor 3 operating period up to 26th February 2016.
 - Ref 11 - This described the on-site intervention inspection activities undertaken by a structural integrity specialist inspector during the 2012 statutory shutdown. A review of boiler inspections conducted on Reactor 3 boiler internals and gas baffle was carried out. The ONR structural integrity inspector indicated that the inspections followed due process and nothing witnessed or discussed threatened the restart of Reactor 3. No issues were identified during this review that would preclude extension of Hinkley point B Reactor 3 operating period up to 26th February 2016.
 - Ref 12 - This judged the extension of the maintenance period for the Reactor 3 north man access penetration from 6 years to 9 years to be adequate. This assessment was reviewed and it was judged that deferral of the inspections at Hinkley Point B Reactor 3 up to 26th February 2016 was unlikely to significantly increase the safety risk. This judgement was based upon the conclusions of the previous assessment that the penetration was tolerant of defects and the regular inspections for the presence of water and Carbon Dioxide.
 - Ref 13 - This summarised all the inspections, including structural integrity, in light of the request to re-start Hinkley Point B Reactor 3 following completion of the 2012 periodic shutdown. The report concluded that ONR was satisfied that the licensee's safety case to start-up and operate for a further period was adequate and recommended granting consent. No other recommendations were made with respect to steels structural integrity. No issues have been identified during this review that would preclude extension of Hinkley Point B Reactor 3 operating period up to 26th February 2016.
26. The structural integrity inspector noted that, due to the extended outage in 2006/2007, nine and twelve year inspections were not affected by extension of the operating period up to 26th February 2016.

27. Finally, it was noted that in EC 353881, the licensee had reviewed the Maintenance Schedule items of specific systems described and furthermore that the EC commitment of reviewing the effect of delaying the planned outage on subsequent outages.
28. In conclusion, from the structural integrity aspect, the specialist was satisfied with the claims, arguments and evidence presented in the submission and he did not have any objections to extension of the operating period.

3.4 CIVIL ENGINEERING ASSESSMENT

29. The ONR civil engineering inspector considered the proposals contained within EC353881, and how they might affect nuclear safety aspects relating to the pre-stressed concrete pressure vessel (PCPV) (Ref 14). He also reviewed the INSA Approval Statement dated July 2015, spoke to the Appointed Examiner and read his 'Specialist Assessment' statement.
30. The civil engineering inspector obtained and reviewed the latest Statutory Examination Report for this reactor (Ref 15 and Ref. A6.4 in the EC) and a report from the Appointed Examiner received on the 6th October regarding the status and condition of the Reactor 3 PCPV (Ref 16). He noted a number of small CO₂ leaks into the PVCW (pressure vessel cooling water system) the more significant of which had been isolated and were planned to be sealed during the forthcoming statutory outage. He believed this to be an appropriate leak management strategy. Since the PCPV tendon load checks were undertaken on-load, this particular surveillance activity had not been affected by the proposed outage deferral.
31. Therefore, the civil engineering inspector did not identify any concerns that could preclude ONR from agreeing to extend the current operating period of Hinkley Point B Reactor 3 up 26th February 2016.

3.5 GRAPHITE ASSESSMENT

32. The ONR graphite inspector considered the two significant ageing mechanisms affecting the graphite core (Ref 17):
 - Weight loss as a result of radiolytic oxidation.
 - Brick cracking as a result of dimensional change.
33. His original assessment was carried out in September 2015 prior to the periodic shutdown of Hunterston Reactor 3 in October 2015. He considered the safety implications for the graphite core of Hinkley Point B power station's request to defer the periodic shutdown of Reactor 3. He found no issues with regard to structural integrity of the graphite core that would prevent him recommending that ONR accepts the request by NGL to defer the periodic shutdown for Hinkley Point B Reactor 3 from 6th December 2015 up to 26th February.
34. During the Hunterston B outage, KRC was identified and as a result of this the assessment findings made in September were reviewed. To this end, confirmation from site was obtained that the final Super Articulated Control Rod (SACR) had been installed in Hinkley Point B Reactor 3 and that the new Nitrogen hold down system was in full operational service.
35. In addition he noted that:

