科目： 192008
知能類：K1.01 [3.4/3.5]
序號： P364

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

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

A. 1, 2, 3

B. 1, 2, 4

C. 1, 3, 4

D. 2, 3, 4

ANSWER: D.

下列那三項參數應於接近臨界時密切監控？

1. 軸向通率差異(軸向分佈指數)
2. 反應器起動率
3. 源階(中子)計數率
4. 控制棒位置

A. 1、2、3

B. 1、2、4

C. 1、3、4

D. 2、3、4

答案：D.

科目： 192008
知能類：K1.01 [3.4/3.5]
序號： P565

During a nuclear reactor startup, the first reactivity addition caused the source range count rate to increase from 20 to 40 cps. The second reactivity addition caused the count rate to increase from 40 to 160 cps.
Which one of the following statements accurately compares the two reactivity additions?

A. The first reactivity addition was larger.

B. The second reactivity addition was larger.

C. The first and second reactivity additions were equal.

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

ANSWER: A.

核子反應器起動期間，第一次加入反應度讓源階計數率從 20 增至 40 cps，第二次加入則讓計數率從 40 增至 160 cps。

下列那項敘述正確比較了兩次加入反應度？

A. 第一次加入的反應度較大。

B. 第二次加入的反應度較大。

C. 兩次加入的反應度相等。

D. 資料不足而無法判斷反應度數值關係。

答案：A.

科目： 192008
知能類：K1.01 [3.4/3.5]
序號： P1665

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

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

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

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

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

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

ANSWER: C.

核子反應器起動期間，第一次加入正反應度讓計數率從 20 增至 30 cps，第二次加入正反應度，計數率則從 30 增至 60 cps。假設在第一次加入反應度之前的 k_{eff} 為 0.97。

下列那項敘述說明了加入反應度的大小？

A. 第一次加入的反應度，約較第二次大 50%。

B. 第二次加入的反應度，約較第一次大 50%。

C. 第一次與第二次加入的反應度約為相同。

D. 資料不足而無法判斷反應度數值關係。

答案：C.

科目： 192008
知能類：K1.02 [2.8/3.1]
序號： P3366

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

A. The operator fully withdraws the shutdown control rods.

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

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

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

ANSWER: A.

核能電廠於接近燃料週期末期時，以 100%功率穩態運轉，反應器此時發生急停。急停 4 小時後，反應器冷卻水溫度若處於正常無載溫度，請問下列何者將導致反應器的爐心分裂率增加？

A. 運轉員將停機控制棒完全抽出。

B. 反應器冷卻水溫度增加 3°F。

C. 反應器冷卻水硼濃度增加 10 ppm。

D. 於電廠參數沒有其他變化下，再歷經兩小時。

答案：A.

科目： 192008
知能類：K1.02 [2.8/3.1]
序號： P3464 (B3465)

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

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

A. The operator fully withdraws the shutdown control rods.

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

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

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

ANSWER: D.

核能電廠於接近燃料週期末期時以100%功率穩態運轉，此時反應器發生急停。急停4小時後，在反應器冷卻水溫度處於正常無載溫度下，預定開始起動反應器。

此時，下列何者將導致反應器的爐心分裂率降低？

A. 運轉員將停機控制棒完全抽出。

B. 反應器冷卻水溫降低 3°F。

C. 反應器冷卻水硼濃度降低 10 ppm。

D. 於電廠參數沒有其他變化下，再歷經兩小時。

答案：D.

科目： 192008
知能類：K1.03 [3.9/4.0]
序號： P65 (B266)

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

A. double; subcritical

B. more than double; subcritical

C. double; critical

D. more than double; critical

ANSWER: D.

在反應器接近臨界時抽出控制棒，其穩定計數率則倍增。若再加入造成首度倍增的等量反應度，穩定計數率將_____，而反應器將_____。

A. 倍增；次臨界

B. 大於倍增；次臨界

C. 倍增；臨界

D. 大於倍增；臨界

答案：D.

科目： 192008
知能類：K1.03 [3.9/4.0]
序號： P265

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

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

B. gradually decrease and stabilize at zero.

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

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

ANSWER: B.

一部核子反應器進行起動，並處於微幅次臨界。假設該反應器仍在次臨界時，稍微抽出控制棒，將導致反應器起動率指示值，於正向方向迅速增加，然後……

A. 迅速降低，再穩定於-1/3 DPM 處。

B. 逐漸降低並穩定在零。

C. 趨於穩定達到加熱起始點(POAH)為止；然後降至零。

D. 繼續迅速增加，直到達到 POAH 為止；然後降至零。

答案：B.

科目： 192008
知能類：K1.03 [3.9/4.0]
序號： P1065 (B1565)

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

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

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

C. The numerical change in equilibrium count rate increases.

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

ANSWER: C.

起動核子反應器時，連續加入相等增量的正反應度，每次加入後都使計數率達到平衡。連續加入反應度之後，下列何者是關於平衡計數率的正確說明？

A. 達到平衡計數率所需的時間均相等。

B. 達到平衡計數率所需的時間更短暫。

C. 平衡計數率的數值改變增加。

D. 平衡計數率的數值變化不變。

答案：C.

科目： 192008
知能類：K1.03 [3.9/4.0]
序號： P1166

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

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

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

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

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

ANSWER: D.

若在 K_{eff} = 0.99 時微幅抽出控制棒，相較於在 K_{eff} = 0.95 時的同樣控制棒抽出量，下列何者描述了兩者導致的計數率變化？(假設加入反應度相等，反應器仍維持在次臨界)

A. 兩者的計數率瞬發跳升(prompt jump)及增加量相同。

B. K_{eff} = 0.99 時，計數率瞬發跳升較大，但是兩者的計數率增加量相同。

C. 兩者的計數率瞬發跳升相同，但是 K_{eff} = 0.99 時的計數率增加量較大。

D. K_{eff} = 0.99 時，計數率瞬發跳升和增加量均較大。

答案：D.

科目： 192008
知能類：K1.03 [3.9/4.0]
序號： P1766

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

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

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

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

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

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

ANSWER: B.

一部核子反應器進行起動，該反應器目前為次臨界。

若在 K_{eff} = 0.99 時微幅抽出控制棒，相較於在 K_{eff} = 0.95 時的同樣控制棒抽出量，下列何者描述了兩者導致的計數率變化？(假設加入反應度相等，反應器仍維持在次臨界)

A. 兩者的計數率瞬發跳升及穩定計數率增加量相同。

B. K_{eff} = 0.95 時，計數率瞬發跳升和穩態計數率增加量均較小。

C. K_{eff} = 0.95 時，計數率瞬發跳升較小，但是兩者的穩定計數率增加量相同。

D. 兩者的計數率瞬發跳升相同，但是在 K_{eff} = 0.95 時，穩定計數率增加量較小。

答案：B.

科目： 192008
知能類：K1.03 [3.9/4.0]
序號： P2466 (B2465)

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

A. increases; remains the same

B. increases; increases

C. remains the same; remains the same

D. remains the same; increases

ANSWER: B.

一部核子反應器以加入等量正反應度，並等待中子數達到穩定的方式起動。當反應器接近臨界，每次加入反應度後，穩定中子數的數值變化會_____，而每次加入反應度後，中子數達到穩定所需的時間會_____。

A. 增加；維持不變

B. 增加；增加

C. 維持不變；維持不變

D. 維持不變；增加

答案：B.

科目： 192008
知能類：K1.03 [3.9/4.0]
序號： P2467

Why are control rod insertion limits established for power operation?

A. To minimize the worth of a postulated dropped control rod.

B. To maintain a negative moderator temperature coefficient in the reactor.

C. To provide adequate shutdown margin after a reactor scram.

D. To ensure sufficient positive reactivity is available to compensate for the remaining power defect.

ANSWER: C.

功率運轉時，為何要制定控制棒插入限值？

A. 為了將假想掉棒的控制棒本領降至最低。

B. 為了維持反應器的緩和劑溫度係數負值。

C. 為了在反應器急停後，提供足夠的停機餘裕。

D. 為了確保有足夠的正反應度，來彌補剩餘的功率欠缺(power defect)。

答案：C.

科目： 192008
知能類：K1.04 [3.8/3.8]
序號： P266 (B1566)

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

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

A. 4.0% ΔK/K

B. 2.0% ΔK/K

C. 1.0% ΔK/K

D. 0.5% ΔK/K

ANSWER: D.

核子反應器起動時，運轉員抽出控制棒以加入1.0 % ΔK/K的正反應度，因而讓平衡源階中子計數率從220 cps增至440 cps。

欲將源階中子計數率增至880 cps，需要再加入多少正反應度？

A. 4.0% ΔK/K

B. 2.0% ΔK/K

C. 1.0% ΔK/K

D. 0.5% ΔK/K

答案：D.

科目： 192008
知能類：K1.04 [3.8/3.8]
序號： P566

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

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

A. 750 cps

B. 1000 cps

C. 2000 cps

D. 2250 cps

ANSWER: A.

在核子反應器起動期間，以抽出控制棒的方式加入1.05 % ΔK/K的反應度，抽出控制棒之前的K_{eff} = 0.97，計數率為500 cps。

下列何者為抽出控制棒之後，最終穩態計數率的近似值？

A. 750 cps

B. 1000 cps

C. 2000 cps

D. 2250 cps

答案：A.

科目： 192008
知能類：K1.04 [3.8/3.8]
序號： P666

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

A. 707 cps

B. 1000 cps

C. 1500 cps

D. 2000 cps

ANSWER: B.

在起動核子反應器期間，以抽出控制棒的方式讓 K_{eff} 從 0.98 增至 0.99。如果抽出控制棒之前的計數率為 500 cps，下列何者將是最終計數率？

A. 707 cps

B. 1000 cps

C. 1500 cps

D. 2000 cps

答案：B.

科目： 192008
知能類：K1.04 [3.8/3.8]
序號： P1265 (B1967)

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

A. 0.25

B. 0.5

C. 0.75

D. 1.0

ANSWER: C.

初始燃料裝填期間，首度裝入100個燃料元件後，次臨界增殖因數從1.0增至4.0。下列何者是相對應的最終K_{eff}值？

A. 0.25

B. 0.5

C. 0.75

D. 1.0

答案：C.

科目： 192008
知能類：K1.04 [3.8/3.8]
序號： P1770 (B1665)

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

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

A. A; shorter

B. A; longer

C. C; shorter

D. C; longer

ANSWER: C.

請參照下面的三條1/M座標圖，分別標示為A，B與C。

座標圖_____表示達到臨界的最不保守方式，而與其他座標圖表示的狀況相比，可能是因進行加填燃料步驟之後，採_____時間間隔記錄計數率所致。

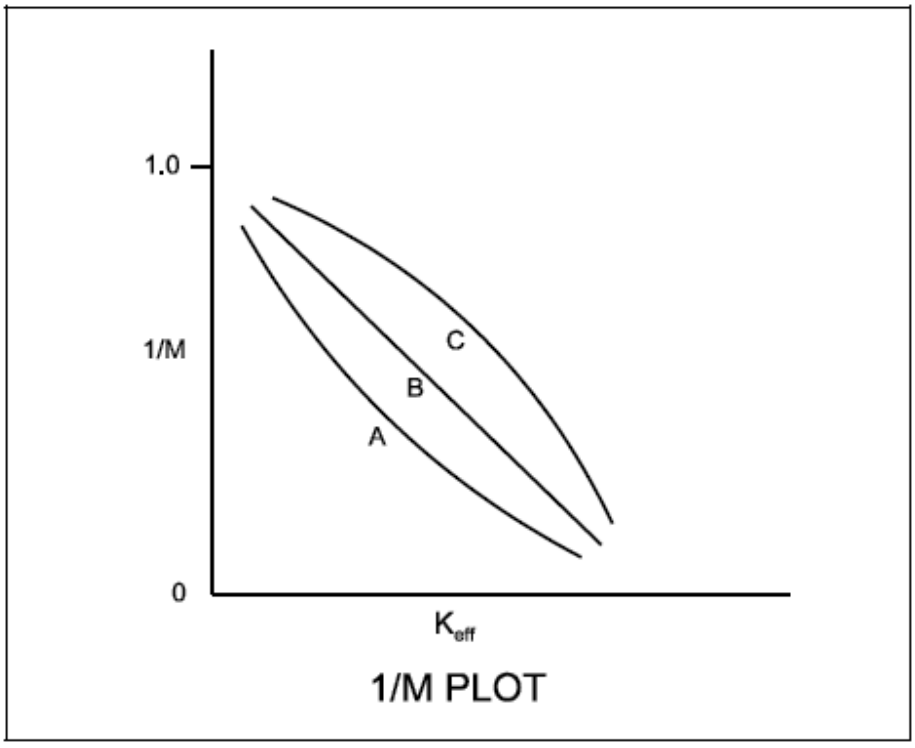
A. A；較短

B. A；較長

C. C；較短

D. C；較長

答案：C.



科目： 192008
知能類：K1.04 [3.8/3.8]
序號： P1866 (B2266)

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

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

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

C. length of time from neutron birth to absorption.

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

ANSWER: B.

在核子反應器起動並接近臨界時，每次抽出控制棒以後，達到平衡中子計數率所需的時間漸長，其原因是何者增加？

A. 中子產生所需的時間。

B. 為達到穩定中子計數率所需的中子世代數。

C. 從中子誕生到被吸收的時間。

D. 到達臨界時產生的延遲中子分率。

答案：B.

科目： 192008
知能類：K1.04 [3.8/3.8]
序號： P1867

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

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

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

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

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

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

ANSWER: A.

在核子反應器起動期間，第一次加入反應度讓計數率從 20 增至 40 cps，第二次加入反應度則讓計數率從 40 增至 80 cps。假設在第一次加入反應度之前，K_{eff} 等於 0.92。

下列那項敘述描述了加入反應度的大小？

A. 第一次加入的反應度，約是第二次的兩倍大。

B. 第二次加入的反應度，約是第一次的兩倍大。

C. 兩次加入的反應度大約相等。

D. 資料不足而無法判斷反應度數值關係。

答案：A.

科目： 192008
知能類：K1.04 [3.8/3.8]
序號： P1972 (B1067)

At one point during a nuclear reactor startup and approach to criticality, count rate is noted to be 780 cps, and K_{eff} is calculated to be 0.92. Later in the same startup, stable count rate is 4160 cps.

What is the new K_{eff}?

A. 0.945

B. 0.950

C. 0.975

D. 0.985

ANSWER: D.

核子反應器起動並接近臨界時，某點計數率為780 cps，而K_{eff}計算值為0.92。計數率於該次起動後達到4160 cps。

下列何者是新的K_{eff}值？

A. 0.945

B. 0.950

C. 0.975

D. 0.985

答案：D.

科目： 192008
知能類：K1.04 [3.8/3.8]
序號： P2265 (B366)

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

A. 0.963

B. 0.972

C. 0.981

D. 0.990

ANSWER: C.

在核子反應器起動期間，源階指示值穩定在100 cps，K_{eff}為0.95。

抽出數根控制棒後，源階指示值穩定在270 cps。請問下列何者是新的K_{eff}值？(假設反應器起動率在抽出控制棒前後都是零)

A. 0.963

B. 0.972

C. 0.981

D. 0.990

答案：C.

科目： 192008
知能類：K1.04 [3.8/3.8]
序號： P2366 (B2365)

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

A. 200 cps

B. 245 cps

C. 300 cps

D. 375 cps

ANSWER: A.

一部核子反應器正進行起動，目前的K_{eff}等於0.95，穩定源階計數率為120 cps。當K_{eff}變成0.97時，穩定計數率將是多少？

A. 200 cps

B. 245 cps

C. 300 cps

D. 375 cps

答案：A.

科目： 192008
知能類：K1.04 [3.8/3.8]
序號： P2468 (B1766)

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

A. 210 cps

B. 245 cps

C. 300 cps

D. 375 cps

ANSWER: D.

