Consumers Power Company

General Offices: 212 West Michigan Avenue, Jackson, Michigan 49201 • Area Code 517 788-0550

March 6, 1975

Mr. Paul F. Collins
Chief Operator Licensing Branch
Division of Reactor Licensing
US Nuclear Regulatory Commission
Washington, DC 20555

Re: Docket 50-255
License DPR-20
Palisades Plant

Dear Mr. Collins:

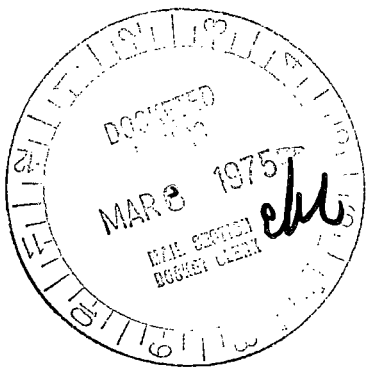
Attached is a copy of a program titled "Palisades Plant Training Program, Hot License Candidates." This program is submitted for your review and approval.

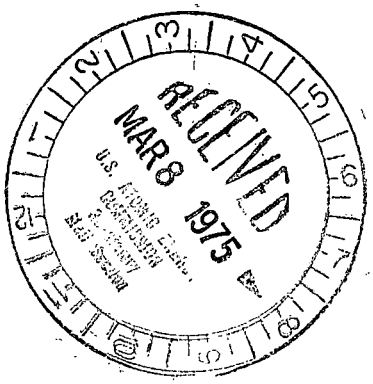
Yours very truly,

Ralph B. Sewell
Nuclear Licensing Administrator

RBS/ww

CC: JGKeppler, USNRC





2588

PALISADES PLANT

Training Program
Hot License Candidates

This program is proposed for use at the Palisades Plant when the option of using a simulator for the demonstration portion of the reactor operator's license exam is desired as described in P. F. Collins letter to L. M. Hausler dated October 3, 1974.

The objective of this program is to prepare license candidates, as thoroughly as practical, in fundamentals of plant operation, and response to abnormal or emergency conditions. It is our philosophy that the better a person understands the basic theory, the better his judgment will be in abnormal situations. We, therefore, concentrate heavily on this area plus the background (math, general science, basic nuclear physics, etc) for this material.

Prerequisites - Prior to entering the program, each candidate shall have a minimum of one-year experience as an auxiliary operator at the Palisades Plant.

The candidate shall have satisfactorily completed the "Nuclear Power Plant Steam and Mechanical Fundamentals" course. He shall have satisfactorily completed the RWP exemption tests. A review of basic mathematics shall also be satisfactorily completed.

Staff members, other than auxiliary operators, wishing to become licensed will be considered on an individual basis as to their eligibility and prerequisites. These candidates will be subjected to a comparable program tailored to their specific needs.

Training Program - The formal full-time training program will be, in general, in accordance with the schedule set forth in Attachment A. This attachment tabulates the classroom topics to be covered. Weekly quizzes are administered and, quite often, daily quizzes are administered in these classroom sessions. An instructor is in attendance during all classroom activities and evaluates progress of individual trainees.

Plant systems and equipment training include work in the control room and the plant to follow through procedures and locate all equipment

and controls. Checklists are used to point out individual activities to be accomplished for a number of the more important systems. Where practical, actual equipment operation and performance of evolutions will be included. Quizzes on systems, equipment and procedures are included for evaluation of the trainees' progress throughout the program.

In addition to the program incorporating classroom work on basic fundamentals plus plant systems and equipment, each person will participate in a program at an appropriate simulator. Candidates applying for an original license with very little experience or technical educational background will participate in the three-week simulator program described in Attachment C. The intent of this program is to introduce the trainee to all aspects of control room operation so he can gain experience and, therefore, confidence in handling the full spectrum of situations. It is expected he will return from this simulator program significantly better prepared to handle the duties of a licensed operator. Those candidates with significant experience or technical education will participate in the one-week program described in Attachment D. This program reviews significant operations and provides hands-on experience and a means of evaluation of the candidates' knowledge and abilities.

A maximum of four people will participate in a simulator program at one time as a group. Two groups of four people may participate at the same time on an overlapping shift arrangement.

Upon returning to the Palisades Plant following the simulator training, each candidate will review general and emergency procedures by way of drills conducted in the control room to refamiliarize them with the Palisades Plant controls.

Manipulation Experience - Prior to applying for a license examination, the candidate shall have actual experience manipulating controls of the Palisades Plant. Manipulation of controls through five reactivity changes, or significant operations other than reactivity changes as specified in Attachment B, shall be accomplished by each candidate. No more than three of the five will be the same manipulations. At least two different manipulations must be undertaken by each candidate.

