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

During a reactor startup, the first reactivity addition caused the stable source range count rate to increase from 20 cps to 40 cps. The second reactivity addition caused the stable count rate to increase from 40 cps 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 <u>not</u> enough information given to compare the reactivity values.

[redacted]

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

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

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

A. The first and second reactivity additions were approximately equal.

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

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

D. There is not enough information given to compare the reactivity values.

[redacted]

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

A nuclear power plant was operating at steady-state 100 percent 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 one bank/group of control rods.

B. Reactor coolant temperature increases by 3°F.

C. Reactor coolant boron concentration increases by 10 ppm.

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

[redacted]

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

A nuclear power plant was operating at steady-state 100 percent power near the end of a fuel cycle when a reactor trip occurred. Four hours after the trip, reactor coolant temperature is currently 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 one bank/group of control rods.

B. Reactor coolant temperature decreases by 3°F.

C. Reactor coolant boron concentration decreases by 10 ppm.

D. An additional 2 hours is allowed to pass with no other changes in plant parameters.

[redacted]

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

While withdrawing control rods during a reactor startup, the stable source range count rate doubled. If the same amount of reactivity that caused the first doubling is added again, the stable count rate will __________; and the reactor will be __________.

A. more than double; subcritical

B. more than double; critical

C. double; subcritical

D. double; critical

[redacted]

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

A reactor startup is in progress and the reactor is slightly subcritical in the source range. Assuming the reactor remains subcritical, a short control rod withdrawal will cause the reactor startup rate indication to increase sharply 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 increasing until the POAH is reached; then decrease to zero.

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P448 (B1949)

A subcritical reactor has a stable source range count rate of 150 cps with a shutdown reactivity of -2.0 %ΔK/K. How much positive reactivity must be added to establish a stable count rate of 300 cps?

A. 0.5 %ΔK/K

B. 1.0 %ΔK/K

C. 1.5 %ΔK/K

D. 2.0 %ΔK/K

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P848 (B2149)

A subcritical reactor has an initial $K_{eff}$ of 0.8 with a stable source range count rate of 100 cps. If positive reactivity is added until $K_{eff}$ equals 0.95, at what value will the count rate stabilize?

A. 150 cps

B. 200 cps

C. 300 cps

D. 400 cps

[redacted]

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

During a reactor startup, equal amounts of positive reactivity are being sequentially added, and the source range count rate is allowed to reach equilibrium after each addition. Which one of the following statements applies for 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 is greater.

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

[redacted]

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

Which one of the following describes the prompt jump and the change in stable source range 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 the reactivity additions are equal, and the reactor remains subcritical.)

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

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

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

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P1348 (B1449)

A reactor is shut down by 1.8 %ΔK/K. Positive reactivity is added that increases the stable source range count rate from 15 cps to 300 cps.

What is the current value of $K_{eff}$?

A. 0.982

B. 0.990

C. 0.995

D. 0.999

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P1448 (B1849)

A subcritical reactor has a stable source range count rate of 150 cps with a shutdown reactivity of -2.0 %ΔK/K. Approximately how much positive reactivity must be added to establish a stable count rate of 600 cps?

A. 0.5 %ΔK/K

B. 1.0 %ΔK/K

C. 1.5 %ΔK/K

D. 2.0 %ΔK/K

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P1748

A subcritical reactor has a stable source range count rate of 60 cps with a shutdown reactivity of -2.0 %ΔK/K. How much positive reactivity must be added to establish a stable count rate of 300 cps?

A. 0.4 %ΔK/K

B. 0.6 %ΔK/K

C. 1.4 %ΔK/K

D. 1.6 %ΔK/K

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P1766 (B2165)

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

Which one of the following describes the change in source range count rate resulting from a short control rod withdrawal with $K_{eff}$ at 0.95 compared to an identical control rod withdrawal with $K_{eff}$ at 0.98? (Assume the 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 for both values of $K_{eff}$.

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 rates will be the same.

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

[redacted]

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

A 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 resulting from each reactivity addition will __________; and the time required for the neutron population to stabilize after each reactivity addition will __________.

A. increase; remain the same

B. increase; increase

C. remain the same; remain the same

D. remain the same; increase

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P2448 (B2649)

A reactor startup is being performed with xenon-free conditions. Control rod withdrawal is stopped when $K_{eff}$ equals 0.995 and source range count rate stabilizes at 1,000 cps. No additional operator actions are taken.

Which one of the following describes the count rate 20 minutes after rod withdrawal is stopped?

A. Less than 1,000 cps and decreasing toward the prestartup count rate.

B. Less than 1,000 cps and stable above the prestartup count rate.

C. Greater than 1,000 cps and increasing toward criticality.

D. 1,000 cps and constant.

[redacted]

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 DPM. A short control rod insertion will cause the reactor startup rate indication to initially become negative, and then...

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

B. gradually become more negative until source neutrons become the only significant contributor to the neutron population, and then return to 0.0 DPM.

C. stabilize until source neutrons become the only significant contributor to the neutron population, 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.

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P3048 (B3049)

A reactor startup is being commenced with the initial source range count rate stable at 20 cps. After a period of control rod withdrawal, count rate stabilizes at 80 cps.

If the total reactivity added by the above control rod withdrawal is 4.5 %ΔK/K, how much additional positive reactivity must be inserted to make the reactor critical?

A. 1.5 %ΔK/K

B. 2.0 %ΔK/K

C. 2.5 %ΔK/K

D. 3.0 %ΔK/K

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P3348

A xenon-free shutdown nuclear power plant is slowly cooling down due to an unisolable steam leak. The leak began when reactor coolant temperature was 400°F and the readings on all source range channels were 80 cps. Currently, reactor coolant temperature is 350°F and all source range channels indicate 160 cps.

Assume the moderator temperature coefficient remains constant throughout the cooldown, and no operator action is taken. What will the status of the reactor be when reactor coolant temperature reaches 290°F?

A. Subcritical, with source range count rate less than 320 cps.

B. Subcritical, with source range count rate greater than 320 cps.

C. Supercritical, with source range count rate less than 320 cps.

D. Supercritical, with source range count rate greater than 320 cps.

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P3925 (B3925)

A reactor startup is in progress with $K_{eff}$ initially equal to 0.90. By what factor will the core neutron level increase if the reactor is stabilized when $K_{eff}$ equals 0.99?

A. 10

B. 100

C. 1,000

D. 10,000

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P4225 (B4225)

A reactor is shutdown with a $K_{eff}$ of 0.96 and a stable source range count rate of 50 cps when a reactor startup is commenced. Which one of the following will be the stable count rate when $K_{eff}$ reaches 0.995?

A. 400 cps

B. 800 cps

C. 4,000 cps

D. 8,000 cps

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P4525 (B4525)

A nuclear power plant is being cooled down from 500°F to 190°F. Just prior to commencing the cooldown, the source range count rate was stable at 32 cps. After two hours, with reactor coolant temperature at 350°F, the source range count rate is stable at 64 cps.

Assume the moderator temperature coefficient remains constant throughout the cooldown and reactor power remains below the point of adding heat.

Without additional operator action, what will the status of the reactor be when reactor coolant temperature reaches 190°F?

A. Subcritical, with source range count rate below 150 cps.

B. Subcritical, with source range count rate above 150 cps.

C. Exactly critical.

D. Supercritical.

[redacted]

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

A 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 DPM

B. 0.66 DPM

C. 0.7 DPM

D. 0.76 DPM

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P5025

Initially, a nuclear power plant is shut down with a $K_{eff}$ of 0.92 and a stable source range count rate of 200 cps. Then, a reactor startup is initiated. All control rod motion is stopped when $K_{eff}$ equals 0.995. The instant that rod motion stops, source range count rate is 1,800 cps.

When source range count rate stabilizes, count rate will be approximately...

A. 1,800 cps

B. 2,400 cps

C. 3,200 cps

D. 3,600 cps

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P5225 (B5225)

Initially, a nuclear power plant was shut down with a stable source range count rate of 30 cps. Using many small additions of positive reactivity, a total of 0.1 %ΔK/K was added to the core and the stable source range count rate is currently 60 cps.

What was the stable source range count rate after only 0.05 %ΔK/K had been added during the above process?

A. 40 cps

B. 45 cps

C. 50 cps

D. 55 cps

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P5625

A PWR nuclear power plant has been shut down for two weeks and currently has the following stable conditions:

| | | |
|---|---|---|
| Reactor coolant temperature | = | 550°F |
| Reactor coolant boron concentration | = | 800 ppm |
| Source range count rate | = | 32 cps |

A reactor coolant boron dilution is commenced. After two hours, with reactor coolant boron concentration stable at 775 ppm, the source range count rate is stable at 48 cps.

Assume the differential boron worth (ΔK/K/ppm) remains constant throughout the dilution. Also assume that reactor coolant temperature remains constant, control rod position does not change, and no reactor protection actuations occur.

If the reactor coolant boron concentration is further reduced to750 ppm, what will be the status of the reactor?

