科目： 192004
知能類：K1.01 [3.1/3.2]
序號： P133

Moderator temperature coefficient is defined as the change in core reactivity per degree change in...

A. fuel temperature.

B. fuel clad temperature.

C. reactor vessel temperature.

D. reactor coolant temperature.

ANSWER: D.

緩和劑溫度係數意指爐心反應度隨著下列何者的每度變化而產生的改變？

A. 燃料溫度。

B. 燃料護套(fuel clad)溫度。

C. 反應爐溫度。

D. 反應器冷卻水溫度。

答案：D.

科目： 192004
知能類：K1.02 [3.0/3.2]
序號： P350 (B353)

Which one of the following will result in a less negative fuel temperature coefficient? (Consider only the direct effect of the change in the listed parameters.)

A. Increase in fuel burnup.

B. Decrease in fuel temperature.

C. Increase in void fraction.

D. Decrease in moderator temperature.

ANSWER: D.

下列何者將直接導致較小的負燃料溫度係數？(僅考慮所列參數變化產生的直接影響)

A. 燃料燃耗增加。

B. 燃料溫度降低。

C. 空泡分率增加。

D. 緩和劑溫度降低。

答案：D.

科目： 192004
知能類：K1.02 [3.0/3.2]
序號： P650 (B1952)

Which one of the following isotopes is the most significant contributor to resonance capture of fission neutrons in a nuclear reactor core at the beginning of core life?

A. U-233

B. U-238

C. Pu-239

D. Pu-240

ANSWER: B.

對於一處於爐心壽命初期的核子反應器爐心而言，下列哪種同位素是最主要的分裂中子共振捕獲者？

A. U-233

B. U-238

C. Pu-239

D. Pu-240

答案：B.

科目： 192004
知能類：K1.02 [3.0/3.2]
序號： P1950 (B753)

Factors that affect resonance absorption of a neutron into a nucleus include...

A. kinetic energy of the nucleus, kinetic energy of the neutron, and excitation energy of the nucleus.

B. kinetic energy of the neutron, excitation energy of the nucleus, and excitation energy of the neutron.

C. excitation energy of the nucleus, excitation energy of the neutron, and kinetic energy of the nucleus.

D. excitation energy of the neutron, kinetic energy of the nucleus, and kinetic energy of the neutron.

ANSWER: A.

影響中子被原子核共振吸收的因素，包括……

A. 原子核的動能、中子的動能、以及原子核的激動能量。

B. 中子的動能、原子核的激動能量、以及中子的激動能量。

C. 原子核的激動能量、中子的激動能量、以及原子核的動能。

D. 中子的激動能量、原子核的動能、以及中子的動能。

答案：A.

科目： 192004
知能類：K1.02 [3.0/3.2]
序號： P2050 (B3352)

Which one of the following isotopes is the most significant contributor to resonance capture of fission neutrons in a nuclear reactor core at the end of a fuel cycle?

A. U-235

B. U-238

C. Pu-239

D. Pu-240

ANSWER: B.

對於一處於燃料週期末期的核子反應器爐心而言，下列哪種同位素是最主要的分裂中子共振捕獲者？

A. U-235

B. U-238

C. Pu-239

D. Pu-240

答案：B.

科目： 192004
知能類：K1.02 [3.0/3.2]
序號： P3150 (B3153)

Which one of the following exhibits the smallest microscopic cross section for absorption of a thermal neutron in an operating nuclear reactor?

A. Uranium-235

B. Uranium-238

C. Samarium-149

D. Xenon-135

ANSWER: B.

在一部運轉中的核子反應器內，下列何者具有最小的熱中子微觀吸收截面(microscopic absorption cross section)？

A. U-235

B. U-238

C. Sm-149

D. Xe-135

答案：B.

科目： 192004
知能類：K1.03 [2.9/3.1]
序號： P251 (B2252)

Under which one of the following conditions is a nuclear reactor core most likely to have a positive moderator temperature coefficient?

A. Low coolant temperature at beginning-of-life

B. Low coolant temperature at end-of-life

C. High coolant temperature at beginning-of-life

D. High coolant temperature at end-of-life

ANSWER: A.

核子反應器爐心在下列何種條件下，最可能擁有正的緩和劑溫度係數？

A. 壽命初期，冷卻水溫度低之時。

B. 壽命末期，冷卻水溫度低之時。

C. 壽命初期，冷卻水溫度高之時。

D. 壽命末期，冷卻水溫度高之時。

答案：A.

科目： 192004
知能類：K1.03 [2.9/3.1]
序號： P1150

A nuclear reactor has operated at steady-state 100% power for the past 6 months. Compared to 6 months ago, current moderator temperature coefficient is...