NRC License Exam - The NRC license exam will be administered upon completion of all phases of the training program. Applications for license shall include certification by the simulator operator of satisfactory performance by the candidate in the simulator program.

ATTACHMENT A

WEEK		MON	TUES	WED	THURS	FRI
1	AM	BNP 2 Atomic Models Elements Atoms Molecules	BNP 3 Atomic Characteristics Weight Avogadro's Number Density	BNP 4 Molecules Avogadro's Law Molecular Density Parts Per Million	BNP 5 Mass and Energy $E = mc^2$ Binding Energy Mass Defect	BNP 6 Energy Production Energy from Fission Heat from Fission Power from Fission
	PM	Condenser Circulating Water, Cooling Towers	Service Water	Fire System	Component Cooling Water System	BNP Weekly Quiz Systems Review & Quiz
2	AM	BNP 7 Nucleus Structure Review to Date Isotopes Nuclides Abundance	BNP 8 Nucleus Model Model of Nuclei Chart of the Nuclides Nuclear Reactions	BNP 9 Reactions Involving Nuclei Chain Decay Nuclear Notation Mapping of Reactions	BNP 10 Radioactive Decay Activity Half-Life Decay Law	BNP 11 Radioactivity Graphing Radioactive Decay A Mixture of Nuclides Shielding Considerations
	PM	Makeup Water System	Service and Instrument Air System	Heating, Ventilation and Air Conditioning System	Spent Fuel Pool System	BNP Weekly Quiz Systems Review & Quiz
3	AM	BNP 12 Nuclear Fission Nuclear Models Fission Reaction Review of Nuclear Reactions	BNP 13 Cross Sections Microscopic Cross Section Macroscopic Cross Section Cross Section for Molecules	BNP 14 Reaction Rates Neutron Flux Reaction Rates Reactor Power	BNP 15 Neutron Spectrum & Energy Effects Neutron Spectrum Cross Sections and Energy Resonances	BNP 16 Neutron Slowing Down Collisions Slowing Down Nuclear Physics and Safe Operations
	PM	Fuel Handling System	Auxiliary Feed System	Condensate System	Feedwater System	BNP Final Exam Systems Review & Quiz
4	AM	RO2 Neutron Production Analogy Raising Rabbits Maintaining Inventory Accounting Systems	RO3 Application of Neutron Production Analogy Rabbits and Neutrons Neutron Life Cycle Define 4 Factors	RO4 4-Factor Formula Reproduction Factor Reproduction Factor Fast Fission Factor	RO5 4-Factor Formula (p,f) Resonance Escape (p) Thermal Utilization (f) Thermal Utilization (f)	RO6 Buckling and Leakage Buckling Concept Buckling Application Neutron Leakage
	PM	Turbine Lube Oil System	Generator Seal Oil System Hydrogen Cooling Isophase Bus	Turbine - Gen Control System	Main Steam System Extraction & Heater Drain System	RO Weekly Quiz System Review & Quiz

5	AM	RO7 Space Dependence Review to Date Power Distribution Distribution Measurement	RO8 Reactor Control Control Rod Effects Control Rod Worth Poison Competition	RO9 Reactivity Coefficients Temperature Coefficient Other Reactivity Coefficients Power Coefficient	RO10 Reactor Kinetics Neutron Population Neutron Lifetime Period and Power	RO11 Time Dependence and Fission Prod- ucts Delayed Neutrons Reactivity and in- hour Equation Fission Products
	PM	Chemical and Volume Control System →		Control Rod Drive System →		RO Weekly Quiz Systems Review & Quiz
6	AM	RO12 Core Depletion Xenon Behavior Long Term Effects Reactivity Budget	RO13 Startup and Shutdown Sources Sub-Critical Multi- plication Criticality and Shut- down	RO14 Normal Operation Reactor Utilization Operator Duties Xenon Oscillations End of Life	RO15 Refueling Refueling Fuel Management Physics Testing	RO16 Reactor Safety Hazards Safeguards Summary
	PM	Control Room Tech- nical Data Book	Criticality Predic tions	Reactivity Balance Calculations	Subcritical Multi- plication Problems, Exercises	RO Final Exam Review
7	AM	CP2 Thermodynamic Properties Pressure Temperature Specific Heat Specific Volume Enthalpy Heat of Vaporization	CP3 Thermodynamics Steam Tables Energy Work Power	CP4 Thermodynamics and Heat Balance Quality and Carryover Calorimeter Plant Heat Balance	CP5 Heat Balance Efficiency Reactor Heat Balance Efficiency Effects on Efficiency	CP6 Fluid Flow Pressure Drop Flow Characteristics Flow Measurement
	PM	Primary Coolant System →		Plant Heat Balance Calculation	Primary Coolant System Leakage Calculation	CP Weekly Quiz System Review & Quiz
8	AM	CP7 Pump Characteristics NPSH Centrifugal Pumps Jet Pumps	CP8 Heat Transfer Concepts Conduction Convection	CP9 Boiling Heat Transfer Nucleate Boiling Boiling Effects Critical Heat Flux	CP10 Core Thermal Performance Linear Heat Rate Hot Channel Factors	CP11 Core Thermal Perf- ormance Fuel Cladding Integrity DNBR Safety Limits Operating Limits
	PM	Safety Injection System	Safety Injection System	Containment Spray System Iodine Removal	Containment Air Coolers	CP Weekly Quiz Systems Review & Quiz

