NATIONAL NUCLEAR REGULATOR

For the protection of persons, property and the environment against nuclear damage

REGULATORY GUIDE

Interim Guidance

INTERIM GUIDANCE ON THE CONDUCT AND RE-REGISTRATION OF NUCLEAR POWER PLANT REACTOR OPERATORS

RG-0023

APPROVAL RECORD				
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1 BACKGROUND

Regulations are mandatory and provide specific requirements to be upheld by the authorisation holder and/or an applicant for a nuclear authorisation. Regulatory Guidance documents are developed to assist authorisation holders and/or an applicant for an authorisation in meeting the regulatory requirements. In this respect general regulatory guidance documents have to be adhered to by the holder and/or the applicant. Any deviation from regulatory guidance has to be justified and agreed with the NNR in accordance with respective regulations.

The suite of National Nuclear Regulator (NNR) regulations include draft Specific Nuclear Safety Regulations: Nuclear Facilities, that are applicable in a graded approach to nuclear facilities being regulated by the NNR.

This document provides guidance on the regulatory requirements as contained in the Specific Nuclear Safety Regulations: Nuclear Facilities, relevant to the conduct and training, qualification and re-registration of nuclear power plant reactor operators.

The NNR strives to ensure that this Regulatory Guidance document is complete and accurate. However, in recognition of the fact that this document is being presented to authorisation holders prior to the promulgation of its associated Regulations, the NNR makes no warranty, express or implied, to the accuracy, completeness, or usefulness of any information, including warranties to the adequacy of its contents. This Regulatory Guidance document is provided as INTERIM guidance in good faith and its aim is to assist authorisation holders to achieve high levels of safety for facilities and activities that are part of the nuclear fuel cycle. The NNR assumes no legal liability or responsibility for any action taken by you due to information in this document and such actions are expressly carried out at your own risk. The information in this document is subject to change due to promulgation of its associated Regulations. Complying with applicable laws remains the responsibility of authorisation holder.

This document will be revised once the regulations in question have been promulgated and circulated to solicit stakeholder comments in accordance with the Regulator's document development process.

2 PURPOSE

This document provides guidance for the implementation of the requirements as set out in the Specific Nuclear Safety Regulations: Nuclear Facilities, on the conduct of and training, qualification and re-registration of reactor operators for nuclear power plants or as required by the respective nuclear authorisations.

3 SCOPE

This guidance document clarifies regulatory requirements by providing how-to information, process and procedural guidance related to the conduct and training, qualification and re-registration of nuclear power plant reactor operators.

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4 TERMS, DEFINITIONS AND ABBREVIATIONS

In this Regulatory Guide (RG) any word or expression to which a meaning has been assigned in the NNR Act or the Regulations promulgated in terms of the NNR Act, should have the meaning so assigned. Only additional terms, definitions and abbreviations are provided.

4.1 Terms and Definitions

"Active Involvement" means involvement of the registered operator in a position for at least the minimum times specified in Section 8.

"**Active Status**" means an operator that has been registered with the Regulator and satisfies the requirements for maintaining such registration.

"Direct Supervision" means a situation in which the registered operator has discussed and understood the intended actions of the trainee and will have positioned himself in such a manner that he may interrupt and correct the trainee's actions which he deems as incorrect or inappropriate.

"**Registered Operator**" means an operator in possession of a Reactor Operator or Senior Reactor Operator registration issued by the Regulator.

"**Systematic Approach to Training (SAT)**" means a systematic five-stage process used to produce, deliver and implement a performance-based training and qualification programme. The five stages are:

1. Systematic analysis of the needs, jobs and tasks;
2. Design of the training programme based on the results of the systematic analysis;
3. Development of the materials for training and assessment;
4. Implementation of training and assessment of the learners; and
5. Evaluation and revision of the training based on the performance of trained personnel in the job settings as well as feedback on the training process.

"Unit SRO" the senior reactor operator assigned to a unit. This person is responsible for the operation of the applicable unit and its auxiliaries and will therefore be in direct control of that unit's operation.