A. more negative due to control rod withdrawal.

B. less negative due to control rod insertion.

C. more negative due to decreased reactor coolant system (RCS) boron concentration.

D. less negative due to increased RCS boron concentration.

ANSWER: C.

一部核子反應器以 100%穩態功率運轉六個月。相較於六個月前，目前的緩和劑溫度係數……

A. 由於抽出控制棒，該係數成為較大負值(more negative)。

B. 由於插入控制棒，該係數成為較小負值(less negative)。

C. 由於反應器冷卻水系統(RCS)的硼濃度降低，該係數成為較大負值(more negative)。

D. 由於反應器冷卻水系統(RCS)的硼濃度增加，該係數成為較小負值(less negative)。

答案：C.

科目： 192004
知能類：K1.03 [2.9/3.1]
序號： P1650 (B652)

Which one of the following contains the pair of nuclides that are the most significant contributors to the total resonance capture in the core near the end of a fuel cycle?

A. Pu-239 and U-235

B. Pu-239 and Pu-240

C. U-238 and Pu-240

D. U-238 and Pu-239

ANSWER: C.

對接近燃料週期末期的爐心而言，下列何組核種是所有共振捕獲的最重要貢獻者？

A. Pu-239和U-235

B. Pu-239和Pu-240

C. U-238和Pu-240

D. U-238和Pu-239

答案：C.

科目： 192004
知能類：K1.03/K1.06 [2.9/3.1]
序號： P2150

Which one of the following conditions will cause the moderator temperature coefficient (MTC) to become more negative? (Consider only the direct effect of the indicated change on MTC.)

A. The controlling bank of control rods is inserted 5% into the core.

B. Fuel temperature decreases from 1500°F to 1200°F.

C. Reactor coolant boron concentration increases by 20 ppm.

D. Moderator temperature decreases from 500°F to 450°F.

ANSWER: A.

下列哪項條件將導致緩和劑溫度係數(MTC)變成較大負值(more negative)？(僅考慮所指變化對 MTC 造成的直接影響)

A. 將控制棒組再插入爐心 5%。

B. 燃料溫度從 1500°F 降至 1200°F。

C. 反應器冷卻水的硼濃度增加 20 ppm。

D. 緩和劑溫度從 500°F 降至 450°F。

答案：A.

科目： 192004
知能類：K1.03 [2.9/3.1]
序號： P2151 (B2152)

Which one of the following contains the nuclides responsible for most of the resonance capture of fission neutrons in a nuclear reactor core at the beginning of the sixth fuel cycle? (Assume that each refueling replaces one-third of the fuel.)

A. U-235 and Pu-239

B. U-235 and U-238

C. U-238 and Pu-239

D. U-238 and Pu-240

ANSWER: D.

對於處在第六燃料週期初期的核子反應器爐心，下列哪組核種造成大部分的分裂中子共振捕獲？(假設每次更換燃料時，將更換原有燃料的三分之一)

A. U-235和Pu-239

B. U-235和U-238

C. U-238和Pu-239

D. U-238和Pu-240

答案：D.

科目： 192004
知能類：K1.03 [2.9/3.1]
序號： P2251 (B652)

Which one of the following contains two isotopes, both of which are responsible for the negative reactivity inserted when fuel temperature increases near the end of core life?

A. U-235 and Pu-239

B. U-235 and Pu-240

C. U-238 and Pu-239

D. U-238 and Pu-240

ANSWER: D.

在接近爐心壽命末期時，下列哪一組同位素會造成因燃料溫度上升引起的負反應度？

A. U-235和Pu-239

B. U-235和Pu-240

C. U-238和Pu-239

D. U-238和Pu-240

答案：D.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P50

As the reactor coolant boron concentration increases, the moderator temperature coefficient becomes less negative. This is because, at higher boron concentrations, a 1°F increase in reactor coolant temperature at higher boron concentrations results in a larger increase in the...

A. fast fission factor.

B. thermal utilization factor.

C. total nonleakage probability.

D. resonance escape probability.

ANSWER: B.

緩和劑溫度係數會隨著反應器冷卻水硼濃度增加而變成較小負值(less negative)，這是因為硼濃度較高時，反應器冷卻水溫度每升高 1°F，將導致下列何者產生較大增加值？

A. 快分裂因數。

B. 熱中子利用因數(thermal utilization factor)。

C. 無洩漏總機率。

D. 共振逃逸機率(resonance escape probability)。

答案：B.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P123

In which of the following conditions is the moderator temperature coefficient most negative?

A. Beginning of core life (BOL), high temperature

B. BOL, low temperature

C. End of core life (EOL), high temperature

D. EOL, low temperature

ANSWER: C.

