U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Examination Report No. 50-528/84-02

Facility: Palo Verde Nuclear Generating Station, Unit 1

Docket No.: 50-528

Examinations administered at Palo Verde Nuclear Generating Station, Wintersberg, Arizona.

Chief Examiner: Paul Gage 9-12-84
Paul Gage, Operator Licensing Examiner — Date Signed

Approved: JP O'Brien 9-12-84
Jack O'Brien, Chief, Operations Section — Date Signed

Summary:

Examinations on July 10, 1984.

Written, oral, and simulator examinations were administered to nine SROs, thirteen ROs, and two instructor candidates. A written examination was administered to two additional RO retake candidates and Section V of a written examination was administered to an SRO retake candidate. One SRO and three ROs failed the written examination. All others passed these examinations.

REPORT DETAILS

1. Persons Examined:

SRO Candidates:

D. Wootten
D. N. Stover
R. D. Middleton
E. R. Gonsowski
A. G. Nelsen
R. W. Wells
K. L. Koppleman
B. A. Grabo
M. D. Carnes
T. C. Cannon, Jr.

RO Candidates:

G. E. Willer
G. D. Hughes
D. M. Smith
J. A. Turner
J. T. Taylor
T. E. Stahler
L. M. Speight
W. K. Myers
D. W. King
J. R. Garden
E. T. Cesena
L. A. Florence, Sr.
J. C. Brannen
W. E. Stearns
M. D. Vaughn

Instructor Candidates:

R. M. Wilferd
B. R. Lee

2. Examiners:

*P. Gage, NRC
L. Miller, NRC
J. Smith, PNL
R. Clark, PNL
J. Upton, PNL
J. Boegel, PNL
A. Pritchard, PNL

*Chief Examiner

3. Persons attending the exit meeting:

NRC:

Paul Gage, Operator Licensing Examiner, RV
Roy Zimmerman, Resident Inspector

APS:

Joe Bynum, PVNGS Plant Manager
Jim Smith, PVNGS Compliance
J. M. Allen, Operations
J. E. Cook, Quality Audits
Forrest Hicks, Training Manager
Patrick Wiley, Licensed Training Supervisor
W. F. Fernow, PVNGS Plant Services
Gary Irick, APS QS&E

4. Written Examination Reviewers:

a. NRC Review

John Elin, Operator Licensing Examiner, RV (examination)
Jack O'Brien, Operator Licensing Examiner, RV (grading)

b. Facility Review

RO Exam:	SRO Exam:
D. Marks	R. Buzard
M. Zerkel	D. Swan
W. Rudolph	C. Anderson
P. Radtke	J. Scott

5. Written Examination & Facility Review:

Written examinations were administered to fifteen RO and twelve SRO candidates between 8:10 AM. and 2.10 PM on July 10, 1984. At the conclusion of the examination, from 2:30 PM to 4:30 PM on July 10, 1984, the examiner met with the persons noted in paragraph 4(b) above to review the written examination and grading key. No facility review of the written examination was allowed prior to the completion of the examination by the candidates. Additionally the candidates were instructed to have no contact with the examination review staff between the start of the examination and the completion of the review. The facility staff comments were noted on a "plant review" copy of the examination Key. These comments were discussed with the facility review staff and appropriate revisions to the master examination Key were made by the Chief Examiner prior to reviewing or grading the candidates responses.

6. Oral Examinations:

Oral examinations and plant walkthroughs of eleven SRO and thirteen RO candidates were conducted from July 11 to July 26, 1984. The following general weaknesses were noted by the examiners:

a. General use and knowledge of portable radiation detectors.

b. Indications for natural circulation and coastdown effects that reactor coolant pumps can have on temperature parameters.

c. Diesel generator cross-tie capability from Unit 2 to Unit 1 (station blackout).

d. Override capability of engineering safety features.

These weaknesses were not sufficient to justify failure of the candidates but the examiner recommended additional instruction in these areas.

7. Exit Meeting:

On July 27, 1984, the Examiner met with licensee representatives as detailed in paragraph 3. Those individuals who clearly passed the oral were identified in this meeting. Additionally, the significant areas of weakness noted in the oral examinations were discussed.

U. S. NUCLEAR REGULATORY COMMISSION
SENIOR REACTOR OPERATOR EXAMINATION

MASTER KEY

Facility: Palo Verde

Reactor Type: Combustion Engineering

Date Administered: 10 July 1984

Examiner: Paul Gage

Candidate: ______________

INSTRUCTIONS TO CANDIDATE:

Use separate paper for the answers. Write answers on one side only. Staple question sheet on top of the answer sheet. Points for each question are indicated in parenthesis after the question. The passing grade requires at least 70% in each category and a final grade of at least 80%. Examination papers will be picked up six (6) hours after the examination starts.