4.2 Abbreviations

IAEA	International Atomic Energy Agency
NNR	National Nuclear Regulator
RG	Regulatory Guide
RO	Reactor Operator
SRO	Senior Reactor Operator

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5 REGULATORY FRAMEWORK

5.1 Legal basis

1) In terms of Section 23 of the Act, the Chief Executive Officer may impose (and amend) conditions of authorisation which are necessary to ensure the protection of persons, property and the environment against nuclear damage.
2) Where deemed necessary, current nuclear installation licenses for the operation of nuclear power plants include conditions on control room reactor operator training and qualification with which control room reactor operator training and qualification must comply.

5.2 Regulatory standards

1) The NNR has promulgated, in terms of section 36 of the Act, regulations on staffing and qualification of nuclear power plants. These are given in Regulation R388 on Safety Standards and Regulatory Practices that should be complied with.
2) The implementation of these requirements is currently further supported by the following document relating to the reactor operators for nuclear power plants:
   a) LD-1081, “Requirements for Operator License Holders at Koeberg Nuclear Power Station”, Rev 3;
3) The regulations are being revised and will be superseded by revised General Nuclear Safety Regulations and Specific Nuclear Safety Regulations: Nuclear Facilities.
4) Section 8(15) of the Specific Nuclear Safety Regulations: Nuclear Facilities, contains requirements on training and qualification of reactor operators for nuclear facilities in general with section 8(15)(o) detailing specific requirements for authorisation holders of nuclear power plants.
5) These requirements will come into effect with the promulgation of the new and revised regulations and should be complied with.
6) This RG-0023 will supersede the regulatory document listed in 2) above.

6 GENERAL CONSIDERATIONS

1) The following positions should be occupied by a Registered Reactor or Senior Reactor Operator:
   a) Shift Manager [Registered Senior Reactor Operator];
   b) Senior Shift Supervisor [Registered Senior Reactor Operator];
   c) Shift Supervisor (Primary) [Registered Reactor Operator]; and
   d) Shift Supervisor (Secondary) [Registered Reactor Operator].
2) The person who performs the Critical Safety Function monitoring, as required by the Functional Restoration Procedures, should be a Registered RO or SRO who does not fill any of the operator positions in the “Minimum Shift Composition” as listed in Section 9.3.

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7 RE-REGISTRATION OF REACTOR OPERATORS

7.1 Re-Registration Concept

1) Following the initial Registration with the NNR (Refer to RG-0015), all Reactor and Senior Reactor Operators should undergo a process of periodic re-registration. The process as depicted in Appendix 1 is based on the following:
   a) Registered Operator meeting the requirements to maintain such registration;
   b) Registered Operator successfully completing the re-registration examination process; and
   c) Registered Operator applies to the NNR for re-registration.

2) Re-registration for all registered operators should be performed every two (2) years on the 1st of August or on a date as agreed with the NNR.

3) In the case of an unsuccessful re-registration application, there is allowance to consider and implement the authorisation holder approved remediation processes.

7.2 Requalification Programme

1) Registered operators should undergo a programme of continuous training accepted by the NNR.

2) The authorisation holder should establish, implement and maintain a requalification programme designed to permit operators to be trained on the knowledge, skills and abilities needed to perform the duties of registered operators, in line with the following objectives:
   a) Ensuring that registered operators maintain, and continuously improve, the high level of knowledge, skills and abilities required to perform their duties; and
   b) Ensuring that registered operators are kept abreast of all changes to plant and procedures, and of any relevant operating experience.

3) The programme should have a regular format designed to permit all registered operators to be trained on the knowledge, skills and abilities needed to perform the duties of a registered operator. The knowledge, skills and abilities should be identified, in part, from learning objectives derived from a systematic analysis of operator duties and from information in the Safety Case, problem notifications and operating procedures. Training in the area of teamwork and management skills should be included.

