

PERMISSION FOR MAJOR EQUIPMENT ERECTION OF KKNPP-3&4

References

1. Application for Erection of Major Equipment (MEE) of KKNPP-3&4 submitted vide No. NPCIL/Engg-LWR/KK-3&4/2020/M/16, dtd, August 21, 2020
2. Updated Application for Erection of Major Equipment of KKNPP-3&4 vide No. NPCIL/Engg-LWR/KK-3&4/2022/M/503, dtd, February 11, 2022
3. Review Report of NPSD, AERB on application for MEE of KKNPP-3&4 vide No. AERB/NPSD/DVP/CN/SR/133212/2022/00298, dtd, April 19, 2022

Consent No.	KKNPP-3&4/CN/MEE/0/26042022
Stage of Consent	MAJOR EQUIPMENT ERECTION (MEE) of KKNPP-3&4
Applicant	Project Director, KKNPP-3&4 (Application – Ref.1, Updated application – Ref.2)
Brief description of Nuclear Power Project	Name: Kudankulam Nuclear Power Plant Units 3&4 Type: 1000 MWe Pressurised Water Reactor (PWR) based Nuclear Power Plant Site: Existing site with KKNPP-1&2 operating and KKNPP-5&6 under construction Location: Kudankulam, Radhapuram Taluk, District: Tirunelveli, Tamil Nadu-627106 Present Status: Construction of Main Plant Buildings and Hydro-Technical Structure of KKNPP-3&4 are in progress. Preparation towards MEE and related activities is in progress.
Basis of issuing the Consent	Adherence to Regulatory requirements as per AERB Codes/Guides, AERB/SC/G (Regulation of Nuclear & radiation facilities), AERB/NPP-LWR/SC/D (Design of Light Water Reactor based Nuclear Power Plants) and necessary submissions as per AERB/NPP&RR/SG/G-1 (Consenting process for Nuclear Power Plants and Research Reactors).

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Safety Review	Safety review towards KKNPP-3&4 MEE consent commenced with NPSD, DRP&E followed by multi-tier safety reviews, viz.: 1 st tier review by the Project Design safety Committee (PDSC-LWR) and 2 nd tier review by the Advisory Committee for Project Safety Review (ACPSR-NPP) in its meeting #9. Salient details of regulatory processes, compliance to regulatory requirements and review carried out towards the grant of Consent are briefly given in Annexure-1.
Responsibility of Safety	The prime responsibility for safety of the facility or activity lies with the Licensee. It is the responsibility of Licensee to comply with safety requirements as specified in Regulations.
Other Statutory requirements	Licensee shall ensure that all other applicable statutory clearances are obtained and valid for present stage of Consent, i.e. Major Equipment Erection of KKNPP-3&4.
AERB Stipulations and Conditions	AERB Stipulations and conditions for MEE to enable effective regulatory control are appended as Annexure-2.

Based on satisfactory review as brought out above, Permission is hereby issued for Erection of Major Equipment of KKNPP-3&4, subject to satisfactory compliance to the Stipulations and Conditions, as brought out in Annexure-2. The Permission will be subject to re-review for any non-compliance to the Stipulations and Conditions.

This Permission is valid till 30th April, 2029. Activities related to erection of major equipment shall be completed within the validity period, else extension shall be sought with justification.

This Permission shall be suspended or cancelled, if any declaration made or information given in the application is found to be false or if any undertaking given in the application is not complied with.

Encl.: Annexures-1 & 2


C.S. VARGHESE
EXECUTIVE DIRECTOR
for (G. Nageswara Rao)

Chairman & Managing Director
Nuclear Power Corporation of India Limited

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Copy to:

AERB

Executive Director

Director, NFRG

Head, NPSD

Head, LWR&FCF-PS, NPSD

Head, S&SES, NPSD

AERB Committees

Chairman & Member Secretary, ACPSR-NPP

Chairman & Member Secretaries, PDSC-LWR

Chairman & Member Secretary, CRSA

NPCIL

Director (T-LWR)

Director (P-LWR)

Director (O)

Regulatory Interface, Engg-LWR

KKNPP-3&4 Site

Site Director

Project Director

Chief Construction Engineer

Safety Review for
Consent for Erection of Major Equipment (MEE) of
Kudankulam Nuclear Power Plant Units 3&4