Category Value	% of Total	Candidate's Score	% of Cat. Value	Category
25.0	25%			5. Theory of Nuclear Power Plant Operation, Fluids, and Thermodynamics
25.0	25%			6. Plant Systems Design, Control and Instrumentation
25.0	25%			7. Procedures - Normal, Abnormal, Emergency and Radiological Control
25.0	25%			8. Administrative Procedures, Conditions, and Limitations
100.0				TOTALS

Final Grade ______ %

All work done on this examination is my own; I have neither given nor received aid.

____
Candidate's Signature

EQUATION SHEET

$f = ma$

$v = s/t$

Cycle efficiency = (Network out)/(Energy in)

$w = mg$

$s = V_o t + \frac{1}{2} at^2$

$E = mc^2$

$KE = \frac{1}{2} mv^2$

$a = (V_f - V_o)/t$

$A = \lambda N$ $\quad A = A_o e^{-\lambda t}$

$PE = mgh$

$\lambda = \ln 2/t_{1/2} = 0.693/t_{1/2}$

$V_f = V_o + at$

$w = \theta/t$

$t_{1/2}eff = \frac{[(t_{1/2})(t_b)]}{[(t_{1/2}) + (t_b)]}$

$\Delta E = 931 \, \Delta m$

$I = I_o e^{-\mu x}$

$\dot{Q} = \dot{m} C_p \Delta t$

$I = I_o \, 10^{-x/TVL}$

$\dot{Q} = UA\Delta T$

$TVL = 1.3/\mu$

$Pwr = W_f \Delta n$

$HVL = -0.693/\mu$

$P = P_o 10^{sur(t)}$

$SCR = S/(1 - K_{eff})$

$CR_x = S/(1 - K_{effx})$

$P = P_o e^{t/T}$

$CR_1(1 - K_{eff1}) = CR_2(1 - k_{eff1})$

$SUR = 26\rho/\ell^* + (\beta - \rho)T$

$M = 1/(1 - K_{eff}) = CR_1/CR_o$

$T = (\ell^*/\rho) + [(\beta - \rho)/\bar{\lambda}\rho]$

$M = (1 - K_{effo})/(1 - K_{eff1})$

$T = \ell/(\rho - \beta)$

$SDM = (1 - K_{eff})/K_{eff}$

$T = (\beta - \rho)/(\lambda\rho)$

$\ell^* = 10^{-4}$ seconds

$\rho = (K_{eff} - 1)/K_{eff} = \Delta K_{eff}/K_{eff}$

$\bar{\lambda} = 0.1 \text{ seconds}^{-1}$

$\rho = [(\ell^*/(T K_{eff})] + [\bar{\beta}_{eff}/(1 + \bar{\lambda}T)]$

$I_1 d_1 = I_2 d_2$

$P = (\Sigma \phi V)/(3 \times 10^{10})$

$I_1 d_1^2 = I_2 d_2^2$

$\Sigma = \sigma N$

$SUR = 26.06/T$

$R/hr = (0.5 \, CE)/d^2 (\text{meters})$

Water Parameters

1 gal. = 8.345 lbm.
1 gal. = 3.78 liters
1 ft^3 = 7.48 gal.
Density = 62.4 lbm/ft^3
Density = 1 gm/cm^3
Heat of vaporization = 970 Btu/lbm
Heat of fusion = 144 Btu/lbm
1 Atm = 14.7 psi = 29.9 in. Hg.

Miscellaneous Conversions

1 curie = 3.7×10^{10} dps
1 kg = 2.21 lbm
1 hp = 2.54×10^3 Btu/hr
1 mw = 3.41×10^6 Btu/hr
1 in = 2.54 cm
°F = 9/5°C + 32
°C = 5/9 (°F-32)

SECTION 5 THEORY OF NUCLEAR POWER PLANT OPERATION, FLUIDS, AND THERMODYNAMICS

5.1 (2.0)

What are 4 reactivity terms considered in determining the shutdown margin while the reactor is subcritical?

(0.5ea)
(2.0max)

1. Power defect
2. Xenon concentration
3. Boron concentration
4. CEA position
5. RCS Tavg

Vol. 9 section 12 72ST - 9RX09

5.2 (3.0)

Reactor power is increasing on a stable 1.0 DPM start up rate. Assume B=.0065 and the effective decay constant is 0.1 per second:

a) How much reactivity is in the core in order to maintain the steady 1.0 DPM start-up rate?

b) In order to stop reactor power form increasing, the operator initiates a negative reactivity insertion. What will be the start-up rate the moment power "turns"?

c) What will happen to reactor power if the operator stops the reactivity insertion at the moment power turns? Explain.