一部核子反應器正進行起動，目前的K_{eff}為0.95，平衡源階計數率為150 cps。當K_{eff}變成0.98時，平衡計數率將是多少？

A. 210 cps

B. 245 cps

C. 300 cps

D. 375 cps

答案：D.

科目： 192008
知能類：K1.04 [3.8/3.8]
序號： P2766 (B2765)

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

A. 0.96

B. 0.97

C. 0.98

D. 0.99

ANSWER: D.

核子反應器起動期間，源階指示值穩定於120 cps，而K_{eff}等於0.95。抽出控制棒一段時間後，源階指示值穩定於600 cps。下列何者是新的K_{eff}近似值？

A. 0.96

B. 0.97

C. 0.98

D. 0.99

答案：D.

科目： 192008
知能類：K1.04 [3.8/3.8]
序號： P3665 (B3665)

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

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

A. small; fuel enrichment

B. small; reactivity

C. large; fuel enrichment

D. large; reactivity

ANSWER: D.

請參照下面的1/M座標圖，上面有曲線A與B。假設兩座標軸均為線性單位。

相較於更換燃料後期，在更換燃料初期，若每裝入一個燃料元件，將導致源階計數率擁有較_____的比例改變，則會產生曲線A；若每個燃料元件含有相等_____，則會產生曲線B。

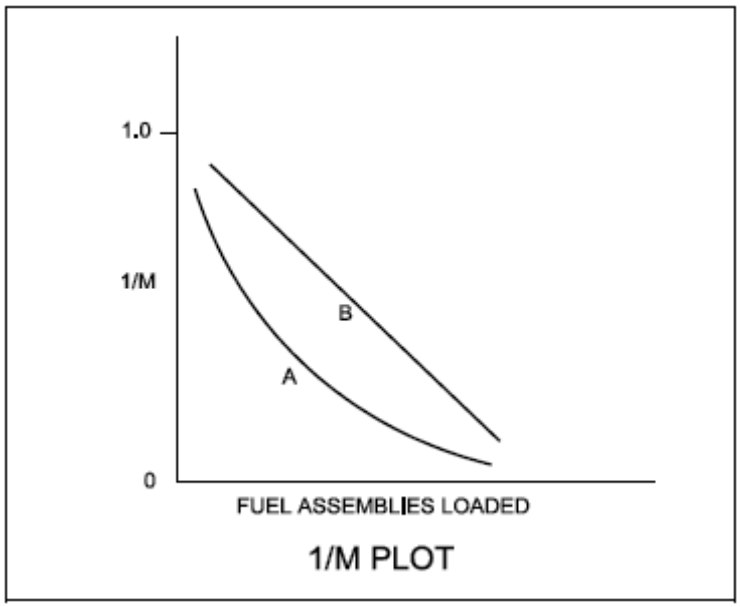
A. 小；燃料濃度

B. 小；反應度

C. 大；燃料濃度

D. 大；反應度

答案：D.



科目： 192008
知能類：K1.05 [3.8/3.9]
序號： P66

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

A. the point of adding heat.

B. supercriticality.

C. subcriticality.

D. equilibrium subcritical count rate.

ANSWER: D.

帶有中子源的核子反應器，若其中子通率於幾分鐘內沒有變化，意指達到臨界或……

A. 加熱起始點

B. 超臨界

C. 次臨界

D. 平衡次臨界計數率

答案：D.

科目： 192008
知能類：K1.05 [3.8/3.9]
序號： P267

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

A. smaller; shorter

B. smaller; longer

C. greater; shorter

D. greater; longer

ANSWER: D.

若在核子反應器起動並接近臨界時，加入等量的正反應度，將導致平衡中子計數率出現_____的絕對變化，每次達到新平衡中子通率所需的時間則_____。

A. 較小；變短

B. 較小；變長

C. 較大；變短

D. 較大；變長

答案：D.

科目： 192008
知能類：K1.05 [3.8/3.9]
序號： P365 (B365)

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

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

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

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

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

ANSWER: C.

一部核子反應器於穩定源階計數率下進行起動，同時該反應器接近臨界。下列何者描述了在控制棒抽出過程中與抽出後5秒的計數率特性？(假設反應器維持次臨界)

A. 計數率沒有改變，直到達到臨界。

B. 計數率將快速增加(瞬發跳升)至較高穩定值。

C. 計數率將快速增加(瞬發跳升)，然後緩慢增加並穩定於一較高值。

D. 計數率將快速增加(瞬發跳升)，然後緩慢降低並穩定於原值。

答案：C.

科目： 192008
知能類：K1.05 [3.8/3.9]
序號： P3567 (B3566)

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

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

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

A. positive; at

B. positive; above

C. negative; at

D. negative; above

ANSWER: B.

核子反應器於燃料週期中期進行起動。該反應器處於正常運轉溫度及壓力。主蒸汽隔離閥開啟，而主汽機旁通(亦稱為蒸汽排放)閥關閉。此反應器接近臨界。

反應器起動率(SUR)穩定於零時，汽機旁通閥突然故障打開(fail open)而卡在開啟位置，並將蒸汽排入主冷凝器。運轉員立即確認控制棒無任何移動，亦未採取進一步行動。假設蒸汽產生器水位維持穩定，反應器並未急停，亦沒有發生其他反應器保護動作。

基於閥故障所致，起動率將先變成_____；反應器功率將_____加熱起始點處穩定。

A. 正值；在

B. 正值；在高於

C. 負值；在

D. 負值，在高於

答案：B.

科目： 192008
知能類：K1.06 [2.9/3.1]
序號： P466

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

A. decreases toward zero.

B. decreases toward 1.0.

C. increases toward infinity.

D. increases toward 1.0.

ANSWER: A.

核子反應器起動期間，隨著 K_{eff} 朝 1.0 增加，1/M 數值……

A. 朝 0 降低

B. 朝 1.0 降低

C. 朝無限值增加

D. 朝 1.0 增加

答案：A.

科目： 192008
知能類：K1.06 [2.9/3.1]
序號： P969

The following data was obtained during a nuclear reactor startup:

ROD POSITION (UNITS WITHDRAWN)	COUNT RATE (CPS)
0	20
10	25
15	29
20	33
25	40
30	50

Assuming uniform differential rod worth, at what rod height will criticality occur?

A. 66 to 75 units withdrawn

B. 56 to 65 units withdrawn

C. 46 to 55 units withdrawn

D. 35 to 45 units withdrawn

ANSWER: C.

一部核子反應器於起動期間的資料如下：

控制棒位置 (抽出單位)	計數率 (CPS)
0	20
10	25
15	29
20	33
25	40
30	50

假設微分控制棒本領平均分佈，臨界時的控制棒高度為多少？

A. 66-75抽出單位

B. 56-65抽出單位

C. 46-55抽出單位

D. 35-45抽出單位

答案：C.

科目： 192008
知能類：K1.06 [2.9/3.1]
序號： P1167

The following data was obtained during a nuclear reactor startup:

ROD POSITION (UNITS WITHDRAWN)	COUNT RATE (CPS)
0	180
10	210
15	250
20	300
25	360
30	420

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

A. 35 to 45 units withdrawn

B. 46 to 55 units withdrawn

C. 56 to 65 units withdrawn

D. 66 to 75 units withdrawn

ANSWER: B.

一部核子反應器起動時取得的資料如下：

控制棒位置 (抽出單位)	計數率 (CPS)
0	180
10	210
15	250
20	300
25	360
30	420

假設微分控制棒本領平均分佈，臨界時的控制棒高度約為多少？

A. 35-45抽出單位

B. 46-55抽出單位

C. 56-65抽出單位

D. 66-75抽出單位

答案：B.

科目： 192008
知能類：K1.06 [2.9/3.1]
序號： P1667 (B1567)

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

ROD POSITION (UNITS WITHDRAWN)	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 rod position should criticality occur?

A. Approximately 70 units withdrawn

B. Approximately 60 units withdrawn

C. Approximately 50 units withdrawn

D. Approximately 40 units withdrawn

ANSWER: C.

一部核子反應器在起動期間取得的穩態條件如下：

控制棒位置 (抽出單位)	計數率 (CPS)
0	180
5	200
10	225
15	257
20	300
25	360
30	450

假設微分控制棒本領平均分佈，臨界時的控制棒位置應為何處？

A. 約為70抽出單位

B. 約為60抽出單位

C. 約為50抽出單位

D. 約為40抽出單位

答案：C.

科目： 192008
知能類：K1.06 [2.9/3.1]
序號： P1966 (B1767)

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

ROD POSITION (UNITS WITHDRAWN)	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 rod position will criticality occur? (A grid is provided below.)

A. 50 units withdrawn

B. 60 units withdrawn

C. 70 units withdrawn

D. 80 units withdrawn

ANSWER: B.

一部核子反應器在起動期間取得的穩態條件如下：

控制棒位置 (抽出單位)	計數率 (CPS)
10	360
15	400
20	450
25	514
30	600
35	720
40	900

假設微分控制棒本領平均分佈，臨界時的控制棒位置應為何處？(下面提供座標方格)

A. 50抽出單位

B. 60抽出單位

C. 70抽出單位

D. 80抽出單位

答案：B.

科目： 192008
知能類：K1.07 [3.5/3.6]
序號： P67

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

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

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

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

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

ANSWER: B.

一部接近爐心壽命末期的核子反應器，於 100%功率平衡條件下急停，4 小時後起動，此時算出臨界控制棒位置。發生下列那一狀況時，實際的臨界控制棒位置，將低於預期的臨界棒位？

A. 延到急停 8 小時後再起動。

B. 蒸汽排放壓設定值較反應器起動前低上 100 psi。

C. 實際硼濃度較假設硼濃度高出 10 ppm。

D. 接近臨界期間，一根控制棒仍維持完全插入。

答案：B.

科目： 192008
知能類：K1.07 [3.5/3.6]
序號： P268

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

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

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

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

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

ANSWER: B.

在開始起動核子反應器之前，運轉員欲預測臨界控制棒位置，必須考量下列何者的停機後變化所加入的反應度數量……

A. 反應器冷卻水硼濃度、中子通率與可燃性毒物。

B. 控制棒位置、爐心氙-135 濃度與緩和劑溫度。

C. 中子通率、反應器冷卻水硼濃度與控制棒位置。

D. 緩和劑溫度、可燃性毒物和爐心氙-135 濃度。

答案：B.

科目： 192008
知能類：K1.07 [3.5/3.6]
序號： P367

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

A. Reactor power level just prior to the trip

B. Steam generator levels just prior to the trip

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

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

ANSWER: B.

一部核子反應器意外急停，並預定在急停 48 小時後起動，請問下列何者為預估臨界硼濃度時，無須考慮的因素？

A. 急停前的反應器功率。

B. 急停前的蒸汽產生器水位。

C. 急停前的爐心氙反應度。

D. 急停前的爐心釤反應度。

答案：B.

科目： 192008
知能類：K1.07 [3.5/3.6]
序號： P467

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

A. The startup is delayed for approximately 2 hours.

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

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

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

ANSWER: C.

一部核子反應器以全功率運轉 60 天後急停，並預定在急停 6 小時後起動，此時已經正確算出預估臨界棒位(ECP)。下列那項事件或狀況，將導致實際臨界棒位低於預估臨界棒位？

A. 延後約 2 小時再起動。

B. 臨界前的蒸汽產生器飼水飼入率降低 5%。

C. 臨界前的蒸汽產生器壓力降低 100 psi。

D. 新硼酸樣本顯示，目前的硼濃度較計算 ECP 使用的濃度高出 20 ppm。

答案：C.

科目： 192008
知能類：K1.07 [3.5/3.6]
序號： P765

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

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

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

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

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

ANSWER: A.

下列何種情況將導致在低於預估控制棒位處發生臨界？

A. 調整反應器冷卻水系統的硼濃度，讓其低於起動計算假設值 50 ppm。

B. 發生故障，導致控制棒速度低於正常速度。

C. 將反應器(於 100%平衡功率條件下急停)的起動時間，從急停後 10 天延至 14 天。

D. 誤調蒸汽排放(汽機旁通)控制器，讓蒸汽壓力維持在高出所需無載設定 50 psig 之處。

答案：A.

科目： 192008
知能類：K1.07 [3.5/3.6]
序號： P970

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

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

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

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

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

ANSWER: B.

一部核子反應器於 100%平衡功率條件下急停，並預定在急停後 15 小時起動，此時已經正確算出預估臨界棒位((ECP)。下列那項事件或狀況，將導致實際臨界棒位高於預估臨界棒位？

A. 計算 ECP 時採用 90%的反應器功率。

B. 反應器較預期提早約 2 小時到達臨界。

C. 蒸汽產生器的壓力於臨界前降低 100 psi。

D. 目前的硼濃度較計算 ECP 所用的數值低 10 ppm。

答案：B.

科目： 192008
知能類：K1.07 [3.5/3.6]
序號： P1266

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

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

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

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

D. An inadvertent dilution of reactor coolant system boron concentration

ANSWER: D.

一部進行起動的核子反應器處於次臨界。下列那項條件將導致臨界控制棒位低於預估臨界棒位？

A. 發生故障，導致控制棒速度快於正常速度。

B. 發生故障，導致控制棒速度慢於正常速度。

C. 將反應器(於 100%平衡功率條件下急停)的起動時間，從急停後 3 小時延後至 5 小時。

D. 反應器冷卻水系統硼濃度意外遭到稀釋。

答案：D.

科目： 192008
知能類：K1.07 [3.5/3.6]
序號： P1365

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

A. Steam generator pressure increases by 50 psia.

B. Steam generator level increases by 10%.

C. Pressurizer pressure increases by 50 psia.

D. Pressurizer level increases by 10%.

ANSWER: A.

一部核子反應器於爐心壽命末期起動並抽出控制棒。下列那一選項將導致反應器在高於預估臨界棒位的控制棒高度達到臨界？

A. 蒸汽產生器壓力增加 50 psia。

B. 蒸汽產生器水位增加 10%。

C. 調壓槽壓力增加 50 psia。

D. 調壓槽水位增加 10%。

答案：A.

科目： 192008
知能類：K1.07 [3.5/3.6]
序號： P1565

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

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

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

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

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

ANSWER: A.

一部處於爐心壽命末期的核子反應器，以 100%穩態功率運轉時急停，現在正進行起動。下列那一情況將導致發生臨界的位置高於預估臨界棒位？

A. 誤調蒸汽排放(汽機旁通)控制器，導致蒸汽產生器的壓力，維持在高於所需無載設定 50 psig 處。

B. 調整反應器冷卻水系統的硼濃度，讓其低於起動計算假設濃度 50 ppm。

C. 發生故障，導致控制棒速度較正常速度慢 10%。

D. 將急停後的起動時間，從 10 天延至 14 天。

答案：A.

科目： 192008
知能類：K1.07 [3.5/3.6]
序號： P1666

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

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

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

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

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

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

ANSWER: D.

一部核子反應器以 100%功率運轉三個月時急停，並預定在 15 小時後起動，此時已經正確算出臨界控制棒位預估值(ECP)。

下列那一狀況將導致在低於預估臨界棒位處達到臨界？

A. 調整反應器冷卻水系統的硼濃度，讓其高於起動計算假設值 50 ppm。

B. 發生故障，讓控制棒速度慢於正常速度。

C. 將急停後的起動時間，從 15 小時提前至 12 小時。

D. 使用 90%的急停前功率來決定功率欠缺(power defect)。

答案：D.

科目： 192008
知能類：K1.07 [3.5/3.6]
序號： P1765

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

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

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

A. Decreasing reactor coolant system boron concentration to 350 ppm

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

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

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

ANSWER: D.

一部反應器發生急停時，正以 100%反應器功率運轉，爐心氙-135 狀況達到平衡，並接近燃料週期末期。預估臨界棒位((ECP)已用下列假設算出：

急停 24 小時後發生臨界
反應器冷卻水溫度為 550°F
反應器冷卻水硼濃度為 400 ppm

下列那一選項將導致臨界時的控制棒位高於算出的預估臨界棒位？

A. 反應器冷卻水系統的硼濃度降至 350 ppm。

B. 發生故障，導致控制棒速度較正常速度快上 20%。

C. 急停後的臨界時間改為 30 小時。

D. 誤調蒸汽排放(汽機旁通)控制器，讓反應器冷卻水的溫度維持在 553°F。

答案：D.