1.0 INTRODUCTION

Kudankulam Nuclear Power Project Units 3&4 (KKNPP-3&4) is a twin unit 1000 MWe PWR based Nuclear Power plant at Kudankulam (Tamil Nadu) under construction and is similar in design to the 1000 MWe PWR plant KKNPP-1&2 (Operational at the same site), except for certain design differences due to implementation of new fuel TVS-2M, design improvements and changes based on feedback from KKNPP-1&2 and earlier NPPs and site specific changes mainly w.r.t layout and civil engineering aspects. KKNPP Units-5&6, identical in design to KKNPP-3&4, are also under construction at the same site.

Following Regulatory Consents have been issued for KKNPP-3&4 till date:

Regulatory Consents	Date of Issue
SITING STAGE	
Siting Consent for KKNPP-3 to 6	February 09, 2011
CONSTRUCTION STAGE	
Site Excavation Consent for KKNPP-3&4	January 21, 2016
First Pour of Concrete Consent for KKNPP-3&4	June 23, 2017

NPCIL submitted application (Ref.1) seeking Consent for Major Equipment Erection of KKNPP-3&4 on August 21, 2022. The adequacy check of Application along with associated documents as part of admittance for MEE consent was carried out by NPSD vis-à-vis AERB/SG/NPP&RR/G-1. Based on adequacy check, the application was conditionally admitted subject to submission of supporting documents as identified. NPCIL progressively submitted the supporting documents. NPCIL later updated the application and submitted on February 11, 2022 (Ref.2).

The application along with supporting submissions were reviewed as per approved review plan by NPSD and by Project Design Safety Committee (PDSC-LWRs). Review of nuclear security aspects was

carried out by AERB Committee for Review of Security Aspects (CRSA). Thereafter, final review was carried out by Advisory Committee for Project Safety Review of Nuclear Power Plants (ACPSR-NPP).

Compliance to the requirements of regulatory codes/guides as relevant to MEE consenting stage was ensured during the review. The stipulations / recommendations of earlier consents were also followed up for compliance & resolution.

Based on the satisfactory review of Nuclear & Radiological Safety aspects along with accident analyses, Industrial & Fire Safety and Civil Engineering aspects as required for the current stage of KKNPP-3&4, it was concluded that Consent for Erection of Major Equipment of KKNPP-3&4 may be issued, subject to compliance with the review recommendations and the progressive resolution of the Regulatory Hold Points identified for various sub-stages within MEE consent.

2.0 KKNPP-3&4 Compliance to AERB/NPP&RR/SG/G-1 Regulatory Requirements w.r.t. MEE

2.1 Review of Preliminary Safety Analysis Reports (PSARs): PSAR Chapters 1, 2 & 3 were earlier reviewed at the time of Excavation Consent. PSAR Chapters 4, 5, 6, 7, 8, 9, 11, 12 & 17 were also reviewed during FPC consenting stage. PSAR Chapters 10, 13, 14 & 15 which are relevant to MEE consenting stage were reviewed with focus on design changes w.r.t KKNPP-1&2, experience feedbacks from KKNPP-1&2 and compliance to new regulations developed over the course.

2.2 Status of pending issues based on earlier stage reviews: NPCIL submitted response to the stipulations / recommendations upto FPC consent of KKNPP-3&4 which were taken cognizance of during the safety review towards MEE consent.

2.3 Validation of Computer Codes used in Design & Safety Evaluation: For KKNPP-3&4, most of the computer codes used during design evaluation are identical to those used for KKNPP-1&2 and where new codes are used in design evaluation for KKNPP-3&4, NPCIL had informed that they are approved by regulatory body of Russian Federation (RF). Analysis for in-vessel phase & ex-vessel phase of accident progression during DEC-B scenario of Double ended Guillotine Break in RCS along with SBO leading to core melt, was carried out using NPCIL developed in house codes. During verification exercise, result of these analysis were found to match to a great extent with the results mentioned in FSAR S-15 of KKNPP-1&2. Observation related to validation of these in-house codes is covered as specific stipulation in Annexure-2.