(1.0) a) SUR = 26/T = 26(0.1p)/(B-p)

initially the reactivity in the core is:
1 = 26(0.1p)/(0.0065-p)
p = +180 PCM

(1.0) b) power turns when SUR = 0

(0.5) c) power will increase
(0.5) because the reactor is still supercritical (net positive reactivity in the core)

Vol. 17 section 1 pp 114-119

5.3 **(2.0)**

With no fuel in the reactor, count rate is equal to 100 cps. After loading 6 fuel assemblies, the count rate increases to 800 cps. What is the value of Keff with the 6 fuel assemblies in place?

(1.0) CRo(1-KEFFo) = CR(1-KEFF)

(0.8) initially with no fuel , KEFFo = 0

CRo = CR(1-KEFF)

100 = 800(1-KEFF)

(0.2) KEFF = 0.8750

Vol. 17 section 1 [illegible] 1-8

5.4 (2.5)

State how each of the following reactivity coefficients change (increase, decrease, constant) in magnitude over the life of the core (assuming normal 100% power plant parameters). Explain in each case.

a) Fuel Temperature Coefficient

b) Moderator Temperature Coefficient

c) Isothermal Temperature Coefficient

d) Void Coefficient

e) Pressure Coefficient

(0.5ea)

a) INCREASE, due to Plutonium's larger resonance absorption for neutrons, and decreased fuel temperature.

b) INCREASE, due to less boron concentration.

c) INCREASE, since ITC = MTC + FTC, which both become more negative. ~~CONSTANT, used only below point of adding heat.~~

d) INCREASE, due to less boron. ~~CONSTANT, function of void formation, temperature, pressure, which are unchanged for normal operating parameters.~~

e) INCREASE, due to less boron. ~~CONSTANT, since there is no change in pressure.~~

Vol. 17 section I pp 122-128

5.5 **(3.0)**

Explain why the maximum differential rod worth is nearer to the bottom of the core than at the mid-plane or the upper portion of the core. Refer to figure 72.

The peak is near the bottom due to:

(1.0) 1. insertion of rods and

(1.0) 2. increased moderator density

(1.0) As rods are inserted, the neutron flux is shifted to the bottom which increases the rod worth. Colder water near the bottom of the core will account for a higher neutron flux near the bottom and thus a higher differential rod worth.