科目： 192008
知能類：K1.09 [3.2/3.3]
序號： P68 (B123)

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

A. 1.54% ΔK/K

B. 1.52% ΔK/K

C. 1.50% ΔK/K

D. 1.48% ΔK/K

ANSWER: B.

當K_{eff} = 0.985時，需要加入多少反應度，方能使核子反應器恰好達到臨界？

A. 1.54% ΔK/K

B. 1.52% ΔK/K

C. 1.50% ΔK/K

D. 1.48% ΔK/K

答案：B.

科目： 192008
知能類：K1.09 [3.2/3.3]
序號： P469

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

A. subcritical.

B. critical.

C. supercritical.

D. prompt critical.

ANSWER: A.

一部次臨界核子反應器距離臨界 1.0 %ΔK/K，運轉員此時以 30 ppm 的硼酸，稀釋反應器冷卻水系統。假設硼本領為-0.025% ΔK/K/ppm，而且反應度沒有其他變化，該反應器處於……

A. 次臨界

B. 臨界

C. 超臨界

D. 瞬發臨界(prompt critical)

答案：A.

科目： 192008
知能類：K1.09 [3.2/3.3]
序號： P2267 (B867)

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

A. infinity.

B. undefined.

C. 0.0 ΔK/K.

D. 1.0 ΔK/K.

ANSWER: C.

一部核子反應器處於臨界時，其反應度為……

A. 無限大

B. 無定義

C. 0.0 ΔK/K

D. 1.0 ΔK/K

答案：C.

科目： 192008
知能類：K1.10 [3.3/3.4]
序號： P69 (B269)

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

A. exactly critical.

B. supercritical.

C. subcritical.

D. prompt critical.

ANSWER: B.

起動核子反應器時，若未加入額外反應度下，起動率維持固定正值，則該反應器處於……

A. 恰好臨界

B. 超臨界

C. 次臨界

D. 瞬發臨界

答案：B.

科目： 192008
知能類：K1.10 [3.3/3.4]
序號： P125

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

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

A. greater; at

B. greater; above

C. less; at

D. less; above

ANSWER: D.

一部核子反應器起初於 10,000 cps 處臨界，此時的蒸汽產生器大氣釋壓閥(atmospheric relief valve)故障打開(fail open)。假設反應器處於爐心壽命末期、沒有急停、運轉員也沒有採取行動。

反應器穩定時，其冷卻水平均溫度(T_{ave})將_____T_{ave} 初值，反應器功率將_____加熱起始點。

A. 高於；位在

B. 高於；高於

C. 低於；位在

D. 低於；高於

答案：D.

科目： 192008
知能類：K1.10 [3.3/3.4]
序號： P136

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

A. remain constant.

B. decrease linearly.

C. decrease geometrically.

D. decrease exponentially.

ANSWER: A.

一部核子反應器於停機一個月後起動。如果反應器達到臨界，接著於源階/起動階的 10,000 cps 處穩定，往後 10 分鐘的計數率將……

A. 維持不變。

B. 呈線性減少。

C. 呈幾何減少。

D. 呈指數減少。

答案：A.

科目： 192008
知能類：K1.10 [3.3/3.4]
序號： P1870 (B2168)

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

After an additional 30 seconds reactor power will be _____ and reactor period will be _____. (Assume reactor power remains below the point of adding heat.)

A. increasing; increasing

B. increasing; constant

C. constant; increasing

D. constant; constant

ANSWER: B.

一部核子反應器在停機一個月後進行起動中。運轉員於達到臨界時建立+80秒週期，並停止控制棒移動。

再過30秒後，反應器功率將_____，反應器週期將_____。(假設反應器功率維持在加熱起始點下方)

A. 增加；增加

B. 增加；維持不變

C. 維持不變；增加

D. 維持不變；維持不變

答案：B.

科目： 192008
知能類：K1.10 [3.3/3.4]
序號： P2667 (B2668)

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

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

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

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

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

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

ANSWER: D.

一部核子反應器在功率10^{-6}%達到臨界。控制棒抽出5秒然後停止，導致穩定起動率(SUR)為+0.2 dpm。

若控制棒在反應器起初於功率10^{-6}%達到臨界時插入(而非抽出)5秒，則穩定起動率將是：(假設在兩狀況中加入的反應度絕對值均相等)

A. 較-0.2 dpm快，因為相較於反應器功率增加，反應器功率減少造成較小的延遲中子分率。

B. 較-0.2 dpm快，因為相較於反應器功率增加，延遲中子對反應器功率減少的限制較小。

C. 較-0.2 dpm慢，因為相較於反應器功率增加，反應器功率減少造成較大的延遲中子分率。

D. 較-0.2 dpm慢，因為相較於反應器功率增加，延遲中子對反應器功率減少的限制較大。

答案：D.

科目： 192008
知能類：K1.10 [3.3/3.4]
序號： P3467 (B3451)

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

With the stable positive SUR, the following is observed:

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

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

A. 3.16×10^{-5}%

B. 5.0×10^{-5}%

C. 6.32×10^{-5}%

D. 1.0×10^{-4}%

ANSWER: A.

核能電廠起動期間，核子反應器爐心於加熱起始點下方達到臨界，接著在爐心加入少量正反應度以建立穩定正起動率(SUR)。

起動率為穩定正值時，觀察到下列數值：

時間	功率
0 秒	3.16×10^{-7}%
90 秒	1.0×10^{-5}%

下列何者為 120 秒時的反應器功率？

A. 3.16×10^{-5}%

B. 5.0×10^{-5}%

C. 6.32×10^{-5}%

D. 1.0×10^{-4}%

答案：A.

科目： 192008
知能類：K1.11 [3.8/3.8]
序號： P868 (B868)

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

A. Constant positive startup rate during rod withdrawal

B. Increasing positive startup rate during rod withdrawal

C. Constant positive startup rate with no rod motion

D. Increasing positive startup rate with no rod motion

ANSWER: C.

下列何者指出核子反應器在正常起動期間達到臨界？

A. 正起動率於抽出控制棒期間維持不變。

B. 正起動率於抽出控制棒期間增加。

C. 正起動率在控制棒不移動下維持不變。

D. 正起動率在控制棒不移動下增加。

答案：C.

科目： 192008
知能類：K1.11 [3.8/3.8]
序號： P2968 (B2966)

A nuclear reactor startup is in progress; control rod withdrawal has just been stopped to assess criticality. Which one of the following is a combination of indications in which each listed indication supports a declaration that the reactor is critical?

A. Stable startup rate equals 0.0 dpm; source range count rate is stable; inverse multiplication (1/M) value equals 1.111.

B. Stable startup rate equals +0.2 dpm; source range count rate is slowly increasing; inverse multiplication (1/M) value equals 1.000

C. Stable startup rate equals 0.0 dpm; source range count rate is stable; inverse multiplication (1/M) value equals 0.111.

D. Stable startup rate equals +0.2 dpm; source range count rate is slowly increasing; inverse multiplication (1/M) value equals 0.000.

ANSWER: D.

一部核子反應器進行起動中；控制棒剛停止抽出以評估臨界度。下列那項指示值組合中，每一項都證實反應器臨界？

A. 穩定起動率等於 0.0 dmp；源階計數率穩定；增殖倒數(1/M)值等於 1.111。

B. 穩定起動率等於+0.2 dmp；源階計數率緩慢增加；增殖倒數(1/M)值等於 1.000。

C. 穩定起動率等於 0.0 dmp；源階計數率穩定；增殖倒數(1/M)值等於 0.111。

D. 穩定起動率等於+0.2 dmp；源階計數率緩慢增加；增殖倒數(1/M)值等於 0.000。

答案：D.

科目： 192008
知能類：K1.12 [3.5/3.6]
序號： P767

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

A possible cause for these indications is...

A. inadvertent boration.

B. reaching the point of adding heat.

C. fuel depletion.

D. burnable poison burnout.

ANSWER: A.

一部核子反應器從無氙條件下起動時，剛於 10^{-8}%功率處達到臨界。運轉員建立 0.5 dpm 起動率以增加功率。10 分鐘後，起動率先降至零，再逐漸變為更大負值(increasingly negative)。

這些跡象的可能原因是……

A. 意外加入硼酸。

B. 達到加熱起始點。

C. 燃料耗竭。

D. 可燃性毒物燃耗。

答案：A.

科目： 192008
知能類：K1.12 [3.5/3.6]
序號： P1366

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

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

A. Inadvertent boration of the RCS

B. Xenon buildup in the core

C. Gradual cooling of the RCS

D. Fission-induced heating of the fuel

ANSWER: A.

一部核子反應器從無氙條件下起動期間，運轉員記下臨界資料後，建立正起動率以持續增加功率。幾分鐘內，反應器功率在達到加熱起始點之前停止增加，並開始緩慢降低。

下列那項變化能造成此項行為？

A. 意外於 RCS 加入硼酸。

B. 爐心累積氙。

C. RCS 逐漸冷卻。

D. 燃料分裂引發的加熱。

答案：A.

科目： 192008
知能類：K1.14 [3.1/3.1]
序號： P3668 (B3668)

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

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

A. stabilize at a positive value.

B. turn and slowly increase.

C. stabilize at zero.

D. continue to slowly decrease.

ANSWER: A.

一部核子反應器在起動中達到稍微超臨界。抽出一小段控制棒以建立所欲起動率。假設反應器在抽出控制棒後，仍維持稍微超臨界，同時反應器功率維持在加熱起始點之下相當距離。

停止抽出控制棒後，反應器起動率起先降低，然後……

A. 穩定於一正值。

B. 轉變且緩慢增加。

C. 穩定在零。

D. 持續緩慢降低。

答案：A.

科目： 192008
知能類：K1.13 [3.4/3.6]
序號： P670 (B670)

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

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

A. 0.16% ΔK/K

B. 0.19% ΔK/K

C. 0.23% ΔK/K

D. 0.29% ΔK/K

ANSWER: A.

運轉員取得核子反應器起動的臨界資料後，建立1 DPM起動率以增加功率至加熱起始點(POAH)。請問必須加入多少負反應度回饋，才能讓功率停在POAH處而不再增加？

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

A. 0.16% ΔK/K

B. 0.19% ΔK/K

C. 0.23% ΔK/K

D. 0.29% ΔK/K

答案：A.

科目： 192008
知能類：K1.13 [3.4/3.6]
序號： P768

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

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

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

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

D. to support main turbine operations.

ANSWER: C.

加熱起始點意指：核子反應器達到產生足夠熱量的功率，以使…

A. 都卜勒係數產生正反應度回饋。

B. 空泡係數產生負反應度回饋。

C. 燃料與冷卻水產生可量測的增溫。

D. 支援主汽機運轉。

答案：C.

科目： 192008
知能類：K1.13 [3.4/3.6]
序號： P2370 (B2369)

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

A. -0.10% ΔK/K

B. -0.12% ΔK/K

C. -0.01% ΔK/K

D. -0.012% ΔK/K

ANSWER: A.

運轉員記錄反應器起動期間的臨界資料後，建立起+48秒的反應器週期，以增加功率至加熱起始點。為使功率穩定於加熱起始點，大約得加入多少反應度？(假設$\bar{\beta}_{eff} = 0.00579$)

A. -0.10% ΔK/K

B. -0.12% ΔK/K

C. -0.01% ΔK/K

D. -0.012% ΔK/K

答案：A.

科目： 192008
知能類：K1.13 [3.4/3.6]
序號： P2470

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

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

A. increasing; increasing

B. increasing; constant

C. constant; increasing

D. constant; constant

ANSWER: B.

一部核子反應器在停機一個月後進行起動。運轉員於反應器達到臨界時，建立+1.0 dpm 的穩定起動率，並停止控制棒移動。

再過 30 秒後，反應器功率將_____，起動率將_____。(假設反應器功率維持在加熱起始點下方)

A. 增加；增加

B. 增加；維持不變

C. 維持不變；增加

D. 維持不變；維持不變

答案：B.

科目： 192008
知能類：K1.13 [3.4/3.6]
序號： P2668 (B2671)

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

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

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

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

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

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

ANSWER: D.

一部核子反應器於無氙起動下達到臨界，其功率於中程階增加，並擁有0.5 dpm的穩定起動率(SUR)。

假設運轉員未採取影響反應度的行動，起動率將維持固定不變，直到……

A. 反應器冷卻水開始增溫，起動率接著增加。

B. 爐心氙-135生成變得顯著，起動率接著增加。

C. 遲延中子生成率超過瞬發中子生成率，起動率接著減少。

D. 燃料溫度開始增加，起動率接著減少。

答案：D.

科目： 192008
知能類：K1.13 [3.4/3.6]
序號： P3068 (B3068)

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

A. -0.10 %ΔK/K

B. -0.12 %ΔK/K

C. -0.15 %ΔK/K

D. -0.28 %ΔK/K

ANSWER: C.

運轉員取得核子反應器起動期間的臨界資料後，建立0.75 dpm的穩定起動率，增加功率至加熱起始點(POAH)。大約得加入多少反應度，才能讓反應器功率穩定在POAH？(假設$\bar{\beta}_{eff} = 0.0066$)

A. -0.10 %ΔK/K

B. -0.12 %ΔK/K

C. -0.15 %ΔK/K

D. -0.28 %ΔK/K

答案：C.

科目： 192008
知能類：K1.13 [3.4/3.6]
序號： P3935 (B3934)

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

A. -0.01 %ΔK/K

B. -0.06 %ΔK/K

C. -0.10 %ΔK/K

D. -0.60 %ΔK/K

ANSWER: C.

運轉員取得核子反應器起動期間的臨界資料後，建立0.52 dpm的穩定起動率，藉此增加功率至加熱起始點(POAH)。大約得加入多少反應度，才能讓反應器功率穩定在POAH？(假設$\bar{\beta}_{eff} = 0.0066$)

A. -0.01 %ΔK/K

B. -0.06 %ΔK/K

C. -0.10 %ΔK/K

D. -0.60 %ΔK/K

答案：C.

科目： 192008
知能類：K1.14 [3.1/3.1]
序號： P568

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

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

A. cannot be compared to

B. is greater than

C. is the same as

D. is less than

ANSWER: C.

反應器從無氙條件下起動時，由於意外而在低於適當中程階位(IR Level) 2 個十進位(decades)之處取得臨界資料。之後，再於相同的反應器冷卻水溫度及硼濃度下，於適當中程階位取得臨界資料。

在適當中程階位取得的臨界控制棒位，_____在低於適當中程階位 2 個十進位(decades)之處取得的臨界棒位。

A. 無法對照

B. 大於

C. 等於

D. 小於

答案：C.

科目： 192008
知能類：K1.14 [3.1/3.1]
序號： P669

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

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

A. less than

B. the same as

C. greater than

D. unrelated to

ANSWER: B.

核子反應器從無氙條件下起動時，由於意外而在高於適當中程階位(IR Level) 1 個十進位(decade)之處取得臨界資料。之後，再於相同的反應器冷卻水溫度及硼濃度下，於適當中程階位取得臨界資料。

在適當中程階位取得的臨界控制棒位，_____在高於適當中程階位 1 個十進位(decade)之處取得的臨界棒位。

A. 小於

B. 等於

C. 大於

D. 無關於

答案：B.

科目： 192008
知能類：K1.14 [3.1/3.1]
序號： P972 (B133)

A nuclear 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 to the core prior to reaching the POAH, reactor power will stabilize...

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

B. lower than the initial power level.

C. at the initial power level.

D. at the POAH.

ANSWER: A.