A. Subcritical, with a stable source range count rate of approximately 64 cps.

B. Subcritical, with a stable source range count rate of approximately 96 cps.

C. Critical, with a stable source range count rate of approximately 64 cps.

D. Critical, with a stable source range count rate of approximately 96 cps.

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P7627 (B7627)

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

Which one of the following events, initiated at 0 seconds, could cause the reactor response shown on the graph?

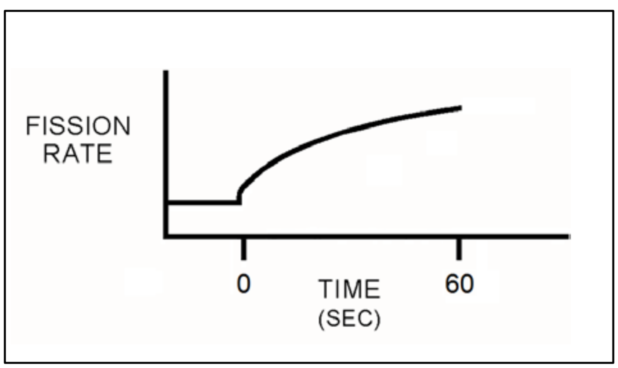
A. A step addition of positive reactivity to a reactor that is initially subcritical in the source range and remains subcritical for the duration of the 60-second interval shown.

B. 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 60-second interval shown.

C. A continuous addition of positive reactivity at a constant rate to a reactor that is initially subcritical in the source range and remains subcritical for the duration of the 60-second interval shown.

D. A continuous addition of positive reactivity at a constant rate to a reactor that is initially critical in the source range and remains below the point of adding heat for the duration of the 60-second interval shown.

[redacted]



TOPIC: 192008
KNOWLEDGE: K1.03 [3.9/4.0]
QID: P7668 (B7668)

At the beginning of a reactor startup, $K_{eff}$ was 0.97 and the stable source range count rate was 40 cps. After several incremental control rod withdrawals, the stable source range count rate was 400 cps. The next incremental control rod withdrawal resulted in a stable source range count rate of 600 cps. What is the current $K_{eff}$?

A. 0.98

B. 0.988

C. 0.998

D. There is not enough information given to calculate the current $K_{eff}$.

[redacted]

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

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

Approximately how much additional positive reactivity is required to raise the stable count rate to 880 cps?

A. 4.0 %ΔK/K

B. 2.0 %ΔK/K

C. 1.0 %ΔK/K

D. 0.5 %ΔK/K

[redacted]

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

Initially, a reactor is subcritical with a $K_{eff}$ of 0.97 and a stable source range count rate of 500 cps.

Which one of the following will be the approximate final steady-state count rate following a rod withdrawal that adds 1.05 %ΔK/K?

A. 750 cps

B. 1,000 cps

C. 2,000 cps

D. 2,250 cps

[redacted]

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

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

A. 707 cps

B. 1,000 cps

C. 1,500 cps

D. 2,000 cps

[redacted]

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

As a reactor approaches criticality during a reactor startup, it takes longer to reach an equilibrium source range 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 fission neutrons being produced.

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P1867 (B2167)

During a reactor startup, the first reactivity addition caused the stable source range count rate to increase from 20 cps to 40 cps. The second reactivity addition caused the stable count rate to increase from 40 cps to 80 cps. $K_{eff}$ 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.

[redacted]

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

With $K_{eff}$ at 0.92 during a reactor startup, the stable source range count rate is noted to be 780 cps. Later in the same startup, the stable count rate is 4,160 cps.

What is the current value of $K_{eff}$?

A. 0.945

B. 0.950

C. 0.975

D. 0.985

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P2248 (B2249)

Two reactors are currently shut down with reactor startups in progress. The reactors are identical except that reactor A has a source neutron strength of 100 neutrons per second and reactor B has a source neutron strength of 200 neutrons per second. The control rods are stationary and $K_{eff}$ is 0.98 in both reactors. Core neutron levels have stabilized in both reactors.

Which one of the following lists the core neutron levels (neutrons per second) in reactors A and B?

| | Reactor A (n/sec) | Reactor B (n/sec) |
|---|---|---|
| A. | 5,000 | 10,000 |
| B. | 10,000 | 20,000 |
| C. | 10,000 | 40,000 |
| D. | 20,000 | 40,000 |

[redacted]

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

With $K_{eff}$ at 0.95 during a reactor startup, source range indication is stable at 100 cps. After a number of control rods have been withdrawn, source range indication stabilizes at 270 cps. What is the current value of $K_{eff}$?

A. 0.963

B. 0.972

C. 0.981

D. 0.990

[redacted]

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

A reactor startup is in progress with a current $K_{eff}$ of 0.95 and a 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

[redacted]

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

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

A. 210 cps

B. 245 cps

C. 300 cps

D. 375 cps

[redacted]

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

With $K_{eff}$ at 0.95 during a reactor startup, source range indication is stable at 120 cps. After a period of control rod withdrawal, source range indication stabilizes at 600 cps.

What is the current value of $K_{eff}$?

A. 0.96

B. 0.97

C. 0.98

D. 0.99

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P3848 (B3849)

A reactor is shutdown with a $K_{eff}$ of 0.8. The source range count rate is stable at 800 cps. What percentage of the core neutron population is being contributed directly by neutron sources other than neutron-induced fission?

A. 10 percent

B. 20 percent

C. 80 percent

D. 100 percent

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P4734 (B7638)

During a reactor startup, positive reactivity addition X caused the stable source range count rate to increase from 20 cps to 40 cps. Later in the startup, after several more 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.

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P6133 (B6134)

A subcritical reactor has a stable source range count rate of 2.0 x $10^5$ cps with a $K_{eff}$ of 0.98. Positive reactivity is added to the core until a stable count rate of 5.0 x $10^5$ cps is achieved. What is the current value of $K_{eff}$?

A. 0.984

B. 0.988

C. 0.992

D. 0.996

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P7628 (B7628)

A reactor is shutdown with a $K_{eff}$ of 0.8. The source range count rate is stable at 800 cps. What percentage of the core neutron population is being contributed directly by neutron-induced fission?

A. 10 percent

B. 20 percent

C. 80 percent

D. 100 percent

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P7698 (B7698)

A reactor is shutdown with a $K_{eff}$ of 0.96. The source range count rate is stable at 480 cps. What percentage of the core neutron population is being contributed directly by neutron sources other than neutron-induced fission?

A. 4 percent

B. 50 percent

C. 96 percent

D. 100 percent

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.04 [3.8/3.8]
QID: P7718 (B7718)

During a reactor startup, positive reactivity addition X caused the stable source range count rate to increase from 15 cps to 30 cps. Later in the startup, after several more positive reactivity additions, positive reactivity addition Y caused the stable source range count rate to increase from 60 cps to 120 cps.

With the reactor still subcritical, which one of the following statements describes how the magnitudes of positive reactivity additions X and Y compare?

A. Positive reactivity addition X was smaller than positive reactivity addition Y.

B. Positive reactivity addition X was greater than positive reactivity addition Y.

C. Positive reactivity additions X and Y were about equal in magnitude.

D. There is not enough information given to compare the positive reactivity additions.

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.05 [3.8/3.9]
QID: P267 (B1365)

As criticality is approached during a reactor startup, equal insertions of positive reactivity result in a __________ numerical change in the stable source range count rate and a __________ time to reach each new stable count rate.

A. larger; longer

B. larger; shorter

C. smaller; longer

D. smaller; shorter

[redacted]

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

A 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 original value.

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.05 [3.8/3.9]
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 $K_{eff}$ after the first 100 fuel assemblies are loaded?

A. 0.25

B. 0.5

C. 0.75

D. 1.0

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.05 [3.8/3.9]
QID: P1770 (B1665)

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

The least conservative approach to criticality is represented by plot __________; which could possibly result from recording source range count rates at __________ time intervals after incremental fuel loading steps as compared to the conditions represented by the other plots.

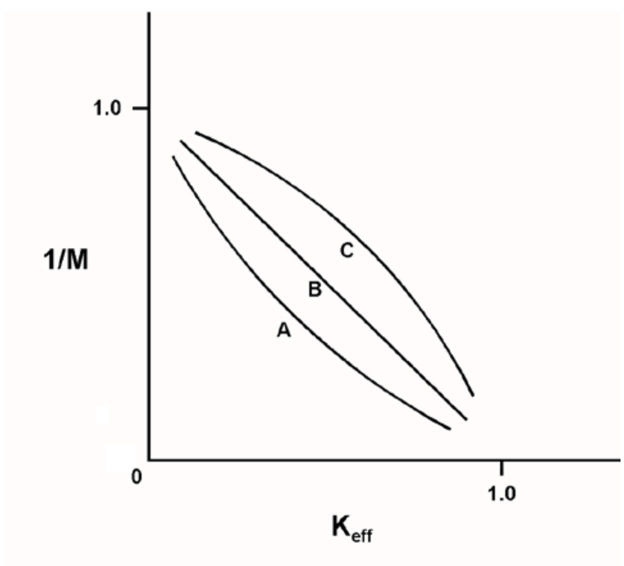
A. A; shorter

B. A; longer

C. C; shorter

D. C; longer

[redacted]



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

A reactor startup is in progress for a reactor that is in the middle of a fuel cycle. The reactor coolant system 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 the steam generator water levels remain stable, and no automatic 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

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.05 [3.8/3.9]
QID: P3665 (B3665)

Refer to the drawing of a 1/M plot with curves A and B (see figure below). 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 __________.