緩和劑溫度係數在下列何種條件下成為最大負值(most negative)？

A. 爐心壽命初期(BOL)與高溫。

B. 爐心壽命初期與低溫。

C. 爐心壽命末期(EOL)與高溫。

D. 爐心壽命末期與低溫。

答案：C.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P252

During a nuclear power plant heat-up at end of core life, the moderator temperature coefficient becomes increasingly more negative . This is because...

A. as moderator density decreases, more thermal neutrons are absorbed by the moderator than by the fuel.

B. the change in the thermal utilization factor dominates the change in the resonance escape probability.

C. a greater density change per EF occurs at higher reactor coolant temperatures.

D. the core transitions from an undermoderated condition to an overmoderated condition.

ANSWER: C.

核能電廠於爐心壽命末期時升溫，導致緩和劑溫度係數增加而變成更大負值(more negative)，這是因為……

A. 隨著緩和劑密度降低，緩和劑較燃料吸收了更多熱中子。

B. 熱中子利用因數的變化，主導了共振逃逸機率的變化。

C. 反應器冷卻水溫度較高時，每°F 產生的密度變化較大。

D. 爐心從欠緩和(undermoderated)狀態轉為過緩和(overmoderated)狀態。

答案：C.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P450

The moderator temperature coefficient will be least negative at a _____ reactor coolant temperature and a _____ reactor coolant boron concentration.

A. high; high

B. high; low

C. low; high

D. low; low

ANSWER: C.

緩和劑溫度係數在反應器冷卻水溫度_____及硼濃度_____時，具有最小負值(least negative)。

A. 高；高

B. 高；低

C. 低；高

D. 低；低

答案：C.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P751 (B651)

A nuclear reactor is operating at full power following a refueling outage. In comparison to the current moderator temperature coefficient (MTC), the MTC just prior to the refueling was...

A. less negative at all coolant temperatures.

B. more negative at all coolant temperatures.

C. less negative below approximately 350°F coolant temperature and more negative above approximately 350°F coolant temperature.

D. more negative below approximately 350°F coolant temperature and less negative above approximately 350°F coolant temperature.

ANSWER: B.

一部核子反應器在更換燃料大修後以全功率運轉。相較於目前的緩和劑溫度係數(MTC)，更換燃料前的MTC……

A. 在所有冷卻水溫度下，負值均較小(less negative)。

B. 在所有冷卻水溫度下，負值均較大(more negative)。

C. 在冷卻水溫度約350°F以下時負值較小；在冷卻水溫度約350°F以上時負值較大(more negative)。

D. 在冷卻水溫度約350°F以下時負值較大；在冷卻水溫度約350°F以上時負值較小(less negative)。

答案：B.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P951 (B2452)

During a reactor coolant system (RCS) cooldown, positive reactivity is added to the core (assuming a negative moderator temperature coefficient). This is partially due to...

A. a decrease in the thermal utilization factor.

B. an increase in the thermal utilization factor.

C. a decrease in the resonance escape probability.

D. an increase in the resonance escape probability.

ANSWER: D.

在反應器冷卻水系統(RCS)冷卻時，將正反應度加入爐心(假設緩和劑溫度係數為負值)，部分原因是因為……

A. 熱中子利用因數(thermal utilization factor)下降。

B. 熱中子利用因數增加。

C. 共振逃逸機率(resonance escape probability)下降。

D. 共振逃逸機率增加。

答案：D.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P1250

As the core ages, the moderator temperature coefficient becomes more negative. This is primarily due to...

A. fission product poison buildup in the fuel.

B. decreasing fuel centerline temperature.

C. decreasing control rod worth.

D. decreasing reactor coolant system boron concentration.

ANSWER: D.

緩和劑溫度係數隨著爐心老化而變成較大負值(more negative)，此情況主要是下列何者所導致？

A. 燃料中累積的分裂產物毒素。

B. 燃料中央溫度降低。

C. 控制棒本領降低。

D. 反應器冷卻水系統的硼濃度降低。

答案：D.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P1450

The moderator temperature coefficient will be most negative at a _____ reactor coolant temperature and a _____ reactor coolant boron concentration.

A. low; low

B. high; low

C. low; high

D. high; high

ANSWER: B.

緩和劑溫度係數於反應器冷卻水溫度_____及硼濃度_____時，具有最大負值(most negative)。

A. 低；低

B. 高；低

C. 低；高

D. 高；高

答案：B.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P1752 (B1752)

Which one of the following describes the net reactivity effect of a moderator temperature decrease in an undermoderated nuclear reactor core?

A. Negative reactivity will be added because more neutrons will be absorbed at resonance energies while slowing down.

B. Negative reactivity will be added because more neutrons will be captured by the moderator.

C. Positive reactivity will be added because fewer neutrons will be absorbed at resonance energies while slowing down.

D. Positive reactivity will be added because fewer neutrons will be captured by the moderator.

ANSWER: C.