Vol. 17 section 1 p 134

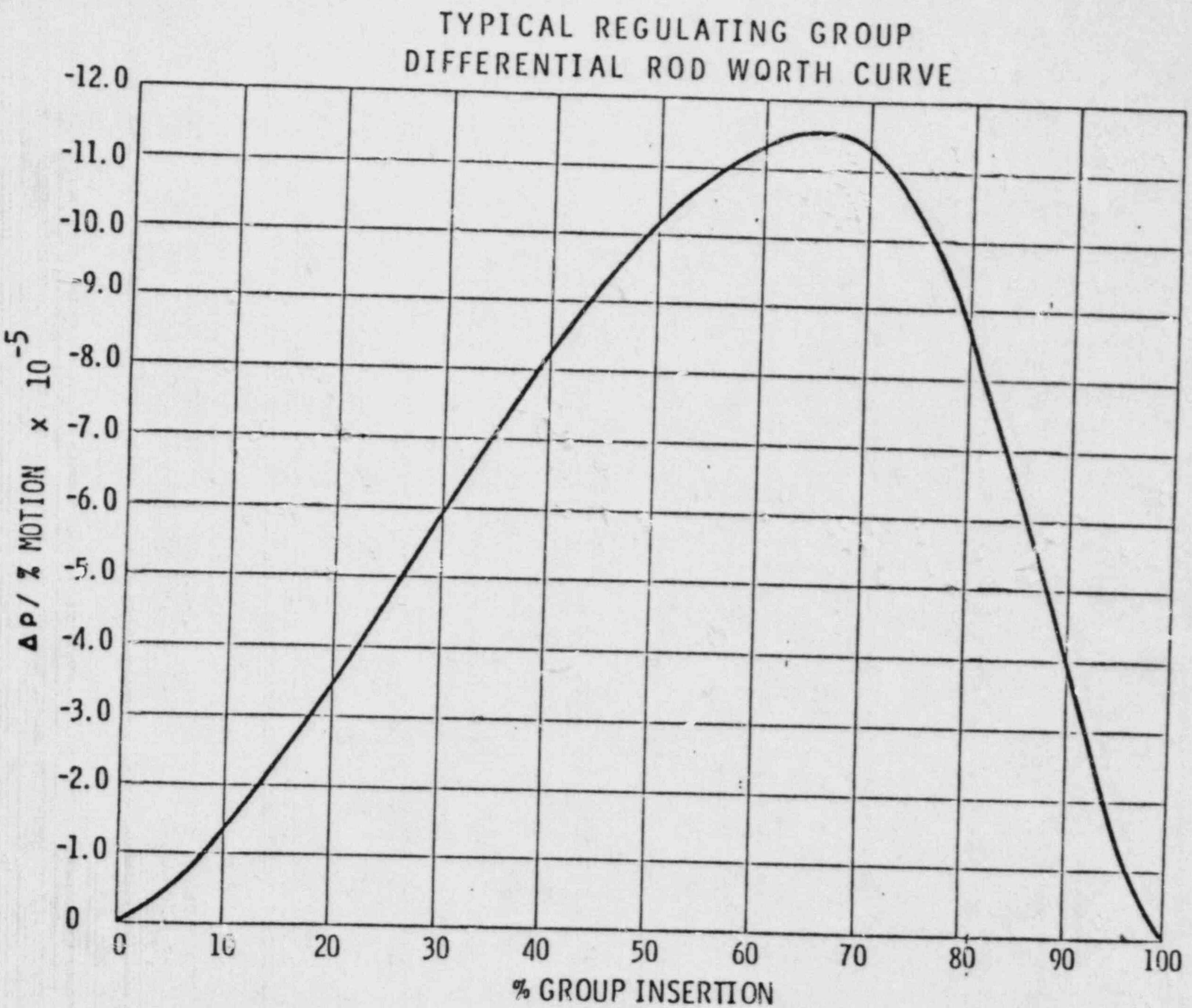


Figure 72 Typical regulating group differential rod worth curve.

5.6 (2.5)

Concerning Xenon-135 and Samarium-149, indicate whether the following statements are true or false:

a) Both Xe and Sm concentrations will initially increase following a decrease in reactor power with Sm reaching its peak sooner than Xe.

b) After a complete shutdown, it takes approximately 3 days for most of the Sm to be removed from the core.

c) Both Xe and Sm have removal terms which include neutron capture.

d) The equilibrium concentrations for Xe and Sm are power dependent.

e) 100% equilibrium Xenon concentration decreases over the life of the core.

(0.5ea)

a) False
b) False
c) True
d) False
e) True

Vol. 17 section 1 pp 138-141
Vol. 17 section 1 figures 79-89

5.7 (2.0)

List 2 types (or forms) in which Bulk Boiling occurs.

(1.0ea)
(2.0max)

1. Bubbly flow
2. Slug flow
3. Annular flow
4. Nucleate boiling
5. Film boiling

Vol. 17 section 2 p 17

5.8 (2.0)

Determine the total heat available in the secondary in terms of percent reactor power (3800Mw = 100%) for the following heat balance parameters:

1. Total steam flow rate is 15 million lbm/hr.
2. SG temperature = 552F
3. Feedwater inlet temperature to SG is 448F

(0.5) hs = 1190.6 Btu/lbm (sat. vapor at 552F)

(0.5) hf = 428.0 Btu/lbm (sat. liquid at 448F)

(1.0) Q = m (hs - hf) in BTU/hr

$Q = 15\times10^6 (1190.6 - 428) / 3.41\times10^6 = 3355Mw$

$Q = (3355/3800)\times100\% = 88\%$

Vol. 17 section 2 p 53

5.9 (3.0)

The margin to DNB is influenced by pressure, inlet core temperature, flow rate, localized power and power distribution. State whether DNBR increases or decreases with the foloowing parameter changes (assume only that specific parameter changes for each individual case):

a) Flow rate INCREASES

b) Tc INCREASES

c) Pressure INCREASES

(1.0ea) a) INCREASES

b) DECREASES

c) INCREASES

Vol. 17 section 2 p 38

5.10 (2.0)

Refer to figure 5.2, a sketch of a centrifugal pump curve and a system characteristic curve for a centrifugal auxilary feedwater pump system, for the following questions:

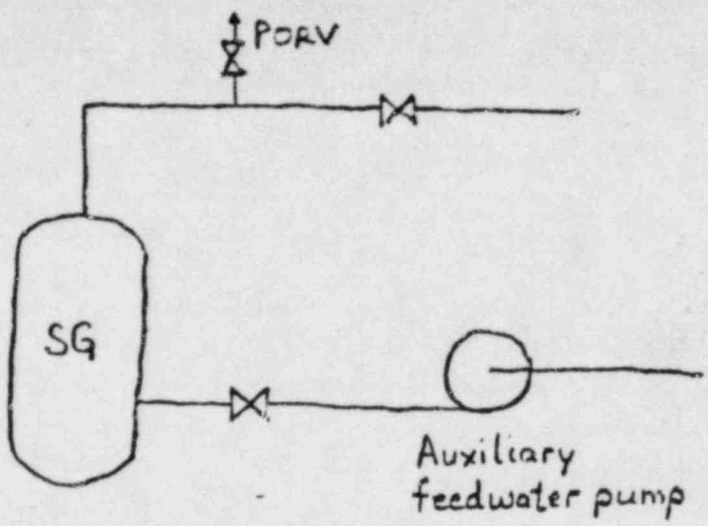
a) Show how the curve(s) will change as the PORV opens and reduces the steam generator pressure by 50%.

b) Show the additional changes (from part a above) to the curve's) as the pump discharge valve is partially shut.