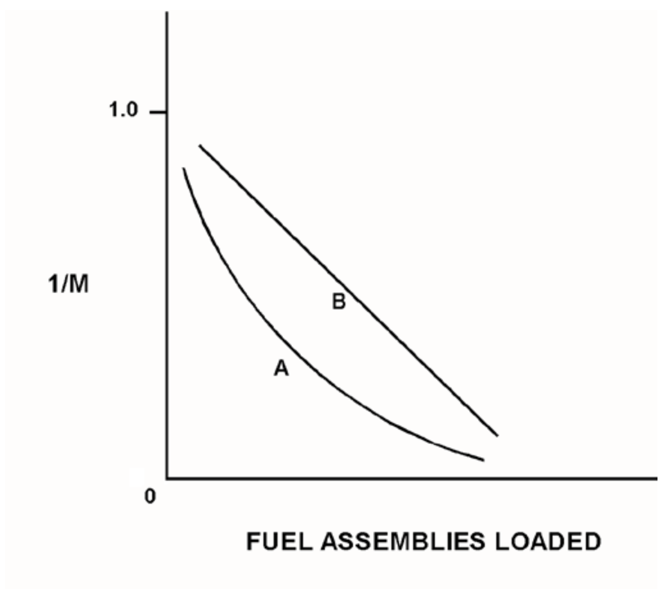
A. small; fuel enrichment

B. small; reactivity

C. large; fuel enrichment

D. large; reactivity

[redacted]



TOPIC: 192008
KNOWLEDGE: K1.05 [3.8/3.9]
QID: P5733 (B5733)

During an initial fuel load, the subcritical multiplication factor increases from 1.0 to 8.0. What is the current value of $K_{eff}$?

A. 0.125

B. 0.5

C. 0.75

D. 0.875

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.05 [3.8/3.9]
QID: P6034 (B6033)

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

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

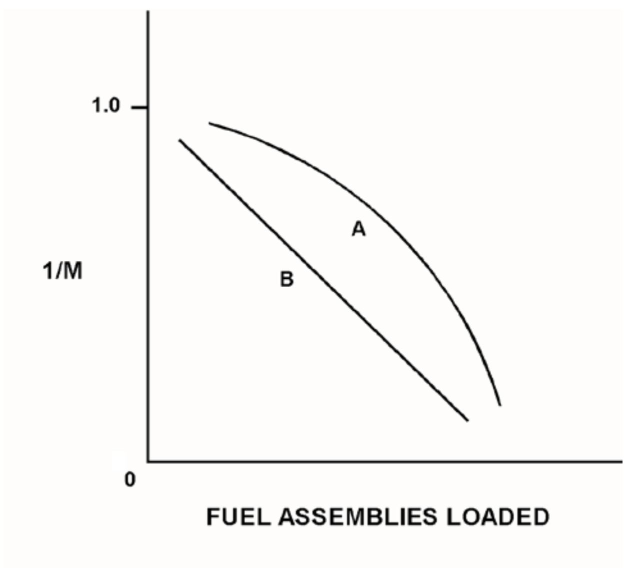
A. small; fuel enrichment

B. small; reactivity

C. large; fuel enrichment

D. large; reactivity

[redacted]



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

During a 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.

[redacted]

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

The following data was obtained under stable conditions during a reactor startup:

| Control Rod Position (units withdrawn) | Source Range Count Rate (cps) |
|---|---|
| 0 | 20 |
| 10 | 25 |
| 15 | 28 |
| 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

[redacted]

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

The following data was obtained under stable conditions during a reactor startup:

| Control Rod Position (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

[redacted]

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

The following data was obtained under stable conditions during a reactor startup:

| Control Rod Position (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 will criticality occur?

A. 40 units withdrawn

B. 50 units withdrawn

C. 60 units withdrawn

D. 70 units withdrawn

[redacted]

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

The following data was obtained under stable conditions during a reactor startup:

| Control Rod Position (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

[redacted]

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

An estimated critical rod position has been calculated for criticality to occur 4 hours after a reactor trip from steady-state 100 percent power. The actual critical rod position will be lower than the estimated 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.

[redacted]

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 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-135 reactivity in the core just prior to the trip.

D. Samarium-149 reactivity in the core just prior to the trip.

[redacted]

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

An estimated critical rod position (ECP) has been calculated for criticality to occur 6 hours after a reactor trip from 60 days of operation at 100 percent power. 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 percent 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.

[redacted]

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

Which one of the following conditions will result in criticality occurring at a rod position that is lower than the 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 percent 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.

[redacted]

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

An estimated critical rod position (ECP) has been calculated for criticality to occur 15 hours after a reactor trip from long-term 100 percent power operation. Which one of the following conditions would cause the actual critical rod position to be higher than the ECP?

A. A 90 percent 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.

[redacted]

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

A 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 percent power equilibrium conditions.

D. An inadvertent dilution of reactor coolant system boron concentration.

[redacted]

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

Control rods are being withdrawn during a reactor startup. Which one of the following will result in reactor criticality at a rod position that is higher than the estimated critical rod position?

A. Steam generator pressure increases by 50 psia.

B. Steam generator level increases by 10 percent.

C. Pressurizer pressure increases by 50 psia.

D. Pressurizer level increases by 10 percent.

[redacted]

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

A reactor startup is in progress following a reactor trip from steady-state 100 percent power. Which one of the following conditions will result in criticality occurring at a rod position that is higher than the 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 percent slower than normal speed.

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

[redacted]

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

An estimated critical rod position (ECP) has been calculated for criticality to occur 15 hours after a reactor trip that ended three months of operation at 100 percent power.

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

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 percent to determine power defect.

[redacted]

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

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

- Criticality occurs 24 hours after the 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 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 percent 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.

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.07 [3.5/3.6]
QID: P7335

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

- Criticality occurs 24 hours after the 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 lower than the calculated ECP?

A. Moving the time of criticality to 18 hours after the trip.

B. Decreasing reactor coolant system boron concentration to 350 ppm.

C. A malfunction resulting in control rod speed being 20 percent lower than normal speed.

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

[redacted]

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

With $K_{eff}$ at 0.985, how much reactivity must be added to make a reactor exactly critical?

A. 1.48 %ΔK/K

B. 1.50 %ΔK/K

C. 1.52 %ΔK/K

D. 1.54 %ΔK/K

[redacted]

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

A reactor is subcritical by 1.0 %ΔK/K when the operator dilutes the reactor coolant system boron concentration by 30 ppm. If differential boron worth is -0.025 %ΔK/K/ppm, the reactor is currently...

A. subcritical.

B. critical.

C. supercritical.

D. prompt critical.

[redacted]

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

When a reactor is critical, reactivity is...

A. infinity.

B. undefined.

C. 0.0 ΔK/K.

D. 1.0 ΔK/K.

[redacted]

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

During a reactor startup, if the startup rate is constant and positive without any further reactivity addition, then the reactor is...

A. critical.

B. supercritical.

C. subcritical.

D. prompt critical.

[redacted]

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

Initially, a reactor is critical at 10,000 cps in the source range when a steam generator atmospheric relief valve fails open. Assume end of fuel cycle conditions, no reactor trip, and no operator actions are taken.

When the reactor stabilizes, the average reactor coolant 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; greater than

C. less; at

D. less; greater than

[redacted]

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

A 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 range, over the next 10 minutes the count rate will...

A. remain constant.

B. decrease linearly.

C. decrease geometrically.

D. decrease exponentially.

[redacted]

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

A reactor startup is in progress following a one-month shutdown. Upon reaching criticality, the operator establishes a positive 0.5 DPM startup rate and stops control rod motion.

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

A. constant; constant

B. constant; increasing

C. increasing; constant

D. increasing; increasing

[redacted]

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

A reactor is critical at 1.0 x $10^{-6}$ percent power. Control rods are withdrawn for 5 seconds and then stopped, resulting in a stable startup rate (SUR) of positive 0.2 DPM.

If the control rods had been inserted for 5 seconds instead of withdrawn, the stable SUR would have been: (Assume equal absolute values of reactivity are added in both cases.)

A. more negative than -0.2 DPM because, compared to reactor power increases, reactor power decreases result in smaller delayed neutron fractions.

B. more negative than -0.2 DPM because, compared to reactor power increases, reactor power decreases are less limited by delayed neutrons.

C. less negative than -0.2 DPM because, compared to reactor power increases, reactor power decreases result in larger delayed neutron fractions.