- NGL had previously prepared a contingency safety case (EC356101/356102) to address the discovery of ≤ 2 KRC. The discovery of 3 KRCs at Hunterston B Reactor 3 meant that this contingency safety case could no longer valid.
 - NGL subsequently produced an Interim Justification for Continued Operation (IJCO) for Hinkley point B Reactor 3 and Reactor 4 and Hunterston B Reactor 4 (EC356991, Ref 18).
36. The ONR graphite inspector noted the possibility of exceeding an operational limit based on conservative analysis, but did not consider this to be a significant safety challenge that would prevent the request to defer commencement of the next periodic shutdown of Hinkley Point B Reactor 3 to February 26th 2016.

3.6 MECHANICAL ENGINEERING

37. The ONR mechanical engineering inspector confirmed (Ref 19) that there was no technical objection to the extended operation of Hinkley Point B Reactor 3. Based on his review of EC353881, the proposed extension to the Reactor 3 statutory outage should not significantly impact on mechanical equipment and did not in his judgement significantly impact on nuclear safety. He was satisfied based on the systems reviews discussed within EC353881 that adequate consideration had been given to the impact of the deferment on the planned routine and plant maintenance schedules.
38. He was also satisfied that EC353881 presented appropriate due diligence taken by station in respect to identification of items requiring statutory inspection under PSSR and LOLER. It was noted by the technical specialist that any equipment which exceeds its statutory exam (or as defined by a Written Scheme of Examination) period as a result of the deferment would require formal notification to ONR for an extension. Only one extension may be granted in the life of the equipment in question.

3.7 RADIOLOGICAL WASTE ASSESSMENT

39. The ONR radiological waste inspector confirmed that there was no technical objection to the extended operation of Hinkley Point B Reactor 3 (Ref 20).

3.8 CONVENTIONAL SAFETY

40. The ONR conventional safety inspector raised three points (Ref 21):
- Flow Assisted Corrosion (FAC) of pressure parts is potentially an issue at Hinkley B and was the subject of work in the 2012 outage. The concern was that the proposed extension to the Reactor 3 operating period may potentially challenge remaining component lifetimes. The NGL response indicated that the rate of pipe work thinning was insufficient to cause failure within three years (from the 2012 outage) and that this pipe work will be replaced in the 2016 outage.
 - Statutory examinations are a legal requirement and failure to follow them would potentially be a legal breach of the regulations. The conventional safety inspector sought confirmation that the station has reviewed this and sought confirmation from the appropriate competent person. The NGL response confirmed that this had been done and that three competent persons had been informed of the change. These included the Pre-stressed Concrete Pressure Vessel Appointed Examiner, the NGL penetrations person and the Pressure System Safety Regulation (Bureau Veritas Site inspector). This confirmation has now been provided (Ref 9).

41. The conventional safety inspector was content with the response (Ref 4) and had no further objections to the proposed extension to the Reactor 3 operating period.