一部核子反應器在爐心加入少量正反應度之下，於低於加熱起始點(POAH)數個十進位(decades)之處達到臨界。若在達到加熱起始點之前，再加入等量的負反應度，則反應器功率將穩定在……

A. 高於初始功率、低於加熱起始點之處。

B. 初始功率下方。

C. 初始功率。

D. 加熱起始點。

答案：A.

科目： 192008
知能類：K1.14 [3.1/3.1]
序號： P1267

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

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

A. less than

B. equal to

C. greater than

D. independent of

ANSWER: B.

一部在無氙條件下起動的核子反應器剛達到臨界，並將增加其功率以記錄臨界資料。運轉員未按照起動程序書將功率穩定在 10^{-5}%處，不慎將功率穩定在 10^{-4}%處。

假設反應器冷卻水系統(RCS)溫度及其硼濃度沒有改變，功率為 10^{-4}%時的臨界控制棒高度，將_____功率為 10^{-5}%時的臨界控制棒高度。(忽略任何源階中子效應)

A. 低於

B. 等於

C. 高於

D. 無關於

答案：B.

科目： 192008
知能類：K1.14 [3.1/3.1]
序號： P1268

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

A. the point of adding heat.

B. the initial power level.

C. somewhat lower than the initial power level.

D. the subcritical multiplication equilibrium level.

ANSWER: C.

一部核子反應器於爐心加入－0.01% ΔK/K 的反應度時，在低於加熱起始點 2 個十進位(decades)之處達到臨界。如果 2 分鐘後再於爐心加入＋0.01% ΔK/K，反應器功率將穩定在……

A. 加熱起始點。

B. 初期功率。

C. 略低於初期功率之處。

D. 次臨界增殖平衡階。

答案：C.

科目： 192008
知能類：K1.14 [3.1/3.1]
序號： P1669

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

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

A. equal to; greater than

B. equal to; equal to

C. less than; greater than

D. less than; equal to

ANSWER: C.

一部核子反應器在 10^{-5}%功率處臨界，並於蒸汽產生器釋壓閥故障打開(fail open)時，記錄臨界資料。該反應器處於爐心壽命中期，並以手動操作控制棒。

假設運轉員沒有採取行動，反應器亦無急停，當反應器穩定時，平均冷卻水溫度將_____初始冷卻水溫度，反應器最終功率將_____加熱起始點。

A. 等於；高於

B. 等於；等於

C. 低於；高於

D. 低於；等於

答案：C.

科目： 192008
知能類：K1.14 [3.1/3.1]
序號： P2269

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

A. increase and stabilize at the POAH.

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

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

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

ANSWER: B.

一部核子反應器於加熱起始點(POAH)達到臨界，在爐心加入少量負反應度。若在約5分鐘後，加入等量的正反應度，反應器功率將……

A. 增加並穩定在POAH。

B. 迅速穩定在POAH下方的功率。

C. 以-80秒的週期持續降低，直至達到停機平衡中子量為止。

D. 以未知週期持續降低，直至達到停機平衡中子量為止。

答案：B.

科目： 192008
知能類：K1.14 [3.1/3.1]
序號： P2568 (B2568)

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

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

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

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

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

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

ANSWER: A.

一部核子反應器的目前功率為10^{-3}%，反應器週期為+60秒。在爐心加入負反應度，讓反應器週期成為-40秒週期。

若約在5分鐘後，於爐心加入等量的正反應度，則反應器功率將……

A. 增加並於加熱起始點達到穩定。

B. 增加並於10^{-3}%功率處達到穩定。

C. 以-40秒週期持續降低，直到達到平衡源階中子計數率為止。

D. 以不確定週期持續降低，直到達到平衡源階中子計數率為止。

答案：A.

科目： 192008
知能類：K1.14 [3.1/3.1]
序號： P4033

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

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

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

A. A; A

B. A; B

C. B; A

D. B; B

ANSWER: A.

請參照下圖中的兩張曲線圖。各圖座標軸均為線性比例。

一部核子反應器起初於源階達到臨界。時間 ＝0 秒時，開始等速加入正反應度。假設在圖中所示的整個期間，反應器功率都維持在加熱起始點下方。

起動率對此事件的一般反應如圖_____所示；反應器功率對此事件的一般反應如圖_____所示。(附註：每張圖可選擇一次、兩次或不選)

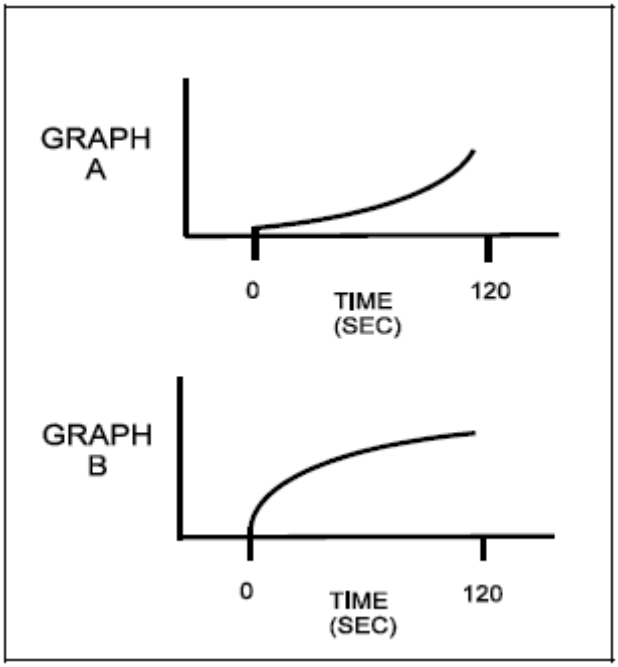
A. A；A

B. A；B

C. B；A

D. B；B

答案：A.


GRAPH
A
0
TIME
(SEC)
120
GRAPH
B
0
TIME
(SEC)
120

科目： 192008
知能類：K1.14 [3.1/3.1]
序號： P4434

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

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

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

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

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

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

ANSWER: D.

請參照下圖所示的起動率-時間座標圖。兩座標軸均為線性比例。

下列那項在 0 秒時發生的事件，將導致反應器出現圖中所示反應？

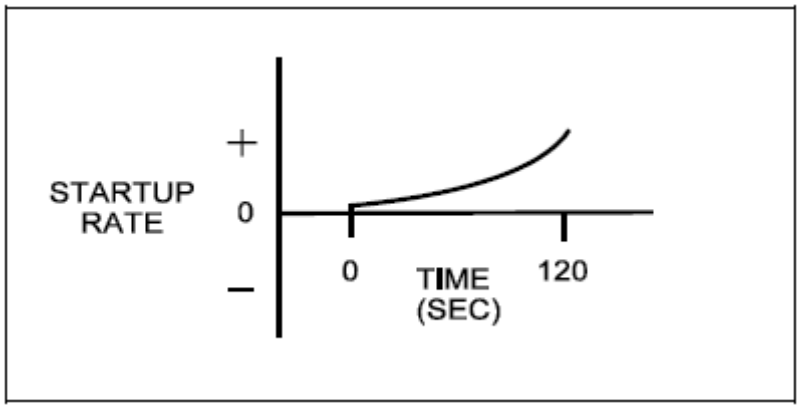
A. 在起初穩定於功率階、並於圖中所示的 120 秒期間仍維持在功率階的反應器，階增(step addition)加入正反應度。

B. 在起初穩定於功率階、並於圖中所示的 120 秒期間仍維持在功率階的反應器，等速加入正反應度。

C. 在起初於源階達到臨界、並於圖中所示的 120 秒期間仍維持在加熱起始點下方的反應器，階增(step addition)加入正反應度。

D. 在起初於源階達到臨界、並於圖中所示的 120 秒期間仍維持在加熱起始點下方的反應器，等速加入正反應度。

答案：D.


STARTUP
RATE
+
0
–
0
TIME
(SEC)
120

科目： 192008
知能類：K1.15 [3.4/3.4]
序號： P569

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

A. Pressurizer level

B. Reactor coolant temperature

C. Reactor power

D. Startup rate

ANSWER: D.

一部核子反應器於加熱起始點(POAH)下方達到臨界。運轉員加入足夠反應度以獲得 0.5 dpm 的起動率。反應器達到 POAH 時，下列何者將先降低？

A. 調壓槽水位。

B. 反應器冷卻水溫度。

C. 反應器功率。

D. 起動率。

答案：D.

科目： 192008
知能類：K1.17 [3.3/3.4]
序號： P70

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

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

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

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

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

ANSWER: D.

已知一部運轉中的核子反應器，於加熱起始點(POAH)下方達到臨界，那些反應度效應與達到 POAH 有關？

A. 反應器已經臨界，所以沒有反應度效應。

B. 由於燃料溫度升高，開始產生正反應度效應。

C. 由於燃料溫度降低，開始產生負反應度效應。

D. 由於燃料溫度升高，開始產生負反應度效應。

答案：D.

科目： 192008
知能類：K1.17 [3.3/3.4]
序號： P471

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

A. steam generator levels.

B. steam demand.

C. T_{ave}.

D. reactor coolant system boron concentration.

ANSWER: B.

一部核子反應器於略高於加熱起始點之處運轉。欲使反應器功率升至較高的穩定功率，運轉員必須增加……

A. 蒸汽產生器水位

B. 蒸汽需求

C. 平均溫度(T_{ave})

D. 反應器冷卻水系統硼濃度

答案：B.

科目： 192008
知能類：K1.17 [3.3/3.4]
序號： P1070

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

A. Moderator temperature only

B. Fuel temperature only

C. Moderator temperature and fuel temperature

D. Fuel temperature and voids

ANSWER: C.

一部核子反應器達到臨界時，其穩定功率位於加熱起始點(POAH)下方，此時加入少量正反應度。下列那項反應度係數，將讓反應器功率穩定在 POAH 處？

A. 僅有緩和劑溫度

B. 僅有燃料溫度

C. 緩和劑溫度與燃料溫度

D. 燃料溫度與空泡

答案：C.

科目： 192008
知能類：K1.17 [3.3/3.4]
序號： P1172

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

A. 100%

B. 50%

C. 10%

D. 1% (point of adding heat)

ANSWER: D.

一部接近爐心壽命末期的核子反應器，其功率為 5 x 10^{-2}%，起動率為 0.3 DPM。如果運轉員沒有採取行動，10 分鐘後的反應器功率約為多少？(假設系統保護措施未動作)

A. 100%

B. 50%

C. 10%

D. 1%(加熱起始點)

答案：D.

科目： 192008
知能類：K1.17 [3.3/3.4]
序號： P1367 (B1966)

A nuclear reactor startup is in progress near the end of core life. Reactor power is 5 x 10^{-6} amps (5 x 10^{-2} %) 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 49%.

D. Approximately 50%.

ANSWER: B.

一部核子反應器於爐心壽命末期進行起動。反應器功率為5 x 10^{-6} amps(5 x 10^{-2}%)，並以0.3 DPM的穩定起動率緩慢增加。假設運轉員沒有採取行動、反應器無急停、亦無釋出蒸汽，10分鐘後的反應器功率為多少？

A. 低於加熱起始點(POAH)

B. 位於POAH

C. 高於POAH但小於49%

D. 約在50%

答案：B.

科目： 192008
知能類：K1.17 [3.3/3.4]
序號： P1465

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

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

A. longer; lower

B. shorter; lower

C. longer; higher

D. shorter; higher

ANSWER: D.

一部核子反應器需要 3 小時的時間，才能將功率從 70%升至 100%，該反應器處於爐心壽命末期，僅以最高速率稀釋反應器冷卻水系統(RCS)硼濃度，來控制 RCS 溫度。

更換燃料後，欲以相同條件進行同樣的功率變更，此時需要_____的時間，因為 RCS 硼濃度的降低速率，在爐心壽命初期_____。

A. 較長；較低

B. 較短；較低

C. 較長；較高

D. 較短；較高

答案：D.

科目： 192008
知能類：K1.17 [3.3/3.4]
序號： P1470 (B1371)

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

A. 1% power to 4% power

B. 5% power to 15% power

C. 20% power to 35% power

D. 40% power to 60% power

ANSWER: A.

對於具有固定週期的核子反應器，下列何種功率變化所需的時間最長？

A. 1%功率至4%功率

B. 5%功率至15%功率

C. 20%功率至35%功率

D. 40%功率至60%功率

答案：A.

科目： 192008
知能類：K1.17 [3.3/3.4]
序號： P1567 (B1570)

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

A. 1% power to 6% power

B. 10% power to 20% power

C. 20% power to 35% power

D. 40% power to 60% power

ANSWER: D.

對於具有30秒固定週期的核子反應器，下列何種功率變化所需的時間最短？

A. 1%功率至6%功率

B. 10%功率至20%功率

C. 20%功率至35%功率

D. 40%功率至60%功率

答案：D.

科目： 192008
知能類：K1.17 [3.3/3.4]
序號： P2069 (B2072)

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

A. 3% power to 5% power

B. 5% power to 15% power

C. 15% power to 30% power

D. 30% power to 60% power

ANSWER: B.

對於具有180秒固定週期的核子反應器，下列何種功率變化所需的時間最長？

A. 3%功率至5%功率

B. 5%功率至15%功率

C. 15%功率至30%功率

D. 30%功率至60%功率

答案：B.

科目： 192008
知能類：K1.17 [3.3/3.4]
序號： P2168

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

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

A. greater than; equal to

B. greater than; greater than

C. equal to; equal to

D. equal to; greater than

ANSWER: B.

一部核子反應器於加熱起始點(POAH)達到穩定，起動期間的反應器冷卻水平均溫度為550°F。之後，抽出控制棒幾吋以增加蒸汽產生器的蒸汽產生率。

反應器穩定時，其功率將_____POAH，其冷卻水平均溫度將_____550°F。

A. 高於；等於

B. 高於；高於

C. 等於；等於

D. 等於；高於

答案：B.

科目： 192008
知能類：K1.17 [3.3/3.4]
序號： P2770 (B2770)

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

A. 3% power to 5% power

B. 5% power to 15% power

C. 15% power to 30% power

D. 30% power to 60% power

ANSWER: A.

對於具有180秒固定週期的核子反應器，下列何種功率變化所需的時間最短？

A. 3%功率至5%功率

B. 5%功率至15%功率

C. 15%功率至30%功率

D. 30%功率至60%功率

答案：A.

科目： 192008
知能類：K1.18 [3.6/3.5]
序號： P270

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

A. Reactor coolant temperature will be higher.

B. Reactor coolant system pressure will be lower.

C. Reactor power will be higher.

D. Pressurizer level will be lower.

ANSWER: A.

核能電廠以 50%平衡額定功率運轉。手動抽出控制棒 5 秒。請問在電廠穩定之後，將觀察到下列那項電廠參數變化？

A. 反應器冷卻水溫度較高。

B. 反應器冷卻水系統壓力較低。

C. 反應器功率較高。

D. 調壓槽水位較低。

答案：A.

科目： 192008
知能類：K1.18 [3.6/3.5]
序號： P869

A nuclear power plant is operating at 100% power at the end of core life with all control systems in manual. The reactor operator inadvertently adds 10 gallons of boric acid to the reactor coolant system (RCS).

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

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. T_{ave} will increase and stabilize at a higher value.

ANSWER: A.

核能電廠於爐心壽命末期以 100%功率運轉，所有控制系統均採手動。反應器運轉員不慎誤將 10 加侖硼酸加至反應器冷卻水系統(RCS)。

下列何者將於加入硼酸後發生？(假設發電機輸出電力維持不變)

A. 調壓槽水位將降低並穩定在較低數值。

B. RCS 壓力將升高並穩定在較高數值。

C. 反應器功率將降低並穩定在較低數值。

D. T_{ave} 將升高並穩定在較高數值。

答案：A.

科目： 192008
知能類：K1.18 [3.6/3.5]
序號： P1071

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

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

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

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

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

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

A. -0.0% ΔK/K

B. -0.2% ΔK/K

C. -0.6% ΔK/K

D. -0.8% ΔK/K

ANSWER: A.