D. less negative than -0.2 DPM because, compared to reactor power increases, reactor power decreases are more limited by delayed neutrons.

[redacted]

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

A reactor is critical well below the point of adding heat during a 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 power levels are observed:

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

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

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

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

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

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

[redacted]

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

Given:

- 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

[redacted]

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

A reactor is currently operating in the source range with a stable positive 90-second period. The core effective delayed neutron fraction ($\bar{\beta}_{eff}$) is 0.006. How much additional positive reactivity is needed to establish a stable positive 60-second period?

A. 0.026 %ΔK/K

B. 0.033 %ΔK/K

C. 0.067 %ΔK/K

D. 0.086 %ΔK/K

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.10 [3.3/3.4]
QID: P6435 (B6434)

A reactor is critical near the end of a fuel cycle with power level stable at 1.0 x $10^{-10}$ percent. Which one of the following is the smallest listed amount of positive reactivity that is capable of increasing reactor power level to the point of adding heat?

A. 0.001 %ΔK/K

B. 0.003 %ΔK/K

C. 0.005 %ΔK/K

D. 0.007 %ΔK/K

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.10 [3.3/3.4]
QID: P6734 (B6734)

Reactors A and B are identical except that reactor A has an effective delayed neutron fraction of 0.007 and reactor B has an effective delayed neutron fraction of 0.006. Initially, both reactors are critical at 1.0 x $10^{-8}$ percent power when +0.1 %ΔK/K is simultaneously added to both reactors.

Five minutes after the reactivity additions, reactor _____ will be at the higher power level; and reactor _____ will have the higher startup rate.

A. A; A

B. A; B

C. B; A

D. B; B

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.10 [3.3/3.4]
QID: P7688 (B7688)

Given:

- Reactors A and B are identical except that reactor A has an effective delayed neutron fraction of 0.0055 and reactor B has an effective delayed neutron fraction of 0.0052.
- Reactor A has a stable period of 42 seconds and reactor B has a stable period of 45 seconds.
- Both reactors pass through $1.0 \times 10^{-8}$ percent power at the same instant.

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

A. A; A

B. A; B

C. B; A

D. B; B

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.10 [3.3/3.4]
QID: P7727

Reactors A and B are identical except that reactor A is operating near the beginning of a fuel cycle, while reactor B is operating near the end of a fuel cycle. Both reactors have the same value for $K_{eff}$, which is slightly greater than 1.0.

If both reactors pass through $1.0 \times 10^{-6}$ percent reactor power at the same time, which reactor, if any, will reach the point of adding heat (POAH) first, and why?

A. Reactor A, because it has the greater startup rate.

B. Reactor B, because it has the greater startup rate.

C. Both reactors will reach the POAH at the same time, because they both have the same value for startup rate.

D. Both reactors will reach the POAH at the same time, because they are both supercritical by the same amount of positive reactivity.

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.10 [3.3/3.4]
KNOWLEDGE: K1.13 [3.4/3.6]
QID: P7778

A reactor and plant startup is in progress. Reactor power is currently 5.0 x $10^{-5}$ percent and increasing, with a constant startup rate of 0.2 DPM. Reactivity is <u>not</u> changing.

The reactor is currently __________, at a power level that is __________ the point of adding heat.

A. critical; less than

B. critical; greater than

C. supercritical; less than

D. supercritical; greater than

[redacted]

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

Which one of the following indicates that a 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.

[redacted]

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

A 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 that together support 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.

[redacted]

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

A reactor has just achieved criticality at $1.0 \times 10^{-8}$ percent reactor power during a reactor startup from xenon-free conditions. The operator establishes a 0.5 DPM 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.

[redacted]

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

During a reactor startup from a xenon-free condition, and after recording critical data, the operator establishes a positive 0.4 DPM startup rate to increase power. Within 10 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.

[redacted]

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

After taking critical data during a reactor startup, the operator establishes a positive 1.0 DPM startup rate to increase power to the point of adding heat (POAH). Which one of the following is the approximate amount of reactivity needed to stabilize reactor power at the POAH? (Assume that $\bar{\beta}_{eff}$ = 0.00579.)

A. -0.16 %ΔK/K

B. -0.19 %ΔK/K

C. -0.23 %ΔK/K

D. -0.29 %ΔK/K

[redacted]

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

The point of adding heat can be defined as the power level at which the reactor is producing enough heat...

A. for the fuel temperature coefficient to produce a positive reactivity feedback.

B. for the 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.

[redacted]

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 0.54 DPM startup rate to increase reactor 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 $\bar{\beta}_{eff}$ = 0.00579.)

A. +0.10 %ΔK/K

B. +0.12 %ΔK/K

C. -0.10 %ΔK/K

D. -0.12 %ΔK/K

[redacted]

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

A reactor startup is in progress following a one-month shutdown. Upon reaching criticality, the operator establishes a stable positive 1.0 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

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.13 [3.4/3.6]
QID: P2668

A 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.

[redacted]

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

After taking critical data during a reactor startup, the operator establishes a positive 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 needed to stabilize reactor power at the POAH? (Assume $\bar{\beta}_{eff}$ = 0.0066.)

A. -0.10 %ΔK/K

B. -0.12 %ΔK/K

C. -0.15 %ΔK/K

D. -0.28 %ΔK/K

[redacted]

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

After taking critical data during a reactor startup, the operator establishes a positive 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 needed to stabilize reactor power at the POAH? (Assume $\bar{\beta}_{eff}$ = 0.006.)

A. -0.01 %ΔK/K

B. -0.06 %ΔK/K

C. -0.10 %ΔK/K

D. -0.60 %ΔK/K

[redacted]

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) power level. The critical data was taken again at the proper IR power level with the same reactor coolant temperature and boron concentration.

The critical rod position taken at the proper IR power level is __________ the critical rod position taken two decades below the proper IR power level.

A. unrelated to

B. greater than

C. the same as

D. less than

[redacted]

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

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

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

A. less than

B. the same as

C. greater than

D. unrelated to

[redacted]

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

A reactor is critical several decades below the point of adding heat (POAH) when a small amount of positive reactivity is added to the core. If the exact same amount of negative reactivity is then added 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.

[redacted]

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

A 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 1.0 x $10^{-5}$ percent per the startup procedure, the operator inadvertently stabilizes power at 1.0 x $10^{-4}$ percent.

Assuming reactor coolant system (RCS) temperature and RCS boron concentration do not change, the critical rod height at 1.0 x $10^{-4}$ percent power will be __________ the critical rod height at 1.0 x $10^{-5}$ percent power.

A. less than

B. equal to

C. greater than

D. independent of

[redacted]

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

A reactor is exactly critical two decades below the point of adding heat when -0.01 %ΔK/K of reactivity is added. If +0.01 %ΔK/K is added 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. an equilibrium subcritical power level.

[redacted]

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

Initially, a reactor is critical at 1.0 x $10^{-5}$ percent power near the middle of a fuel cycle with manual rod control when a steam generator relief valve fails open. Assume no operator actions are taken and the reactor does not trip.

When the reactor stabilizes, average reactor coolant temperature will be __________ the initial reactor coolant temperature; and 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

[redacted]

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

A reactor is critical at the point of adding heat (POAH) when a small amount of negative reactivity is added. If the same amount of positive reactivity is added 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 with a -1/3 DPM startup rate until an equilibrium shutdown neutron level is reached.

D. continue to decrease with an unknown startup rate until an equilibrium shutdown neutron level is reached.

[redacted]

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

A reactor was operating at $1.0 \times 10^{-3}$ percent power with a positive 0.6 DPM startup rate when an amount of negative reactivity was inserted that caused reactor power to decrease with a negative 0.4 DPM startup rate.

If an equal amount of positive reactivity is added 5 minutes later, reactor power will...

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

B. increase and stabilize at $1.0 \times 10^{-3}$ percent power.

C. continue to decrease with a negative 0.4 DPM startup rate until an equilibrium shutdown neutron level is reached.

D. continue to decrease with an unknown startup rate until an equilibrium shutdown neutron level is reached.

[redacted]

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

A reactor is slightly supercritical during a reactor startup. A short control rod withdrawal is performed to establish the desired positive 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 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.

[redacted]

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

Refer to the figure below for the following question. The axes on each graph have linear scales.

Initially, a reactor is critical in the source range. At 0 seconds, a constant rate addition of positive reactivity commences. Assume that 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.)

