TOPIC: 192008
KNOWLEDGE: K1.01 [3.4/3.5]
QID: P364

Which three of the following parameters should be closely monitored and controlled during the approach to criticality?

1. Axial flux difference (axial shape index)
2. Reactor startup rate
3. Source range (neutron) count rate
4. Rod position

A. 1, 2, 3

B. 1, 2, 4

C. 1, 3, 4

D. 2, 3, 4

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.01 [3.4/3.5]
QID: P565

During a nuclear reactor startup, the first reactivity addition caused the source range count rate to increase from 20 to 40 cps. The second reactivity addition caused the count rate to increase from 40 to 160 cps.

Which one of the following statements accurately compares the two reactivity additions?

A. The first reactivity addition was larger.

B. The second reactivity addition was larger.

C. The first and second reactivity additions were equal.

D. There is not enough data given to determine the relationship of reactivity values.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.01 [3.4/3.5]
QID: P1665

During a nuclear reactor startup, the first positive reactivity addition caused the count rate to increase from 20 to 30 cps. The second positive reactivity addition caused the count rate to increase from 30 to 60 cps. Assume K_{eff} was 0.97 prior to the first reactivity addition.

Which one of the following statements describes the magnitude of the reactivity additions?

A. The first reactivity addition was approximately 50% larger than the second.

B. The second reactivity addition was approximately 50% larger than the first.

C. The first and second reactivity additions were approximately the same.

D. There is not enough information given to determine the relationship of the reactivity values.

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.02 [2.8/3.1]
QID: P3366

A nuclear power plant was operating at steady-state 100% power near the end of a fuel cycle when a reactor trip occurred. Four hours after the trip, with reactor coolant temperature at normal no-load temperature, which one of the following will cause the fission rate in the reactor core to increase?

A. The operator fully withdraws the shutdown control rods.

B. Reactor coolant temperature is allowed to increase by 3°F.

C. Reactor coolant boron concentration is increased by 10 ppm.

D. An additional two hours is allowed to pass with no other changes in plant parameters.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.02 [2.8/3.1]
QID: P3464

A nuclear power plant was operating at steady-state 100% power near the end of a fuel cycle when a reactor trip occurred. Four hours after the trip, reactor coolant temperature is being maintained at normal no-load temperature in anticipation of commencing a reactor startup.

At this time, which one of the following will cause the fission rate in the reactor core to decrease?

A. The operator fully withdraws the shutdown control rods.

B. Reactor coolant temperature is allowed to decrease by 3°F.

C. Reactor coolant boron concentration is decreased by 10 ppm.

D. An additional two hours is allowed to pass with no other changes in plant parameters.

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P65 (B266)

While withdrawing control rods during an approach to criticality, the stable count rate doubles. If the same amount of reactivity that caused the first doubling is added again, stable count rate will __________ and the reactor will be __________.

A. double; subcritical

B. more than double; subcritical

C. double; critical

D. more than double; critical

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P265

A nuclear reactor startup is in progress and the reactor is slightly subcritical. Assuming the reactor remains subcritical, a short control rod withdrawal will cause the reactor startup rate indication to increase rapidly in the positive direction, and then...

A. rapidly decrease and stabilize at a negative 1/3 dpm.

B. gradually decrease and stabilize at zero.

C. stabilize until the point of adding heat (POAH) is reached; then decrease to zero.

D. continue a rapid increase until the POAH is reached; then decrease to zero.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P1065 (B1565)

During a nuclear reactor startup, equal increments of positive reactivity are being sequentially added and the count rate is allowed to reach equilibrium after each addition. Which one of the following statements concerning the equilibrium count rate applies after each successive reactivity addition?

A. The time required to reach equilibrium count rate is the same.

B. The time required to reach equilibrium count rate is shorter.

C. The numerical change in equilibrium count rate increases.

D. The numerical change in equilibrium count rate is the same.

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P1166

Which one of the following describes the change in neutron count rate resulting from a short control rod withdrawal with K_{eff} at 0.95 as compared to an identical control rod withdrawal with K_{eff} at 0.99? (Assume reactivity additions are equal, and the reactor remains subcritical.)

A. The prompt jump in count rate will be the same, and the increase in count rate will be the same.

B. The prompt jump in count rate will be greater with K_{eff} at 0.99, but the increase in count rate will be the same.

C. The prompt jump in count rate will be the same, but the increase in count rate will be greater with K_{eff} at 0.99.

D. The prompt jump in count rate will be greater, and the increase in count rate will be greater with K_{eff} at 0.99.

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P1766

A nuclear reactor startup is in progress with the reactor currently subcritical.

Which one of the following describes the change in count rate resulting from a short control rod withdrawal with K_{eff} at 0.99 as compared to an identical control rod withdrawal with K_{eff} at 0.95? (Assume reactivity additions are equal, and the reactor remains subcritical.)

A. Both the prompt jump in count rate and the increase in stable count rate will be the same.

B. Both the prompt jump in count rate and the increase in stable count rate will be smaller with K_{eff} at 0.95.

C. The prompt jump in count rate will be smaller with K_{eff} at 0.95, but the increase in stable count rate will be the same.

D. The prompt jump in count rate will be the same, but the increase in stable count rate will be smaller with K_{eff} at 0.95.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P2466 (B2465)

A nuclear reactor startup is being performed by adding equal amounts of positive reactivity and waiting for neutron population to stabilize. As the reactor approaches criticality, the numerical change in stable neutron population after each reactivity addition __________, and the time required for the neutron population to stabilize after each reactivity addition ___________.

A. increases; remains the same

B. increases; increases

C. remains the same; remains the same

D. remains the same; increases

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P2467

A reactor startup is in progress. The reactor is slightly subcritical with a constant startup rate of 0.0 decades per minute (dpm). A short control rod insertion will cause the reactor startup rate indication to initially decrease (become negative), and then...

A. gradually become less negative and return to 0.0 dpm.

B. gradually become more negative until neutron population reaches the source range equilibrium level, and then return to 0.0 dpm.

C. stabilize until neutron population reaches the source range equilibrium level, and then return to 0.0 dpm.

D. stabilize at -1/3 dpm until fission neutrons are no longer a significant contributor to the neutron population, and then return to 0.0 dpm.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P4534

A nuclear reactor is critical in the source range during a reactor startup with a core effective delayed neutron fraction of 0.007. The operator then adds positive reactivity to establish a stable 0.5 dpm startup rate.

If the core effective delayed neutron fraction had been 0.005, what would be the approximate stable startup rate after the addition of the same amount of positive reactivity?

A. 0.6

B. 0.66

C. 0.7

D. 0.76

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P266 (B1566)

During a nuclear reactor startup, the operator adds 1.0% ΔK/K of positive reactivity by withdrawing control rods, thereby increasing equilibrium source range neutron level from 220 cps to 440 cps.

To raise equilibrium source range neutron level to 880 cps, an additional ______________ of positive reactivity must be added.

A. 4.0% ΔK/K

B. 2.0% ΔK/K

C. 1.0% ΔK/K

D. 0.5% ΔK/K

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P566

During a nuclear reactor startup, control rods are withdrawn such that 1.05% ΔK/K of reactivity is added. Before the withdrawal K_{eff} was 0.97 and count rate was 500 cps.

Which one of the following will be the approximate final steady-state count rate following the rod withdrawal?

A. 750 cps

B. 1000 cps

C. 2000 cps

D. 2250 cps

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P666

During a nuclear reactor startup, control rods are withdrawn such that K_{eff} increases from 0.98 to 0.99. If the count rate before the rod withdrawal was 500 cps, which one of the following will be the final count rate?

A. 707 cps

B. 1000 cps

C. 1500 cps

D. 2000 cps

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P1265 (B1967)

During an initial fuel load, the subcritical multiplication factor increases from 1.0 to 4.0 as the first 100 fuel assemblies are loaded. What is the corresponding final K_{eff}?

A. 0.25

B. 0.5

C. 0.75

D. 1.0

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P1770 (B1665)

Refer to the drawing of three 1/M plots labeled A, B, and C (see figure below).

The least conservative approach to criticality is represented by plot _____ and could possibly be the result of recording count rates at ________ time intervals after incremental fuel loading steps compared to the situations represented by the other plots.

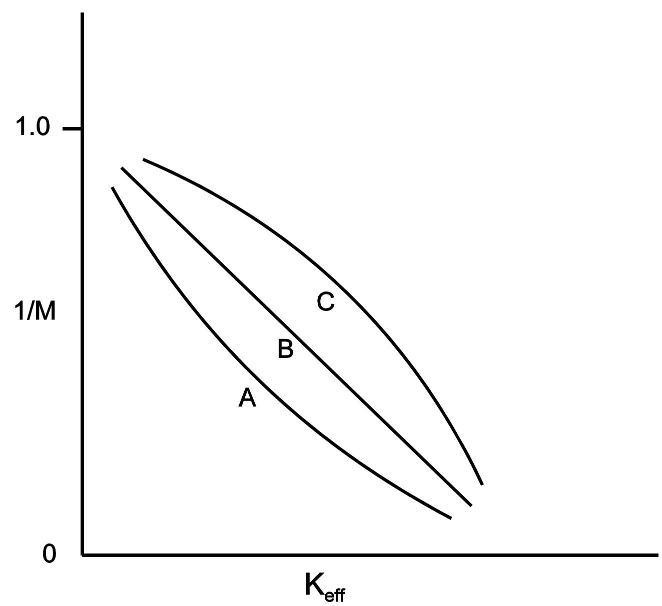
A. A; shorter

B. A; longer

C. C; shorter

D. C; longer

ANSWER: C.