核能電廠於下列初始穩態條件下運轉：

功率 = 100%
冷卻水硼濃度 = 620 ppm
冷卻水溫度 = 587°F

降載後，穩態條件如下所示：

功率 = 80%
冷卻水硼濃度 = 650 ppm
冷卻水溫度 = 577°F

已知下列數值下，降載期間因移動控制棒而加入了多少反應度？(忽略分裂產物毒素的反應度變化)

微分硼本領 = -1.0 x 10^{-2}% ΔK/K/ppm
總功率係數 = -1.5 x 10^{-2}% ΔK/K/%
緩和劑溫度係數 = -2.0 x 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

答案：A.

科目： 192008
知能類：K1.18 [3.6/3.5]
序號： P1871

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

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

After a load decrease, stable conditions are as follows:

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

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

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

A. +0.15% Δk/k

B. +0.25% Δk/k

C. -0.15% Δk/k

D. -0.25% Δk/k

ANSWER: C.

核能電廠於下列初始穩態條件下運轉：

功率 = 100%
冷卻水硼濃度 = 630 ppm
冷卻水溫度 = 582°F

降載後，穩態條件如下所示：

功率 = 80%
冷卻水硼濃度 = 640 ppm
冷卻水溫度 = 577°F

已知下列數值下，降載期間因移動控制棒而加入了多少反應度？(假設分裂產物毒素的反應度不變)

總功率係數　　= -1.5 x 10^{-2}% ΔK/K/%
緩和劑溫度係數 = -2.0 x 10^{-2}% ΔK/K/°F
微分硼本領　　= -1.5 x 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

答案：C.

科目： 192008
知能類：K1.18 [3.6/3.5]
序號： P1968

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

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

After a normal load decrease, conditions are as follows:

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

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

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

A. -0.5% ΔK/K

B. -0.15% ΔK/K

C. -0.25% ΔK/K

D. -0.35% ΔK/K

ANSWER: B.

核能電廠於下列初始條件下運轉：

功率	= 80%
冷卻水硼濃度	= 630 ppm
冷卻水溫度	= 582°F

正常降載後，條件如下所示：

功率	= 50%
冷卻水硼濃度	= 650 ppm
冷卻水溫度	= 572°F

已知下列數值下，降載期間因移動控制棒而加入了多少反應度？(假設分裂產物毒素的反應度沒有改變)

總功率係數　　= -1.5 x 10^{-2}% ΔK/K/%
緩和劑溫度係數 = -2.0 x 10^{-2}% ΔK/K/°F
微分硼本領　　=-1.5 x 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

答案：B.

科目： 192008
知能類：K1.18 [3.6/3.5]
序號： P2070

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

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

After a load decrease, conditions are as follows:

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

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

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

A. -0.2% ΔK/K

B. +0.2% ΔK/K

C. -0.4% ΔK/K

D. +0.4% ΔK/K

ANSWER: A.

核能電廠於下列初始條件下運轉：

功率	= 100%
冷卻水硼濃度	= 620 ppm
冷卻水溫度	= 587°F

降載後，條件如下所示：

功率	= 80%
冷卻水硼濃度	= 630 ppm
冷卻水溫度	= 577°F

已知下列數值下，降載期間因移動控制棒而加入了多少反應度？(假設分裂產物毒素的反應度沒有變化)

總功率係數 = -1.5 x 10^{-2}% ΔK/K/%
緩和劑溫度係數 = -2.0 x 10^{-2}% ΔK/K/°F
微分硼本領 = -1.0 x 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

答案：A.

科目： 192008
知能類：K1.18 [3.6/3.5]
序號： P3269

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

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

A. Decrease slowly due to fuel burnup only.

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

C. Increase slowly due to burnable poison burnout only.

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

ANSWER: B.

核能電廠進行更換燃料大修，一週後以 80%額定功率運轉，控制棒完全抽出。大修期間，以新燃料元件更換整個爐心，並於爐心內不同位置，置入新的可燃性毒物元件。

假設反應器功率和控制棒位置沒有改變，如果運轉員沒有採取行動，反應器冷卻水平均溫度在隔週將有何變化？理由何在？

A. 緩慢降低，僅因燃料燃耗所致。

B. 緩慢降低，因燃料燃耗與分裂產物毒素累積所致。

C. 緩慢增加，僅因可燃性毒物燃耗所致。

D. 緩慢增加，因可燃性毒物燃耗與分裂產物毒素衰變所致。

答案：B.

科目： 192008
知能類：K1.19 [3.5/3.6]
序號： P570

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

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

ANSWER: A.

反應器功率從 15%正常攀升至 75%時，下列參數將如何改變？

	主汽機 第一級壓力	反應器冷卻水系統 硼濃度
A.	增加	降低
B.	降低	降低
C.	增加	增加
D.	降低	增加

答案：A.

科目： 192008
知能類：K1.19 [3.5/3.6]
序號： P1672 (B1671)

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

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

A. U-235 and U-238

B. U-238 and Pu-239

C. U-235 and Pu-239

D. U-235 and Pu-241

ANSWER: C.

更換燃料大修剛結束，並以新燃料元件更換三分之一的爐心。此時起動反應器並宣告開始第六燃料週期，其功率正朝向 100%增加。

反應器達到 100%功率時，下列那組反應器燃料為爐心產生熱的最大來源？

A. U-235 與 U-238

B. U-238 與 Pu-239

C. U-235 與 Pu-239

D. U-235 與 Pu-241

答案：C.

科目： 192008
知能類：K1.19 [3.5/3.6]
序號： P2272

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

A. U-235 and U-238.

B. U-235 and Pu-239.

C. U-238 and Pu-239.

D. U-238 and Pu-241.

ANSWER: B.

核能電廠於接近爐心壽命末期以 100%功率運轉。下列那一選項的分裂為爐心產生熱的最大來源？

A. U-235 與 U-238

B. U-235 與 Pu-239

C. U-238 與 Pu-239

D. U-238 與 Pu-241

答案：B.

科目： 192008
知能類：K1.19 [3.5/3.6]
序號： P2868

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

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

A. U-235 and U-238

B. U-238 and Pu-239

C. U-235 and Pu-239

D. U-235 and Pu-241

ANSWER: A.

更換燃料大修剛結束，整個爐心卸載並更換新燃料。起動反應器且功率正朝向 100%增加。

反應器達到 100%功率時，下列那組反應器燃料為爐心產生熱的最大來源？

A. U-235 與 U-238

B. U-238 與 Pu-239

C. U-235 與 Pu-239

D. U-235 與 Pu-241

答案：A.

科目： 192008
知能類：K1.20 [3.8/3.9]
序號： P271

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

A. 2.4 minutes

B. 5.4 minutes

C. 7.4 minutes

D. 10.4 minutes

ANSWER: B.

核子反應器於 2 x 10^{-8}%功率達到臨界。運轉員視需要抽出控制棒，以便立即建立並維持 0.10 DPM 的起動率。該反應器需要花多久的時間，才能達到 7 x 10^{-8}%的功率？

A. 2.4 分鐘

B. 5.4 分鐘

C. 7.4 分鐘

D. 10.4 分鐘

答案：B.

科目： 192008
知能類：K1.20 [3.8/3.9]
序號： P571 (B2268)

A nuclear reactor startup is in progress and criticality has just been achieved. After recording critical rod height, the operator withdraws control rods for 20 seconds to establish a positive 1.0 dpm startup rate. One minute later (prior to the point of adding heat) the operator inserts the same control rods for 25 seconds. (Assume the control rod withdrawal and insertion rates are the same.)

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

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

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

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

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

ANSWER: D.

一部核子反應器進行起動且剛達到臨界。運轉員記下臨界控制棒高度後，抽出控制棒 20 秒以建立 1.0 dpm 的正起動率。1 分鐘後(達到加熱起始點之前)，運轉員將相同控制棒插入 25 秒。(假設控制棒的抽出及插入速率相同)

插入控制棒時，起動率將……

A. 在插入控制棒的整個期間都變成負值。

B. 在控制棒通過臨界控制棒高度後不久變成負值。

C. 在控制棒通過臨界控制棒高度之際變成負值。

D. 在控制棒即將通過臨界控制棒高度前變成負值。

答案：D.

科目： 192008
知能類：K1.20 [3.8/3.9]
序號： P2869

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

A. 3.7 minutes

B. 5.4 minutes

C. 6.7 minutes

D. 8.4 minutes

ANSWER: A.

核子反應器於 3 x 10^{-8}%功率達到臨界。運轉員視需要抽出控制棒，以便立即建立並維持 0.10 DPM 的穩定正起動率。請問反應器需要花多久的時間，才能到達 7 x 10^{-8}%的功率？

A. 3.7 分鐘

B. 5.4 分鐘

C. 6.7 分鐘

D. 8.4 分鐘

答案：A.

科目： 192008
知能類：K1.20 [3.8/3.9]
序號： P2970 (B2969)

A nuclear reactor startup is in progress and criticality has just been achieved. After recording the critical rod heights, the operator withdraws a control rod for 20 seconds to establish a stable 1.0 dpm startup rate (SUR). One minute later (prior to reaching the point of adding heat), the operator inserts the same control rod for 25 seconds.

During the insertion, when will the SUR become negative?

A. Immediately when the control rod insertion is initiated.

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

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

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

ANSWER: D.

一部核子反應器進行起動且剛達到臨界。運轉員記下臨界控制棒高度後，抽出控制棒 20 秒以建立 1.0 dpm 的穩定起動率(SUR)。1 分鐘後(達到加熱起始點之前)，運轉員將相同控制棒插入 25 秒。

在控制棒插入期間，起動率將於何時變成負值？

A. 開始插入控制棒時立刻變成負值。

B. 控制棒通過臨界控制棒高度後。

C. 控制棒通過臨界控制棒高度之際。

D. 控制棒即將通過臨界控制棒高度之前。

答案：D.

科目： 192008
知能類：K1.21 [3.6/3.8]
序號： P272

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

A. increase; increase

B. not change; increase

C. increase; decrease

D. not change; decrease

ANSWER: C.

核能電廠以 75%額定功率運轉數週。此時一條蒸汽管部分破裂，總蒸汽流量外洩 3%。假設運轉員沒有採取行動，系統亦無自動作動，反應器的穩定功率將_____，反應器冷卻水穩定溫度將_____。

A. 增加；升高

B. 維持不變；升高

C. 增加；降低

D. 維持不變；降低

答案：C.

科目： 192008
知能類：K1.21 [3.6/3.8]
序號： P368

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

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

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

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

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

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

ANSWER: C.

一部核子反應器達到臨界時，其穩定功率位於加熱起始點(POAH)下方。此時有一條無法隔離(unisolable)的蒸汽管線破裂，3%額定蒸汽流量外洩。

假設反應器沒有急停，下列那一選項說明了反應器的反應？(假設緩和劑溫度係數為負值)

A. T_{ave} 將降低。反應器將到達次臨界。

B. T_{ave} 將維持不變。反應器將到達 3%功率。

C. T_{ave} 將降低，反應器將到達 3%功率。

D. T_{ave} 將降低。由於反應器於 POAH 之下，功率沒有改變。

答案：C.

科目： 192008
知能類：K1.21 [3.6/3.8]
序號： P1370

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

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

A. higher; higher

B. unchanged; higher

C. higher; lower

D. unchanged; lower

ANSWER: C.

核能電廠以 80%額定功率運轉數週。此時一條蒸汽管部份破裂，總蒸汽流量外洩 2%。汽機負載與控制棒位置維持不變。

假設運轉員沒有採取行動，系統亦無自動動作，反應器功率將_____，反應器冷卻水平均溫度將_____。

A. 較高；較高

B. 維持不變；較高

C. 較高；較低

D. 維持不變；較低

答案：C.

科目： 192008
知能類：K1.21 [3.6/3.8]
序號： P1570

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

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

A. above; above

B. above; below

C. below; above

D. below; below

ANSWER: B.

核能電廠於爐心壽命末期以 85%額定功率運轉，反應器冷卻水平均溫度(T_{ave})為 580°F。汽機控制系統發生故障，導致汽機控制閥開啟，讓額外的 10%蒸汽流量進入主汽機。運轉員沒有採取行動，保護系統亦無起動，控制棒為手動操作。

在此暫態後，反應器功率將於 85%_____穩定，T_{ave} 將於 580°F_____穩定。

A. 上方；上方

B. 上方；下方

C. 下方；上方

D. 下方；下方

答案：B.

科目： 192008
知能類：K1.21 [3.6/3.8]
序號： P2372

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

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

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

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

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

ANSWER: B.

核能電廠於爐心壽命末期以 90%額定功率運轉，控制棒置於手動模式，汽機控制系統此時發生故障，讓汽機控制閥再開啟 5%。反應器功率起初將……

A. 增加，因為緩和劑的中子吸收速率先降低。

B. 增加，因為 U-238 共振能量的中子吸收速率先降低。

C. 降低，因為緩和劑的中子吸收速率先增加。

D. 降低，因為 U-238 共振能量的中子吸收速率先增加。

答案：B.

科目： 192008
知能類：K1.21 [3.6/3.8]
序號： P2671

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

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

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

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

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

ANSWER: D.

核能電廠於接近爐心壽命末期以 100%功率運轉，主汽機於此時急停。如果反應器沒有立刻急停，下列何者將率先發生而改變反應器功率？

A. 都卜勒係數加入正反應度，將造成反應器功率先增加。

B. 緩和劑溫度係數加入正反應度，將造成反應器功率先增加。

C. 都卜勒係數加入負反應度，將造成反應器功率先降低。

D. 緩和劑溫度係數加入負反應度，將造成反應器功率先降低。

答案：D.

科目： 192008
知能類：K1.21 [3.6/3.8]
序號： P2771 (N/A)

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

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

A. at; above

B. at; below

C. below; above

D. below; below

ANSWER: C.

核能電廠於爐心壽命末期以 80%額定功率運轉，反應器冷卻水平均溫度(T_{ave})為 580°F，控制棒置於手動模式。汽機控制系統此時發生故障，導致汽機控制閥部分關閉，讓進入主汽機的蒸汽流量減少 5%。運轉員沒有採取行動，保護系統亦無起動。

在此暫態後，反應器功率將於 80%_____穩定，T_{ave} 將於 580°F_____穩定。

A. 之處；上方

B. 之處；下方

C. 下方；上方

D. 下方；下方

答案：C.

科目： 192008
知能類：K1.21 [3.6/3.8]
序號： P3171 (B3169)

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

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

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

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

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

ANSWER: C.

核能電廠於燃料週期中期，以60%額定功率運轉，控制棒置於手動模式，此時汽機控制系統故障，而讓汽機進口閥多關5%。下列何者描述了初始反應器功率降低的原因？

A. 爐心Xe-135的中子吸收速率先增加。

B. 緩和劑的中子吸收速率先增加。

C. U-238共振能量(resonance energies)的中子吸收速率先增加。

D. 反應器冷卻水中硼的中子吸收速率先增加。

答案：C.

科目： 192008
知能類：K1.21 [3.6/3.8]
序號： P4035

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

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

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

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

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

ANSWER: C.

核能電廠於燃料週期中期以60%額定功率運轉，控制棒置於手動模式，此時汽機控制系統故障，而讓汽機蒸氣進口閥多開5%。下列何者描述初始反應器功率增加的原因？

A. 爐心Xe-135的中子吸收速率先降低。

B. 緩和劑的中子吸收速率先降低。

C. U-238共振能量(resonance energies)的中子吸收速率先降低。

D. 反應器冷卻水中硼的中子吸收速率先降低。

答案：C.

科目： 192008
知能類：K1.22 [2.6/3.8]
序號： P72

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

A. a reduction in the shutdown margin.

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

C. an increase in core life.

D. a reduction in the effect of resonance capture.

ANSWER: C.

核子反應器使用硼的主要原因，在於……

A. 減少停機餘裕。

B. 增加置入的控制棒數量。

C. 增加爐心壽命。

D. 降低共振捕獲(resonance capture)效應。

答案：C.