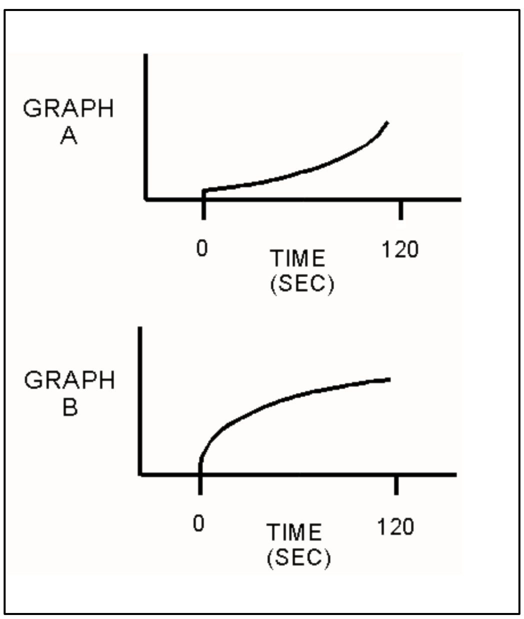
A. A; A

B. A; B

C. B; A

D. B; B

[redacted]



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, initiated at 0 seconds, would cause the reactor response shown on the graph?

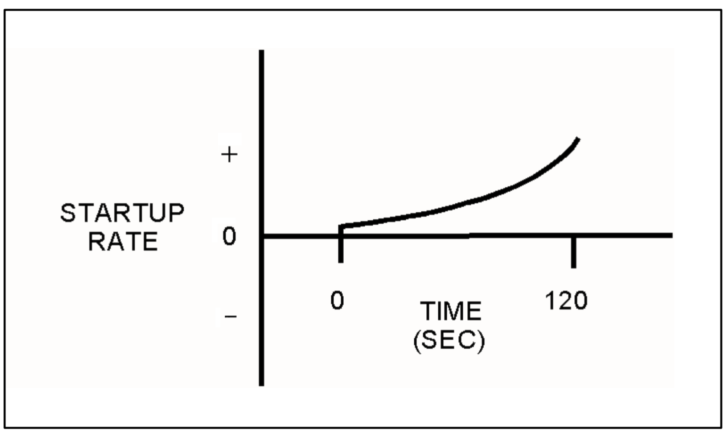
A. A step addition of positive reactivity to a reactor that is initially stable in the power range and remains in the power range for the duration of the 120-second interval shown.

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.

[redacted]



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?

A. 0.6 DPM

B. 0.9 DPM

C. 1.4 DPM

D. 2.0 DPM

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.14 [3.1/3.1]
QID: P5834 (B5833)

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

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

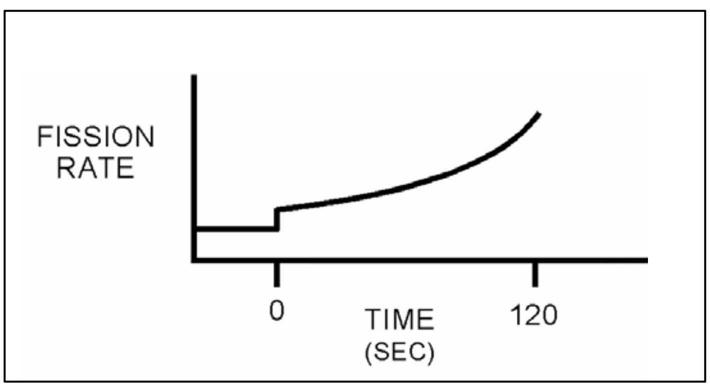
A. A step addition of positive reactivity to a reactor that is initially subcritical in the source range and remains subcritical for the duration of the 120-second interval shown.

B. 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.

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

[redacted]



TOPIC: 192008
KNOWLEDGE: K1.14 [3.1/3.1]
QID: P6335

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

Which one of the following events, initiated at 0 seconds, would cause the startup rate response shown on the graph?

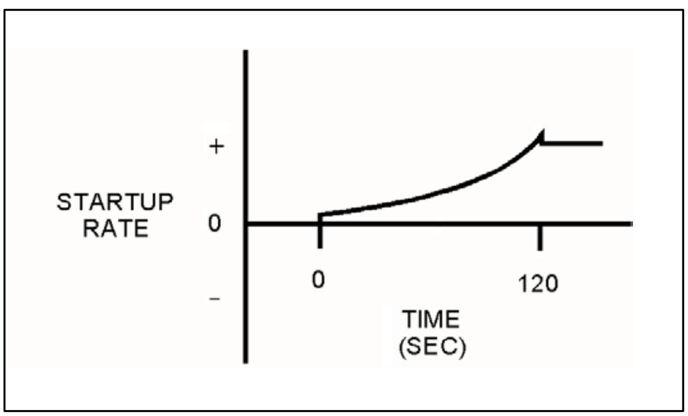
A. A step addition of positive reactivity to a reactor that is initially critical in the source range. Reactor power enters the power range at 120 seconds.

B. A step addition of positive reactivity to a reactor that is initially stable in the power range. A step addition of negative reactivity is inserted at 120 seconds.

C. A controlled 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. The positive reactivity addition ends at 120 seconds.

D. A controlled constant rate of positive reactivity addition to a reactor that is initially stable in the power range and remains in the power range. The positive reactivity addition ends at 120 seconds.

[redacted]



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

A 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

[redacted]

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

For a slightly supercritical reactor operating below the point of adding heat (POAH), what reactivity effects are associated with reaching the POAH?

A. There are no reactivity effects.

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

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

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

[redacted]

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

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

A. steam demand.

B. steam generator water levels.

C. average reactor coolant temperature.

D. reactor coolant system boron concentration.

[redacted]

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

A 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 moderator voids

[redacted]

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

A reactor startup is in progress near the end of a fuel cycle. Reactor power is $5 \times 10^{-2}$ percent 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. 100 percent

B. 50 percent

C. 10 percent

D. 1 percent (point of adding heat)

[redacted]

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

A reactor startup is in progress near the end of a fuel cycle. Reactor power is $5 \times 10^{-3}$ percent 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 percent.

D. Greater than 50 percent.

[redacted]

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

Near the end of a fuel cycle, a reactor required three hours to increase power from 70 percent to 100 percent using only reactor coolant system (RCS) boron dilution at the maximum rate to control RCS temperature.

Following a refueling outage, the same reactor power change performed under the same conditions will require a __________ period of time because the rate at which RCS boron concentration can be decreased at the beginning of a fuel cycle is __________.

A. longer; slower

B. shorter; slower

C. longer; faster

D. shorter; faster

[redacted]

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

With a reactor on a constant startup rate, which one of the following power changes requires the <u>longest</u> time to occur?

A. $1.0 \times 10^{-8}$ percent to $4.0 \times 10^{-8}$ percent

B. $5.0 \times 10^{-8}$ percent to $1.5 \times 10^{-7}$ percent

C. $2.0 \times 10^{-7}$ percent to $3.5 \times 10^{-7}$ percent

D. $4.0 \times 10^{-7}$ percent to $6.0 \times 10^{-7}$ percent

[redacted]

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

With a reactor on a constant startup rate, which one of the following power changes requires the least amount of time to occur?

A. 1.0 x $10^{-8}$ percent to 6.0 x $10^{-8}$ percent

B. 1.0 x $10^{-7}$ percent to 2.0 x $10^{-7}$ percent

C. 2.0 x $10^{-7}$ percent to 3.5 x $10^{-7}$ percent

D. 4.0 x $10^{-7}$ percent to 6.0 x $10^{-7}$ percent

[redacted]

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

With a reactor on a constant startup rate, which one of the following power changes requires the longest amount of time to occur?

A. 3.0 x $10^{-8}$ percent to 5.0 x $10^{-8}$ percent

B. 5.0 x $10^{-8}$ percent to 1.5 x $10^{-7}$ percent

C. 1.5 x $10^{-7}$ percent to 3.0 x $10^{-7}$ percent

D. 3.0 x $10^{-7}$ percent to 6.0 x $10^{-7}$ percent

[redacted]

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

Initially, a reactor is stable at the point of adding heat (POAH) during a reactor startup with the average reactor coolant temperature at 550°F. Control rods are manually 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

[redacted]

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

With a reactor on a constant startup rate, which one of the following power changes requires the least amount of time to occur?

A. $3.0 \times 10^{-8}$ percent to $5.0 \times 10^{-8}$ percent

B. $5.0 \times 10^{-8}$ percent to $1.5 \times 10^{-7}$ percent

C. $1.5 \times 10^{-7}$ percent to $3.0 \times 10^{-7}$ percent

D. $3.0 \times 10^{-7}$ percent to $6.0 \times 10^{-7}$ percent

[redacted]

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

A nuclear power plant is operating at 100 percent 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 percent 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.