9	AM	CP12 Performance and Control Heat Generation Measurement Reactor Control Core Protection	CP13 Reactor Materials Fuel and Clad Burnup Absorbers and Coolants	CP14 Reactor Vessel Internals Refueling Material NDTT	CP15 Thermal-Hydraulic Application Pump Heat Pressurizer-Temp vs Level	CP16 Course Review
	PM	Surveillance Testing	General Operating Procedures →			CP Final Exam Procedure Review & Quiz
			Cold Shutdown to Hot Standby	Hot Standby to 100% Power	Plant Shutdown-100% Power to Cold Shutdown	
10	AM	RP2 Interaction of Radiation Decay-Neutron Production Radiation-Contamination Interaction with Matter	RP3 Biological Effects Cell Reactions Physiological Effects Contamination Effects	RP4 Units Exposure and Dose Activity and Modifying Rate and Volume	RP5 Protection Against Radiation Time Distance Shielding	RP6 Protection Against Contamination Shielding and Radiation Work Permits Contamination Protection Protective Clothing
	PM	Process Monitors - Area Monitors →		Portable Monitors, Personnel Dosimetry →		RP Weekly Quiz Review
11	AM	RP8 Detection of Radiation Ionization Detection Six Region Curve	RP9 Misc Detectors, Personnel Monitoring Misc Radiation Detectors Personnel Monitors - Radiation Personnel Monitors - Contamination	RP10 Survey Techniques General Survey Techniques Radiation Surveys Contamination Surveys	RP Final Exam	10 CFR 19
	PM	Palisades Radiation Protection Procedures →				Procedures Review & Quiz
12	AM	PC3 Coolant Parameters pH Conductivity Dissolved Gases	PC4 Chemical Processes Ion Exchange Filtration Evaporation Adsorption	PC5 Corrosion - Types Basic Corrosion Types of Corrosion	PC6 Corrosion - Materials Carbon Steel Nickel-Base Alloys Copper-Base Alloys Zircaloy	PC7 Chemistry Control Equipment Filters Ion Exchangers Filter-Demineralizers Evaporators
	PM	Chemical Control Equipment, Feed Equipment, In Line Monitors →		Sampling Systems	Chemical Lab Equipment	PC Weekly Quiz System Review & Quiz

13	AM	PC8 Radiation Effects - I Radiolytic Decomposition Radiation Synthesis Fission Products	PC9 Radiation Effects - II Activation Products Crud Cycle Crud Properties	PC10 Primary Water Chemistry Vendor Specifications Chemical and Volume Control System Miscellaneous	PC11 Boiler Water Chemistry (PWR) pH - Phosphate Oxygen Carryover Chloride Solids Feedwater Hideout Once-through Steam Generator	PC12 Make-Up Water System Clarification Chlorination and Softening Deaeration and Adsorption Reverse Osmosis and Electrodialysis
	PM	Rad Waste Systems →				PC Final Exam
14	AM	IC1 Basic Electricity Electrical Circuits Ohm's Law Power	IC2 Basic Electrical Circuits Series and Parallel Circuits Amplifiers	IC3 Measurement Methods Temperature Pressure Flow Level	IC4 Process Instrumentation Pneumatic Electrical	IC6 Neutron Detection Detector Applications Pulse-type Detection Chambers Current-type Detection Chambers Self-pwered Detectors
	PM	Feedwater Control System	Reactor Control System Pressurizer Controls (Level-Pressure) Steam Pump and Turbine Bypass Control →		IC5 Basic Control Systems Control Concepts Proportional Control Control Modes	IC Weekly Quiz Systems Review
15	AM	Neutron Monitoring Systems	Data Loggers	RPCIC	Protective System Logic Diagrams	Review
	PM	Reactor Protection System	SPI PIP	SIAS		IC Final Exam
16	AM	POP2 Nuclear Plant Incidents Decay Heat Water Hammer Water Hammer Incidents	POP4 Trial Examination - 1 Quizmanship Principles of Reactor Operation Features of Facility Design	POP5 Trial Examination - 2 Reactor Theory Fuel Handling and Core Parameters	POP6 Trial Examination - 3 Reactor Operation (Simulated Oral Exam)	Procedures, Technical Specification Review ↓
	PM	Abnormal Occurrence Review →		Facility Change Review →		