科目： 192008
知能類：K1.22 [2.6/3.8]
序號： P671

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

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

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

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

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

ANSWER: C.

核子反應器爐心以硼為可燃性毒物的原因？

A. 增加產生等量熱量所需的燃料數量。

B. 讓電廠能以較少燃料運轉更久。

C. 能裝入更多燃料並延長爐心壽命。

D. 吸收原本會從爐心漏失(lost)的中子。

答案：C.

科目： 192008
知能類：K1.22 [2.6/3.8]
序號： P1072

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

A. compensate for excess reactivity in the fuel.

B. ensure a negative moderator temperature coefficient exists.

C. flatten the axial and radial neutron flux distributions.

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

ANSWER: A.

爐心壽命初期，需要高硼濃度的理由是……

A. 彌補燃料的過剩反應度。

B. 確保緩和劑溫度係數為負值。

C. 軸向與徑向中子通率分佈均勻一點。

D. 將控制棒本領提高至最大，直到分裂產物毒素累積為止。

答案：A.

科目： 192008
知能類：K1.22 [2.6/3.8]
序號： P2570

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

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

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

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

D. The differential boron worth will become positive.

ANSWER: B.

爐心更換燃料期間，置入濃度較高的 U-235 燃料元件，將燃料週期從 12 個月延長至 16 個月。如果以硼濃度較高的反應器冷卻水，來彌補新燃料的所有過剩正反應度，下列何者為可能結果？

A. 反應器冷卻水的硼酸將於降溫時沈澱。

B. RCS 降溫將導致負反應度加入。

C. 功率變化所需的 RCS 硼酸稀釋時間將變長。

D. 微分硼本領將變成正值。

答案：B.

科目： 192008
知能類：K1.23 [2.9/3.1]
序號： P71 (B72)

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

A. 90

B. 180

C. 270

D. 360

ANSWER: B.

反應器急停後不久，在達到穩定負起動率時，反應器功率指示0.5%。反應器功率欲降低至0.05%，約需要多少時間？

A. 90秒

B. 180秒

C. 270秒

D. 360秒

答案：B.

科目： 192008
知能類：K1.23 [2.9/3.1]
序號： P572 (B2272)

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

A. 1 to 8 days

B. 1 to 8 hours

C. 1 to 8 minutes

D. 1 to 8 seconds

ANSWER: B.

核能電廠以100%功率運轉數週，此時發生反應器急停。急停後，爐心產生熱量降至1%所需的時間為多少？

A. 1至8天

B. 1至8小時

C. 1至8分鐘

D. 1至8秒

答案：B.

科目： 192008
知能類：K1.23 [2.9/3.1]
序號： P770 (B771)

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

A. The longest-lived fission product poisons

B. The shortest-lived fission product poisons

C. The longest-lived delayed neutron precursors

D. The shortest-lived delayed neutron precursors

ANSWER: C.

反應器急停後，下列何者導致其發生-80秒穩定週期？

A. 壽命最長的分裂產物毒素。

B. 壽命最短的分裂產物毒素。

C. 壽命最長的延遲中子母核。

D. 壽命最短的延遲中子母核。

答案：C.

科目： 192008
知能類：K1.23 [2.9/3.1]
序號： P1965 (B1369)

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

A. 380

B. 280

C. 180

D. 80

ANSWER: C.

反應器急停後不久，在達到穩定的負反應度週期時，其功率指示為10^{-3}%，若反應器功率要降至10^{-4}%，所需時間約為_____秒。

A. 380

B. 280

C. 180

D. 80

答案：C.

科目： 192008
知能類：K1.23 [2.9/3.1]
序號： P2171 (B1770)

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

A. 24 seconds

B. 55 seconds

C. 173 seconds

D. 240 seconds

ANSWER: B.

反應器急停後，在觀察到典型的穩定週期時，其功率指示為0.1%，若功率降至0.05%，所需時間約為多久？

A. 24秒

B. 55秒

C. 173秒

D. 240秒

答案：B.

科目： 192008
知能類：K1.23 [2.9/3.1]
序號： P2672 (B131)

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

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

ANSWER: B.

一部核子反應器長期以100%功率運轉，發生急停後，反應器分別於1秒及1小時產生的衰變熱約為多少？

	1秒	1小時
A.	15.0%	1.0%
B.	7.0%	1.0%
C.	1.0%	0.1%
D.	0.5%	0.1%

答案：B.

科目： 192008
知能類：K1.23 [2.9/3.1]
序號： P2768 (B2769)

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

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

A. Reactor A due to the greater shutdown reactivity.

B. Reactor B due to the smaller shutdown reactivity.

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

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

ANSWER: D.

核子反應器A與B相同，並以100%功率運轉六個月，此時兩反應器同時發生急停。反應器A的所有控制棒完全插入，而B的一根控制棒卡在全出位置。

何者在急停後5分鐘內所具的反應器週期最長？

A. 反應器A，因為停機反應度較大。

B. 反應器B，因為停機反應度較小。

C. 兩反應器的週期相同，因為在5分鐘後，兩反應器將於源階較低功率處達到穩定。

D. 兩反應器的週期相同，因為在5分鐘後，只有壽命最長的延遲中子母核，會釋放出分裂中子。

答案：D.

科目： 192008
知能類：K1.23 [2.9/3.1]
序號： P2969

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

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

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

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

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

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

ANSWER: D.

核子反應器A與B相同，並以100%功率運轉六個月，此時兩反應器同時發生急停。反應器A的所有控制棒完全插入，反應器B有一根控制棒卡在全出位置。

急停後5分鐘內，何者所具的反應器週期較長？

A. 反應器A，因為遲延中子分率較小。

B. 反應器B，因為遲延中子分率較大。

C. 兩反應器的週期相同，因為在5分鐘後，兩反應器將於源階較低功率處達到穩定。

D. 兩反應器的週期相同，因為在5分鐘後，只有壽命最長的延遲中子母核，會釋放出分裂中子。

答案：D.

科目： 192008
知能類：K1.23 [2.9/3.1]
序號： P3271 (B3271)

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

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

A. the same; shorter

B. the same; the same

C. lower; shorter

D. lower; the same

ANSWER: D.

核子反應器A與B相同，以100%功率運轉六個月，此時兩反應器同時發生急停。反應器A的所有控制棒完全插入，而B的一根控制棒卡在全出位置。

5分鐘後，與反應器B相比，反應器A的爐心分裂率將_____，而其反應器週期將_____。

A. 相等；較短

B. 相等；相等

C. 較低；較短

D. 較低；相等

答案：D.

科目： 192008
知能類：K1.23 [2.9/3.1]
序號： P3468 (B3472)

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

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

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

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

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

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

ANSWER: B.

一部核子反應器在加熱起始點之下達到臨界，此時反應器意外發生急停。除了一根控制棒維持完全抽出外，其他控制棒全數完全插入。反應器急停5分鐘後，其起動率(SUR)約於-1/3 dpm處達到穩定，維持抽出的控制棒突然掉落(完全插入)。

下列何者描述最後一根控制棒掉落時的反應器反應？

A. 起動率約於-1/3 dpm處維持穩定。

B. 起動率立刻變成較大負值，然後回到約-1/3 dpm處並穩定。

C. 起動率立刻變成較大負值，然後回到大於-1/3 dpm的負值處並穩定。

D. 起動率立刻變成較大負值，然後回到小於-1/3 dpm的負值處並穩定。

答案：B.

科目： 192008
知能類：K1.24 [3.5/3.6]
序號： P672 (B1969)

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

A. zero.

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

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

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

ANSWER: C.

一部核子反應器在加熱起始點之下恰好達到臨界，此時一控制棒完全插入爐心。假設無運轉員操作，系統亦無自動動作，反應器功率將會緩慢降至……

A. 零。

B. 一等於源中子(source neutron)強度的平衡值。

C. 一較源中子強度為大的平衡值。

D. 一略低數值，然後緩慢回復至初始值。

答案：C.

科目： 192008
知能類：K1.24 [3.5/3.6]
序號： P1472

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

A. the same; the same

B. the same; lower

C. lower; the same

D. lower; lower

ANSWER: C.

一部核子反應器在加熱起始點下方恰好達到臨界，此時有一控制棒掉入爐心。假設運轉員沒有採取行動，系統亦無自動動作，當電廠穩定時，反應器功率將_____，反應器冷卻水平均溫度將_____。

A. 相同；相同

B. 相同；較低

C. 較低；相同

D. 較低；較低

答案：C.

科目： 192008
知能類：K1.25 [2.9/3.1]
序號： P772

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

A. To prevent uneven fuel burnup

B. To prevent an excessive reactor coolant system cooldown rate

C. To prevent abnormally high local power peaks

D. To prevent divergent xenon oscillations

ANSWER: C.

反應器正常停機時，將控制棒依預定棒序插入的原因為何？

A. 避免燃料燃耗不均。

B. 避免反應器冷卻水系統降溫速率過大。

C. 避免局部功率峰值過高。

D. 避免氙振盪(xenon oscillation)分散。

答案：C.

科目： 192008
知能類：K1.25 [2.9/3.1]
序號： P2971

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

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

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

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

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

ANSWER: C.

在反應器正常停機期間插入控制棒的棒序為何？

A. 以相反順序插入控制棒，每次插入一組，藉此維持可接受的功率分佈。

B. 以相反順序插入控制棒，每次插入一組，如此仍能利用剩餘控制棒迅速停機。

C. 以重疊順序插入控制棒組，藉此維持相對固定的微分控制棒本領。

D. 以重疊順序插入控制棒組，藉此限制控制棒意外射出時加入的正反應度。

答案：C.

科目： 192008
知能類：K1.26 [3.1/3.2]
序號： P369

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

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

A. reactor coolant pumps.

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

C. subcritical fast fission of U-238.

D. fission product decay.

ANSWER: A.

核子反應器以 100%功率運轉數月後於一週前停機。反應器冷卻水維持在 500°F，所有反應器冷卻水泵均運轉中。

此時，反應器冷卻水的主要熱量來源為……

A. 反應器冷卻水泵。

B. U-235 與 Pu-239 的次臨界熱分裂。

C. U-238 的次臨界快分裂。

D. 分裂產物衰變。

答案：A.

科目： 192008
知能類：K1.26 [3.1/3.2]
序號： P370 (B372)

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

A. greater than 10%.

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

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

D. less than 1%.

ANSWER: B.

一部核子反應器以100%功率運轉一個月後，運轉中反應器由分裂產物衰變而產生的熱功率分率……

A. 大於10%。

B. 大於5%但小於10%。

C. 大於1%但小於5%。

D. 小於1%。

答案：B.

科目： 192008
知能類：K1.27 [3.1/3.4]
序號： P132

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

A. core burnup.

B. power history.

C. final power at shutdown.

D. control rod worth at shutdown.

ANSWER: B.

衰變熱產生的大小主要取決於下列何者？

A. 爐心燃耗。

B. 功率歷史。

C. 停機時的最終功率。

D. 停機時的控制棒本領。

答案：B.

科目： 192008
知能類：K1.27 [3.1/3.4]
序號： P1272 (B1372)

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

A. amount of fuel that has been depleted.

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

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

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

ANSWER: B.

反應器以全功率運轉三個月後停機，其後爐心熱量的產生將繼續一段時間。爐心熱量的產生率將依何者而變？

A. 燃耗燃料量。

B. K_{eff}降到1.0以下後所經歷的時間。

C. 反應器壓力槽冷卻所需的時間。

D. 停機後光中子源強度的衰減速率。

答案：B.

科目： 192008
知能類：K1.27 [3.1/3.4]
序號： P1372

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

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

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

A. 8 to 15°F/hour

B. 50 to 75°F/hour

C. 100 to 150°F/hour

D. 300 to 350°F/hour

ANSWER: D.

核能電廠以 100%功率運轉六個月，此時有一蒸汽管線破裂，造成反應器急停，大約經過 1 小時後，所有蒸汽產生器(S/G)都洩放(排光)。蒸汽產生器洩放造成反應器冷卻水系統(RCS)溫度降至 400°F，此時 RCS 開始加熱。

已知下列資料下，所有蒸汽產生器排光後 5 分鐘內，RCS 的平均加熱速率為多少？

反應器額定熱功率：	3,400 MWt
衰變熱：	1.0%額定熱功率
反應器冷卻水泵輸入 RCS 的熱量：	15 MWt
RCS 總流失熱量：	忽略
RCS c_p:：	1.1 Btu/lbm-°F
RCS 存量(扣除調壓槽)：	475,000 lbm

A. 每小時 8 - 15°F

B. 每小時 50 - 75°F

C. 每小時 100 - 150°F

D. 每小時 300 - 350°F

答案：D.

科目： 192008
知能類：K1.27 [3.1/3.4]
序號： P2572

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

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

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

A. 8 to 15°F/hour

B. 25 to 50°F/hour

C. 80 to 150°F/hour

D. 300 to 400°F/hour

ANSWER: D.

核能電廠以 100%功率運轉六個月，此時有一蒸汽管線破裂，造成反應器急停，大約經過 1 小時後，所有蒸汽產生器(S/G)都洩放(排光)。蒸汽產生器洩放造成反應器冷卻水系統(RCS)溫度降至 400°F。

已知下列資料下，所有蒸汽產生器排光後 5 分鐘內，RCS 的平均加熱速率為多少？

反應器額定熱功率：	2,400 MWt
衰變熱：	1.0%額定熱功率
反應器冷卻水泵輸入 RCS 的熱量：	13 MWt
RCS 總流失熱量：	2.4 MWt
RCS c_p:：	1.1 Btu/lbm-°F
RCS 存量(扣除調壓槽)：	325,000 lbm

A. 每小時 8 - 15°F

B. 每小時 25 – 50°F

C. 每小時 80 - 150°F

D. 每小時 300 - 400°F

答案：D.

科目： 192008
知能類：K1.27 [3.1/3.4]
序號： P2872 (B2872)

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

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

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

A. Less than 25°F/hour

B. 26 to 50°F/hour

C. 51 to 75°F/hour

D. More than 76°F/hour

ANSWER: B.

一部核子反應器停機數週後，由於失去所有交流電源，導致強制衰變熱移除流量喪失。

已知下列條件下，在失去強制衰變熱移除流量後的20分鐘內，下列何者是反應器冷卻水的平均加熱率？假設僅有散失至環境的熱量，能從反應器冷卻水系統(RCS)移除熱量。

反應器額定熱功率：	2,800 MWt
衰變熱功率：	0.2%額定熱功率
RCS散失至環境的熱損失率：	2.4 MWt
RCS c_p：	1.1 Btu/lbm-°F
反應器冷卻水總量：	325,000 lbm

A. 每小時小於25°F

B. 每小時26至50°F

C. 每小時51至75°F

D. 每小時大於76°F

答案：B.

科目： 192008
知能類：K1.27 [3.1/3.4]
序號： P2972 (B2972)

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

A. 1% to 2%

B. 3% to 5%

C. 6% to 8%

D. 9% to 11%

ANSWER: B.

核能電廠以100%穩態功率運轉六個月後，以50%額定功率運轉1小時。請問目前有多少比例的額定熱功率源自反應器的衰變熱？

A. 1%至2%

B. 3%至5%

C. 6%至8%

D. 9%至11%

答案：B.

科目： 192008
知能類：K1.27 [3.1/3.4]
序號： P4336 (B4336)

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

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

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

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

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

ANSWER: A.

核能電廠以額定功率運轉六個月後，反應器發生急停。下列何者描述了反應器急停後 30 分鐘內的爐心生熱來源？

A. 分裂產物衰變為爐心生熱的唯一顯著來源。

B. 遲延中子引發的分裂，為爐心生熱的唯一顯著來源。

C. 分裂產物衰變及衰變中子引發的分裂都是顯著來源，兩者的爐心生熱速率相等。

D. 分裂產物衰變及遲延中子引發的分裂都是顯著來源，兩者的爐心生熱速率，慢於爐心散熱至四週環境的損失率。

答案：A.