[redacted]

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

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

| | | |
|---|---|---|
| Power level | = | 100 percent |
| Reactor coolant boron concentration | = | 620 ppm |
| Average reactor coolant temperature | = | 587°F |

After a load decrease, the current steady-state conditions are as follows:

| | | |
|---|---|---|
| Power level | = | 80 percent |
| Reactor coolant boron concentration | = | 650 ppm |
| Average reactor coolant temperature | = | 577°F |

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

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

A. 0.0 %ΔK/K

B. -0.2 %ΔK/K

C. -0.6 %ΔK/K

D. -0.8 %ΔK/K

[redacted]

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

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

| | | |
|---|---|---|
| Power level | = | 100 percent |
| Reactor coolant boron concentration | = | 630 ppm |
| Average reactor coolant temperature | = | 582°F |

After a load decrease, the current steady-state conditions are as follows:

| | | |
|---|---|---|
| Power level | = | 80 percent |
| Reactor coolant boron concentration | = | 640 ppm |
| Average reactor 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

[redacted]

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

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

| | | |
|---|---|---|
| Power level | = | 80 percent |
| Reactor coolant boron concentration | = | 630 ppm |
| Average reactor coolant temperature | = | 582°F |

After a normal load decrease, the current steady-state conditions are as follows:

| | | |
|---|---|---|
| Power level | = | 50 percent |
| Reactor coolant boron concentration | = | 650 ppm |
| Average reactor 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 | = | $-1.5 \times 10^{-2}$ %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. -0.5 %ΔK/K

B. -0.15 %ΔK/K

C. -0.25 %ΔK/K

D. -0.35 %ΔK/K

[redacted]

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

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

| | | |
|---|---|---|
| Power level | = | 100 percent |
| Reactor coolant boron concentration | = | 620 ppm |
| Average reactor coolant temperature | = | 587°F |

After a load decrease, the current steady-state conditions are as follows:

| | | |
|---|---|---|
| Power level | = | 80 percent |
| Reactor coolant boron concentration | = | 630 ppm |
| Average reactor 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 | = | $-1.0 \times 10^{-2}$ %ΔK/K/ppm |

A. -0.2 %ΔK/K

B. +0.2 %ΔK/K

C. -0.4 %ΔK/K

D. +0.4 %ΔK/K

[redacted]

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

One week after a refueling outage, a nuclear power plant is currently operating at 80 percent 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.

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

[redacted]

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 percent to 75 percent?

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

[redacted]

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

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

Which one of the following pairs of reactor fuels will provide the greatest contribution to core heat production when the reactor reaches 100 percent 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

[redacted]

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

A nuclear power plant is operating at 100 percent power near the end of a fuel cycle. 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.

[redacted]

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

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

Which one of the following pairs of reactor fuels will provide the greatest contribution to core heat production when the reactor reaches 100 percent 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

[redacted]

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

A reactor is critical at $2.0 \times 10^{-8}$ percent power. The operator withdraws rods as necessary to immediately establish and maintain a positive 0.1 DPM startup rate. How long will it take the reactor to reach $7.0 \times 10^{-8}$ percent power?

A. 2.4 minutes

B. 5.4 minutes

C. 7.4 minutes

D. 10.4 minutes

[redacted]

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

A reactor is critical at $3.0 \times 10^{-8}$ percent power. The operator withdraws rods as necessary to immediately establish and maintain a positive 0.1 DPM startup rate. How long will it take the reactor to reach $7.0 \times 10^{-8}$ percent power?

A. 3.7 minutes

B. 5.4 minutes

C. 6.7 minutes

D. 8.4 minutes

[redacted]

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

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

During the rod insertion, when will the SUR become negative?

A. Immediately when the control rod insertion is initiated.

B. After the control rods pass through the critical rod height.

C. Just as the control rods pass through the critical rod height.

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

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.20 [3.8/3.9]
QID: P3050 (B3051)

A reactor startup is in progress with the reactor at normal operating temperature and pressure. With reactor power stable at the point of adding heat, a control rod malfunction causes an inadvertent rod withdrawal that results in adding 0.3 %ΔK/K reactivity.

Given:

- All control rod motion has been stopped.
- No automatic system or operator actions occur to inhibit the power increase.
- Power coefficient equals -0.04 %ΔK/K/percent.
- The effective delayed neutron fraction equals 0.006.

What is the reactor power level increase required to offset the reactivity added by the inadvertent control rod withdrawal? (Ignore any reactivity effects from changes in fission product poisons.)

A. 3.0 percent

B. 5.0 percent

C. 6.7 percent

D. 7.5 percent

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.20 [3.8/3.9]
QID: P4327 (B4325)

A reactor startup is in progress with the reactor at normal operating temperature and pressure. With reactor power level stable at the point of adding heat, a control rod malfunction causes an inadvertent rod withdrawal that results in adding 0.2 %ΔK/K reactivity.

Given:

- All control rod motion has been stopped.
- No automatic system or operator actions occur to inhibit the power increase.
- Power coefficient equals -0.04 %ΔK/K/percent.
- The effective delayed neutron fraction equals 0.006.

What is the reactor power level increase required to offset the reactivity added by the inadvertent control rod withdrawal? (Ignore any reactivity effects from changes in fission product poisons.)

A. 3.3 percent

B. 5.0 percent

C. 6.7 percent

D. 7.5 percent

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.20 [3.8/3.9]
QID: P6727 (B6736)

A reactor startup is in progress with the reactor at normal operating temperature and pressure. With reactor power level stable at the point of adding heat, a control rod malfunction causes a short rod withdrawal that increases reactivity by 0.14 %ΔK/K.

Given:

- All control rod motion has stopped.
- No automatic system or operator actions occur to inhibit the power increase.
- Power coefficient equals -0.028 %ΔK/K/percent.
- The effective delayed neutron fraction equals 0.006.

What is the reactor power level increase required to offset the reactivity added by the control rod withdrawal? (Ignore any reactivity effects from changes in fission product poisons.)

A. 2.0 percent

B. 5.0 percent

C. 20 percent

D. 50 percent

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.20 [3.8/3.9]
QID: P7728

A reactor startup is in progress with the reactor at normal operating temperature and pressure. With reactor power stable at the point of adding heat, a control rod malfunction causes an inadvertent control rod withdrawal that adds positive 0.32 %ΔK/K to the reactor.

Given:

- All control rod motion has stopped.
- No automatic system or operator actions occur to inhibit the power increase.
- Power coefficient equals -0.02 %ΔK/K/percent.
- The effective delayed neutron fraction equals 0.005.

What is the power level increase required to offset the reactivity added by the control rod withdrawal? (Ignore any reactivity effects from changes in fission product poisons.)

A. 1.6 percent

B. 6.4 percent

C. 16 percent

D. 64 percent

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.20 [3.8/3.9]
QID: P7748

A reactor is operating at steady-state 80 percent power near the end of a fuel cycle with a symmetrical axial power distribution peaked at the core midplane. Control rods are in manual control.

If the reactor coolant system (RCS) boron concentration is increased by 10 ppm, the axial power distribution will shift toward the __________ of the core. Then, if the control rods are repositioned to return RCS temperatures to normal for 80 percent power, the axial power distribution will shift toward the __________ of the core.

A. top; top

B. top; bottom

C. bottom; top

D. bottom; bottom

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.20 [3.8/3.9]
QID: P7798

A reactor is operating at steady-state 80 percent power near the end of a fuel cycle with a symmetrical axial power distribution peaked at the core midplane. Control rods are in manual control.

If the reactor coolant system (RCS) boron concentration is decreased by 10 ppm, the axial power distribution will shift toward the __________ of the core. Then, if the control rods are repositioned to return RCS temperatures to normal for 80 percent power, the axial power distribution will shift toward the __________ of the core.

A. top; top

B. top; bottom

C. bottom; top

D. bottom; bottom

[redacted]

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

A nuclear power plant has been operating at 75 percent power for several weeks when a partial main steam line break occurs that releases 3 percent of rated steam flow. Assuming no operator or automatic actions occur, reactor power will stabilize __________ 75 percent; and average reactor coolant temperature will stabilize at a __________ temperature.

A. greater than; higher

B. at; higher

C. greater than; lower

D. at; lower

[redacted]

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

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

Assuming no reactor trip, which one of the following describes the response of the reactor?

A. Reactor coolant average temperature will decrease. The reactor will become subcritical.

B. Reactor coolant average temperature will remain the same. The reactor will stabilize at 3 percent power.

C. Reactor coolant average temperature will decrease. The reactor will stabilize at 3 percent power.

D. Reactor coolant average temperature will decrease. Reactor power will not change because the reactor was below the POAH.

[redacted]

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

A nuclear power plant has been operating at 80 percent power for several weeks when a partial steam line break occurs that releases 2 percent of rated steam flow. Main turbine load and control rod position remain the same.

Assuming no operator or protective actions occur, 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

[redacted]

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

A nuclear power plant is operating at steady-state 85 percent power and 580°F average reactor coolant temperature ($T_{ave}$) near the end of a fuel cycle. A failure of the turbine control system opens the turbine control valves to admit 10 percent 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 percent; and $T_{ave}$ will stabilize __________ 580°F.

A. above; above

B. above; below

C. below; above

D. below; below

[redacted]

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

A nuclear power plant is operating at steady-state 90 percent power near the end of a fuel cycle with manual rod control when a turbine control system malfunction opens the main turbine steam inlet 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.