2.4 Equipment qualification and its acceptance criteria: Seismic qualification part of mechanical equipment & piping, Electrical & C&I equipment (involved in implementing safety functions of EP &

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ESFAS), covered in PSAR S-3 section 3.9 & 3.10, were reviewed. Details about environmental qualification of all safety related equipment (Mechanical/Electrical & I&C) involved in shutdown, decay heat removal, Confinement of radioactivity & support systems upto DEC-A , covered in PSAR S-3 section 3.11, were reviewed. Safety related equipment (credited upto DEC-A) are qualified to the prevailing environmental conditions. Observation relevant to equipment qualification of all SSCs (Mechanical/Electrical & I&C) under prevailing environmental conditions during DEC-B is covered as specific stipulation in Annexure-2.

- 2.5 **Safety significant observations made during manufacture of safety related structures, equipment and components:** NPCIL submitted report on Basis of Acceptance (BoA) of major equipment such as Reactor Pressure Vessel (RPV), Steam generators, Reactor coolant pump (RCP), main coolant piping and Pressurizer of KKNPP-3&4. Basis of acceptance document was reviewed in NPSD and it was noted that test reports pertaining to material chemical composition, mechanical tests indicate that the achieved values are well within the acceptable limits and no significant non-conformances were reported during manufacturing of above mentioned equipment. Observation relevant to BoA documents of RCP bowls of KKNPP Unit-4 is covered as specific stipulation in Annexure-2.
- 2.6 **Pre and post installation preservation methods for safety related equipment and components:** Adequacy of Storage and preservation of major equipment of KKNPP-3&4 was verified periodically during Regulatory inspections. Note on post Installation Preservation of Major Equipment in KKNPP-3&4 viz., RPV, SGs, RCPs and safety systems pumps & HXs submitted by NPCIL addressing the aspects related to preservation, frequency of inspection, Foreign Material Exclusion (FME) program, preservation checks and re-preservation methods & instructions etc., as per manufacturer preservation manual was reviewed and found acceptable vis-à-vis post-installation requirements. The implementation aspects of preservation of safety related equipment, fire-fighting and ventilation arrangements will be checked and verified during RIs.
- 2.7 **Operating experience feedback:** Necessary experience feedback from KKNPP-1&2 have been obtained and addressed by NPCIL for KKNPP-3&4. No changes in the size of safety and safety related buildings are envisaged in the plant layout, however minor changes are proposed for equipment location and piping layout. To address the congestion issue, internal layout optimization of buildings was carried out. NPCIL further made provisions in KKNPP-3&4 to address the difficulties that arose in KKNPP-1 & 2 while carrying out ISI activities as adequate changes are made in internal layout of Reactor building of KKNPP-3&4 to reduce congestion and to facilitate inspection.



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- 2.8 **Emergency Preparedness Plan (for existing site):** Emergency Preparedness Plan (EPP) Manual covers three parts i.e., (1) Plant emergency (2) Site Emergency and (3) Off-Site emergency. Emergency Preparedness Plan (EPP) manual of KKNPP-1&2 was reviewed by AERB and was issued by NPCIL in June, 2011. Further NPCIL has revised Site EPP manual including the personnel involved in construction activities and specified requirements of KKNPP-3&4 and KKNPP-5&6 along with identification of the assembly and sheltering areas for employees and workers of KKNPP Units 3 to 6. After satisfactory review, the document on Site Emergency Preparedness & Response Manual of KKNPP Site (Vol-II, Rev-1) was approved by SARCOP on September 19, 2018. NPCIL was asked to progressively augment the capacity & locations of EAAs and sheltering areas to commensurate with manpower expected during MEE stage.
- 2.9 **Industrial & Fire Safety:** NPCIL submissions related to I&FS of KKNPP-3&4 were reviewed w.r.t. requirements relevant to MEE consenting stage, including compliances w.r.t safety and regulatory requirements specified in Atomic Energy (Factories) Rules, 1996, relevant AERB Safety Codes/Standards/ Guides and previous recommendations related to I&FS of KKNPP-1 to 4.
- 2.10 **Nuclear Security:** Reviews related to nuclear security aspects associated with the MEE stage of KK-NPP 3&4 submissions were reviewed by Security Cell of AERB and CRSA. CRSA has recommended issuing consent for MEE for KKNPP-3&4.
- 2.11 **Statutory Clearances:** The Ministry of Environment & Forests and Climate Change (MoEF & CC) had issued Environmental Clearance for KKNPP 3&4 on September, 2008 followed by renewal in January, 2014. Currently the MoEF & CC clearance is valid till December, 2026. State pollution board clearance (TNPCB) was last obtained in December, 2014.