下列何者正確描述了欠緩和(undermoderated)的核子反應器爐心中，因緩和劑溫度下降而造成淨反應度的影響？

A. 將加入負反應度，因為在減速時遭到共振能量吸收的中子更多。

B. 將加入負反應度，因為緩和劑捕獲的中子更多。

C. 將加入正反應度，因為在減速時遭到共振能量吸收的中子更少。

D. 將加入正反應度，因為緩和劑捕獲的中子更少。

答案：C.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P1850 (N/A)

Which one of the following describes why the moderator temperature coefficient is more negative at the end of core life (EOL) compared to the beginning of core life (BOL)?

A. Increased nucleate boiling at the EOL amplifies the negative reactivity added by a 1°F moderator temperature increase.

B. Increased control rod insertion at the EOL amplifies the negative reactivity added by a 1°F moderator temperature increase.

C. Decreased fuel temperature at the EOL results in reduced resonance neutron capture for a 1°F increase in moderator temperature.

D. Decreased coolant boron concentration at the EOL results in fewer boron atoms leaving the core for a 1°F moderator temperature increase.

ANSWER: D.

緩和劑溫度係數在爐心壽命末期(EOL)的負值，為何較爐心壽命初期(BOL)的負值更大(more negative)？

A. 爐心壽命末期的核沸騰增加，放大了緩和劑溫度每升高 1°F 而增加的負反應度。

B. 爐心壽命末期的控制棒插入值增加，放大了緩和劑溫度每升高 1°F 而增加的負反應度。

C. 爐心壽命末期的燃料溫度降低，導致緩和劑溫度每升高 1°F 時，捕獲的共振中子量減少。

D. 爐心壽命末期的冷卻水硼濃度降低，導致緩和劑溫度每升高 1°F 時，離開爐心的硼原子數變少。

答案：D.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P2650 (B2652)

Which one of the following describes the net reactivity effect of a moderator temperature decrease in an overmoderated reactor core?

A. Positive reactivity will be added because fewer neutrons will be captured by the moderator.

B. Positive reactivity will be added because fewer neutrons will be absorbed at resonance energies while slowing down.

C. Negative reactivity will be added because more neutrons will be captured by the moderator.

D. Negative reactivity will be added because more neutrons will be absorbed at resonance energies while slowing down.

ANSWER: C.

下列何者正確描述了過緩和(overmoderated)的反應器爐心中，因緩和劑溫度下降而造成淨反應度的影響？

A. 將加入正反應度，因為緩和劑將捕獲更少中子。

B. 將加入正反應度，因為在減速時遭到共振能量吸收的中子更少。

C. 將加入負反應度，因為緩和劑將捕獲更多中子。

D. 將加入負反應度，因為在減速時遭到共振能量吸收的中子更多。

答案：C.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P2750

A nuclear reactor is operating at full power following a refueling outage. Compared to the moderator temperature coefficient (MTC) just prior to the refueling, the current MTC is...

A. less negative at all coolant temperatures.

B. more negative at all coolant temperatures.

C. less negative below approximately 350°F coolant temperature and more negative above approximately 350°F coolant temperature.

D. more negative below approximately 350°F coolant temperature and less negative above approximately 350°F coolant temperature.

ANSWER: A.

一部核子反應器在更換燃料大修後以全功率運轉。相較於更換燃料前的緩和劑溫度係數(MTC)，目前的MTC……

A. 在所有冷卻水溫度下，負值均較小(less negative)。

B. 在所有冷卻水溫度下，負值均較大(more negative)。

C. 在冷卻水溫度約350°F以下時負值較小(less negative)；在冷卻水溫度約350°F以上時負值較大(more negative)。

D. 在冷卻水溫度約350°F以下時負值較大(more negative)；在冷卻水溫度約350°F以上時負值較小(less negative)。

答案：A.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P2950 (B2952)

Which one of the following describes the net reactivity effect of a moderator temperature increase in an overmoderated nuclear reactor core?

A. Negative reactivity will be added because more neutrons will be absorbed at resonance energies while slowing down.

B. Negative reactivity will be added because more neutrons will be captured by the moderator.

C. Positive reactivity will be added because fewer neutrons will be absorbed at resonance energies while slowing down..

D. Positive reactivity will be added because fewer neutrons will be captured by the moderator.

ANSWER: D.