[redacted]

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

A nuclear power plant is operating at 100 percent power near the end of a fuel cycle when the main turbine trips. If the reactor does not immediately trip, reactor power will initially…

A. increase, due to positive reactivity from the Doppler coefficient.

B. increase, due to positive reactivity from the moderator temperature coefficient.

C. decrease, due to negative reactivity from the Doppler coefficient.

D. decrease, due to negative reactivity from the moderator temperature coefficient.

[redacted]

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

A nuclear power plant is operating at steady-state 80 percent power and 580°F average reactor coolant temperature ($T_{ave}$) near the end of a fuel cycle with manual rod control. A turbine control system malfunction partially closes the turbine control valves resulting in 5 percent 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 percent; and $T_{ave}$ will stabilize __________ 580°F.

A. at; above

B. at; below

C. below; above

D. below; below

[redacted]

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

A nuclear power plant is operating at steady-state 60 percent 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 most responsible for the initial reactor power decrease?

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

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

C. The rate of neutron absorption by the fuel at resonance energies initially increases.

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

[redacted]

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

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

Immediately after the MSIV closure, the cold leg temperature ($T_{cold}$) in the reactor coolant loop with the closed MSIV will initially __________; and the $T_{cold}$ in a loop with an open MSIV will initially __________.

A. decrease; increase

B. decrease; decrease

C. increase; increase

D. increase; decrease

[redacted]

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

A nuclear power plant is operating at steady-state 60 percent power in the middle of a fuel cycle with manual rod control when a turbine control system malfunction opens the main 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.

[redacted]

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

Initially, a nuclear power plant is operating at steady-state 100 percent reactor power with the main generator producing 1,100 MW. Then, 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 percent 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 percent

B. 35 percent

C. 50 percent

D. 65 percent

[redacted]

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

A high boron concentration is necessary at the beginning of a fuel cycle to...

A. compensate for excess reactivity in the fuel.

B. produce a negative moderator temperature coefficient.

C. flatten the axial and radial neutron flux distributions.

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

[redacted]

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

During a refueling outage, new fuel assemblies with higher enrichments of U-235 were loaded 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 assemblies with a higher concentration of boron in the reactor coolant?

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

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

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

D. The differential boron worth ($\Delta K/K/ppm$) may become positive.

[redacted]

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

Shortly after a reactor trip, reactor power indicates $5.0 \times 10^{-2}$ percent when a stable negative startup rate is attained. Approximately how much additional time is required for reactor power to decrease to $5.0 \times 10^{-3}$ percent?

A. 90 seconds

B. 180 seconds

C. 270 seconds

D. 360 seconds

[redacted]

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

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

A. 1 to 8 seconds

B. 1 to 8 minutes

C. 1 to 8 hours

D. 1 to 8 days

[redacted]

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

Which one of the following determines the value of the stable negative startup rate observed shortly after a reactor trip?

A. The shortest-lived delayed neutron precursors.

B. The longest-lived delayed neutron precursors.

C. The shutdown margin just prior to the trip.

D. The worth of the inserted control rods.

[redacted]

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

Shortly after a reactor trip, reactor power indicates 1.0 x $10^{-3}$ percent when a stable negative startup rate is attained. Reactor power will decrease to 1.0 x $10^{-4}$ percent in approximately _______ seconds.

A. 380

B. 280

C. 180

D. 80

[redacted]

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

Following a reactor trip, reactor power indicates 0.1 percent when the typical stable post-trip startup rate is observed. Approximately how much additional time is required for reactor power to decrease to 0.05 percent?

A. 24 seconds

B. 55 seconds

C. 173 seconds

D. 240 seconds

[redacted]

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

Which one of the following approximates the fission product decay heat produced in a reactor at one second and one hour following a reactor trip from long-term operation at 100 percent power?

| | One Second | One Hour |
|---|---|---|
| A. | 15 percent | 1 percent |
| B. | 7 percent | 1 percent |
| C. | 1 percent | 0.1 percent |
| D. | 0.5 percent | 0.1 percent |

[redacted]

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

Reactors A and B are identical and have operated at 100 percent power for six months when a reactor trip occurs simultaneously on both reactors. All control rods fully insert, except for one reactor B control rod that remains fully withdrawn.

Which reactor, if any, will have the smaller negative startup rate five minutes after the trip, and why?

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 startup rate because both reactors will be stable at a power level low in the source range.

D. Both reactors will have the same startup rate because only the longest-lived delayed neutron precursors will be releasing fission neutrons.

[redacted]

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

Reactors A and B are identical and have operated at 100 percent 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 smaller negative startup rate five minutes after the trip, and why?

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 startup rate because both reactors will be stable at a power level low in the source range.

D. Both reactors will have the same startup rate because only the longest-lived delayed neutron precursors will be releasing fission neutrons.

[redacted]

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

Reactors A and B are identical and have operated at 100 percent 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, but all others fully insert.

Five minutes after the trip, when compared to reactor B the fission rate in reactor A will be __________; and the startup rate in reactor A will be __________.

A. the same; more negative

B. the same; the same

C. smaller; more negative

D. smaller; the same

[redacted]

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

A 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.

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P7035

A nuclear power plant is operating at steady-state 100 percent power when a reactor trip occurs. As a result of the trip, the core neutron flux will initially decrease at a startup rate that is much __________ negative than -1/3 DPM; the startup rate will become approximately -1/3 DPM about __________ minutes after the trip.

A. less; 3

B. less; 30

C. more; 3

D. more; 30

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P7618 (B7618)

Refer to the graph of neutron flux versus time (see figure below) for a nuclear power plant reactor that experienced a reactor trip from extended full power operation at time = 0 seconds.

Which section(s) of the curve has/have a slope that is primarily determined by the production rate of delayed neutrons?

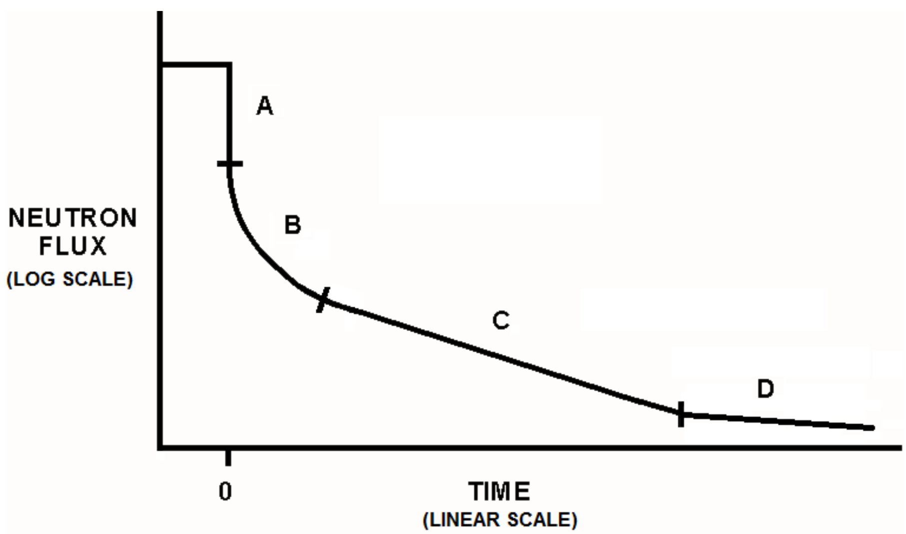
A. B only

B. B and C

C. C only

D. C and D

[redacted]



TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P7658 (B7658)

Refer to the graph of neutron flux versus time (see figure below) for a nuclear power plant that experienced a reactor trip from extended full power operation at time = 0 seconds.

In which section of the curve does the production rate of source neutrons primarily determine the slope of the curve?

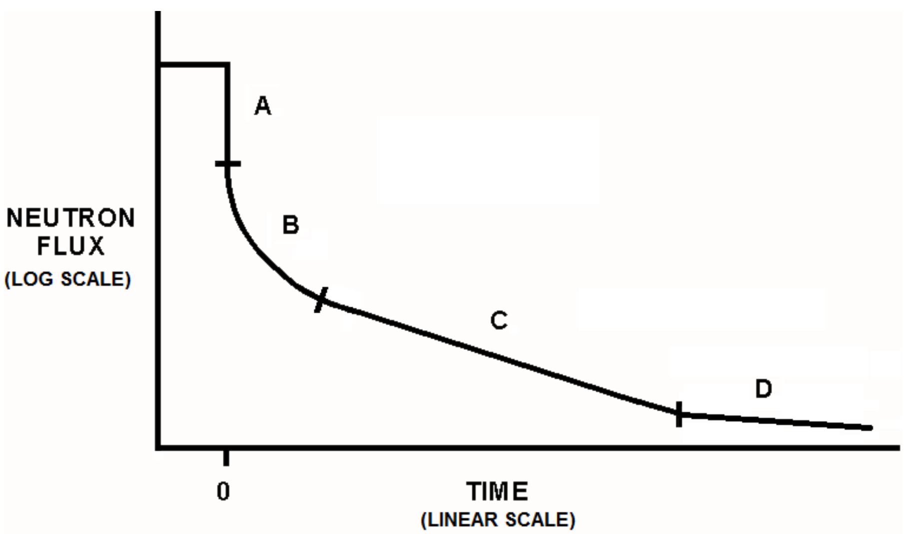
A. A

B. B

C. C

D. D

[redacted]



TOPIC: 192008
KNOWLEDGE: K1.23 (2.9/3.1)
QID: P7708 (B7708)

A reactor was operating for several months at 100 percent power when a reactor trip occurred. Which one of the following is primarily responsible for the startup rate value 2 minutes after the trip?