3.9 NOMINATED SITE INSPECTOR

42. The nominated site inspector provided the following comments in regard to EC353881 in (Ref 22):
- **Hot Standpipes.** Some reactor standpipes at Hinkley Point B were known to be running at elevated temperatures due to standpipe cracking that had been discovered several years ago. The affected channels were fitted with Anti Thermal Syphon (ATS) seals to limit the temperature rise. One of these channels (3V29) had been running at elevated temperatures for some time and recent calculations indicated that its allotted time at temperature would not meet the proposed date of the statutory outage. Clearly this would be an issue for the station and any proposed extension to the operating period. Until recently these assemblies could only be refuelled off-load, but in response to this challenge, NGL developed a new safety case to allow on load discharge of these assemblies. As a result, the ATS fuel in 3V29 was recently successfully discharged on-load without incident. The replacement fuel was fitted with a new design of ATS and preliminary indications were that the standpipe temperature had returned to normal.
 - **Generator Transformer.** The temperature of the Turbo Alternator 7 (Yellow Phase) associated with Reactor 3 had been monitored by station over the past few months by the Operations Department and via a thermal imaging camera. The temperatures were currently stable and did not represent a challenge to the proposed extension to the Reactor 3 operating period, but the monitoring will continue until the reactor is shut down. Both the Yellow & Blue phases (including the bushing on the yellow phase) will be replaced during the forthcoming outage.
 - **Diverse Hold Down and Shutdown Systems.** He noted that the final Super Articulated Control Rod (SACR) had now been installed in Reactor 3, meaning that the full complement of 24 SACR (12 in each reactor) were now in place. The new Nitrogen hold down system was also in full operational service and he considered that both systems were a significant enhancement to the shutdown systems.
43. Overall, the nominated site inspector was satisfied that these issues were being adequately managed and he had no other concerns that could preclude ONR agreeing to extend the current operating period of Hinkley point B Reactor 3.

3.10 COMMITMENTS MADE WITHIN THE EC

44. I have reviewed the commitments in the EC and have sought confirmation that the Commitments have been addressed (Ref 23) and was advised that all have been completed apart from those which can only be completed once the EC has been approved (ie after the Licence Instrument has been issued by ONR).

3.11 OTHER GOVERNMENT DEPARTMENT LIAISON

45. The views of the nominated Environment Agency Site Inspector were sought over the proposed extension to the operating period of Reactor 3 and he did not have any objections. (Ref 24).

3.12 REGULATORY CONSIDERATIONS

46. I have considered NGL's request for an ONR Agreement for the extension of Hinkley Point B Reactor 3 operating period and note that:
- NGL have requested an extension to the operating period of Hinkley Point B Reactor 3 under the correct licence condition, LC30 (2).
 - NGL's justification to extend operation of Reactor 3 at Hinkley Point B, EC353881 has completed the company's due process for a Category 2 submission in the production, review and authorisation of the statutory outage deferral justification. The safety case received full INSA approval with no caveats being raised.
 - NGL's justification to extend operation of Reactor 3 at Hinkley Point B has been assessed by specialist assessors within ONR who have not identified any matters of nuclear safety significance. No inspector has objected to an extension of the operating period.
 - The Agreement requested by NGL requires the issue by ONR of a non-routine Licence Instrument. The wording for non-routine Licence Instrument LI 549 has been reviewed by the Treasury Solicitor's Office (Ref 25) and the Licence Instrument has been confirmed as acceptable.
 - Hinkley Point B has an Approved Maintenance Schedule (MS) Preface under LC28 (5) which was originally issued as LI5 (now superseded) in 1996 and an Agreement under LC28 (7) to extend maintenance intervals (issued August 2012). This allows NGL to manage the extension of operating period.

4 MATTERS ARISING FROM ONR'S WORK

47. No issues preventing issue of this LI arose from the assessment of the Licensee's safety justification by ONR inspectors, the EA inspector or myself.

5 CONCLUSIONS

48. I judge that NGL has made an adequate justification for an extension of Hinkley Point B Reactor 3 operating period from 6th December 2015 up to 26th February 2016 based on:
- NGL's safety case presented in EC353881 Version 3 having satisfactorily completed company due process.
 - NGL's safety case having INSA approval with no caveats being raised.
 - All commitments in EC353881 Version 3 addressed.
 - Assessment of the deferral safety justification by ONR specialist inspectors.

6 RECOMMENDATIONS

49. I recommend that the Superintending Inspector:
- Signs this Project Assessment Report to confirm acceptance for the technical and regulatory arguments that justify issuing of Hinkley Point B Licence Instrument 549.

- Signs Hinkley Point B Licence Instrument 549, an Agreement under Licence Condition 30(2) to extend the operating period of Reactor 3 from 6th December 2015 up to 26th February 2016.
- Signs this Project Assessment Report approving its release for publication, after redaction where appropriate.

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