1/M PLOT

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P1866 (B2266)

As a nuclear reactor approaches criticality during a reactor startup it takes longer to reach an equilibrium neutron count rate after each control rod withdrawal due to the increased...

A. length of time required to complete a neutron generation.

B. number of neutron generations required to reach a stable neutron level.

C. length of time from neutron birth to absorption.

D. fraction of delayed neutrons being produced as criticality is approached.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P1867

During a nuclear reactor startup, the first reactivity addition caused the count rate to increase from 20 to 40 cps. The second reactivity addition caused the count rate to increase from 40 to 80 cps. Assume K_{eff} was 0.92 prior to the first reactivity addition.

Which one of the following statements describes the magnitude of the reactivity additions?

A. The first reactivity addition was approximately twice as large as the second.

B. The second reactivity addition was approximately twice as large as the first.

C. The first and second reactivity additions were approximately the same.

D. There is not enough data given to determine the relationship between reactivity values.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P1972 (B1067)

At one point during a nuclear reactor startup and approach to criticality, count rate is noted to be 780 cps, and K_{eff} is calculated to be 0.92. Later in the same startup, stable count rate is 4,160 cps.

What is the new K_{eff}?

A. 0.945

B. 0.950

C. 0.975

D. 0.985

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P2265 (B366)

During a nuclear reactor startup, source range indication is stable at 100 cps, and K_{eff} is 0.95. After a number of control rods have been withdrawn, source range indication stabilizes at 270 cps. Which one of the following is the new K_{eff}? (Assume reactor startup rate is zero before and after the rod withdrawal.)

A. 0.963

B. 0.972

C. 0.981

D. 0.990

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P2366 (B2365)

A nuclear reactor startup is in progress with a current K_{eff} of 0.95 and a current stable source range count rate of 120 cps. Which one of the following stable count rates will occur when K_{eff} becomes 0.97?

A. 200 cps

B. 245 cps

C. 300 cps

D. 375 cps

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P2468 (B1766)

A nuclear reactor startup is in progress with a current K_{eff} of 0.95 and a current equilibrium source range count rate of 150 cps. Which one of the following equilibrium count rates will occur when K_{eff} becomes 0.98?

A. 210 cps

B. 245 cps

C. 300 cps

D. 375 cps

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P2766 (B2765)

During a nuclear reactor startup, source range indication is stable at 120 cps with K_{eff} at 0.95. After a period of control rod withdrawal, source range indication stabilizes at 600 cps. Which one of the following is the approximate new K_{eff}?

A. 0.96

B. 0.97

C. 0.98

D. 0.99

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P3665 (B3665)

Refer to the drawing of a 1/M plot with curves A and B (see figure below). Assume that each axis has linear units.

Curve A would result if each fuel assembly loaded during the early stages of the refueling caused a relatively ______ fractional change in source range count rate compared to the later stages of the refueling; curve B would result if each fuel assembly contained equal ________.

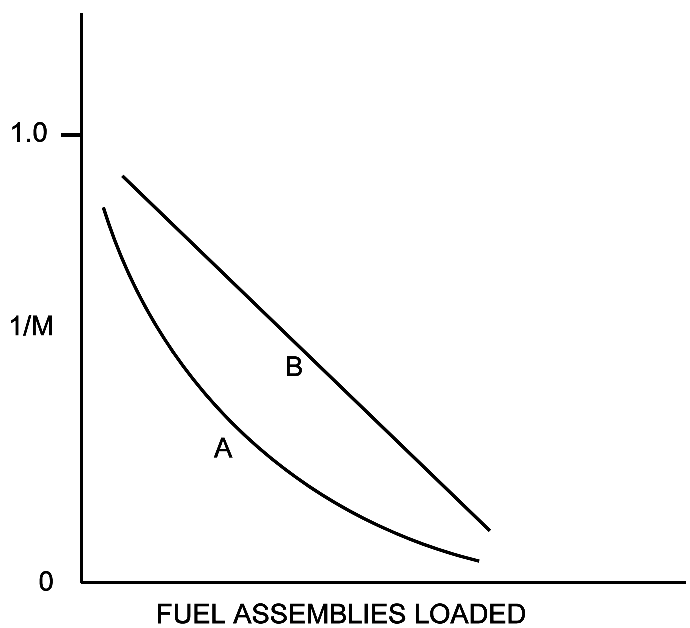
A. small; fuel enrichment

B. small; reactivity

C. large; fuel enrichment

D. large; reactivity

ANSWER: D.



TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P4734

During a nuclear reactor startup, positive reactivity addition X caused the stable source range count rate to increase from 20 to 40 cps. Later in the startup, after several other additions of positive reactivity, positive reactivity addition Y caused the stable source range count rate to increase from 320 cps to 640 cps.

Which one of the following statements describes how the magnitudes of the two positive reactivity additions (X and Y) compare?

A. Reactivity addition X was several times greater in magnitude than reactivity addition Y.

B. Reactivity addition X was several times smaller in magnitude than reactivity addition Y.

C. Reactivity additions X and Y were about equal in magnitude.

D. There is not enough information given to determine the relationship between the reactivity additions.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.05 [3.8/3.9]
QID: P66

In a nuclear reactor with a source, a constant neutron flux over a few minutes is indicative of criticality or...

A. the point of adding heat.

B. supercriticality.

C. subcriticality.

D. equilibrium subcritical count rate.

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.05 [3.8/3.9]
QID: P267

As criticality is approached during a nuclear reactor startup, equal insertions of positive reactivity will result in a ____________ absolute change in equilibrium neutron count rate and a ____________ time to reach each new equilibrium neutron flux level.

A. smaller; shorter

B. smaller; longer

C. greater; shorter

D. greater; longer

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.05 [3.8/3.9]
QID: P365 (B365)

A nuclear reactor startup is in progress with a stable source range count rate and the reactor is near criticality. Which one of the following statements describes count rate characteristics during and after a 5-second control rod withdrawal? (Assume the reactor remains subcritical.)

A. There will be no change in count rate until criticality is achieved.

B. The count rate will rapidly increase (prompt jump) to a stable higher value.

C. The count rate will rapidly increase (prompt jump) then gradually increase and stabilize at a higher value.

D. The count rate will rapidly increase (prompt jump) then gradually decrease and stabilize at the previous value.

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.05 [3.8/3.9]
QID: P3567 (B3566)

A nuclear reactor startup is in progress for a reactor that is in the middle of a fuel cycle. The reactor is at normal operating temperature and pressure. The main steam isolation valves are open and the main turbine bypass (also called steam dump) valves are closed. The reactor is near criticality.

Reactor startup rate (SUR) is stable at zero when, suddenly, a turbine bypass valve fails open and remains stuck open, dumping steam to the main condenser. The operator immediately ensures no control rod motion is occurring and takes no further action. Assume that the steam generator water levels remain stable, the reactor does not trip, and no other reactor protective actions occur.

As a result of the valve failure, SUR will initially become ____________; and reactor power will stabilize __________ the point of adding heat.

A. positive; at

B. positive; above

C. negative; at

D. negative; above

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.06 [2.9/3.1]
QID: P466

During a nuclear reactor startup as K_{eff} increases toward 1.0, the value of 1/M...

A. decreases toward zero.

B. decreases toward 1.0.

C. increases toward infinity.

D. increases toward 1.0.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.06 [2.9/3.1]
QID: P969

The following data were obtained during a nuclear reactor startup:

Control Rod Units Withdrawn	Source Range Count Rate (cps)
0	20
10	25
15	29
20	33
25	40
30	50

Assuming uniform differential rod worth, at what approximate control rod position will criticality occur?

A. 66 to 75 units withdrawn

B. 56 to 65 units withdrawn

C. 46 to 55 units withdrawn

D. 35 to 45 units withdrawn

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.06 [2.9/3.1]
QID: P1167 (B2767)

The following data were obtained during a nuclear reactor startup:

Control Rod Units Withdrawn	Source Range Count Rate (cps)
0	180
10	210
15	250
20	300
25	360
30	420

Assuming uniform differential rod worth, at what approximate control rod position will criticality occur?

A. 35 to 45 units withdrawn

B. 46 to 55 units withdrawn

C. 56 to 65 units withdrawn

D. 66 to 75 units withdrawn

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.06 [2.9/3.1]
QID: P1667 (B1567)

The following data were obtained at steady-state conditions during a nuclear reactor startup:

Control Rod Units Withdrawn	Source Range Count Rate (cps)
0	180
5	200
10	225
15	257
20	300
25	360
30	450

Assuming uniform differential rod worth, at what approximate control rod position should criticality occur?

A. Approximately 40 units withdrawn

B. Approximately 50 units withdrawn

C. Approximately 60 units withdrawn

D. Approximately 70 units withdrawn

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.06 [2.9/3.1]
QID: P1966 (B1767)

The following data were obtained at steady-state conditions during a nuclear reactor startup:

Control Rod Units Withdrawn	Source Range Count Rate (cps)
10	360
15	400
20	450
25	514
30	600
35	720
40	900

Assuming uniform differential rod worth, at what approximate control rod position will criticality occur?