17	AM	POP10 Trial Examination - 4 Radiation Control and Safety Radioactive Material Handling, Disposal and Hazards	POP11 Trial Examination - 5 Radiation Protection (simulated oral exam)	POP14 Trial Examination - 6 General Operating Characteristics Specific Operating Characteristics	POP15 Trial Examination - 7 Instrumentation and Control Safety and Emergency Systems	POP16 Trial Examination - 9 Plant Operation (simulated oral exam)
	PM	Emergency Procedures, Review and Drills →				
18	AM	Palisades Plant Administrative Procedures →				
	PM	Emergency Procedure Drills (Site Emergency Plan Drill) →				
19	AM	Simulator Orientation →				
	PM	System and Instrumentation Review →				
20		Simulator Program →				
21		Simulator Program →				
22		Simulator Program →				
23		Palisades Refamiliarization Program →				
		Plant General Procedures Review and Drill →				
24		Palisades Refamiliarization Program →				
		Emergency Procedure Drills →				
25		Emergency Procedure Drills →				
26		Practice Oral and Written Exams, Review →				
27		AEC Exams →				

ATTACHMENT B

Significant Control Manipulations

A. Manual control of the reactor during dilution or boration maintaining reactor power. Reactivity change required will be a minimum of .01% ρ.

B. Manual control of the reactor maintaining stable reactor power during a Xenon transient for one hour or more. Manipulation must be performed in the first 15 hours of a transient following a power change of 25% or greater.

C. Change in core reactivity by the operator of 0.1% ρ in less than one hour for any reason utilizing either control rods or boric acid control.

D. Change of reactor power greater than 10% of full power on one hour or less.

E. Attendance at plant controls during and immediately following a plant trip from power level greater than 10%.

F. Operation of the plant controls during any major step in start-up or shutdown, i.e.,

1. Start-up from cold shutdown to hot standby.
2. Critical approach from hot standby to point of adding heat.
3. Turbine generator start-up from hot standby.
4. Plant loading from synchronization.
5. Plant shutdown from power to hot standby.
6. Plant cooldown from hot standby.

G. Control of steam generator levels from synchronization to 15% power including transfer to auto.

H. Manual reactor control from synchronization to 15% power, including transfer to auto.

ATTACHMENT C

Simulator Training

Simulator training will consist of three weeks on the Combustion Engineering Simulator at Windsor, Connecticut. The time will be spent on demonstration sessions, practice sessions and exercise sessions. The demonstration sessions will be for the purpose of orientation and familiarization with controls and response of the simulator. The practice sessions give the students experience in identifying malfunctions and responding to the effects. Exercise sessions are used to evaluate operator action in response to abnormal conditions.

Demonstration sessions will require approximately eight (8) hours to conduct. Fifty-two (52) hours will be spent on practice sessions; approximately forty (40) hours in classroom discussion on details of simulator systems, transient analysis and systems overview. Approximately twenty (20) hours will be spent conducting exercise sessions to evaluate individual operator performance.

Palisades operating procedures and control room nomograms, etc. will be utilized the maximum extent possible during the simulator training. Where differences preclude direct application of Palisades procedures and/or technical data, the differences will be discussed in classroom sessions, to clarify reasons for such deviations.

The simulator program will provide, as a minimum, the following operational experience for each candidate:

A. At least two reactor start-ups with different initial conditions, proceeding with plant start-up to turbine-generator synchronization.

ATTACHMENT C

Simulator Training (Contd)

B. At least one plant heatup from cold shutdown to point of withdrawal of control rods for critical approach.

C. At least one reactor and plant cooldown from hot standby to cold shutdown.

D. A minimum of ten hours in practice sessions on abnormal conditions or emergency conditions with emphasis on identifying the condition.

E. A minimum of twenty hours in responding to abnormal and emergency conditions with emphasis on immediate action. Trainees will be expected to recover from casualty, where possible.

ATTACHMENT D

Simulator Program

The simulator training course for engineers or experienced operators is a one week program. This program provides approximately thirty-five hours of hands-on experience on the simulator. This includes demonstration sessions, practice sessions and evaluation sessions. Trainees will operate the plant controls under a variety of conditions including transient and emergency conditions.

Evaluation exercises will be limited to reactor startup exercises under different conditions and where practicable, some malfunctions included.

Simulator orientation classroom work will be accomplished just prior to reporting to the simulator, to minimize time needed to acquaint trainees with simulator control room, etc.

Palisades technical data and procedures will be utilized during simulator exercises to the extent practical. Differences will be pointed out and discussed as they are encountered.