4) The authorisation holder should ensure that the programme is continually evaluated and updated. Examples of sources of information that should be considered as part of the evaluation process are:
   a) Feedback from plant experience, nationally and internationally;
   b) Reports from plant inspections and evaluations;
   c) Plant modifications and changes in procedures;
   d) Feedback from job supervisors;
   e) Feedback from in-plant experiences of personnel after completing the course;
   f) Feedback from trainees after the training has been completed; and
   g) Feedback from training instructors or the NNR.

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5) The authorisation holder should implement a system for assessing the individual skills and competencies of registered operators, performance of the shift team and have the controls in place to perform an evaluation of training effectiveness.

6) The use of a recognised international standard for the programme preparation and conduct of the assessments is recommended.

7) The use and alignment to any standard is subject to NNR approval.

8) For any new nuclear power plant with significant technological differences, the NNR should be consulted prior to continuation with the programme.

7.3 Re-Registration application

1) An application for re-registration should be presented to the NNR thirty (30) days before the renewal date.

2) In accordance with the information required to be submitted by the Specific Nuclear Safety Regulations: Nuclear Facilities [4], the application should contain the following information of the candidate:

   a) Full name and ID number;

   b) Declaration by the authorisation holder that the candidate meets all the requirements for re-registration application.

3) The above information should be submitted to the NNR in an approved format.

4) When the information has been reviewed, the authorisation holder will be notified in accordance with the requirements in the Specific Nuclear Safety Regulations: Nuclear Facilities [4], on the outcome of the application.

5) If successful, the candidate will receive a re-registration confirmation with original registration number from the NNR. The registration is valid in accordance with the Specific Nuclear Safety Regulations: Nuclear Facilities [4].

6) In order for the registration to stay active the registered operator should comply with the applicable NNR conditions related to:

   a) Maintaining active status;

   b) Fitness for duty;

   c) Medical and psychological status;

   d) Requalification status; and

   e) Security clearance as provided by the holder and/or applicant.

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7.4 Revoking of a Registration

1) The notification of revoking a registration by the NNR will be done 30 days in advance of such deregistration in accordance with the requirements in the Specific Nuclear Safety Regulations: Nuclear Facilities [4].
2) The NNR may revoke an operator's registration if, in its opinion, the individual understood, or should have understood his responsibility or knew or should have known the required actions, and nevertheless knowingly, or with careless disregard, failed to perform the required actions which have actual or potential safety significance.
3) Action should also be taken in cases of individual integrity, such as reporting to work unfit for duty, or knowingly making false statements to the NNR.
4) If a registered operator fails to comply with Section 8 or 9 of this document then his registration may be revoked.
5) If a registered operator contravenes LD-1077 [6], then his registration may be revoked.
6) If the NNR has reasonable doubt that any registered operator has not retained the required level of knowledge, skills or abilities, then the NNR may request that the registered operator retake an assessment, or any part thereof, within 90 days of the request. During this period, the operator's registration status should be considered as revoked.
7) In the event of a registered operator leaving the employ of the authorisation holder, then fourteen (14) days prior to his final day in the employment of the authorisation holder his registration should be considered as revoked.

8 ACTIVE INVOLVEMENT

1) To maintain an active registration status, the operator should perform the function of a registered operator on a minimum of seven (7) 8-hour or five (5) 12-hour shifts per calendar quarter.
2) Work as an Outage Shift Manger, Outage Senior Shift Supervisor or Outage Shift Supervisor, may be credited up to a maximum of two (2) 8-hour shifts per calendar quarter.
3) The authorisation holder should have means to ensure that re-familiarization of personnel interchanging between control rooms meets the requirements prior to responsibility on the new unit being assumed.
4) The operator should attend the minimum required requalification training hours and perform the duties and responsibilities as listed in Section 9.1.
5) For simulator training hours to be credited, the simulator should meet the requirements of LD-1093 [7].
6) If a registered operator has not had any active involvement for a period greater than 45 days, then either section 8.1 or 8.2 below applies.

