Operator Cold License Training Plan for Advanced Nuclear Reactors

Prepared by the Nuclear Energy Institute
April 2023
## Revision Table

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<tr>
<td>Draft Rev. A</td>
<td>Initial revision</td>
<td>4/2023</td>
<td>Rick Stadtlander</td>
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Acknowledgements

This document was developed by the Operational Aspects of Advanced Reactors Team, led by Nuclear Energy Institute. NEI acknowledges and appreciates the contributions of NEI members and other organizations in the preparation of this document.

NEI Project Lead: Rick Stadtlander

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Executive Summary

NEI 23-01, “Operator Cold License Training Plan for Advanced Nuclear Reactors,” provides guidance for licensees of advanced nuclear reactors to utilize when licensing operators on a plant that has not yet been constructed, or is in the process of being constructed. The main objective of this report is to assist members in ensuring the proper qualifications are met in licensing operators.
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1 INTRODUCTION

The guidance document establishes an approach to meeting the requirements in 10 CFR 55 for the training of licensed operators. This guidance is based upon the NRC-endorsed guidance NEI 06-13A for cold licensed operator training and is tailored to advanced nuclear reactors, which include light-water small modular reactors (LWR SMRs) and non-LWRs. Prior to operation, plant experience requirements specified in regulatory and industry guidance documents and other standard guidance for operator selection, training, and qualification cannot be met. This document proposes a method to address this issue.

Cold licensing of operators provides a method for operations personnel to acquire the knowledge and experience required for licensed operator duties during the unique conditions of new plant construction and initial operation. Table 2: Comparison of Hot and Cold License Guidance, shows the current experience requirement and the associated cold license experience method. Table 3: Illustration of Cold Licensing Plan by Candidate Type, shows education and experience methods for each licensed operator candidate type.

Licensed operator candidates need not satisfy the experience requirements prior to entering a licensed operator training program. Experience and plant evolution requirements that have not been met at the time the licensed operator examination is administered shall be met prior to issuing the individual’s NRC operator license. In such a case, the licensee will notify the NRC when the candidate meets the experience and plant evolution requirements.

The methods described in this guidance, along with the other cold license training elements provided within, provide the licensed operator candidate with meaningful experience on the reactor for which the license is sought. These criteria provide reasonable assurance that, at the end of the training program, the personnel will be qualified to operate and maintain the facility in a safe manner in all modes of operation.

2 DEFINITIONS

Advanced Nuclear Reactor (ANR)

This term is used throughout this plan. It describes a fission reactor with significant improvements, including additional inherent safety features, compared to reactors operating on December 27, 2020, in the United States. This includes Light Water Reactors (LWR), Small Modular Reactors (SMR), non-LWRs, and micro-reactors. This is consistent with the definition of Advanced Nuclear Reactor in 42 United States Code (USC) 16271.

Alternate Cold License Methods for OJT/TPE

The On-the-Job-Training (OJT) and Task-Performance-Evaluation (TPE) phase during Cold Licensing will be modified to allow completion of this training before the plant becomes available. Acceptable methods for the conduct of on-the-job training and task-performance-evaluation include discussion, simulation, tabletop exercises, and use of mockup equipment and virtual reality technology. This training includes familiarity with plant locations by use of plant layout diagrams and equipment diagrams. During the tabletop exercises the diagrams are used to allow the candidate to gain knowledge of important plant equipment building, elevation and room locations. Examples of mock-up equipment
which may be used are control room simulators (plant referenced, NRC staff approved, or part task simulators) training breaker labs, maintenance flow loop trainers, and Radiological Controls Area (RCA) mock-up trainers.

**Crew Cumulative Nuclear Power Plant Experience**

Each crew must have a cumulative total of at least 24 months of nuclear power plant experience. The crew’s cumulative nuclear power plant experience is gained by working at nuclear power plants and military nuclear propulsion plants, conducting licensed operator training, participating in new nuclear plant construction and testing, and completing academic degree requirements. The cumulative crew nuclear power plant experience is the sum of each individual’s experience after applying weighting factors and maximum credit limits in Table 1: Crew Cumulative Nuclear Power Plant Experience Equivalencies. When determining cumulative nuclear power plant experience, one crew member should not be contributing all 24 months of experience. In addition, at least one crew member must have hot plant experience.

**Hot Plant Experience**

This term is used in Figures 1, 2, and 3. It describes work experience at a power reactor that includes the following: at least six weeks of that experience included at least one unit operating above 20 percent power, a startup from subcritical to 20 percent power, a shutdown from above 20 percent power to cold and subcritical, and startup preparations following a fueling or refueling. The startup, shutdown, and startup preparations may have been performed at an operating plant or a plant simulator. The hot plant experience can be gained at any power reactor of any design, vendor, or vintage.