下列何者正確描述了過緩和(overmoderated)的核子反應器爐心中，緩和劑溫度增加的淨反應度效應？

A. 將加入負反應度，因為在減速時遭到共振能量吸收的中子更多。

B. 將加入負反應度，因為緩和劑將捕獲更多中子。

C. 將加入正反應度，因為在減速時遭到共振能量吸收的中子更少。

D. 將加入正反應度，因為緩和劑捕獲的中子更少。

答案：D.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P3151 (B3152)

How does the addition of boric acid to the reactor coolant affect the moderator temperature coefficient in an undermoderated nuclear reactor core?

A. The initially negative MTC becomes more negative.

B. The initially negative MTC becomes less negative.

C. The initially positive MTC becomes more positive.

D. The initially positive MTC becomes less positive.

ANSWER: B.

在欠緩和(undermoderated)的核子反應器爐心中，將硼酸加入反應器冷卻水，將對緩和劑溫度係數造成何種影響？

A. 原本為負值的MTC，負值變多(more negative)。

B. 原本為負值的MTC，負值變少(less negative)。

C. 原本為正值的MTC，正值變多。

D. 原本為正值的MTC，正值變少。

答案：B.

科目： 192004
知能類：K1.06 [2.5/2.6]
序號： P3352

As compared to the moderator temperature coefficient (MTC) of reactivity at the beginning of core life, the MTC at the end of core life is: (Assume 100% power for all cases.)

A. more negative because as U-235 depletes, more fission neutrons are able to escape resonance capture.

B. less negative because as U-238 depletes, more fission neutrons are able to escape resonance capture.

C. more negative because as reactor coolant boron concentration decreases, the thermal utilization of fission neutrons increases.

D. less negative because as control rods are withdrawn from the core, the thermal utilization of fission neutrons increases.

ANSWER: C.

相較於爐心壽命初期反應度的緩和劑溫度係數(MTC)，爐心壽命末期的 MTC……(假設所有情況均為 100%功率)

A. 由於 U-235 耗盡而變成較大負值(more negative)，能逃過共振捕獲的分裂中子更多。

B. 由於 U-238 耗盡而變成較小負值(less negative)，能逃過共振捕獲的分裂中子更多。

C. 由於反應器冷卻水硼濃度降低而變成較大負值(more negative)，分裂中子的熱利用度增加。

D. 由於從爐心抽出控制棒而變成較小負值(less negative)，分裂中子的熱利用度增加。

答案：C.

科目： 192004
知能類：K1.06 [3.1/3.1]
序號： P3650 (B3652)

Which one of the following describes the overall core reactivity effect of a moderator temperature increase in an undermoderated nuclear reactor core?

A. Negative reactivity will be added because more neutrons will be absorbed by U-238 at resonance energies while slowing down.

B. Negative reactivity will be added because more neutrons will be captured by the moderator while slowing down.

C. Positive reactivity will be added because fewer neutrons will be absorbed by U-238 at resonance energies while slowing down.

D. Positive reactivity will be added because fewer neutrons will be captured by the moderator while slowing down.

ANSWER: A.

在欠緩和(undermoderated)的核子反應器爐心中，下列何者正確描述了緩和劑溫度增加對整體爐心反應度的效應？

A. 將加入負反應度，因為更多中子在減速時被U-238在共振能量下吸收。

B. 將加入負反應度，因為更多中子在減速時被緩和劑捕獲。

C. 將加入正反應度，因為較少中子在減速時被U-238在共振能量下吸收。

D. 將加入正反應度，因為較少中子在減速時被緩和劑捕獲。

答案：A.

科目： 192004
知能類：K1.07 [2.9/2.9]
序號： P51

Why does the fuel temperature (Doppler) coefficient becomes less negative at higher fuel temperatures?

A. As reactor power increases, the rate of increase in the fuel temperature diminishes.

B. Neutrons penetrate deeper into the fuel, resulting in an increase in the fast fission factor.

C. The amount of self-shielding increases, resulting in less neutron absorption by the inner fuel.

D. The amount of Doppler broadening per degree change in fuel temperature diminishes.

ANSWER: D.

燃料溫度(都卜勒)係數在燃料溫度較高時的負值較小(less negative)，原因在於……

A. 燃料溫度的增加率，隨著反應器功率增加而遞減。

B. 中子更深入穿透燃料，導致快分裂因數增加。

C. 自我屏蔽(self-shielding)量增加，導致爐心燃料吸收的中子變少。

D. 都卜勒增寬量隨著每度燃料溫度變化而遞減。

答案：D.

科目： 192004
知能類：K1.07 [2.9/2.9]
序號： P651

Which one of the following will cause the Doppler power coefficient to become more negative?

A. Increased clad creep

B. Increased pellet swell

C. Lower power level

D. Higher coolant boron concentration

ANSWER: C.