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8.1 No active involvement for a period of greater than 45 days but less than or equal to 90 days

1) Before the registered operator returns to active duty, the Shift Manager should ensure that the registered operator is aware of, and understands, all procedural changes, incidents, abnormal occurrences, modifications and administrative controls that have been implemented on that unit since the registered operator was last active in that position.
2) The Shift Manger should ensure that the registered operator has a minimum of four (4) hours in the control room prior to taking over shift, to ensure that the registered operator is aware of the above changes.

8.2 No active involvement for a period greater than 90 days

1) Before returning to active duties, the registered operator should demonstrate that he has retained the required knowledge, skills and abilities.
2) The authorisation holder should deal with the requirements for each registered operator to resume active duties on an individual basis.
3) The authorisation holder should implement a process acceptable to the NNR to allow for the registered operator to return to active duties.

9 CONDUCT OF REACTOR OPERATORS

9.1 Duties and Responsibilities

9.1.1 General duties and responsibilities of registered operators

1) The registered operator should operate the reactor units and associated unit auxiliaries in accordance with the Nuclear Installation License.
2) Only a registered operator should manipulate or direct the manipulation of a control that directly affects reactor reactivity or power level. All operating of valves, electrical breakers or switches affecting reactivity, power production or nuclear safety should be performed or be directed by a registered operator.
3) A person who is not a registered operator may only make operational recommendations or supply data to the registered operator in their areas of expertise. However, it is the registered operator who should be responsible for supervising or performing operations in accordance with the requirements of the Nuclear Installation License and applicable procedures. Directives to registered operators from the authorisation holder's management should not be contrary to the requirements of the Nuclear Installation License.
4) A person under training as an RO or SRO should only be allowed to manipulate controls when under the direct supervision of a registered operator during normal operation.
5) Only SRO's should have the authority to direct an RO to perform operations that affect power level, core reactivity or critical safety functions.

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6) The authorisation holder should ensure that there is a route of redress in the event of disagreement between registered operators over activities affecting nuclear safety. The final action should be the responsibility of the Unit SRO.

7) All activities, to which procedures apply, should be accomplished by the registered operator in accordance with such procedures. The choice as to whether procedure steps are memorized, or checked during or after actions, is left to the registered operator performing the actions.

8) If a situation arises which cannot be accomplished by plant procedures, the registered operator should act on his training and judgement to restore the unit to a safe mode identified by plant procedures and the Operating Technical Specifications. However, actions that can be performed in accordance with procedures during such abnormal conditions should be accomplished in accordance with those procedures and portions of the Operating Technical Specifications that can be complied with should still be met.

9) A registered operator should shut down the unit(s) or any equipment if, in his judgement, conditions so warrant. If automatic protective actions do not occur after reactor safety setpoints have been exceeded, then the registered operator should perform actions to mitigate the event by the fastest and safest available means consistent with the situation.

10) Prior to taking over shift, each registered operator should be aware of the status and operability of all the unit's systems, and of scheduled maintenance or testing that will affect system operability on his shift and shall check and verify the status of on-going maintenance or testing, from the previous shift.

11) The registered operator should ensure plant conditions are appropriate for surveillance testing requirements. The registered operator should control maintenance items or testing which affect the operating mode of the unit. The registered operator should understand the nature of all maintenance and testing, effects on system indications, and changes to plant equipment status. If scheduled maintenance items or testing are not proceeding as expected, then the registered operator should investigate and, if necessary should stop the maintenance or testing to have any problems corrected.

12) If special plant conditions are required to be established for maintenance or testing, then the registered operator should ensure that the conditions required are safe and necessary for the task. Work should not commence, or continue, until the registered operator is satisfied with plant conditions.

13) Registered operators should ensure that access to the emergency shutdown panel and work on the emergency shutdown panel should only be undertaken in the presence of a registered operator.

14) The registered operator who is designated for critical safety monitoring should, in the event of a reactor trip, safeguard actuation or, on the instruction of the Unit SRO, immediately report to the unit control room.