A. 50 units withdrawn

B. 60 units withdrawn

C. 70 units withdrawn

D. 80 units withdrawn

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.07 [3.5/3.6]
QID: P67

Near the end of core life, critical rod position has been calculated for a nuclear reactor startup 4 hours after a trip from 100% power equilibrium conditions. The actual critical rod position will be lower than the predicted critical rod position if...

A. the startup is delayed until 8 hours after the trip.

B. the steam dump pressure setpoint is lowered by 100 psi prior to reactor startup.

C. actual boron concentration is 10 ppm higher than the assumed boron concentration.

D. one control rod remains fully inserted during the approach to criticality.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.07 [3.5/3.6]
QID: P268

To predict critical control rod position prior to commencing a nuclear reactor startup, the operator must consider the amount of reactivity added by post-shutdown changes in...

A. reactor coolant boron concentration, neutron flux level, and burnable poisons.

B. control rod positions, core xenon-135 concentration, and reactor coolant temperature.

C. neutron flux level, reactor coolant boron concentration, and control rod positions.

D. reactor coolant temperature, burnable poisons, and core xenon-135 concentration.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.07 [3.5/3.6]
QID: P367

Which one of the following is not required to determine the estimated critical boron concentration for a nuclear reactor startup to be performed 48 hours following an inadvertent reactor trip?

A. Reactor power level just prior to the trip

B. Steam generator levels just prior to the trip

C. Xenon reactivity in the core just prior to the trip

D. Samarium reactivity in the core just prior to the trip

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.07 [3.5/3.6]
QID: P467

An estimated critical rod position (ECP) has been correctly calculated for a nuclear reactor startup that is to be performed 6 hours after a trip from a 60 day full power run. Which one of the following events or conditions will result in the actual critical rod position being lower than the ECP?

A. The startup is delayed for approximately 2 hours.

B. Steam generator feedwater addition rate is reduced by 5% just prior to criticality.

C. Steam generator pressures are decreased by 100 psi just prior to criticality.

D. A new boron sample shows a current boron concentration 20 ppm higher than that used in the ECP calculation.

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.07 [3.5/3.6]
QID: P765

Which one of the following conditions will result in criticality occurring at a lower than estimated control rod position?

A. Adjusting reactor coolant system boron concentration to 50 ppm lower than assumed for startup calculations

B. A malfunction resulting in control rod speed being lower than normal speed

C. Delaying the time of startup from 10 days to 14 days following a trip from 100% power equilibrium conditions.

D. Misadjusting the steam dump (turbine bypass) controller such that steam pressure is maintained 50 psig higher than the required no-load setting.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.07 [3.5/3.6]
QID: P970

An estimated critical rod position (ECP) has been calculated for a nuclear reactor startup to be performed 15 hours after a trip from 100% power equilibrium conditions. Which one of the following conditions would cause the actual critical rod position to be <u>higher</u> than the predicted critical rod position?

A. A 90% value for reactor power was used for power defect determination in the ECP calculation.

B. Reactor criticality is achieved approximately 2 hours earlier than anticipated.

C. Steam generator pressures are decreased by 100 psi just prior to criticality.

D. Current boron concentration is 10 ppm lower than the value used in the ECP calculation.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.07 [3.5/3.6]
QID: P1266

A nuclear reactor is subcritical with a startup in progress. Which one of the following conditions will result in a critical rod position that is lower than the estimated critical rod position?

A. A malfunction resulting in control rod speed being faster than normal speed

B. A malfunction resulting in control rod speed being slower than normal speed

C. Delaying the time of startup from 3 hours to 5 hours following a trip from 100% power equilibrium conditions

D. An inadvertent dilution of reactor coolant system boron concentration

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.07 [3.5/3.6]
QID: P1365

Control rods are being withdrawn during a nuclear reactor startup at the end of core life. Which one of the following will result in reactor criticality at a rod height above the estimated critical rod position?

A. Steam generator pressure increases by 50 psia.

B. Steam generator level increases by 10%.

C. Pressurizer pressure increases by 50 psia.

D. Pressurizer level increases by 10%.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.07 [3.5/3.6]
QID: P1565

A nuclear reactor startup is in progress following a reactor trip from steady-state 100% power at the end of core life. Which one of the following conditions will result in criticality occurring at a higher than estimated critical rod position?

A. Misadjusting the steam dump (turbine bypass) controller such that steam generator pressure is maintained 50 psig higher than the required no-load setting

B. Adjusting reactor coolant system boron concentration to 50 ppm lower than assumed for startup calculations

C. A malfunction resulting in control rod speed being 10% slower than normal speed

D. Delaying the time of startup from 10 days to 14 days following the trip

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.07 [3.5/3.6]
QID: P1666

An estimated critical rod position (ECP) has been calculated for a nuclear reactor startup to be performed 15 hours after a reactor trip that ended three months operation at 100% power.

Which one of the following conditions will result in criticality occurring at a lower than estimated critical rod position?

A. Adjusting reactor coolant system boron concentration to 50 ppm higher than assumed for startup calculations

B. A malfunction resulting in control rod speed being slower than normal speed

C. Moving the time of startup from 15 hours to 12 hours following the trip

D. Using a pretrip reactor power of 90% to determine power defect

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.07 [3.5/3.6]
QID: P1765

A reactor trip has occurred from 100% reactor power and equilibrium xenon-135 conditions near the end of a fuel cycle. An estimated critical rod position (ECP) has been calculated using the following assumptions:

Criticality occurs 24 hours after trip.
Reactor coolant temperature is 550°F.
Reactor coolant boron concentration is 400 ppm.

Which one of the following will result in criticality occurring at a control rod position that is higher than the calculated ECP?

A. Decreasing reactor coolant system boron concentration to 350 ppm

B. A malfunction resulting in control rod speed being 20% higher than normal speed

C. Moving the time of criticality to 30 hours after the trip

D. Misadjusting the steam dump (turbine bypass) controller such that reactor coolant temperature is being maintained at 553°F

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.09 [3.2/3.3]
QID: P68 (B123)

With K_{eff} = 0.985, how much reactivity must be added to make a nuclear reactor <u>exactly</u> critical?

A. 1.54% ΔK/K

B. 1.52% ΔK/K

C. 1.50% ΔK/K

D. 1.48% ΔK/K

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.09 [3.2/3.3]
QID: P469

A nuclear reactor is subcritical by 1.0 %ΔK/K when the operator dilutes the reactor coolant system by 30 ppm boron. Assuming boron worth is -0.025% ΔK/K per ppm and that no other reactivity changes occur, the reactor is...

A. subcritical.

B. critical.

C. supercritical.

D. prompt critical.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.09 [3.2/3.3]
QID: P2267 (B867)

When a nuclear reactor is exactly critical, reactivity is...

A. infinity.

B. undefined.

C. 0.0 ΔK/K.

D. 1.0 ΔK/K.

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.10 [3.3/3.4]
QID: P69 (B269)

If, during a nuclear reactor startup, the startup rate is constant and positive without any further reactivity addition, then the reactor is...

A. exactly critical.

B. supercritical.

C. subcritical.

D. prompt critical.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.10 [3.3/3.4]
QID: P125

A nuclear reactor is initially critical at 10,000 cps when a steam generator atmospheric relief valve fails open. Assume end of core life conditions, no reactor trip, and no operator actions are taken.

When the reactor stabilizes, the reactor coolant average temperature (T_{ave}) will be ___________ than the initial T_{ave} and reactor power will be ________ the point of adding heat.

A. greater; at

B. greater; above

C. less; at

D. less; above

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.10 [3.3/3.4]
QID: P136

A nuclear reactor startup is being performed following a one-month shutdown period. If the reactor is taken critical and then stabilized at 10,000 cps in the source/startup range, over the next 10 minutes the count rate will...

A. remain constant.

B. decrease linearly.

C. decrease geometrically.

D. decrease exponentially.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.10 [3.3/3.4]
QID: P1870 (B2168)

A nuclear reactor startup is in progress following a one-month shutdown. Upon reaching criticality, the operator establishes a positive 80-second period and stops control rod motion.

After an additional five minutes, reactor power will be __________ and reactor period will be __________. (Assume reactor power remains below the point of adding heat.)

A. constant; constant

B. constant; increasing

C. increasing; constant

D. increasing; increasing

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.10 [3.3/3.4]
QID: P2667 (B2668)

A nuclear reactor is critical at 10^{-6}% power. Control rods are withdrawn for 5 seconds and then stopped, resulting in a stable startup rate (SUR) of positive 0.2 decades per minute (dpm).

If control rods had been inserted (instead of withdrawn) for 5 seconds with the reactor initially critical at 10^{-6}% power, the stable SUR would have been: (Assume equal absolute values of reactivity are added in both cases.)

A. faster than -0.2 dpm because, compared to reactor power increases, reactor power decreases result in smaller delayed neutron fractions.

B. faster than -0.2 dpm because, compared to reactor power increases, reactor power decreases are less limited by delayed neutrons.

C. slower than -0.2 dpm because, compared to reactor power increases, reactor power decreases result in larger delayed neutron fractions.

D. slower than -0.2 dpm because, compared to reactor power increases, reactor power decreases are more limited by delayed neutrons.

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.10 [3.3/3.4]
QID: P3467 (B3451)

A nuclear reactor core is exactly critical well below the point of adding heat during a nuclear power plant startup. A small amount of positive reactivity is then added to the core, and a stable positive startup rate (SUR) is established.