下列何者將造成都卜勒功率係數變成更大負值(more negative)？

A. 護套潛變(clad creep)增加。

B. 燃料丸膨脹度增加。

C. 功率較低。

D. 冷卻水硼濃度較高。

答案：C.

科目： 192004
知能類：K1.07 [2.9/2.9]
序號： P1052

As core age increases, for the same power level the fuel temperature coefficient of reactivity becomes _____ negative because average fuel temperature _____.

A. more; decreases

B. more; increases

C. less; decreases

D. less; increases

ANSWER: A.

隨著爐心逐漸老化，燃料溫度係數在相同功率下將變成_____，這是平均燃料溫度_____所致。

A. 較大負值(more negative)；降低

B. 較大負值(more negative)；升高

C. 較小負值(less negative)；降低

D. 較小負值(less negative)；升高

答案：A.

科目： 192004
知能類：K1.07 [2.9/2.9]
序號： P1851

Which one of the following pairs of isotopes is responsible for the negative reactivity associated with a fuel temperature increase near the end of core life?

A. U-235 and Pu-239

B. U-235 and Pu-240

C. U-238 and Pu-239

D. U-238 and Pu-240

ANSWER: D.

反應器爐心接近壽命末期時，下列何組同位素將導致燃料溫度的相關負反應度增加？

A. U-235 與 Pu-239

B. U-235 與 Pu-240

C. U-238 與 Pu-239

D. U-238 與 Pu-240

答案：D.

科目： 192004
知能類：K1.07 [2.9/2.9]
序號： P1951 (B1553)

A nuclear power plant is operating at 70% power. Which one of the following will result in a less negative fuel temperature coefficient? (Consider only the direct effect of the change in each listed parameter.)

A. Increase in Pu-240 inventory in the core

B. Increase in moderator temperature

C. Increase in fuel temperature

D. Increase in void fraction

ANSWER: C.

核能電廠以70%功率運轉。下列何者將使得燃料溫度係數的負值減小(less negative)？(只考慮下列參數變化的直接效應)

A. 增加爐心的Pu-240總量。

B. 提高緩和劑溫度。

C. 提高燃料溫度。

D. 提高空泡分率。

答案：C.

科目： 192004
知能類：K1.07 [2.9/2.9]
序號： P2052 (B2053)

Compared to operation at a low power level, the fuel temperature coefficient of reactivity at a high power level is _____ negative due to _____. (Assume the same core age.)

A. less; improved pellet-to-clad heat transfer

B. more; buildup of fission product poisons

C. less; higher fuel temperature

D. more; increased neutron flux

ANSWER: C.

相較於在低功率運轉的情形，在較高功率運轉下的燃料溫度係數為_____，因為_____。(假設爐心年齡相同)

A. 較小負值(less negative)；燃料丸至護套的熱傳導有所改善

B. 較大負值(more negative)；分裂產物毒素累積

C. 較小負值(less negative)；燃料溫度較高

D. 較大負值(more negative)；中子通率增加

答案：C.

科目： 192004
知能類：K1.07 [2.9/2.9]
序號： P2352 (B2453)

Refer to the drawing of microscopic cross section for absorption versus neutron energy for a resonance peak in U-238 (see figure below).

If fuel temperature increases, the area under the curve will _____ and negative reactivity will be added to the core because _____.

A. increase; neutrons of a wider range of energies will be absorbed by U-238

B. increase; more neutrons will be absorbed by U-238 at the resonance neutron energy

C. remain the same; neutrons of a wider range of energies will be absorbed by U-238

D. remain the same; more neutrons will be absorbed by U-238 at the resonance neutron energy

ANSWER: C.

在U-238共振尖峰之下，微觀吸收截面與中子能量的關係曲線如下圖所示。

若燃料溫度增加，曲線下的面積將_____，同時有負反應度加入爐心，因為_____。

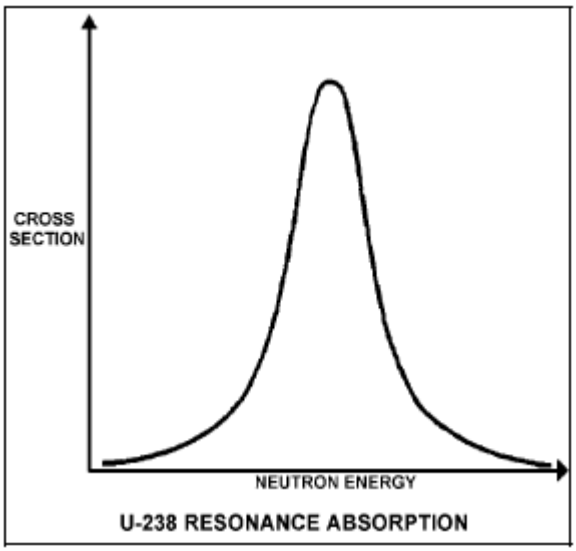
A. 增加；有更廣泛能量範圍的中子會被U-238吸收

B. 增加；有更多中子會被U-238在共振中子能量下吸收

C. 維持不變；有更廣泛能量範圍的中子會被U-238吸收

D. 維持不變；有更多中子會被U-238在共振中子能量下吸收

答案：C.