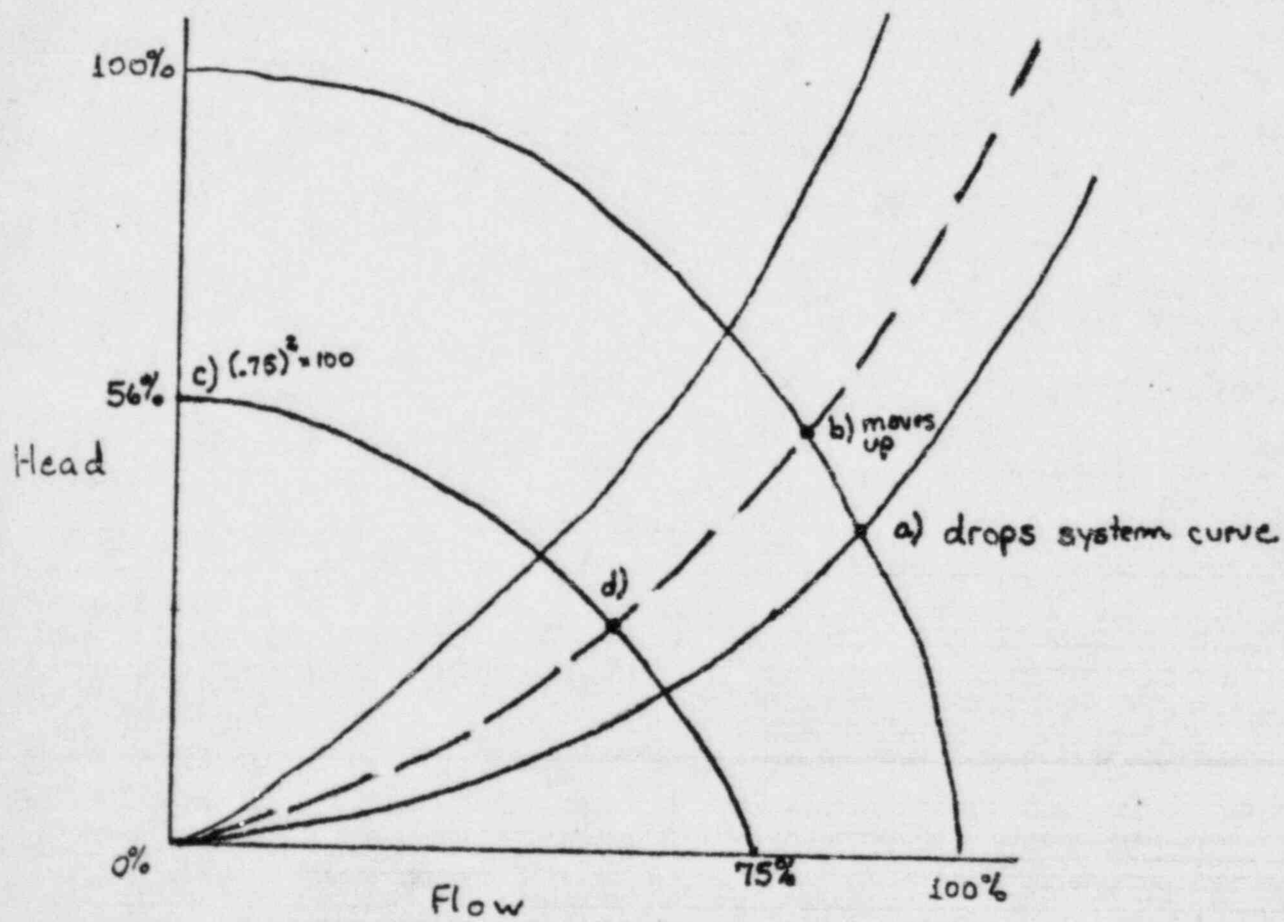
c) Show the additional changes (from part 2 above) to the curve(s) as the pump speed is reduced by 25% (indicate magnitude of changes).

d) Indicate the system flow rate and pump head at the final conditions (reduced SG pressure, partially shut pump discharge valve, and reduced pump speed).