With the stable positive SUR, the following is observed:

Time	Power Level
0 sec	$3.16 \times 10^{-7}\%$
90 sec	$1.0 \times 10^{-5}\%$

Which one of the following will be the reactor power at time = 120 seconds?

A. $3.16 \times 10^{-5}\%$

B. $5.0 \times 10^{-5}\%$

C. $6.32 \times 10^{-5}\%$

D. $1.0 \times 10^{-4}\%$

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.10 [3.3/3.4]
QID: P5334 (B5334)

Given:

- Nuclear reactors A and B are identical except that reactor A has an effective delayed neutron fraction of 0.0068 and reactor B has an effective delayed neutron fraction of 0.0052.
- Reactor A has a stable period of 45 seconds and reactor B has a stable period of 42 seconds.
- Both reactors are initially operating at 1.0 x 10^{-8} percent power.

The reactor that is supercritical by the greater amount of positive reactivity is reactor _______; and the first reactor to reach 1.0 x 10^{-1} percent power will be reactor _______.

A A; A

B. A; B

C. B; A

D. B; B

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.10 [3.3/3.4]
QID: P5535 (B5534)

A nuclear reactor is currently operating in the source range with a stable period of 90 seconds. The core effective delayed neutron fraction ($\overline{\beta}_{eff}$) is 0.006. How much additional positive reactivity must be added to establish a stable period of 60 seconds?

A. 0.00026 ΔK/K

B. 0.00034 ΔK/K

C. 0.00068 ΔK/K

D. 0.00086 ΔK/K

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.11 [3.8/3.8]
QID: P868

Which one of the following indicates that a nuclear reactor has achieved criticality during a normal reactor startup?

A. Constant positive startup rate during rod withdrawal

B. Increasing positive startup rate during rod withdrawal

C. Constant positive startup rate with no rod motion

D. Increasing positive startup rate with no rod motion

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.11 [3.8/3.8]
QID: P2968 (B2966)

A nuclear reactor startup is in progress. Control rod withdrawal was stopped several minutes ago to assess criticality. Which one of the following is a combination of indications in which <u>each</u> listed indication supports a declaration that the reactor has reached criticality?

A. Startup rate is stable at 0.0 dpm; source range count rate is stable.

B. Startup rate is stable at 0.2 dpm; source range count rate is stable.

C. Startup rate is stable at 0.0 dpm; source range count rate is slowly increasing.

D. Startup rate is stable at 0.2 dpm; source range count rate is slowly increasing.

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.12 [3.5/3.6]
QID: P767

A nuclear reactor has just achieved criticality at 10^{-8}% reactor power during a reactor startup from xenon-free conditions. The operator establishes a 0.5 decade per minute startup rate to increase power. Over a period of 10 minutes, startup rate decreases to zero and then becomes increasingly negative.

Which one of the following is a possible cause for these indications?

A. Fuel depletion

B. Burnable poison burnout

C. Reactor power reaching the point of adding heat

D. Inadvertent boration of the reactor coolant system

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.12 [3.5/3.6]
QID: P1366

During a nuclear reactor startup from a xenon-free condition, and after recording critical data, the operator establishes a positive startup rate to continue increasing power. Within a few minutes, and prior to reaching the point of adding heat, reactor power stops increasing and begins to slowly decrease.

Which one of the following changes could have caused this behavior?

A. Inadvertent boration of the RCS

B. Xenon buildup in the core

C. Gradual cooling of the RCS

D. Fission-induced heating of the fuel

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.13 [3.4/3.6]
QID: P670 (B670)

After taking critical data during a nuclear reactor startup, the operator establishes a stable 1 DPM startup rate to increase power to the point of adding heat (POAH). How much negative reactivity feedback must be added at the POAH to stop the power increase?

Assume: $\overline{\beta}_{eff}$ = 0.00579
l^* = 1.0×10^{-5} seconds
λ_{eff} = 0.1 $seconds^{-1}$

A. 0.16% ΔK/K

B. 0.19% ΔK/K

C. 0.23% ΔK/K

D. 0.29% ΔK/K

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.13 [3.4/3.6]
QID: P768

The point of adding heat is defined as that power level where the nuclear reactor is producing enough heat...

A. for Doppler coefficient to produce a positive reactivity feedback.

B. for void coefficient to produce a negative reactivity feedback.

C. to cause a measurable temperature increase in the fuel and coolant.

D. to support main turbine operations.

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.13 [3.4/3.6]
QID: P2370 (B2369)

After taking critical data during a reactor startup, the operator establishes a positive 48-second reactor period to increase power to the point of adding heat (POAH). Which one of the following is the approximate amount of reactivity needed to stabilize power at the POAH? (Assume $\overline{\beta}_{eff}$ = 0.00579.)

A. -0.010% ΔK/K

B. -0.012% ΔK/K

C. -0.10% ΔK/K

D. -0.12% ΔK/K

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.13 [3.4/3.6]
QID: P2470

A nuclear reactor startup is in progress following a one-month shutdown. Upon reaching criticality, the operator establishes a stable positive 1.0 decade per minute (dpm) startup rate and stops rod motion.

After an additional 30 seconds, reactor power will be ________ and startup rate will be ________. (Assume reactor power remains below the point of adding heat.)

A. increasing; increasing

B. increasing; constant

C. constant; increasing

D. constant; constant

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.13 [3.4/3.6]
QID: P2668 (B26 71)

A nuclear reactor is critical during a xenon-free reactor startup. Reactor power is increasing in the intermediate range with a stable 0.5 dpm startup rate (SUR).

Assuming no operator action is taken that affects reactivity, SUR will remain constant until...

A. reactor coolant temperature begins to increase, then SUR will increase.

B. core xenon-135 production becomes significant, then SUR will increase.

C. delayed neutron production rate exceeds prompt neutron production rate, then SUR will decrease.

D. fuel temperature begins to increase, then SUR will decrease.

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.13 [3.4/3.6]
QID: P3068 (B3068)

After taking critical data during a nuclear reactor startup, the operator establishes a stable 0.75 dpm startup rate to increase power to the point of adding heat (POAH). Which one of the following is the approximate amount of reactivity that must be added to stabilize reactor power at the POAH? (Assume $\overline{\beta}_{eff} = 0.0066$.)

A. -0.10 %ΔK/K

B. -0.12 %ΔK/K

C. -0.15 %ΔK/K

D. -0.28 %ΔK/K

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.13 [3.4/3.6]
QID: P3935 (B3934)

After taking critical data during a reactor startup, the operator establishes a stable 0.52 dpm startup rate to increase power to the point of adding heat (POAH). Which one of the following is the approximate amount of reactivity that must be added to stabilize reactor power at the POAH? (Assume $\overline{\beta}_{eff} = 0.006$.)

A. -0.01 %ΔK/K

B. -0.06 %ΔK/K

C. -0.10 %ΔK/K

D. -0.60 %ΔK/K

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.14 [3.1/3.1]
QID: P568

During a xenon-free reactor startup, critical data was inadvertently taken two decades below the required intermediate range (IR) level. The critical data was taken again at the proper IR level with the same reactor coolant temperature and boron concentration.

The critical rod position taken at the proper IR level ________ the critical rod position taken two decades below the proper IR level.

A. cannot be compared to

B. is greater than

C. is the same as

D. is less than

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.14 [3.1/3.1]
QID: P669

During a xenon-free nuclear reactor startup, critical data were inadvertently taken one decade above the required intermediate range (IR) level. The critical data were taken again at the proper IR level with the same reactor coolant temperatures and boron concentration.

The critical rod position taken at the proper IR level is ________ the critical rod position taken one decade above the proper IR level.

A. less than

B. the same as

C. greater than

D. unrelated to

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.14 [3.1/3.1]
QID: P972 (B133)

A nuclear reactor is critical several decades below the point of adding heat (POAH) when a small amount of <u>positive</u> reactivity is added to the core. If the exact same amount of <u>negative</u> reactivity is then added to the core prior to reaching the POAH, reactor power will stabilize...

A. higher than the initial power level but below the POAH.

B. lower than the initial power level.

C. at the initial power level.

D. at the POAH.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.14 [3.1/3.1]
QID: P1267

A nuclear reactor has just achieved criticality during a xenon-free reactor startup and power is being increased to take critical data. Instead of stabilizing power at 10^{-5}% per the startup procedure, the operator inadvertently stabilizes power at 10^{-4}%.

Assuming reactor coolant system (RCS) temperature and RCS boron concentration do not change, the critical rod height at 10^{-4}% power will be __________________ the critical rod height at 10^{-5}% power. (Neglect any effects of source neutrons.)

A. less than

B. equal to

C. greater than

D. independent of

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.14 [3.1/3.1]
QID: P1268

A nuclear reactor is exactly critical two decades below the point of adding heat when -0.01% ΔK/K of reactivity is added to the core. If +0.01% ΔK/K is then added to the core 2 minutes later, reactor power will stabilize at...

A. the point of adding heat.

B. the initial power level.

C. somewhat lower than the initial power level.

D. the subcritical multiplication equilibrium level.

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.14 [3.1/3.1]
QID: P1669

A nuclear reactor is critical at 10^{-5}% power and critical data is being taken when a steam generator relief valve fails open. The reactor is at middle of core life and control rods are in manual.

Assuming no operator actions and no reactor trip, when the reactor stabilizes, average coolant temperature will be _____________ initial coolant temperature and final reactor power will be ____________ the point of adding heat.