CROSS
SECTION
NEUTRON ENERGY
U-238 RESONANCE ABSORPTION

科目： 192004
知能類：K1.07 [2.9/2.9]
序號： P2451 (B552)

Which one of the following describes how the magnitude of the fuel temperature coefficient of reactivity is affected over core life?

A. It remains essentially constant over core life.

B. It becomes more negative due to the buildup of Pu-240.

C. It becomes less negative due to the decrease in RCS boron concentration.

D. It becomes more negative initially due to buildup of fissions product poisons, then less negative due to fuel depletion.

ANSWER: B.

下列何者正確描述了燃料溫度係數的大小，如何在爐心壽命中受到影響？

A. 基本上，在爐心壽命期間維持不變。

B. 因為Pu-240的累積而使得其負值更大(more negative)。

C. 因為RCS硼濃度降低而使得其負值變小(less negative)。

D. 起初由於分裂產物毒素累積而使得其負值變大(more negative)，其後因為燃料耗竭而負值變小(less negative)。

答案：B.

科目： 192004
知能類：K1.07 [2.9/2.9]
序號： P2651(B2553)

The fuel temperature (Doppler) coefficient of reactivity is more negative at the _____ of a fuel cycle because _____. (Assume the same initial fuel temperature throughout the fuel cycle.)

A. end; more Pu-240 is in the core

B. end; more fission products are in the core

C. beginning; more U-238 is in the core

D. beginning; less fission products are in the core

ANSWER: A.

在燃料週期_____時，燃料溫度(都卜勒)係數負值變大(more negative)，因為_____。(假設在整個燃料週期有同樣的初始燃料溫度)

A. 末期；爐心的Pu-240較多

B. 末期；爐心的分裂產物較多

C. 初期；爐心的U-238較多

D. 初期；爐心的分裂產物較少

答案：A.

科目： 192004
知能類：K1.07 [2.9/2.9]
序號： P2751 (B2753)

Refer to the drawing of microscopic cross section for absorption versus neutron energy for a 6.7 electron volt (ev) resonance peak in U-238 for a nuclear reactor operating at 50% power (see figure below).

If fuel temperature decreases by 50°F, the area under the curve will _____ and positive reactivity will be added to the core because _____.

A. decrease; fewer neutrons will be absorbed by U-238 overall

B. decrease; fewer 6.7 ev neutrons will be absorbed by U-238 at the resonance energy

C. remain the same; fewer neutrons will be absorbed by U-238 overall

D. remain the same; fewer 6.7 ev neutrons will be absorbed by U-238 at the resonance energy

ANSWER: C.

一部核子反應器以50%功率運轉，在U-238共振尖峰值6.7電子伏特(ev)下，其微觀吸收截面與中子能量的關係如下圖所示。

燃料溫度若降低50°F，則曲線下的面積將_____，同時正反應度會因為_____而加入爐心。

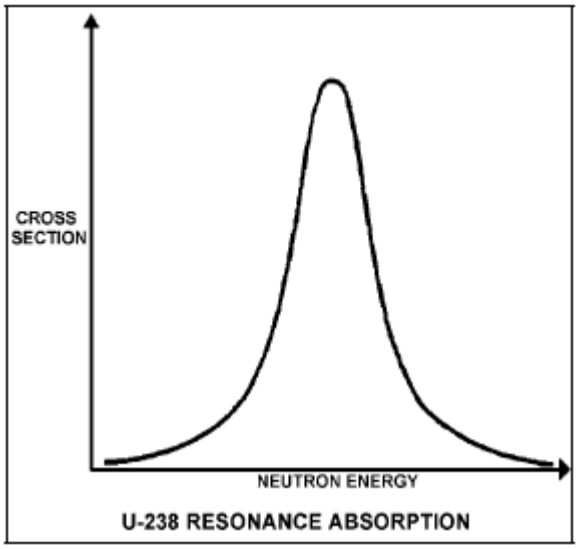
A. 減小；被U-238吸收的中子總數較少

B. 減小；在共振能量下，被U-238吸收的6.7電子伏特中子較少

C. 維持不變；被U-238吸收的中子總數較少

D. 維持不變；在共振能量下，被U-238吸收的6.7電子伏特中子較少

答案：C.