Vol. III chapter 2 section H pp 2-232 to 2-235
Academic Program for Nuclear Power Plant Personnel



PORV
SG
Auxiliary
feedwater pump



100%
56%
c) (.75)² × 100
Head
b) moves up
a) drops system curve
d)
0%
75%
100%
Flow

FIGURE 5.2

5.11 **(1.0)**

Name the four areas of resistance or temperature drops experienced as heat is transferred from the center of the fuel rod temperature to the bulk temperature.

The resistances are as follows:

(0.25ea) 1. The fuel rod itself (UO2)

2. The gas space between the UO2 and the cladding

3. Fuel Cladding

4. Coolant (water)

Vol. 17 section 2 p 19.

SECTION 6 PLANT SYSTEMS: DESIGN, CONTROL, AND INSTRUMENTATION

6.1 (2.0)

List 4 means by which HYDROGEN can be released into containment following a Loss of Coolant Accident.

(0.5ea)

1. Radiolysis of water
2. Corrosion of containment materials by containment spray.
3. Steam and zirconium cladding reaction
4. Depressurization of the RCS

Vol. 1 AS-4C-3

6.2 **(2.0)**

When Tavg is less than 500F, what is the maximum number of RCP's allowed to operate? Explain why this limit is imposed.

(1.0) 1. Three

(1.0) 2. Prevent excessive uplift, which could cause core displacement in the reactor vessel.

Vol. 3 NS-1A-4

6.3 (2.0)

a) State the basis for the capacity of the Refueling Water Tank (RWT).

b) What is the required RWT boron concentration?

(0.2ea) a) 1. Allowing total boric acid recycle
2. Back-to-back cold shutdowns (5% subcritical)
3. Subsequent startups (at 90% core life)
4. Sufficient volume for ESF pump operation
5. Filling the refueling pool

(1.0) b) ~~4400 ppm~~
4000 - 4400ppm

Vol. 3 NS-2A-29

6.4 (3.5)

a) How does a Reactor Trip Overide (RTO) signal affect SG level control?

b) When is the RTO signal removed automatically (ie SG level system returned to single element control)?

RTO causes the following:

(1.0ea) a). 1. Feedwater pump speed to minimum.
2. Shuts the economizer valve
3. Modulates the downcomer vlave

(0.5) b) When SG level is returned to 45% NR

Vol. 5 NS-9A

6.5 (3.0)

List three indications and/or alarms that tell the operator that an emergency diesel generator has failed to start.

(1.0ea) (3.0max)

1. No ~~speed~~ frequency indication
2. No voltage indication
3. Incomplete sequence alarm
4. No DG running alarm

Vol. 8 section 12

6.6 (3.0)

The reactor is operating at 100% power when a rupture in the main feedline to the SG (inside containment) occurs. List all the possible Engineering Safety Features which could actuate, including the signals which will cause their actuation.

(0.25ea)

1. SIAS — High containment pressure
2. CIAS — High ~~high~~ containment pressure
3. AFAS — Low SG level
   low SG press., ~~SG differential pressure~~ ~~SG differential pressure~~ in conjunction with SG differential pressure.
4. MSIS — Low SG pressure
   High containment pressure
5. CSAS — High-high containment pressure

Vol. 4 NS-7

6.7 (4.0)

Assume the plant is operating at 70% power with the CEDMCS in the AS mode. Loop 1B Tc instrument fails low with Tavg selected to AVERAGE. Describe the plant response with no operator action.

(1.0ea)

1.. Low Tave/Tref error
2. Channel deviation alarm and AMI
3. Pressurizer level falls to minimum setpoint
4. FWCS set for minimum refill demanc

Vol. 5 NS-9C-22

6.8 (2.0)

a) At what power level is High Voltage removed from the Start-up channel detectors?

b) Why is it necessary to remove power from the Start-up channel detectors above a certain power level?

c) What control or protective functions are performed by the Start-up channels?

d) What Start-up channel parameters are required to be logged by the control room operator?

(0.5ea) a) 1×10^{-6} % power or approximately 2000 cps

b) Prevent detector damage due to excessive current flow.

c) None, information only.

d) ~~None, no requirements.~~
during reactor start-up and 1/M plots

Vol. 4 NS -4

41OP-1ZZ03

6.9 (1.5)

a) What signal automatically closes the MSIV's?

b) Explain how the control room operator would overide the signal in part (a) to open the MSIV's.

c) What does the blue indicating light inform the operator about the MSIV's?

(0.5) a) MSIS

(0.5) b) Place SLOW CLOSE/SLOW OPEN switch to SLOW CLOSE

After the white overide light is received, place the switch in the SLOW OPEN position.

(0.5) c) The valves are in either EX or ACC CH mode

Vol. 5 PGS-1A-24

6.10 (2.0)

a) What supplies the 125VDC class 1E loads on a failure of a battery charger?

b) How long is the battery capable of supplying power to its loads (without a battery charger or supply)?