科目/題號：192008/1 (2016新增)
知能類：K1.03 [3.9/4.0]
序號：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 stab
B. 1.0 %ΔK/K
C. 1.5 %ΔK/K
D. 2.0 %ΔK/K
ANSWER: B.

一次臨界反應器具有穩定的源階中子計數率150 cps及停機反應度-2.0%△K/K。如要建立穩定300 cps 計數率，大約必須加入多少正反應度？
A.0.5%△K/K
B.1.0%△K/K
C.1.5%△K/K
D.2.0%△K/K

答案： B

科目/題號：192008/2 (2016新增)
知能類：K1.03 [3.9/4.0]
序號：P848 (B2149)

A subcritical reactor has an initial Keff of 0.8 with a stable source range count rate of 100 cps. If positive reactivity is added until Keff equals 0.95, at what value will the count rate stabilize?
A. 150 cps
B. 200 cps
C. 300 cps
D. 400 cps
ANSWER: D.

一次臨界反應器初始有效增殖因數0.8和穩定的源階中子計數率100 cps。假如加入正反應度直到有效增殖因數等於0.95，則此時計數率將穩定在多少？
A.150 cps
B.200 cps
C.300 cps
D.400 cps

答案： D

科目/題號：192008/3 (2016新增)
知能類：K1.03 [3.9/4.0]
序號：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 Keff?
A. 0.982
B. 0.990
C. 0.995
D. 0.999
ANSWER: D.

一反應器以1.8%△K/K停機。加入正反應度使穩定的源階中子計數率由15 cps增加至300 cps。目前的有效增殖因數為何？
A.0.982
B.0.990
C.0.995
D.0.999

答案： D

科目/題號：192008/4 (2016新增)
知能類：K1.03 [3.9/4.0]
序號：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
ANSWER: C.

一次臨界反應器穩定的源階中子計數率150 cps及停機反應度-2.0%△K/K。如要建立穩定600 cps 計數率，大約須加入多少正反應度？
A.0.5%△K/K
B.1.0%△K/K
C.1.5%△K/K
D.2.0%△K/K

答案： C

科目/題號：192008/5 (2016 新增)
知能類：K1.03〔3.9/4.0〕
序號：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
ANSWER: D

一次臨界反應器具有穩定源階計數率 60cps 且其停機反應度為 -2.0%△K/K。要加入多少正反應度才能建立穩定計數率 300cps？
A.0.4%△K/K
B.0.6%△K/K
C.1.4%△K/K
D.1.6%△K/K

答案： D

科目/題號：192008/6 (2016新增)
知能類：K1.03 [3.9/4.0]
序號：P2448 (B2649)

A reactor startup is being performed with xenon-free conditions. Control rod withdrawal is stopped when Keff 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.
ANSWER: D.

一反應器在無氙毒狀況下執行啟動。當有效增殖因數等於0.995時控制棒停止抽出，且源階中子計數率穩定在1000 cps。運轉員未採取任何行動。下列何者敘述係停止抽棒20分鐘後之計數率？
A.小於1,000 cps，且朝向啟動前計數率減少
B.小於1,000 cps，且穩定高於啟動前計數率
C.大於1,000 cps，且增加朝向臨界
D.1,000 cps，且維持固定值

答案： D

科目/題號：192008/7 (2016新增)
知能類：K1.03 [3.9/4.0]
序號：P3048 (B3049)

A reactor startup is being commenced with 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
ANSWER: A.

一反應器開始啟動時之初始穩定源階中子計數率為20 cps 。在抽出控制棒一段期間後，中子計數率穩定在80 cps。假設以上所抽控制棒為4.5%△K/K，則要再加入多少正反應度，反應器才會達臨界？
A. 1.5%△K/K
B. 2.0%△K/K
C. 2.5%△K/K
D. 3.0%△K/K

答案： A

科目/題號：192008/8 (2016 新增)
知能類：K1.03〔3.9/4.0〕
序號：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.
ANSWER: D.

一座無氙毒且停機中的核能電廠，正因為無法隔離的蒸汽洩漏而逐漸降低溫度。洩漏發生時反應器冷卻水溫度為 400°F，而所有源階控道指示是 80cps，當反應器冷卻水溫度為 350°F時，所有源階控道指示是 160cps。假設緩和劑溫度係數在整個降溫過程中維持固定，且運轉員未採取任何行動。當反應器冷卻水溫度達 290°F時，反應器的狀態為何？
A.次臨界，且源階計數率低於 320 cps
B.次臨界，且源階計數率高於 320 cps
C.超臨界，且源階計數率低於 320 cps
D.超臨界，且源階計數率高於 320 cps

答案： D

科目/題號：192008/9 (2016新增)
知能類：K1.03 [3.9/4.0]
序號：P3925 (B3925)

A reactor startup is in progress with Keff initially equal to 0.90. By what factor will the core neutron level increase if the reactor is stabilized when Keff equals 0.99?
A. 10
B. 100
C. 1,000
D. 10,000
ANSWER: A.

一反應器啟動時有效增殖因數為0.90。當反應器穩定在有效增殖因數等於0.99時，爐心中子數增加之因數為何？
A.10
B.100
C.1,000
D.10,000

答案： A

科目/題號：192008/10 (2016新增)
知能類：K1.03 [3.9/4.0]
序號：P4225 (B4225)

A reactor is shutdown with a Keff 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 Keff reaches 0.995?
A. 400 cps
B. 800 cps
C. 4,000 cps
D. 8,000 cps
ANSWER: A.

一反應器停機時，有效增殖因數為0.96。當開始啟動反應器時穩定源階中子計數率為50 cps 。當有效增殖因數為0.995時，下列何者是其穩定計數率？
A.400 cps
B.800 cps
C.4,000 cps
D.8,000 cps

答案： A

科目/題號：192008/11 (2016新增)
知能類：K1.03 [3.9/4.0]
序號：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.
ANSWER: D.

一座核能電廠正從500˚F降溫至190˚F。剛開始降溫時，源階中子計數率穩定在32 cps。兩小時後，反應器水溫為350˚F，源階中子計數率穩定在64 cps。假設在整個降溫過程中緩和劑溫度係數維持不變，而且反應器功率維持在加熱點以下。若運轉員未採取額外行動，當溫度降至190˚F時反應器的狀況為何？
A.次臨界，且源階中子計數率小於150 cps
B.次臨界，且源階中子計數率大於150 cps
C.剛好臨界
D.超臨界

答案： D

科目/題號：192008/12 (2016 新增)
知能類：K1.03〔3.9/4.0〕
序號：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
ANSWER: D.

一反應器啟動期間之爐心有效遲延中子分數為 0.007，並在源階範圍臨界。運轉員然後加入正反應度，以建立穩定的 0.5dpm 啟動率。假若啟動時爐心有效遲延中子分數為 0.005，在加入相同量的正反應度時，穩定的啟動率大約為多少？
A.0.6 dpm
B.0.66 dpm
C.0.7 dpm
D.0.76 dpm

答案： D

科目/題號：192008/13 (2016 新增)
知能類：K1.03〔3.9/4.0〕
序號：P5025

A nuclear power plant is initially shutdown with a Keff 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 Keff 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
ANSWER: C.

一核能電廠停機中之有效增殖因數為 0.92，且穩定源階計數率為 200cps。隨後反應器啟動。當有效增殖因數等於 0.995 時停止所有控制棒移動。而控制棒停止移動的瞬間源階計數率為 1800cps。
當源階計數率穩定時，計數率將大約為多少？
A.1800 cps
B.2400 cps
C.3200 cps
D.3600 cps

答案： C

科目/題號：192008/14 (2016新增)
知能類： K1.03 [3.9/4.0]
序號： P5225 (B5225)

A nuclear power plant was initially shutdown 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
ANSWER: A.

一核能電廠停機中且穩定的源階中子計數率為30 cps。利用加入許多小量正反應度，總共加入0.1%△K/K，而目前穩定的源階中子計數率為60 cps。在此過程中若只加入0.05%△K/K，則穩定的源階中子計數率為多少？
A.40 cps
B.45 cps
C.50 cps
D.55 cps

答案： A

科目/題號：192008/15 (2016 新增)
知能類：K1.03〔3.9/4.0〕
序號：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.

ANSWER: B.

一壓水式核能電廠已停機 2 週，目前具有下列穩定條件：

反應器冷卻水溫度 = 550℉

反應器冷卻水硼酸濃度 = 800ppm

源階計數率 = 32cps

反應器冷卻水硼酸濃度開始稀釋。兩小時後反應器冷卻水硼酸濃度穩定在 775ppm，源階計數率穩定在 48cps。並假設硼酸微分本領(△K/K/ppm)在整個稀釋過程中維持不變。且假設反應器冷卻水溫度維持不變、控制棒位置亦不變及無反應器保護動作發生。假若反應器冷卻水硼酸濃度再進一步的降低至 750ppm，反應器之狀態為何？

A.次臨界，且穩定源階計數率約為 64cps

B.次臨界，且穩定源階計數率約為 96cps

C.臨界，且穩定源階計數率約為 64cps

D.臨界，且穩定源階計數率約為 96cps

答案： B

科目/題號：192008/16 (2016新增)

知能類：K1.03 [3.9/4.0]

序號：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?

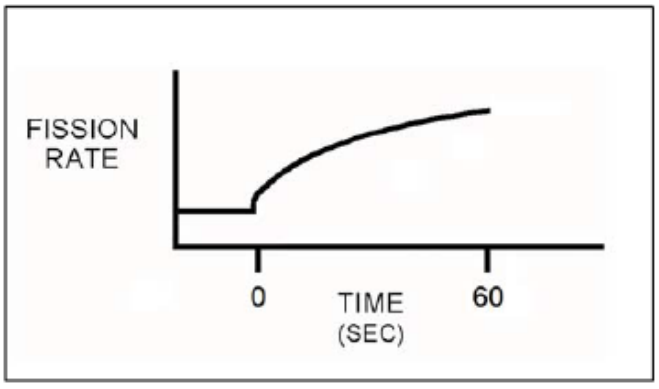
A. A step addition of positive reactivity to a reactor that is initially subcritical in the source range and remains subcritical for the duration of the 60-second interval shown.
B. A step addition of positive reactivity to a reactor that is initially critical in the source range and remains below the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

ANSWER: A.

參考顯示分裂率與時間關係圖(見下圖)兩軸均為線性刻度。下列何者發生在圖中 0 秒時可能引起反應器如圖的反應？

A. 反應器起初為次臨界且在源階，加入一個正的反應度，在所示 60 秒期間內維持次臨界
B. 反應器起初為臨界且在源階，加入一個正的反應度，在所示 60 秒期間內維持在加熱點之下
C. 反應器起初為次臨界且在源階，以固定速率持續加入正的反應度，在所示 60 秒期間內維持次臨界
D. 反應器起初為臨界且在源階，以固定速率持續加入正的反應度，在所示 60 秒期間內維持在加熱點之下

答案： A



科目/題號：192008/17 (2016 新增))
知能類：K1.04 [3.8/3.8]
序號：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 Keff 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

ANSWER: A.

兩座反應器目前均停機並進行反應器啟動。兩座反應器均相同，除了A反應器的中子源強度為100中子/秒，而B反應器的中子源強度為200中子/秒。控制棒均為未抽動且兩座反應器之有效增殖因數均為0.98。兩座反應器之爐心中子位階均為穩定。

下列所列何者為反應器A和B之爐心中子位階(中子/秒)？

	反應器 A (中子/秒)	反應器 B (中子/秒)
A.	5,000	10,000
B.	10,000	20,000
C.	10,000	40,000
D.	20,000	40,000

答案： A

科目/題號：192008/18 (2016新增)
知能類：K1.04 [3.8/3.8]
序號：P3848 (B3849)

A reactor is shutdown with a Keff 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
ANSWER: B.

一反應器停機且有效增殖因數為0.8。源階中子計數率為800 cps 。爐內中子數有多少%是直接由中子源而非中子誘發分裂產生的？
A.10%
B.20%
C.80%
D.100%

答案： B

科目/題號：192008/19 (2016新增)
知能類：K1.04 [3.8/3.8]
序號：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 other additions of positive reactivity, positive reactivity addition Y caused the stable source range count rate to increase from 320 cps to 640 cps.
Which one of the following statements describes how the magnitudes of the two positive reactivity additions (X and Y) compare?

A. Reactivity addition X was several times greater in magnitude than reactivity addition Y.
B. Reactivity addition X was several times smaller in magnitude than reactivity addition Y.
C. Reactivity additions X and Y were about equal in magnitude.
D. There is not enough information given to determine the relationship between the reactivity additions.

ANSWER: A.

當反應器啟動時，加入X正反應度引起穩定源階中子計數率由20 cps 增加至40 cps。後續啟動過程，在加入其它數個正反應度後，加入Y正反應度引起穩定源階中子計數率由320 cps 增加至640 cps。
下列何者為量化描述兩個正反應度(X和Y)的比較？
A.所加入X反應度比Y反應度大數倍
B.所加入X反應度比Y反應度小數倍
C.所加入X和Y反應度兩者大小大約相同
D.所提供資訊不足以決定加入反應度之關聯性

答案： A

科目/題號：192008/20 (2016新增)
知能類：K1.04 [3.8/3.8]
序號：P6133 (B6134)

A subcritical reactor has a stable source range count rate of 2.0 x 10^5 cps with a Keff 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 Keff?
A. 0.984
B. 0.988
C. 0.992
D. 0.996
ANSWER: C.

一次臨界反應器具有穩定源階中子計數率2.0×10^5 cps，且有效增殖因數為0.98。在爐心加入正反應度直到穩定中子計數率達到5.0×10^5 cps。目前之有效增殖因數為多少？
A. 0.984
B. 0.988
C. 0.992
D. 0.996

答案： C

科目/題號：192008/21 (2016新增)
知能類：K1.04 [3.8/3.8]
序號：P7628 (B7628)

A reactor is shutdown with a Keff 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
ANSWER: C.

一反應器停機且有效增殖因數為0.8。源階中子計數率為800 cps。多少%的爐心中子係由中子誘發分裂直接提供的？
A. 10%
B. 20%
C. 80%
D. 100%

答案： C

科目/題號：192008/22 (2016新增)
知能類：K1.05 [3.8/3.9]
序號：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
ANSWER: A.

於反應爐啟動中趨於臨界時，加入等量的正反應度會導致_____平衡計數率的改變，同時每次達到新平衡所需時間_____。
A.較大；較長
B.較大；較短
C.較小；較長
D.較小；較短

答案：A

科目/題號：192008/23 (2016新增)
知能類：K1.05 [3.8/3.9]
序號：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.

ANSWER: C.

一反應爐於穩定源階計數率下進行啟動，同時反應爐接近臨界。下列何者描述了在控制棒抽出過程中與抽出後五秒之計數率特徵？

A.計數率沒有改變，直到達到臨界
B.計數率將會快速增加（瞬間躍升）至穩定的較高值
C.計數率將會快速增加（瞬間躍升），然後緩慢增加並穩定於一較高值
D.計數率將會快速增加（瞬間躍升），然後緩慢降低並穩定於其原值

答案：C

科目/題號：192008/24 (2016新增)
知能類：K1.05 [3.8/3.9]
序號：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 Keff after the first 100 fuel assemblies are loaded?
A. 0.25
B. 0.5
C. 0.75
D. 1.0
ANSWER: C.

燃料裝填時，在最初100個燃料元件裝填後，其次臨界增殖因數從1.0增加至4.0。下列何者是相對應的最終Keff值？
A. 0.25
B. 0.5
C. 0.75
D. 1.0

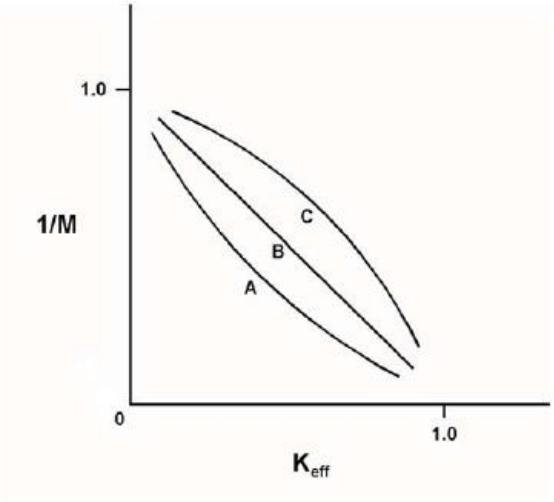
答案：C

科目/題號：192008/25 (2016新增)
知能類：K1.05 [3.8/3.9]
序號：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
ANSWER: C.