AERB STIPULATIONS AND CONDITIONS FOR MAJOR EQUIPMENT ERECTION OF KKNPP-3&4

1.0 General Stipulations

- 1 The Licensee shall not deviate from design as provided in safety analysis reports in any way that might affect safety, without prior approval of AERB.
- 2 Activities under Erection of Major Equipment Consent shall be carried out as per the approved Erection procedures. Deviations, if any, shall be promptly informed to AERB. No changes shall be made to the programs & procedures, which have been approved by AERB, without prior intimation and review of AERB
- 3 Any abnormal occurrence, significant events, industrial accidents or fatalities during the activity shall be promptly reported to AERB.
- 4 The Licensee shall implement the Quality Assurance Program laid down as per requirements of the safety code on "Quality Assurance in Nuclear Power Plants" AERB/NPP/SC/QA (R1) and any other requirements stipulated by the Regulatory Body in this regard from time to time.
- 5 The Licensee shall appoint authorized persons who are qualified to perform the functions under the Consent.
- 6 The Licensee shall comply with Regulatory requirements related to radiation protection and emergency preparedness.
- 7 The Licensee shall adhere to Industrial & Fire Safety requirements including prompt reporting of industrial accidents or fatalities as per the Atomic Energy (Factories) Rules, 1996/AERB notifications and Control of Works. The accident/incident/event occurrences should be promptly reported to AERB as per provisions of Atomic Energy (Factories) Rules, 1996.
- 8 The Licensee shall make no changes to the programs & procedures, which have been approved by AERB, without prior intimation and review of AERB. Significant Event or Change shall be reported as per SECRC (Significant Event/Change Reporting Criteria).
- 9 The Licensee shall progressively augment the capacity & locations of emergency assembly areas to commensurate with manpower expected to be involved during activities associated with MEE and subsequent consenting stages.

10 The Licensee shall adhere to Nuclear Security related stipulations specified by AERB.

11 The Licensee shall ensure availability of all applicable Statutory Clearances and ensure compliance to the Stipulations of the Statutory Clearances.

2.0 Specific Stipulations within MEE consent

S.1. Construction of UKC buildings of KK-3&4 beyond the currently permitted elevation shall progress only after satisfactory review by NPSD, AERB of the revised analysis and design check report of UKC of KKNPP-3&4.

S.2. Reactor Coolant Pump bowls in KKNPP #4 shall be erected only after submission and satisfactory review of their Basis of Acceptance (BoA) documents by NPSD, AERB.

S.3. Details of efficacy of Additional DEC Management system (ADMS) in containment spray mode, equipment qualification of ADMS, details of commissioning tests planned for ADMS, assessment of impact of ADMS system on normal operation of safety systems shall be submitted by NPCIL & satisfactorily reviewed by NPSD, AERB prior to erection of equipment of additional DEC management system.

S.4. Seismic Qualification aspects of Post-Fukushima hook-up system and related piping from Emergency water storage tank to Hook-up points in Reactor Building shall be submitted by NPCIL and satisfactorily reviewed by NPSD, AERB before hot run of KKNPP Unit #3.

S.5. NPCIL shall finalize the approach for conduct Pre-Service Inspection (PSI) & In-Service Inspection (ISI) program of KKNPP-3&4 and submit a note indicating the reference RF standards that would be considered in developing the program along with any changes in scope of inspection, frequency of inspection, acceptance criteria etc. well before commencement of PSI activities of KKNPP-3&4.

S.6. NPCIL shall complete the validation of in-house computer codes used for accident analysis of Design Extension Condition with Core melt (DEC-B) scenario well before IFL of KKNPP Unit # 3.

S.7. Considering open top construction methodology adopted for KKNPP-3&4, NPCIL shall ensure that a proper system is in place for in-situ protection and preservation of the installed safety related equipment against climatic conditions and foreign material drop due to construction activities at the top with enhanced emphasis on foreign material exclusion.