Battery initially supplies bus, then the operator can shift to

(1.0) a) The common backup battery charger

(1.0) b). 2 hours

Vol. 8 PGS-15D-4

SECTION 7 PROCEDURES: NORMAL, ABNORMAL, EMERGENCY, AND RADIOLOGICAL CONTROL

7.1 (2.0)

Define the following radiological terms:

a) Rad

b) Dose

(1.0) a) That amount of any ionizing radiation corresponding to the absorption of 100 ergs per gram of body tissue.

b) That quantity of radiation absorbed, per unit of mass, by the body or any portion of the body.

10 CFR 20.4

7.2 (4.0)

List four plant conditions that require the operator to initiate/restore Safety Injection flow following a Steam Generator tube rupture.

(1.0ea)

1. Indications of void propagation
2. RCS < 28F subcooled
3. No SG is available for removing heat
4. Pressurizer level is 0%

Volume 13 section 7 41RO-1Z206

7.3 (3.0)

List 6 indications or plant conditions that should or may exist in the event of excessive steam demand.

(0.5ea)

1. Variable overpower reactor trip
2. SG low pressure
3. Low Pressurizer level
4. Low Pressurizer pressure
5. INCREASED SG flow with DECREASED electrical output
6. Reactor power increasing (prior to trip)
7. MSIS
8. SIAS

Vol. 13 section 3 41RO - 1Z202

7.4 (2.0)

The emergency operations procedure states that its use is required following a major event. What is considered a major event by this procedure?

(2.0) A major event is any automatically activated plant protective signal :

1. Reactor trip
2. SIAS
3. CIAS
4. CSAS
5. AFAS
6. MSIS

or any large, unexpected fluctuation in plant parameters such that the operators determine a need to enter the emergency operating procedure.

Vol. 13 section 1

7.5 **(2.0)**

When is emergency boration required during the refueling mode?

(1.0ea) 1. KEFF > 0.95

2. Boron concentration < 2150 ppm

Vol. 14 section 1

7.6 (3.0)

a) After a loss of forced flow, how long before indications of natural circulation will be apparent?

b) What indications does the operator check to verify Natural Circulation?

c) Natural circulation flow requires at least 1/3 SG tube coverage. What SG level ensures the operator has adequate SG tube coverage?

(0.5) a) 10 minutes

(0.5ea) b) 1. Th stable or decreasing (use core exit themocouples if Th is off-scale)

2. Tc close to SG Tsat and controllable

3. Core delta T less than full power delta T (57F).

4. Consistency between Th and core exit themocouples (ERFDADS or QSPDS)

(0.5) c) WR level > 0%

Vol. section 1 APPENDIX E

7.7 (2.0)

Since the Main Turbine is not Safety related equipment, why is it necessary for a Limiting Condition for Operation stating that at least one turbine overspeed protection system to be operable in modes 1, 2, and 3?

(2.0) Excessive overspeed of the turbine could generate potentially damaging missiles which could impact and damage safety related components, equipment, or structures.

Technical Specifications Bases 3/4.3.4

7.8 (3.5)

a) What are the maximum heatup and cooldown rates allowed by Technical Specifications during Heatup, Cooldown, and Criticality?

b) What is the maximum temperature change allowed during inservice hydrostatic and leak testing operations?

~~(0.5ea)~~ a) HEATUP

~~20F/hr Tc less than or equal to 95F~~

~~40F/hr 95F < Tc < 400F~~

(1.5) 100F/hr ~~Tc greater than 400F~~

COOLDOWN

~~20F/hr Tc less than or equal to 100F~~

~~40F/hr Tc greater than 100F but less than or equal to 130F~~

(1.5) 100F/hr ~~Tc > 130F~~

~~(0.5)~~
(0.5) b) 10F in any 1 hour period

Technical Specification 3.4.8.1

7.9 (2.0)

While you are frisking , 100 cpm above background is detected. What actions should you take?

(1.0ea)

1. Notify Radiation Protection personnel (to determine extent of contamination.

2. Remain at the frisker to avoid the spread of contamination)

Procedure 75AC - 9ZZ03

7.10 (1.5)

Assume a station Blackout exists (loss of off-site power, with failure of both emergency diesel generators, and the main turbine generator tripped).

a) Why is it necessary to maintain SG pressure less than 1253 psia?

b) How does the operator control SG pressure?

c) The shutdown margin must be met prior to allowing RCS temperature to drop below what value?

(0.5ea) a) Prevent safety valve actuation

b) Atmospheric dump valve operation

c) 410F

Vol. 13 section 10 41RO - 1Z209

SECTION 8 ADMINISTRATIVE PROCEDURES, CONDITIONS, AND LIMITATIONS

8.1 (1.5)

What are the 3 main Fission Product Barriers which protect the public from releases of fission products in the core?