A. equal to; greater than

B. equal to; equal to

C. less than; greater than

D. less than; equal to

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.14 [3.1/3.1]
QID: P2269

A nuclear reactor is critical at the point of adding heat (POAH) when a small amount of <u>negative</u> reactivity is added to the core. If the same amount of <u>positive</u> reactivity is added to the core approximately 5 minutes later, reactor power will...

A. increase and stabilize at the POAH.

B. quickly stabilize at a power level below the POAH.

C. continue to decrease on a negative 80 second period until the shutdown equilibrium neutron level is reached.

D. continue to decrease with an unknown period until the shutdown equilibrium neutron level is reached.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.14 [3.1/3.1]
QID: P2568 (B2568)

A nuclear reactor is currently at 10^{-3}% power with a positive 60 second reactor period. An amount of negative reactivity is added to the core that places the reactor on a negative 40 second reactor period.

If the same amount of positive reactivity is added to the core approximately 5 minutes later, reactor power will...

A. increase and stabilize at the point of adding heat.

B. increase and stabilize at 10^{-3}%.

C. continue to decrease on a negative 40 second period until the equilibrium source neutron level is reached.

D. continue to decrease with an unknown period until the equilibrium source neutron level is reached.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.14 [3.1/3.1]
QID: P3668 (B3668)

A nuclear reactor is slightly supercritical during a reactor startup. A short control rod withdrawal is performed to establish the desired startup rate. Assume that the reactor remains slightly supercritical after the control rod withdrawal, and that reactor power remains well below the point of adding heat.

Immediately after the control rod withdrawal is stopped, the reactor startup rate will initially decrease and then...

A. stabilize at a positive value.

B. turn and slowly increase.

C. stabilize at zero.

D. continue to slowly decrease.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.14 [3.1/3.1]
QID: P4033

Refer to the drawing that shows two graphs (see figure below). The axes on each graph have linear scales.

A nuclear reactor is initially critical in the source range. At time = 0 seconds, a constant rate addition of positive reactivity commences. Assume reactor power remains below the point of adding heat for the entire time interval shown.

The general response of startup rate to this event is shown on graph _____; and the general response of reactor power to this event is shown on graph _____. (Note: Either graph may be chosen once, twice, or not at all.)

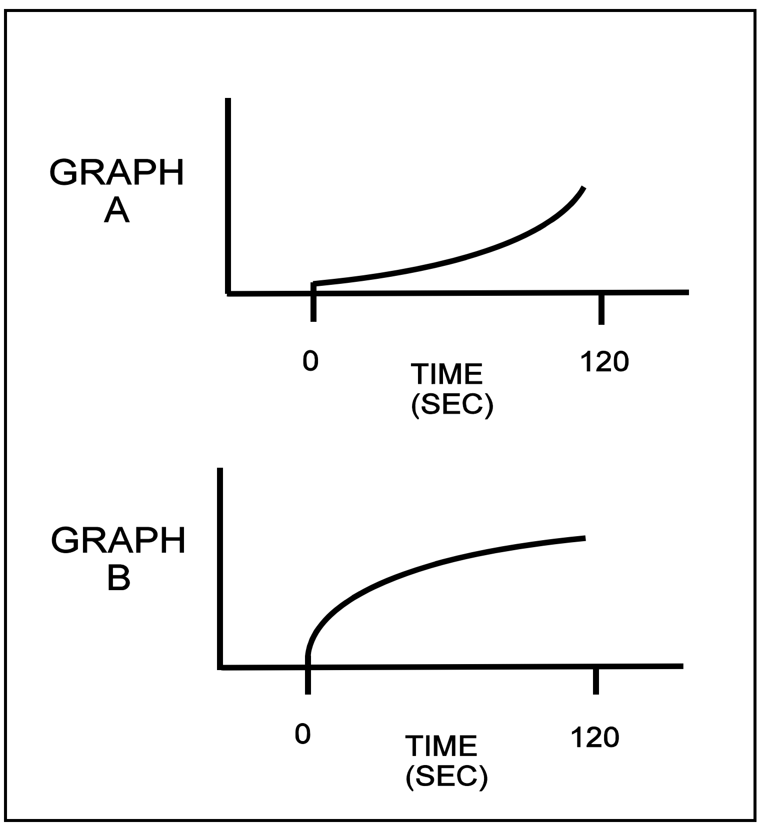
A. A; A

B. A; B

C. B; A

D. B; B

ANSWER: A.



TOPIC: 192008
KNOWLEDGE: K1.14 [3.1/3.1]
QID: P4434

Refer to the drawing that shows a graph of startup rate versus time (see figure below). Both axes have linear scales.

Which one of the following events, occurring at time = 0 seconds, would cause the reactor response shown on the graph?

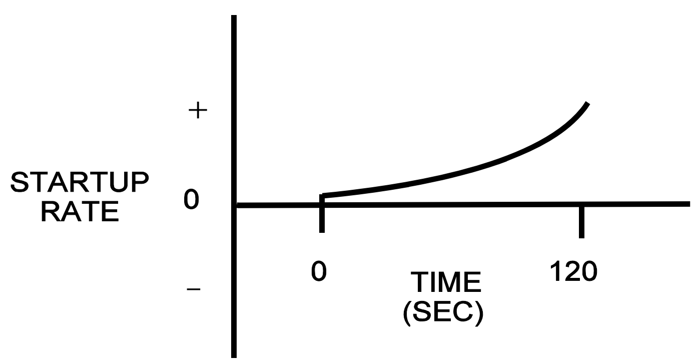
A. A step addition of positive reactivity to a reactor that is initially stable in the power range and remains in the power range for the duration of the 120-second interval shown.

B. A constant rate of positive reactivity addition to a reactor that is initially stable in the power range and remains in the power range for the duration of the 120-second interval shown.

C. A step addition of positive reactivity to a reactor that is initially critical in the source range and remains below the point of adding heat for the duration of the 120-second interval shown.

D. A constant rate of positive reactivity addition to a reactor that is initially critical in the source range and remains below the point of adding heat for the duration of the 120-second interval shown.

ANSWER: D.



TOPIC: 192008
KNOWLEDGE: K1.14 [3.1/3.1]
QID: P4636

During a reactor startup, source range count rate is observed to double every 30 seconds. Which one of the following is the approximate startup rate in decades per minute (dpm)?

A. 0.6 dpm

B. 0.9 dpm

C. 1.4 dpm

D. 2.0 dpm

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.15 [3.4/3.4]
QID: P569

A nuclear reactor is critical below the point of adding heat (POAH). The operator adds enough reactivity to attain a startup rate of 0.5 decades per minute. Which one of the following will decrease first when the reactor reaches the POAH?

A. Pressurizer level

B. Reactor coolant temperature

C. Reactor power

D. Startup rate

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.17 [3.3/3.4]
QID: P70

Given a critical nuclear reactor operating below the point of adding heat (POAH), what reactivity effects are associated with reaching the POAH?

A. There are no reactivity effects because the reactor is critical.

B. The increase in fuel temperature will begin to create a positive reactivity effect.

C. The decrease in fuel temperature will begin to create a negative reactivity effect.

D. The increase in fuel temperature will begin to create a negative reactivity effect.

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.17 [3.3/3.4]
QID: P471

A nuclear reactor is operating just above the point of adding heat. To raise reactor power to a higher stable power level, the operator must increase...

A. steam generator levels.

B. steam demand.

C. T_{ave}.

D. reactor coolant system boron concentration.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.17 [3.3/3.4]
QID: P1070

A nuclear reactor is critical at a stable power level below the point of adding heat (POAH) when a small amount of positive reactivity is added. Which one of the following reactivity coefficient(s) will stabilize reactor power at the POAH?

A. Moderator temperature only

B. Fuel temperature only

C. Moderator temperature and fuel temperature

D. Fuel temperature and voids

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.17 [3.3/3.4]
QID: P1172

A nuclear reactor near the end of core life is at 5×10^{-2}% power with a 0.3 DPM startup rate. With no operator action, what will be the approximate reactor power 10 minutes later? (Assume no protective system actuation.)

A. 100%

B. 50%

C. 10%

D. 1% (point of adding heat)

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.17 [3.3/3.4]
QID: P1367

A nuclear reactor startup is in progress near the end of a fuel cycle. Reactor power is 5 x 10^{-3}% and increasing slowly with a stable 0.3 dpm startup rate. Assuming no operator action, no reactor trip, and no steam release, what will reactor power be after 10 minutes?

A. Below the point of adding heat (POAH).

B. At the POAH.

C. Above the POAH but less than 50%.

D. Greater than 50%.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.17 [3.3/3.4]
QID: P1465

A nuclear reactor required 3 hours to increase power from 70% to 100% at the end of core life using only reactor coolant system (RCS) boron dilution at the maximum rate to control RCS temperature.

Following a refueling, the same power change performed under the same conditions will require a _____________ period of time because the rate at which RCS boron concentration can be decreased is _____________ at the beginning at core life.

A. longer; lower

B. shorter; lower

C. longer; higher

D. shorter; higher

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.17 [3.3/3.4]
QID: P1470 (B1371)

With a nuclear reactor on a constant period, which one of the following power changes requires the longest time to occur?

A. 1% power to 4% power

B. 5% power to 15% power

C. 20% power to 35% power

D. 40% power to 60% power

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.17 [3.3/3.4]
QID: P1567 (B1570)

With a nuclear reactor on a constant period of 30 minutes, which one of the following power changes requires the least time to occur?