參考標示為A，B，C的三條1/M曲線圖（見下圖）。圖____表示達到臨界的最不保守方式，而與其他圖所表示的狀況相比，可能是因進行燃料裝填步驟之後以____的時間間隔記錄計數率所致。
A. A；較短
B. A；較長
C. C；較短
D. C；較長

答案： C



科目/題號：192008/26 (2016新增)
知能類：K1.05 [3.8/3.9]
序號：P5733 (B5733)

During an initial fuel load, the subcritical multiplication factor increases from 1.0 to 8.0. What is the current value of Keff?
A. 0.125
B. 0.5
C. 0.75
D. 0.875
ANSWER: D.

當初始燃料裝填，次臨界增殖因數從1.0增加至8.0時，有效增殖因數為多少？
A. 0.125
B. 0.5
C. 0.75
D. 0.875

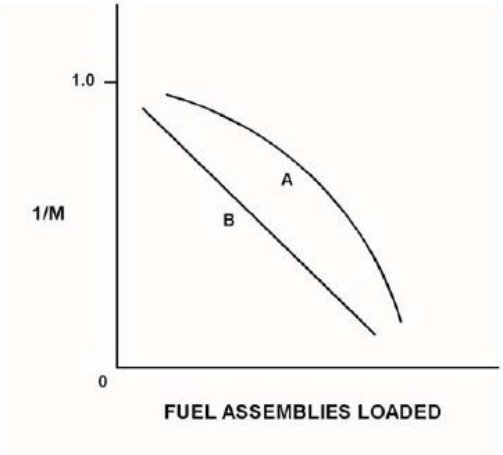
答案： D

科目/題號：192008/27 (2016新增)
知能類：K1.05 [3.8/3.9]
序號：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
ANSWER: B.

參考增殖因素倒數(1/M)曲線A和B(見下圖)。每一軸均為線性刻度。曲線A係假設每一燃料元件在裝填燃料初期階段裝填，相較於在裝填燃料後期階段裝填，對穩定源階計數率的改變比例相對____；曲線B係由於每一燃料組件包含相同___。
A.較小；燃料濃縮度
B.較小；反應度
C.較大；燃料濃縮度
D.較大；反應度

答案： B



科目/題號：192008/28 (2016 新增)
知能類：K1.07〔3.5/3.6〕
序號：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.

ANSWER: B.

反應器於接近燃料週期中期在 100%功率和氙-135 毒素平衡下發生反應器跳脫。隨後反應器啟動之預估臨界棒位(ECP)用下列假設條件計算出：

●反應器跳脫後 24 小時發生臨界
●反應器冷卻水溫度 550°F
●反應器冷卻水硼酸濃度 為 400ppm

下列何者將會導致臨界控制棒棒位低於預估臨界棒位？

A.臨界時間移至反應器跳脫後 18 小時
B.降低反應器冷卻水系統硼酸濃度至 350ppm
C.一項故障導致控制棒移動速率比正常速率低 20%
D.誤操作蒸汽排放(汽機旁通)控制器，以致反應器冷卻水溫度維持在 553°F

答案： B

科目/題號：192008/29 (2016新增)
知能類：K1.10 [3.3/3.4]
序號：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 1.0×10^{-8} percent power.

The reactor that is supercritical by the greater amount of positive reactivity is reactor _____; and the first reactor to reach 1.0×10^{-1} percent power will be reactor _____.
A A; A
B. A; B
C. B; A
D. B; B
ANSWER: B.

已知：
- ●反應器A和B相同，除了反應器A之有效遲延中子分數為0.0068，而反應器B之有效遲延中子分數為0.0052
- ●反應器A的穩定週期為45秒，反應器B的穩定週期為42秒
- ●兩座反應器起初運轉在1.0×10^{-8}%功率。

需要較大量正反應度造成超臨界的反應器是____；先達到1.0×10^{-1}%功率的反應器是___。
A. A；A
B. A；B
C. B；A
D. B；B

答案： B

科目/題號：192008/30 (2016新增)
知能類：K1.10 [3.3/3.4]
序號：P5535 (B5534)

A reactor is currently operating in the source range with a stable positive 90-second period. The core effective delayed neutron fraction (βeff) 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
ANSWER: A.

一反應器運轉在源階，其週期穩定在90秒。爐心有效遲延中子分數是0.006。需要加入多少正反應度才能建立穩定正60秒週期？
A. 0.026 %ΔK/K
B. 0.033 %ΔK/K
C. 0.067 %ΔK/K
D. 0.086 %ΔK/K

答案： A

科目/題號：192008/31 (2016新增)
知能類：K1.10 [3.3/3.4]
序號：P6435 (B6434)

A reactor is critical near the end of a fuel cycle with power level stable at 1.0×10^{-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
ANSWER: A.

一反應器在接近燃料週期末期以1.0×10^{-10}%功率達到臨界。下列何者為增加反應器功率到加熱點的最小正反應度？
A. 0.001 %ΔK/K
B. 0.003 %ΔK/K
C. 0.005 %ΔK/K
D. 0.007 %ΔK/K

答案： A

科目/題號：192008/32 (2016新增)
知能類：K1.10 [3.3/3.4]
序號：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. Both reactors are initially critical at 1.0×10^{-8} percent of rated thermal 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
ANSWER: D.

反應器A和B相同，除了反應器A之有效遲延中子分數為0.007，而反應器B之有效遲延中子分數為0.006。兩座反應器臨界在1.0×10^{-8}%額定熱功率時，再同時將＋0.1%ΔK/K加入兩座反應器。在反應度加入5分鐘後，反應器____將有較高功率；而反應器____將有較短週期。
A. A；A
B. A；B
C. B；A
D. B；B

答案： D

科目/題號：192008/33 (2016新增)
知能類：K1.14 [3.1/3.1]
序號：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.
ANSWER: A.

當反應器啟動時稍微超臨界。抽出一小節控制棒以建立所需要的啟動率。假設反應器在控制棒抽出後仍然稍微超臨界，且反應器功率仍遠在加熱點之下。在控制棒停止抽出後的當下，啟動率將初始下降然後…？
A.穩定在一個正值
B 轉為慢慢增加
C.穩定在零
D.持續漸漸減少

答案： A

科目/題號：192008/34 (2016 新增)
知能類：K1.14〔3.1/3.1〕
序號：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

ANSWER: A.

當反應器啟動時，所觀察到源階計數率每 30 秒增加一倍。下列何者是近似啟動率？

A.0.6 dpm
B.0.9 dpm
C.1.4 dpm
D.2.0 dpm

答案： A

科目/題號：192008/35 (2016新增)
知能類：K1.14 [3.1/3.1]
序號：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?

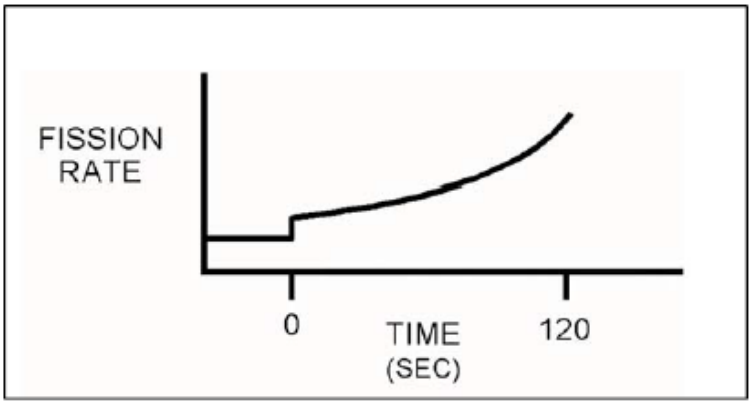
A. A step addition of positive reactivity to a reactor that is initially subcritical in the source range and remains subcritical for the duration of the 120-second interval shown.
B. A step addition of positive reactivity to a reactor that is initially critical in the source range and remains below the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

ANSWER: B.

參考顯示分裂率與時間關係圖(見下圖)，兩軸均為線性刻度。下列何者發生於 0 秒時可能引起反應器如圖的反應？

A.反應器起初為次臨界且在源階，加入一刻度正反應度，在所示 120 秒期間內維持次臨界
B.反應器起初為臨界且在源階，加入一刻度正反應度，在所示 120 秒期間內維持在加熱點之下
C.反應器起初為臨界且在功率階，加入一刻度正反應度，在所示 120 秒期間內維持在功率階
D.反應器起初為臨界且在功率階，以固定速率加入正反應度，在所示 120 秒期間內維持在功率階

答案： B



科目/題號：192008/36 (2016 新增)
知能類：K1.14〔3.1/3.1〕
序號：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?

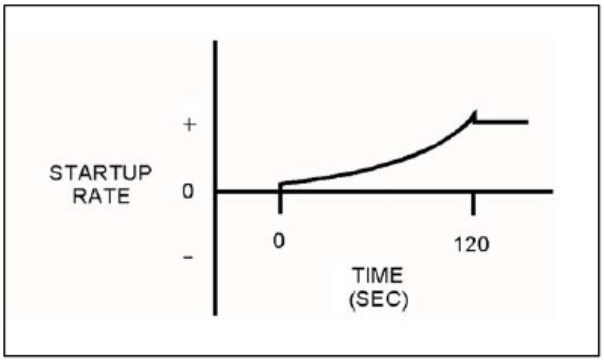
A. A step addition of positive reactivity to a reactor that is initially critical in the source range. Reactor power enters the power range at 120 seconds.
B. A step addition of positive reactivity to a reactor that is initially stable in the power range. A step addition of negative reactivity is inserted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

ANSWER: C.

參考顯示一座反應器啟動率與時間關係圖(見下圖)。兩軸均為線性刻度。在圖中啟動率反應是由下列那一個於 0 秒開始的事件造成？

A.初始臨界在源階之反應器，加入一個正反應度。反應器功率在 120 秒進入功率階
B.反應器初始穩定在功率階，加入一個正反應度。在 120 秒時加入一個負反應度
C.反應器初始臨界在源階，並維持在加熱點之下，以固定速率正反應度加入反應器。在 120 秒時終止加入正反應度
D.反應器初始穩定在功率階，並維持在功率階，以固定速率正反應度加入反應器。在 120 秒時終止加入正反應度

答案： C



科目/題號：192008/37 (2016 新增)
知能類：K1.14〔3.6/3.8〕
序號：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 (Tcold) in the reactor coolant loop with the closed MSIV will initially _____; and the Tcold in a loop with an open MSIV will initially _____.
A. decrease; increase
B. decrease; decrease
C. increase; increase
D. increase; decrease
ANSWER: D.

一座多迴路的核能電廠以手動控制控制棒穩定在 50%功率運轉，其中一個蒸汽產生器的主蒸汽隔離閥(MSIV)不經意的關閉。假設反應器並未跳脫或發生保護動作，且運轉員也未採取行動。在主蒸汽隔離閥關閉之反應器迴路的冷端溫度(Tcold)起初將會____；而主蒸汽隔離閥打開之迴路的冷端溫度(Tcold)起初將會_____。
A.減少；增加
B.減少；減少
C.增加；增加
D.增加；減少

答案： D

科目/題號：192008/38 (2016 新增)
知能類：K1.21〔3.6/3.8〕
序號：P4735

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

- Main generator output is 385 MW.
- Steam dump/bypass system is discharging 15 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

ANSWER: C.

核能電廠起初穩定運轉在 100%功率，且主發電機輸出 1,100MWe。發生一項輸電網擾動，運轉員採取適當的因應行動。電廠目前穩定在下列條件：

- ●主發電機輸出 385MWe
- ●蒸汽排放/旁通系統正排放 15%額定蒸汽流量至主冷凝器
- ●所有反應器冷卻水系統參數均在正常範圍

目前反應器功率大約為多少？

A.15%

B.35%

C.50%

D.65%

答案： C

科目/題號：192008/39 (2016 新增)
知能類：K1.23〔2.9/3.1〕
序號：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
ANSWER: C.

核能電廠穩定運轉在 100%功率時發生反應器跳脫。由於反應器跳脫，爐心中子通量起初以比啟動率 -1/3 dpm 還_____負值減少；約在跳脫後____分鐘，啟動率將變為大約 -1/3 dpm。
A.少；3
B.少；30
C.多；3
D.多；30

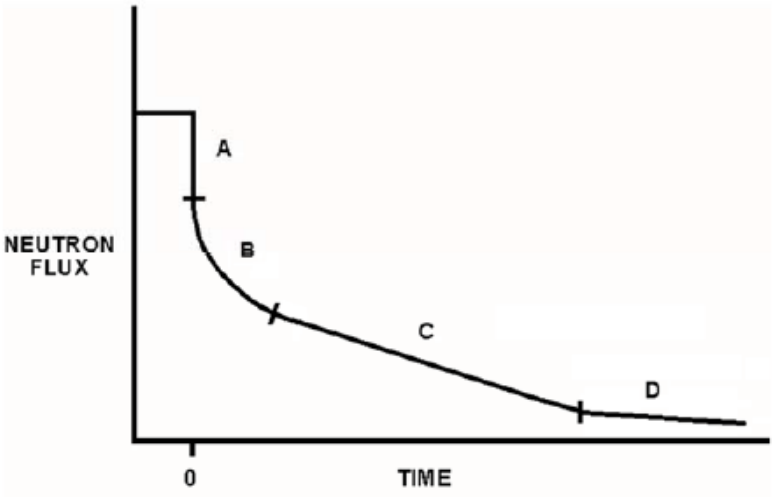
答案： C

科目/題號：192008/40 (2016新增)
知能類：K1.23 [2.9/3.1]
序號：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. The neutron flux axis has a logarithmic scale while the time axis has a linear scale.
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
ANSWER: B.

參考一座核能電廠曾在延長滿載運轉，時間點為零時，反應器發生急停所繪中子通量與時間關係圖(見下圖)。中子通量軸係對數尺度而時間軸為線性刻度。何段曲線的斜率主要係由遲延中子產生率所決定？
A.只有B
B. B和C
C.只有C
D.C和D

答案： B



科目/題號：192008/41 (2016 新增)
知能類：K1.24〔3.5/3.6〕
序號：P5136

A reactor is initially critical in the source range during a reactor startup when the control rods are inserted a small amount. Reactor startup rate stabilizes at -0.15 dpm. Assuming startup rate remains constant, how long will it take for source range count rate to decrease by one-half?
A. 0.3 minutes
B. 2.0 minutes
C. 3.3 minutes
D. 5.0 minutes
ANSWER: B.

當反應器啟動時，起初臨界在源階，插入少量控制棒。反應器啟動率穩定在 -0.15 dpm 。假設啟動率維持固定，源階計數率減少到一半要多久？
A.0.3 分鐘
B.2.0 分鐘
C.3.3 分鐘
D.5.0 分鐘

答案： B

科目/題號：192008/42 (2016 新增)
知能類：K1.27〔3.1/3.4〕
序號：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.

ANSWER: C.

當核能電廠發生反應器跳脫時已 100%功率運轉 6 個月。下列何者敘述反應器跳脫 1 分鐘後爐心熱量產生的來源？

A.分裂產物衰變是唯一能增加燃料溫度的熱源
B.遲延中子誘發分裂是唯一能增加燃料溫度的熱源
C.分裂產物衰變和遲延中子誘發分裂兩者均能增加燃料溫度的熱源
D.分裂產物衰變和遲延中子誘發分裂兩者均不能增加燃料溫度的熱源

答案： C