(0.5ea)

1. Clad
2. Primary Coolant System
3. Reactor Containment

Vol. 9 section 2 APPENDIX A EPIP - 02

8.2 (2.5)

What conditions must exist in order for containment integrity to be established?

(0.5ea)

1. All penetrations required to be closed during accident conditions are either:

   a) capable of being closed by operable automatic isolation valve or

   b) closed by manual valves, blind flanges, or deactivated automatic valves secured in the closed position.

2. All equipment hatches closed and sealed

3. Both air lock doors closed and operable, (at least one closed when used for entry and exit of containment).

4. Containment leakage rates within specification

5. Each penetration sealing mechanism is operable.

Technical Specification 1.7

8.3 (3.0)

Upon declaration of an unusual event, alert, site area emergency, or general emergency, off-site notification shall include which 3 primary telephone contacts. Include the primary communication network for each contact.

(0.5ea)

1. NRC, Emergency Notification System (ENS)
2. State/County govt., Notification and Alert Network (NAN).
3. APS Corporate personnel, Dedicated telephone fanout.

Vol. 9 section 7 EPIP - 07

8.4 (3.0)

Match the following tags with the appropriate use found in the right hand column.

a) Inservice pink tag ______
b) Jurisdictional tag ______
c) Yellow Caution tag ______
d) SOC Danger tag ______
e) Blue dot on an indicator ______
f) Red Danger tag ______

1. Used only on orders form System Operation Super visor.
2. No danger to personnel involved. States specific operating instructions of equipment.
3. If equipment operated, equipment damage or personnel injury could result.
4. Temporary construction (water, air, fire water, gases, etc.).
5. Identifies systems that are transferred to Bechtel Power Corporation startup.
6. Indentifies when electrical functional check or instrument loop calibration has been successfully completed.

(0.5ea) a) 4
b) 5
c) 2
d) 1
e) 6
f) 3

Vol. 9 section 8 40AC - 0Z205

8.5 (2.0)

a) When shall a revision be incorporated into a procedure vice a procedural change notice (PCN)?

b) Who is responsible to ensure the review and approval of a PCN is completed within 14 days of the temporary approval date?

(1.0) a) After 5 PCN's have been issued to a procedure or within 90 days.

(1.0) b) Procedure Coordinator

Vol. 9 section 10 70 - 0Z202

8.6 (2.0)

What are the Technical Specification limits and the BASES for the following types of leakage from the Reactor Coolant System?

a) Primary to Secondary leakage

b) Unidentified leakage

(1.0ea) a) Total leakage form both SG's of 1 gpm
Ensures the dose contribution from the leakage will be limited to < Part 100 guidelines for infrequent limiting fault events.

b) 1 gpm
Threshold value of < 1 gpm is sufficiently low enough to ensure early detection of additional leakage.

Technical Specification BASES 3/4.4.5.2

8.7 (3.0)

a) Define "Hot Spot" as it pertains to radiation exposure within a posted radiation area.

b) Who must submit a request for exceeding the weekly whole body administrative radiation exposure limit?

c) Who must approve the request in part (b) above?

d) What is the value of the weekly whole body administrative limit?

(0.5) a) Any accesible localized point with a contact radiation level equal to or greater than 10 times general area radiation levels AND
(0.5) the hot spot is > 50mRem/hr.

(0.5) b) Effected individual's Supervisor

(0.5) c) Supervising Radiation Physicist, or Radiation Protection Supervisor

(1.0) d) 300 mRem

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8.8 (3.0)

List and explain the reason for the SAFETY LIMITS defined by Technical Specifications for Palo Verde.

(1.0ea)

1. DNBR (greater than or equal to 1.22): so as not to exceed DNB (clad failure).
2. Peak linear heat rate (less than or equal to 21kw/ft): High fuel centerline temperature
3. RCS pressure < 2750 psia : boundary integrity

Technical Specification bases 2.1.1

8.9 (3.0)

In accordance with the Technical Specification for Administrative Controls:

a) What is the minimum crew composition required in mode 3?

b) What is the minimum crew composition required in mode 5?

c) Which operators must be licensed?

(0.2ea) a)
1. one shift supervisor
2. one SRO
3. two RO's
4. two AO's
5. one shift technical advisor

(0.33ea) b)
1. one shift supervisor
2. one RO
3. one AO

(0.33ea) c)
1 shift supervisor
2. SRO
3. RO

Technical Specification Table 6.2-1
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8.10 (2.0)

In accordance with the Technical Specification concerning working hours:

a) What is the longest period of consecutive hours an operator may be scheduled to work?

b) What is the minimum amount of time between shifts, including turnover time?

(1.0) a) 16 hours

(1.0) b) 8 hours

Technical Specification 6.2-1
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