A. 1% power to 6% power

B. 10% power to 20% power

C. 20% power to 35% power

D. 40% power to 60% power

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.17 [3.3/3.4]
QID: P2069 (B2072)

With a nuclear reactor on a constant period of 180 seconds, which one of the following power changes requires the longest amount of time to occur?

A. 3% power to 5% power

B. 5% power to 15% power

C. 15% power to 30% power

D. 30% power to 60% power

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.17 [3.3/3.4]
QID: P2168

A nuclear reactor is stable at the point of adding heat (POAH) with the average reactor coolant temperature at 550°F during a startup. Control rods are then withdrawn a few inches to increase steam generator steaming rate.

When the reactor stabilizes, reactor power will be _________ the POAH, and average reactor coolant temperature will be _________ 550°F.

A. greater than; equal to

B. greater than; greater than

C. equal to; equal to

D. equal to; greater than

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.17 [3.3/3.4]
QID: P2770 (B2770)

With a nuclear reactor on a constant period of 180 seconds, which one of the following power changes requires the shortest amount of time to occur?

A. 3% power to 5% power

B. 5% power to 15% power

C. 15% power to 30% power

D. 30% power to 60% power

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.18 [3.6/3.5]
QID: P270

A nuclear power plant is operating at equilibrium 50% of rated power level. Control rods are manually withdrawn for 5 seconds. Which one of the following plant parameter changes will be observed when the plant stabilizes?

A. Reactor coolant temperature will be higher.

B. Reactor coolant system pressure will be lower.

C. Reactor power will be higher.

D. Pressurizer level will be lower.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.18 [3.6/3.5]
QID: P869

A nuclear power plant is operating at 100% power near the end of a fuel cycle with all control systems in manual. The reactor operator inadvertently adds 100 gallons of boric acid (4% by weight) to the reactor coolant system (RCS).

Which one of the following will occur as a result of the boric acid addition? (Assume a constant main generator output.)

A. Pressurizer level will decrease and stabilize at a lower value.

B. RCS pressure will increase and stabilize at a higher value.

C. Reactor power will decrease and stabilize at a lower value.

D. Average RCS temperature will increase and stabilize at a higher value.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.18 [3.6/3.5]
QID: P1071

A nuclear power plant was operating with the following steady-state initial conditions:

Power level	= 100%
Coolant boron	= 620 ppm
Coolant temperature	= 587°F

After a load decrease, steady-state conditions were as follows:

Power level	= 80%
Coolant boron	= 650 ppm
Coolant temperature	= 577°F

Given the following, how much reactivity was added by control rod movement during the load decrease? (Disregard any fission product poison reactivity change.)

Differential boron worth	= -1.0×10^{-2}% ΔK/K/ppm
Total power coefficient	= -1.5×10^{-2}% ΔK/K/%
Moderator temperature coefficient	= -2.0×10^{-2}% ΔK/K/°F

A. -0.0% ΔK/K

B. -0.2% ΔK/K

C. -0.6% ΔK/K

D. -0.8% ΔK/K

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.18 [3.6/3.5]
QID: P1871

A nuclear power plant is operating with the following stable initial conditions:

Power level	= 100%
Coolant boron	= 630 ppm
Coolant temperature	= 582°F

After a load decrease, stable conditions are as follows:

Power level	= 80%
Coolant boron	= 640 ppm
Coolant temperature	= 577°F

Given the following values, how much reactivity was added by control rod movement during the load decrease? (Assume fission product poison reactivity does not change.)

Total power coefficient	= $-1.5 \times 10^{-2}\%$ Δk/k/%
Moderator temperature coefficient	= $-2.0 \times 10^{-2}\%$ Δk/k/°F
Differential boron worth	= $-1.5 \times 10^{-2}\%$ Δk/k/ppm

A. +0.15% Δk/k

B. +0.25% Δk/k

C. -0.15% Δk/k

D. -0.25% Δk/k

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.18 [3.6/3.5]
QID: P1968

A nuclear power plant is operating with the following initial conditions:

Power level	= 80%
Coolant boron	= 630 ppm
Coolant temperature	= 582°F

After a normal load decrease, conditions are as follows:

Power level	= 50%
Coolant boron	= 650 ppm
Coolant temperature	= 572°F

Given the following values, how much reactivity was added by control rod movement during the load decrease? (Assume fission product poison reactivity does not change.)

Total power coefficient	= -1.5×10^{-2}% ΔK/K/%
Moderator temperature coefficient	= -2.0×10^{-2}% ΔK/K/°F
Differential boron worth	= -1.5×10^{-2}% ΔK/K/ppm

A. -0.5% ΔK/K

B. -0.15% ΔK/K

C. -0.25% ΔK/K

D. -0.35% ΔK/K

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.18 [3.6/3.5]
QID: P2070

A nuclear power plant is operating with the following initial conditions:

Power level	= 100%
Coolant boron	= 620 ppm
Average coolant temperature	= 587°F

After a load decrease, conditions are as follows:

Power level	= 80%
Coolant boron	= 630 ppm
Average coolant temperature	= 577°F

Given the following values, how much reactivity was added by control rod movement during the load decrease? (Assume fission product poison reactivity does not change.)

Total power coefficient	= -1.5×10^{-2}% ΔK/K/%
Moderator temperature coefficient	= -2.0×10^{-2}% ΔK/K/°F
Differential boron worth	= -1.0×10^{-2}% ΔK/K/ppm

A. -0.2% ΔK/K

B. +0.2% ΔK/K

C. -0.4% ΔK/K

D. +0.4% ΔK/K

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.18 [3.6/3.5]
QID: P3269

One week after a refueling outage, a nuclear power plant is operating at 80% of rated power with control rods fully withdrawn. During the outage, the entire core was replaced by new fuel assemblies and new burnable poison assemblies were installed at various locations in the core.

Assume reactor power and control rod position do not change. If no operator action is taken, how and why will reactor coolant average temperature change during the next week?

A. Decrease slowly due to fuel burnup only.

B. Decrease slowly due to fuel burnup and fission product poison buildup.

C. Increase slowly due to burnable poison burnout only.

D. Increase slowly due to burnable poison burnout and fission product poison decay.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.19 [3.5/3.6]
QID: P570

How do the following parameters change during a normal ramp of reactor power from 15% to 75%?

	Main Turbine First Stage Pressure	Reactor Coolant System Boron Concentration
A.	Increases	Decreases
B.	Decreases	Decreases
C.	Increases	Increases
D.	Decreases	Increases

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.19 [3.5/3.6]
QID: P1672 (B1671)

A refueling outage has just been completed in which one-third of the core was replaced with new fuel assemblies. A reactor startup has been performed to mark the beginning of the sixth fuel cycle and reactor power is being increased to 100%.

Which one of the following pairs of reactor fuels will be providing the greatest contribution to core heat production when the reactor reaches 100% power?

A. U-235 and U-238

B. U-238 and Pu-239

C. U-235 and Pu-239

D. U-235 and Pu-241

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.19 [3.5/3.6]
QID: P2272

A nuclear power plant is operating at 100% power near the end of core life. The greatest contribution to core heat production is being provided by the fission of...

A. U-235 and U-238.

B. U-235 and Pu-239.

C. U-238 and Pu-239.

D. U-238 and Pu-241.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.19 [3.5/3.6]
QID: P2868

A refueling outage has just been completed in which the entire core was offloaded and replaced with new fuel. A reactor startup has been performed and power is being increased to 100%.

Which one of the following pairs of reactor fuels will be providing the greatest contribution to core heat production when the reactor reaches 100% power?

A. U-235 and U-238

B. U-238 and Pu-239

C. U-235 and Pu-239

D. U-235 and Pu-241

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.20 [3.8/3.9]
QID: P271

A nuclear reactor is critical at 2×10^{-8}% power. The operator withdraws rods as necessary to immediately establish and maintain a 0.10 Dpm startup rate. How long will it take for the reactor to reach 7×10^{-8}% power?

A. 2.4 minutes

B. 5.4 minutes

C. 7.4 minutes

D. 10.4 minutes

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.20 [3.8/3.9]
QID: P571

A nuclear reactor startup is in progress and criticality has just been achieved. After recording critical rod height, the operator withdraws control rods for 20 seconds to establish a stable positive 0.5 dpm startup rate. One minute later (prior to the point of adding heat) the operator inserts the same control rods for 25 seconds. (Assume the positive and negative reactivity insertion rates are the same.)

During the control rod insertion, the startup rate will become...

A. negative during the entire period of control rod insertion.

B. negative shortly after the control rods pass through the critical rod height.

C. negative just as the control rods pass through the critical rod height.

D. negative shortly before the control rods pass through the critical rod height.

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.20 [3.8/3.9]
QID: P2869

A nuclear reactor is critical at 3×10^{-8}% power. The operator withdraws rods as necessary to immediately establish and maintain a stable, positive 0.10 Dpm startup rate. How long will it take for the reactor to reach 7×10^{-8}% power?

A. 3.7 minutes

B. 5.4 minutes

C. 6.7 minutes

D. 8.4 minutes

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.20 [3.8/3.9]
QID: P2970

A nuclear reactor startup is in progress and criticality has just been achieved. After recording the critical rod heights, the operator withdraws a control rod for 20 seconds to establish a stable 0.5 dpm startup rate (SUR). One minute later (prior to reaching the point of adding heat), the operator inserts the same control rod for 25 seconds.