A. The $K_{eff}$ in the core.

B. The rate of source neutron production in the core.

C. The effective delayed neutron fraction in the core.

D. The decay rates of the delayed neutron precursors in the core.

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P7738 (B7738)

Refer to the graph of neutron flux versus time (see figure below) for a nuclear power plant that experienced a reactor trip from steady-state 100 percent power at time = 0 seconds.

The shape of section A on the graph is primarily determined by a rapid decrease in the production rate of…

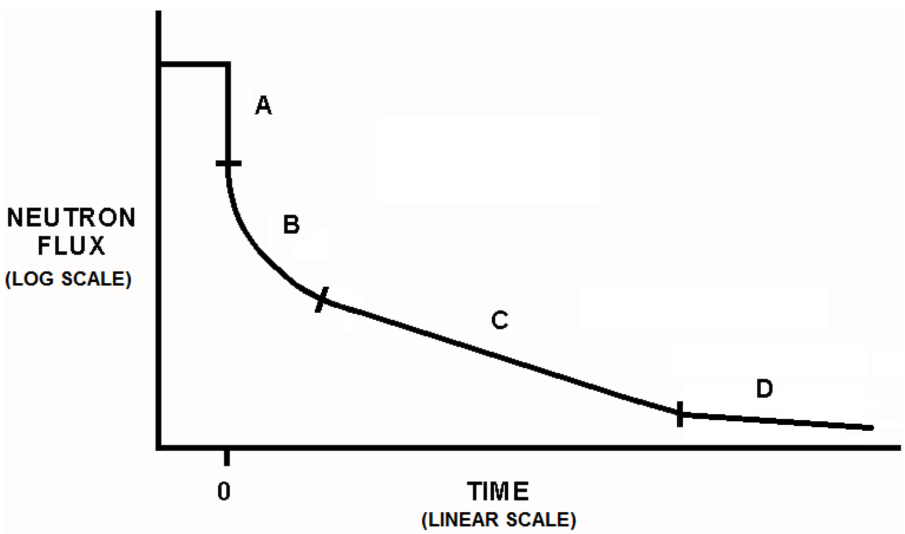
A. intrinsic source neutrons.

B. prompt fission neutrons.

C. delayed fission neutrons.

D. delayed fission neutron precursors.

[redacted]



TOPIC: 192008
KNOWLEDGE: K1.23 [2.9/3.1]
QID: P7758 (B7758)

A reactor was operating for several months at steady-state 100 percent power when a reactor trip occurred. Which one of the following lists the two factors most responsible for the value of the core neutron flux level one hour after the trip?

A. $K_{eff}$ and the rate of source neutron production.

B. $K_{eff}$ and the effective delayed neutron fraction.

C. The decay rates of the delayed neutron precursors and the rate of source neutron production.

D. The decay rates of the delayed neutron precursors and the effective delayed neutron fraction.

[redacted]

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

A reactor is critical below the point of adding heat when a fully withdrawn control rod fully inserts into the core. Assuming no operator or automatic actions, core neutron flux will slowly decrease to...

A. zero.

B. an equilibrium value less than the source neutron flux.

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

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

[redacted]

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

A reactor is critical just below the point of adding heat when a single fully withdrawn control rod drops into the core. Assuming <u>no</u> 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

[redacted]

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

Initially, a reactor is 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

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.24 [3.5/3.6]
QID: P7768 (B7768)

Initially, a reactor was critical just below the point of adding heat during a normal reactor startup when a reactivity event caused a rapid insertion of negative reactivity. No subsequent changes to reactivity occurred.

Ten seconds after the completion of the negative reactivity insertion, the startup rate was observed to be stable at – 0.24 DPM. Was the reactivity event a reactor trip or a dropped fully-withdrawn control rod, and why?

A. Reactor trip, because a dropped fully-withdrawn control rod will <u>not</u> produce a stable negative startup rate 10 seconds after the completion of the negative reactivity insertion.

B. Reactor trip, because a dropped fully-withdrawn control rod will produce a <u>less</u> negative stable startup rate 10 seconds after the completion of the negative reactivity insertion.

C. A dropped fully-withdrawn control rod, because a reactor trip will <u>not</u> produce a stable negative startup rate 10 seconds after the completion of the negative reactivity insertion.

D. A dropped fully-withdrawn control rod, because a reactor trip will produce a <u>more</u> negative stable startup rate 10 seconds after the completion of the negative reactivity insertion.

[redacted]

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-135 oscillations.

[redacted]

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

Which one of the following describes how control rods are inserted during a normal reactor shutdown, and why?

A. One bank at a time, to maintain acceptable power distribution.

B. One bank at a time, to maintain a rapid shutdown capability from the remainder of the control rods.

C. In a bank overlapping sequence, to maintain a relatively constant differential control rod worth.

D. In a bank overlapping sequence, to limit the amount of positive reactivity added during a rod ejection accident.

[redacted]

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

After one month of operation at 100 percent power, the fraction of rated thermal power being produced from the decay of fission products in a reactor is...

A. greater than 10 percent.

B. greater than 5 percent, but less than 10 percent.

C. greater than 1 percent, but less than 5 percent.

D. less than 1 percent.

[redacted]

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.

[redacted]

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

Following a reactor shutdown from three months of operation at 100 percent power, the core decay heat production rate will depend on the...

A. amount of fuel that has been depleted.

B. decay rate of the fission product poisons.

C. time elapsed since $K_{eff}$ decreased below 1.0.

D. decay rate of the photoneutron source.

[redacted]

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

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

Given the following information:

| | |
|---|---|
| Reactor rated thermal power | = 3,400 MW |
| Decay heat rate | = 1.0 percent rated thermal power |
| Reactor coolant pump heat input to the RCS | = 15 MW |
| RCS total heat loss rate | = Negligible |
| RCS specific heat | = 1.1 Btu/lbm-°F |
| RCS inventory (less pressurizer) | = 475,000 lbm |

What will the average RCS heatup rate be during the 5 minutes immediately after all SGs became empty?

A. 8 to 15 °F/hr

B. 50 to 75 °F/hr

C. 100 to 150 °F/hr

D. 300 to 350 °F/hr

[redacted]

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

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

Given the following information:

| | | |
|---|---|---|
| Reactor rated thermal power | = | 2,400 MW |
| Decay heat rate | = | 1.0 percent rated thermal power |
| Reactor coolant pump heat input to the RCS | = | 13 MW |
| RCS total heat loss rate | = | 2.4 MW |
| RCS specific heat | = | 1.1 Btu/lbm-°F |
| RCS inventory (less pressurizer) | = | 325,000 lbm |

What will the average RCS heatup rate be during the 5 minutes immediately after all SGs became empty?

A. 8 to 15 °F/hr

B. 25 to 50 °F/hr

C. 80 to 150 °F/hr

D. 300 to 400 °F/hr

[redacted]

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

A reactor has been shut down for several weeks when a loss of all AC power results in a loss of forced coolant flow in the reactor coolant system (RCS).

Given the following information:

| | |
|---|---|
| Reactor rated thermal power | = 2,800 MW |
| Decay heat rate | = 0.2 percent rated thermal power |
| RCS ambient heat loss rate | = 2.4 MW |
| RCS specific heat | = 1.1 Btu/lbm-°F |
| RCS inventory (less pressurizer) | = 325,000 lbm |

What will the average reactor coolant heatup rate be during the 20 minutes immediately after forced coolant flow is lost? Assume the RCS remains in thermal equilibrium and that only ambient losses are removing heat from the RCS.

A. Less than 25 °F/hour

B. 26 to 50 °F/hour

C. 51 to 75 °F/hour

D. More than 76 °F/hour

[redacted]

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

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

A. 1 percent to 2 percent

B. 3 percent to 5 percent

C. 6 percent to 8 percent

D. 9 percent to 11 percent

[redacted]

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

A nuclear power plant had been operating at 100 percent power for six months when a reactor trip occurred. 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.

[redacted]

TOPIC: 192008
KNOWLEDGE: K1.27 [3.1/3.4]
QID: P7638

A nuclear power plant has been operating at 100 percent power for six months when a reactor trip occurs. Which one of the following describes the source(s) of core heat generation 1 minute after the reactor trip?

A. Fission product decay is the only heat source capable of increasing fuel temperature.

B. Delayed neutron-induced fission is the only heat source capable of increasing fuel temperature.

C. Both fission product decay and delayed neutron-induced fission are capable of increasing fuel temperature.

D. Neither fission product decay nor delayed neutron-induced fission are capable of increasing fuel temperature.

[redacted]