15) All registered operators should ensure that the requirements for Control Room Manning in Section 9.2 are complied with.

16) A registered operator should authorize all radioactive effluent discharges immediately prior to release.

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9.1.2 Additional responsibilities and authorities assigned to Reactor Operators

1) A Registered RO in an active position should:
   a) Be responsible, primarily from the control room area, for the operation of a reactor unit and associated auxiliaries.
   b) Continuously monitor all parameters displayed in the control room.
   c) Manipulate the controls for controlling, operating and/or testing equipment during normal operations.
   d) Take necessary action to control the unit's equipment and mitigate the effects of transient, abnormal and incident conditions.
   e) Direct the activities of plant operators and instruct them to perform tasks.
   f) Increase/Decrease electrical output of the unit within the conditions of authorisation.
   g) Be able to operate the public address system and all other communication equipment from the control room.
   h) Be responsible for the safe shutdown of the unit from positions outside the control room in the event that the control room should be evacuated.
   i) Monitor refuelling activities from the control room.

9.1.3 Additional responsibilities and authorities assigned to Senior Reactor Operators

1) The Unit SRO should be responsible for the safe operation of the applicable unit and its auxiliaries and is therefore in direct control of that unit's operation. The Unit SRO should be responsible for the safe and reliable operation of the unit under all conditions and for compliance with all operating requirements of the Nuclear Installation License, Operating Technical Specifications and the requirements of the NNR.

2) The primary responsibility of the Unit SRO should be to direct and co-ordinate the activities of all persons who are present in the operational areas of his unit and to supervise the activities of the control room staff.

3) The Unit SRO should have the authority to act as necessary to:
   a) Protect the welfare and health of employees and the general public.
   b) Protect the plant from damage.

4) The Unit SRO should have the authority to manage, direct and co-ordinate the activities of all persons who are present in the operational areas of his unit.

5) During emergencies the Unit SRO should assume control over all unit activities and direct appropriate and timely action to ensure the safety of the unit's equipment and to maintain safe operating conditions.

6) In the event of a reactor trip or an unexplained power variation, the Unit SRO should analyse the cause in order to decide on the appropriate action to take. The Unit SRO should allow a reactor start-up only if the causes of the trip have been satisfactory investigated, resolved and thoroughly understood by him and that, in his opinion, there is no safety concern.

7) The Unit SRO is responsible for controlling scheduled safety-related maintenance and core loading activities during outages and refuelling operations. (The core loading supervisor should be accountable to the Unit SRO to ensure that all alterations carried out under his direction do not compromise overall nuclear safety.)

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8) An active SRO should approve the implementation of all maintenance activities immediately prior to actual work commencing. If the SRO is not the Unit SRO, the SRO will be under the direct control of the Unit SRO. The Unit SRO should give permission for all work on safety-related equipment and systems that affect plant operation.

9) The Unit SRO should record parameters and a written narrative of events so that it will be possible to construct the occurrences and unit conditions of that shift, in the future.

10) The Unit SRO should, as required, provide technical leadership, ensure that interpersonal communication is effective and ensure that the registered operators respond to plant conditions of the unit as appropriate.

11) The Unit SRO should take protective actions when he deems it necessary to limit radioactive releases and to minimize other consequences of an incident.

12) On taking over shift, each SRO should ensure that he is familiar with the state of both units so that he is able to respond to emergencies arising on either unit.

13) On each shift an SRO, normally the Shift Manager, should:
    a) Ensure that the minimum required on-shift staffing levels are in accordance with Section 9.3.
    b) Ensure the availability of emergency, first aid and firefighting teams during his shift.
    c) Perform the actions specified in the Emergency Plan in the event of a nuclear emergency, until relieved by the appropriate administrator of those actions.
    d) Initiate initial reporting of occurrences as specified in LD-1000 [5] and in accordance with the requirements specified in RD-0025 [8].