During the insertion, when will the SUR become negative?

A. Immediately when the control rod insertion is initiated.

B. After the control rod passes through the critical rod height.

C. Just as the control rod passes through the critical rod height.

D. Prior to the control rod passing through the critical rod height.

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.21 [3.6/3.8]
QID: P272

A nuclear power plant has been operating at 75% of rated power for several weeks. A partial steam line break occurs and 3% total steam flow is escaping. Assuming no operator or automatic actions, stable reactor power will __________ and stable reactor coolant temperature will __________.

A. increase; increase

B. not change; increase

C. increase; decrease

D. not change; decrease

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.21 [3.6/3.8]
QID: P368

A nuclear reactor is critical at a stable power level below the point of adding heat (POAH). An unisolable steam line break occurs and 3% of rated steam flow is escaping.

Assuming no reactor trip, which one of the following describes the response of the reactor? (Assume a negative moderator temperature coefficient.)

A. T_{ave} will decrease. The reactor will go subcritical.

B. T_{ave} will remain the same. The reactor will go to 3% power.

C. T_{ave} will decrease. The reactor will go to 3% power.

D. T_{ave} will decrease. Power will not change because the reactor was below the POAH.

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.21 [3.6/3.8]
QID: P1370

A nuclear power plant has been operating at 80% of rated power for several weeks. A partial steam line break occurs and 2% total steam flow is escaping. Turbine load and control rod position remain the same.

Assuming no operator or automatic actions, when the plant stabilizes, reactor power will be ____________ and average reactor coolant temperature will be ____________.

A. higher; higher

B. unchanged; higher

C. higher; lower

D. unchanged; lower

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.21 [3.6/3.8]
QID: P1570

A nuclear power plant is operating at 85% of rated power and 580°F average reactor coolant temperature (T_{ave}) at the end of core life. A failure of the turbine control system opens the turbine control valves to admit 10% more steam flow to the main turbine. No operator actions occur and no protective system actuations occur. Rod control is in manual.

Following the transient, reactor power will stabilize ____________ 85% and T_{ave} will stabilize ____________ 580°F.

A. above; above

B. above; below

C. below; above

D. below; below

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.21 [3.6/3.8]
QID: P2372

A nuclear power plant is operating at 90% of rated power at the end of core life with manual rod control when a turbine control system malfunction opens the turbine control valves an additional 5 percent. Reactor power will initially...

A. increase because the rate of neutron absorption in the moderator initially decreases.

B. increase because the rate of neutron absorption at U-238 resonant energies initially decreases.

C. decrease because the rate of neutron absorption in the moderator initially increases.

D. decrease because the rate of neutron absorption at U-238 resonant energies initially increases.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.21 [3.6/3.8]
QID: P2671

A nuclear power plant is operating at 100% power near the end of core life when the main turbine trips. If the reactor does not immediately trip, which one of the following will act first to change reactor power?

A. Positive reactivity addition from the Doppler coefficient will cause reactor power to initially increase.

B. Positive reactivity addition from the moderator temperature coefficient will cause reactor power to initially increase.

C. Negative reactivity addition from the Doppler coefficient will cause reactor power to initially decrease.

D. Negative reactivity addition from the moderator temperature coefficient will cause reactor power to initially decrease.

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.21 [3.6/3.8]
QID: P2771

A nuclear power plant is operating at 80% of rated power and 580°F average reactor coolant temperature (T_{ave}) at the end of core life with manual rod control. A turbine control system malfunction partially closes the turbine control valves resulting in 5% less steam flow to the main turbine. No operator actions occur and no protective system actuations occur.

Following the transient, reactor power will stabilize ____________ 80% and T_{ave} will stabilize ____________ 580°F.

A. at; above

B. at; below

C. below; above

D. below; below

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.21 [3.6/3.8]
QID: P3171 (B3169)

A nuclear power plant is operating at 60% of rated power in the middle of a fuel cycle with manual rod control when a turbine control system malfunction closes the turbine steam inlet valves an additional 5 percent. Which one of the following is responsible for the initial reactor power decrease?

A. The rate of neutron absorption by core Xe-135 initially increases.

B. The rate of neutron absorption in the moderator initially increases.

C. The rate of neutron absorption at U-238 resonance energies initially increases.

D. The rate of neutron absorption by the boron in the reactor coolant initially increases.

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.21 [3.6/3.8]
QID: P3484

A multi-loop nuclear power plant is operating at 50% power with manual rod control when the main steam isolation valve (MSIV) for one steam generator inadvertently closes. Assume that <u>no</u> reactor trip or other protective action occurs, and <u>no</u> operator action is taken.

Immediately after the MSIV closure, the cold leg temperature (Tc) in the reactor coolant loop with the <u>closed</u> MSIV will ___________; and the Tc in a loop with an <u>open</u> MSIV will immediately ____________.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.21 [3.6/3.8]
QID: P4035

A nuclear power plant is operating at 60% of rated power in the middle of a fuel cycle with manual rod control when a turbine control system malfunction opens the turbine steam inlet valves an additional 5 percent. Which one of the following is responsible for the initial reactor power increase?

A. The rate of neutron absorption by core Xe-135 initially decreases.

B. The rate of neutron absorption in the moderator initially decreases.

C. The rate of neutron absorption at U-238 resonance energies initially decreases.

D. The rate of neutron absorption by the boron in the reactor coolant initially decreases.

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.21 [3.6/3.8]
QID: P4735

A nuclear power plant is initially operating at steady-state 100% reactor power with the main generator producing 1,100 MW. A power grid disturbance occurs and appropriate operator actions are taken. The plant is stabilized with the following current conditions:

- Main generator output is 385 MW.
- Steam dump/bypass system is discharging 15% of rated steam flow to the main condenser.
- All reactor coolant system parameters are in their normal ranges.

What is the approximate current reactor power level?

A. 15%

B. 35%

C. 50%

D. 65%

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.22 [2.6/3.8]
QID: P72

The major reason boron is used in a nuclear reactor is to permit...

A. a reduction in the shutdown margin.

B. an increase in the amount of control rods installed.

C. an increase in core life.

D. a reduction in the effect of resonance capture.

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.22 [2.6/3.8]
QID: P671

The use of boron as a burnable poison in a nuclear reactor core...

A. increases the amount of fuel required to produce the same amount of heat.

B. allows the plant to operate longer on a smaller amount of fuel.

C. allows more fuel to be loaded and prolongs core life.

D. absorbs neutrons that would otherwise be lost from the core.

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.22 [2.6/3.8]
QID: P1072

A high boron concentration is necessary at the beginning of core life to...

A. compensate for excess reactivity in the fuel.

B. ensure a negative moderator temperature coefficient exists.

C. flatten the axial and radial neutron flux distributions.

D. maximize control rod worth until fission product poisons accumulate.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.22 [2.6/3.8]
QID: P2570

During a core refueling, fuel assemblies with higher enrichments of U-235 were installed to prolong the fuel cycle from 12 months to 16 months. What is a possible consequence of offsetting all the excess positive reactivity of the new fuel with a higher concentration of boron in the reactor coolant?

A. Boron will precipitate out of the reactor coolant during a cooldown.

B. An RCS temperature decrease will result in a negative reactivity addition.

C. Power changes requiring dilution of RCS boron will take longer.

D. The differential boron worth will become positive.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P71 (B72)

Shortly after a reactor trip, reactor power indicates 0.5% where a stable negative startup rate is attained. Reactor power will be reduced to 0.05% in approximately _______________ seconds.

A. 90

B. 180

C. 270

D. 360

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P572 (B2272)

A nuclear power plant has been operating at 100% power for several weeks when a reactor trip occurs. How much time will be required for core heat production to decrease to 1% following the trip?

A. 1 to 8 days

B. 1 to 8 hours

C. 1 to 8 minutes

D. 1 to 8 seconds

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P770 (B771)

Which one of the following is responsible for the negative 80-second stable reactor period experienced shortly after a reactor scram/trip?

A. The longest-lived fission product poisons

B. The shortest-lived fission product poisons

C. The longest-lived delayed neutron precursors

D. The shortest-lived delayed neutron precursors

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P1965 (B1369)

Shortly after a reactor trip, when reactor power indicates 10^{-3}%, a stable negative period is attained. Reactor power will decrease to 10^{-4}% in approximately ______________ seconds.

A. 380

B. 280

C. 180

D. 80

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P2171 (B1770)

Following a reactor trip, reactor power indicates 0.1% when the typical stable post-trip reactor period is observed. Which one of the following is the approximate time required for reactor power to decrease to 0.05%?

A. 24 seconds

B. 55 seconds

C. 173 seconds

D. 240 seconds

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P2672 (B131)

Which one of the following approximates the decay heat produced in a nuclear reactor at 1 second and at 1 hour, respectively, following a reactor trip from extended operation at 100% power?

	ONE SECOND	ONE HOUR
A.	15.0%	1.0%
B.	7.0%	1.0%
C.	1.0%	0.1%
D.	0.5%	0.1%

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P2768 (B2769)

Nuclear reactors A and B are identical and have been operated at 100% power for six months when a reactor trip occurs simultaneously on both reactors. All reactor A control rods fully insert. One reactor B control rod sticks fully withdrawn.