**Hot Plant Observation**

Candidates who do not have 6 months of hot plant experience (defined above) prior to entering their training program may perform at least 6 weeks of structured observation of operating crews at an operating commercial nuclear power plant of like design – or – complete a plant operational excellence course (defined below). The purpose of these additional training requirements is to familiarize candidates with the licensed operating crew roles, responsibilities and applied techniques for maintaining the high levels of nuclear professionalism expected in an operating nuclear power plant environment. To facilitate learning, it is recommended that structured observation at a “hot” facility include the observation of work activities performed by control room crews, non-licensed operators in the plant areas, work control/work management personnel, clearance and tagging personnel, and the outage planning staff.

**Micro Reactor**

An ANR that has an electric power production capacity that is typically less than 50 megawatts. This definition is consistent with 42 USC 18751.

**Military Reactor Operator Equivalent**

This term, used in Figure 3, describes military nuclear experience where the candidate is qualified to manipulate control rods or supervise the manipulation of control rods. For United States Navy personnel, these positions are reactor operator, engineering officer of the watch, propulsion plant watch officer, engineering watch supervisor, and propulsion plant watch supervisor.
The start date for calculating total military nuclear experience is the date on which military nuclear-power-plant-related initial training is completed. For other military personnel, similar dates for candidate training completion are used for calculation. End dates are calculated using military discharge dates or dates on which the candidate no longer holds the applicable military nuclear qualifications.

**Non-licensed Operator Selected Tasks**

The selected non-licensed operator tasks are those tasks that are important to plant operation and contribute to nuclear safety, defense-in-depth, or that are risk significant. Typically, these tasks are associated with the local operator tasks within the Emergency Operating Procedure network. The tasks are implemented using alternate Cold License methods for OJT/TPE.

**Plant Operational Excellence Course**

Candidates who do not have 6 months of hot plant experience (defined above) prior to entering their training program may complete a plant operational excellence course in lieu of performing Hot Plant Observations (defined above). This option is intended for green field sites without ready access to an operating commercial nuclear power plant. The course duration is 6 weeks. The scope of this course should include training in a full scope simulator, and cover the following topics:

- Teamwork
- Human Performance Factors
- Diagnostic Skills
- Mitigating Core Damage
- Transient and Accident Operations

**Preoperational Test Experience**

Candidates who do not have 6 months of hot plant experience prior to entering their training program may participate in at least 6 weeks of control room activity during the site preoperational testing phase. The preoperational test experience does not have to be completed before applying for an RO license or taking the NRC RO Operator licensing examination but must be completed before the license is issued.

**Practical Work Experience**

Cold License Candidates must complete at least 3 months of practical work experience assignments, OR 1 month of practical work experience for Micro Reactors due to the limited number of activities in this style of reactor. For these activities to be considered meaningful, they must be associated with safety significant or defense-in-depth activities, or other major plant components or systems. These practical and meaningful work assignments include documented participation in preoperational testing and in one or more of the following activities:

- procedure development and validation
- human factors engineering activities
• task analysis verification

• licensed operator classroom presentations or simulator training implementation

These work assignments allow the operator candidate to gain experience on the reactor design for which the license is sought. Therefore, structured observation training at another operating nuclear power plant cannot be used to reduce the duration of these work assignments. The practical work experience does not have to be completed before applying for an RO or SRO license or taking the NRC RO or SRO licensing examination but must be completed before the license is issued.

Site Layout Course

The site layout course is designed to gain familiarity with the site layout before the physical plant becomes available. The course should be consistent with the Systematic Approach to Training (SAT), with a focus on the areas of the plant equipment that will be operated by operations department staff. The course should also include navigation to the local plant equipment used in the RO or SRO qualification guide and the NLO selected task guide, as implemented using Alternate Cold License Methods for OJT/TPE.

The education, experience, and training requirements needed for an initial license operator training course during the plant construction phase (Cold Licensing) of an Advanced Nuclear Reactor (ANR) as a Reactor Operator Candidate are provided here and shown in Figure 1.

SRO Certified Instructor

For the purposes of determining eligibility per Figure 3, an SRO certified instructor is one who has completed initial written and operating examinations to certify SRO-level knowledge — including generic fundamentals; systems; plant normal, abnormal, emergency, and administrative procedures; mitigating core damage; and plant technical specifications. An SRO certified instructor is also one who participates in the licensed operator continuing training program and who satisfactorily completes annual performance examination and biennial comprehensive written examination requirements to certify maintenance of SRO-level knowledge.
3 GENERAL ADVANCED NUCLEAR REACTOR COLD LICENSE TRAINING AND EXPERIENCE REQUIREMENTS

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4 REACTOR OPERATOR (RO) ELIGIBILITY AND TRAINING REQUIREMENTS
Figure 1: ANR RO Eligibility and Training Requirements During Construction Phase
5 SENIOR REACTOR OPERATOR (SRO) ELIGIBILITY AND TRAINING REQUIREMENTS
Figure 2: ANR SRO Eligibility and Training Requirements for Non-Experienced Personnel During Construction Phase
Figure 3: ANR SRO Eligibility and Training Requirements for Previous Operator License, Military Reactor Operator, or SRO Certified instructor During Construction Phase
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