14) The Power Station Manager is responsible for overall unit operation and should delegate this responsibility during his absence. During out-of-office hours the Shift Manger deputizes for the Power Station Manager.

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9.2 Control Room Manning

1) Two registered operators should be present at the controls in the control room of each reactor at all times when there is a fuel assembly in the reactor building. When there is no fuel in the reactor building but fuel assemblies present in the fuel building then there should be at least one registered operator in the control room.
2) Under normal circumstances, at least two registered SRO's should be within the confines of the 20m level Security boundaries.
3) In the event that one of the two registered SRO's plan to leave the 20m level the other registered SRO (s) should be informed. The registered SRO remaining in the control rooms may not leave the control rooms until either another registered SRO returns to the 20m level, (within the confines of the Security boundaries), or he is relieved.
4) If one registered SRO is confined to the control rooms then, the minimum shift composition should be two registered RO's in each of the control rooms and one registered SRO between the two control rooms. Preferably, the unit SRO should be in the control room at all times.
5) A registered SRO should be in the Control Room when planned sensitive operations are taking place.
6) If one of the registered operators who is part of the minimum composition wishes to leave the control room, then the registered operator leaving the control room should be replaced by an equivalent, or higher, level of registered operator. The incoming registered operator should ensure that prior to taking over shift that he fulfils the requirements of Section 8.
7) If the Unit SRO wishes to leave the control room then the following should apply:
   a) The Unit SRO may not go into areas where he cannot be contacted by the control room. If the PA system is affected by noise from the plant then an alternative means of contacting should be used.
   b) If a nuclear emergency is declared whilst the Unit SRO is absent from the control room, he should immediately return to the unit control room.
8) If during an incident no one is available to operate equipment outside the control room, then the most junior registered operator should be used rather than the Unit SRO.

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9.3 Minimum Shift Composition

	PERSON IN CHARGE	OPERATOR (PER UNIT)	
		PLANT STATE 3a – 6b	PLANT STATE 1-2b
Registered Senior Reactor Operator	1	1	1
Registered Reactor Operator		2	2
Plant Operator		2	1
Radiation Protection Assistant (Total)		1	1
Radiation Protection Monitors (Total)		1	1
Fire Team Members (Total)		6	6

1) A registered operator, who is not fulfilling any of the positions above, should be available to perform the Critical Safety Function Monitoring.
2) Shift composition may be less than the minimum requirements for a period of time not exceeding two (2) hours in order to accommodate unavoidable absence of on-duty shift members, provided immediate action is taken to restore the shift composition to within the minimum requirements. This provision should not permit any position to be unmanned on shift change due to an ongoing shift member being late or absent.
3) On each shift there should be at least two registered SRO's who are able to act in the position of Shift Emergency Controller.

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10 REFERENCES

The following references were consulted during the compilation of this document:

[1] Act No. 47, 1999, National Nuclear Regulator Act (2015 revised edition)

[2] Regulations in terms of section 36, of the National Nuclear Regulator Act, 1999 (Act No. 47 of 1999), on Safety Standards and Regulatory Practices (GN R388)

[3] General Nuclear Safety Regulations (Section 36 of NNR Act) (2015 revised edition)

[4] Specific Nuclear Safety Regulations: Nuclear Facilities (Section 36 of NNR Act) (2015 revised edition)

[5] LD-1000, Notification Requirements for Occurrences associated with Koeberg Nuclear Power Station (or as amended from time to time)

[6] LD-1077, Requirements for Medical and Psychological Surveillance and Control at Koeberg Nuclear Power Station (or as amended from time to time)

[7] LD-1093: Requirements for the Full Scope Operator Training Simulator at Koeberg Nuclear Power Station (or as amended from time to time)

[8] RD-0025, Emergency communication with the National Nuclear Regulator (or as amended from time to time)

[9] RG-0015, Interim Guidance on the Registration of Nuclear Power Plant Reactor Operators (or as amended from time to time)