Which reactor, if any, will have the longest reactor period five minutes after the trip?

A. Reactor A due to the greater shutdown reactivity.

B. Reactor B due to the smaller shutdown reactivity.

C. Both reactors will have the same reactor period because, after five minutes, both reactors will be stable at a power level low in the source range.

D. Both reactors will have the same reactor period because, after five minutes, only the longest-lived delayed neutron precursors will be releasing fission neutrons.

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P2969

Nuclear reactors A and B are identical and have been operated at 100% power for six months when a reactor trip occurs simultaneously on both reactors. All reactor A control rods fully insert. One reactor B control rod sticks fully withdrawn.

Which reactor, if any, will have the longer reactor period five minutes after the trip?

A. Reactor A because its delayed neutron fraction will be smaller.

B. Reactor B because its delayed neutron fraction will be larger.

C. Both reactors will have the same reactor period because, after five minutes, both reactors will be stable at a power level low in the source range.

D. Both reactors will have the same reactor period because, after five minutes, only the longest-lived delayed neutron precursors will be releasing fission neutrons.

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P3271 (B3271)

Nuclear reactors A and B are identical and have been operated at 100% power for six months when a reactor trip occurs simultaneously on both reactors. All reactor A control rods fully insert. One reactor B control rod sticks fully withdrawn.

After five minutes, when compared to reactor B, the core fission rate in reactor A will be _____________, and the reactor period in reactor A will be ______________.

A. the same; shorter

B. the same; the same

C. lower; shorter

D. lower; the same

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P3468 (B3472)

A nuclear reactor is critical just below the point of adding heat when an inadvertent reactor trip occurs. All control rods fully insert except for one rod, which remains fully withdrawn. Five minutes after the reactor trip, with reactor startup rate (SUR) stable at approximately -1/3 dpm, the remaining withdrawn control rod suddenly drops (fully inserts).

Which one of the following describes the reactor response to the drop of the last control rod?

A. SUR will remain stable at approximately -1/3 dpm.

B. SUR will immediately become more negative, and then return to and stabilize at approximately -1/3 dpm.

C. SUR will immediately become more negative, and then turn and stabilize at a value more negative than -1/3 dpm.

D. SUR will immediately become more negative, and then turn and stabilize at a value less negative than -1/3 dpm.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.24 [3.5/3.6]
QID: P672 (B1969)

A nuclear reactor is exactly critical below the point of adding heat when a single control rod fully inserts into the core. Assuming no operator or automatic action, reactor power will slowly decrease to...

A. zero.

B. an equilibrium value equal to the source neutron strength.

C. an equilibrium value greater than the source neutron strength.

D. a slightly lower value, then slowly return to the initial value.

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.24 [3.5/3.6]
QID: P1472

A nuclear reactor is exactly critical just below the point of adding heat when a single control rod drops into the core. Assuming no operator or automatic actions occur, when the plant stabilizes, reactor power will be __________ and average reactor coolant temperature will be __________.

A. the same; the same

B. the same; lower

C. lower; the same

D. lower; lower

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.24 [3.5/3.6]
QID: P5136

A nuclear reactor is initially critical in the source range during a reactor startup when the control rods are inserted a small amount. Reactor startup rate stabilizes at -0.15 dpm. Assuming startup rate remains constant, how long will it take for source range count rate to decrease by one-half?

A. 0.3 minutes

B. 2.0 minutes

C. 3.3 minutes

D. 5.0 minutes

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.25 [2.9/3.1]
QID: P772

Which one of the following is the reason for inserting control rods in a predetermined sequence during a normal reactor shutdown?

A. To prevent uneven fuel burnup

B. To prevent an excessive reactor coolant system cooldown rate

C. To prevent abnormally high local power peaks

D. To prevent divergent xenon oscillations

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.25 [2.9/3.1]
QID: P2971

Which one of the following describes the process for inserting control rods during a normal reactor shutdown?

A. Control rods are inserted in reverse order one bank at a time to maintain acceptable power distribution.

B. Control rods are inserted in reverse order one bank at a time to maintain a rapid shutdown capability from the remainder of the control rods.

C. Control rods are inserted in reverse order in a bank overlapping sequence to maintain a relatively constant differential control rod worth.

D. Control rods are inserted in reverse order in a bank overlapping sequence to limit the amount of positive reactivity added during a rod ejection accident.

ANSWER: C.

TOPIC: 192008
KNOWLEDGE: K1.26 [3.1/3.2]
QID: P369

A nuclear reactor was shut down one week ago following several months of operation at 100% power. Reactor coolant is being maintained at 500°F and all reactor coolant pumps are operating.

The principle source of heat input to the reactor coolant is from...

A. reactor coolant pumps.

B. subcritical thermal fission of U-235 and Pu-239.

C. subcritical fast fission of U-238.

D. fission product decay.

ANSWER: A.

TOPIC: 192008
KNOWLEDGE: K1.26 [3.1/3.2]
QID: P370 (B372)

After one month of operation at 100% reactor power, the fraction of thermal power being produced from the decay of fission products in the operating nuclear reactor is...

A. greater than 10%.

B. greater than 5% but less than 10%.

C. greater than 1% but less than 5%.

D. less than 1%.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.27 [3.1/3.4]
QID: P132

The magnitude of decay heat generation is determined primarily by...

A. core burnup.

B. power history.

C. final power at shutdown.

D. control rod worth at shutdown.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.27 [3.1/3.4]
QID: P1272 (B1372)

Following a reactor shutdown from three-months operation at full power, core heat production will continue for a period of time. The rate of core heat production will be dependent upon the...

A. amount of fuel that has been depleted.

B. amount of time that has elapsed since K_{eff} decreased below 1.0.

C. amount of time required for the reactor pressure vessel to cool down.

D. rate at which the photoneutron source strength decays following shutdown.

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.27 [3.1/3.4]
QID: P1372

A nuclear power plant had been operating at 100% power for six months when a steam line rupture occurred that resulted in a reactor trip and all steam generators (S/Gs) blowing down (emptying) after approximately 1 hour. The S/G blowdown caused reactor coolant system (RCS) temperature to decrease to 400°F at which time an RCS heatup began.

Given the following information, what was be the average RCS heatup rate during the 5 minutes immediately after all S/Gs became empty?

Reactor rated thermal power:	3,400 MWt
Decay heat:	1.0% rated thermal power
Reactor coolant pumps heat input to the RCS:	15 MWt
RCS total heat loss:	Negligible
RCS c_p:	1.1 Btu/lbm-°F
RCS inventory (less pressurizer):	475,000 lbm

A. 8 to 15°F/hour

B. 50 to 75°F/hour

C. 100 to 150°F/hour

D. 300 to 350°F/hour

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.27 [3.1/3.4]
QID: P2572

A nuclear power plant had been operating at 100% power for six months when a steam line rupture occurred that resulted in a reactor trip and all steam generators (S/Gs) blowing down (emptying) after approximately 1 hour. The S/G blowdown caused reactor coolant system (RCS) temperature to decrease to 400°F.

Given the following information, what was be the average RCS heatup rate during the 5 minutes immediately after all S/Gs became empty?

Reactor rated thermal power:	2,400 MWt
Decay heat:	1.0% rated thermal power
Reactor coolant pumps heat input to the RCS:	13 MWt
RCS total heat loss:	2.4 MWt
RCS c_p:	1.1 Btu/lbm-°F
RCS inventory (less pressurizer):	325,000 lbm

A. 8 to 15°F/hour

B. 25 to 50°F/hour

C. 80 to 150°F/hour

D. 300 to 400°F/hour

ANSWER: D.

TOPIC: 192008
KNOWLEDGE: K1.27 [3.1/3.4]
QID: P2872 (B2872)

A nuclear reactor has been shutdown for several weeks when a loss of all ac power results in a loss of forced decay heat removal flow.

Given the following information, what will be the average reactor coolant heatup rate during the 20 minutes immediately after decay heat removal flow is lost? Assume that only ambient losses are removing heat from the reactor coolant system (RCS).

Reactor rated thermal power:	2,800 MWt
Decay heat rate:	0.2% rated thermal power
RCS ambient heat loss rate:	2.4 MWt
RCS c_p:	1.1 Btu/lbm-°F
RCS inventory (less pressurizer):	325,000 lbm

A. Less than 25°F/hour

B. 26 to 50°F/hour

C. 51 to 75°F/hour

D. More than 76°F/hour

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.27 [3.1/3.4]
QID: P2972 (B2972)

A nuclear power plant has been operating for one hour at 50% of rated power following six months of operation at steady-state 100% power. What percentage of rated thermal power is currently being generated by reactor decay heat?

A. 1% to 2%

B. 3% to 5%

C. 6% to 8%

D. 9% to 11%

ANSWER: B.

TOPIC: 192008
KNOWLEDGE: K1.27 [3.1/3.4]
QID: P4336 (B4336)

A nuclear power plant has been operating at rated power for six months when a reactor trip occurs. Which one of the following describes the source(s) of core heat generation 30 minutes after the reactor trip?

A. Fission product decay is the only significant source of core heat generation.

B. Delayed neutron-induced fission is the only significant source of core heat generation.

C. Fission product decay and delayed neutron-induced fission are both significant sources and produce approximately equal rates of core heat generation.

D. Fission product decay and delayed neutron-induced fission are both insignificant sources and generate core heat at rates that are less than the rate of ambient heat loss from the core.

ANSWER: A.