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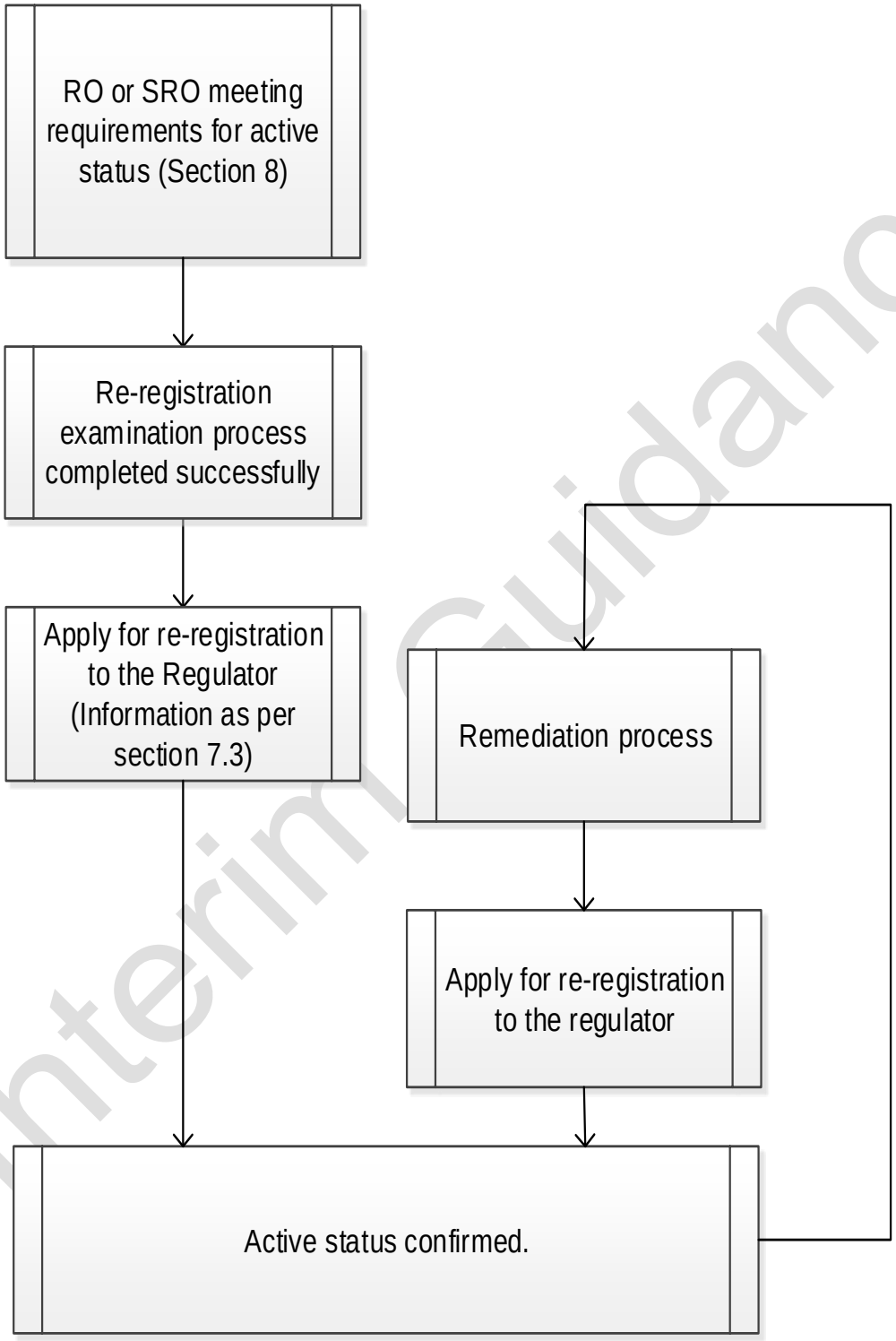
APPENDIX 1: REACTOR OPERATOR RE-REGISTRATION CONCEPT



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