CROSS
SECTION
NEUTRON ENERGY
U-238 RESONANCE ABSORPTION

科目： 192004
知能類：K1.07 [2.9/2.9]
序號： P2850 (B2852)

Refer to the drawing of microscopic cross section for absorption versus neutron energy for a resonance peak in U-238 in a nuclear reactor operating at 80% power (see figure below).

If reactor power is increased to 100%, the height of the curve will _____ and the area under the curve will _____.

A. increase; increase

B. increase; remain the same

C. decrease; decrease

D. decrease; remain the same

ANSWER: D.

一部核子反應器以80%功率運轉，在U-238共振尖峰下，其微觀吸收截面與中子能量的關係如下圖所示。

若反應器功率增至100%，則曲線高度將_____，而曲線下的面積將_____。

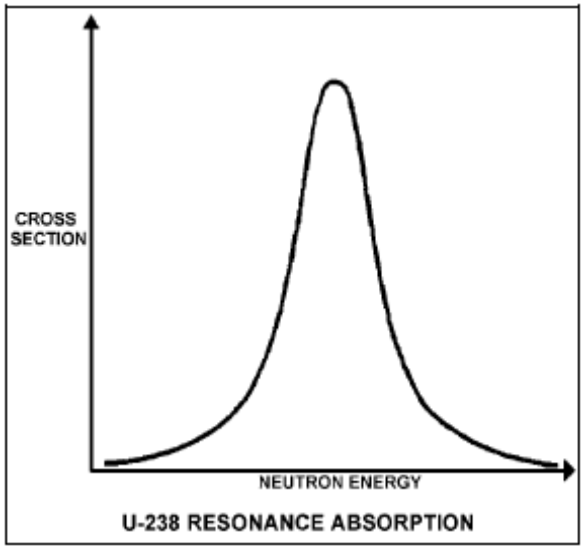
A. 增加；增加

B. 增加；維持不變

C. 減少；減少

D. 減少；維持不變

答案：D.



科目： 192004
知能類：K1.07 [2.9/2.9]
序號： P3750 (B3753)

Refer to the drawing of a curve showing the neutron absorption characteristics of a typical U-238 nucleus at a resonance neutron energy (see figure below). The associated nuclear reactor is currently operating at steady-state 80% power.

During a subsequent reactor power decrease to 70%, the curve will become _____; and the percentage of the core neutron population lost to resonance capture by U-238 will _____.

A. taller and more narrow; decrease

B. taller and more narrow; increase

C. shorter and broader; decrease

D. shorter and broader; increase

ANSWER: A.

請參照下圖中，一典型U-238原子核在共振中子能量下的中子吸收特性曲線。該核子反應器現以80%功率穩態運轉。

其後反應器功率降低至70%，此曲線將變得_____；而爐心中子因被U-238共振捕獲而損耗的百分率將_____。

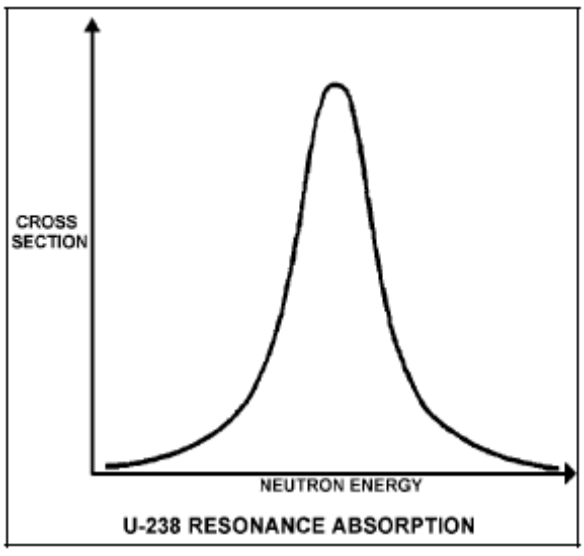
A. 較高且較窄；減少

B. 較高且較窄；增加

C. 較矮且較寬；減少

D. 較矮且較寬；增加

答案：A.



科目： 192004
知能類：K1.07 [2.9/2.9]
序號： P3850 (B3852)

Refer to the drawing of microscopic cross section for absorption versus neutron energy for a resonance peak in U-238 in a nuclear reactor operating at 80% power (see figure below).

If reactor power is decreased to 60%, the height of the curve will _____ and the area under the curve will _____.

A. increase; increase

B. increase; remain the same

C. decrease; decrease

D. decrease; remain the same

ANSWER: B.

一部核子反應器以80%功率穩態運轉，在U-238共振尖峰下，其微觀吸收截面(microcopic cross section)與中子能量的關係曲線如下圖所示。

若反應器功率降低至60%，則曲線高度將_____，而曲線下的面積將_____。

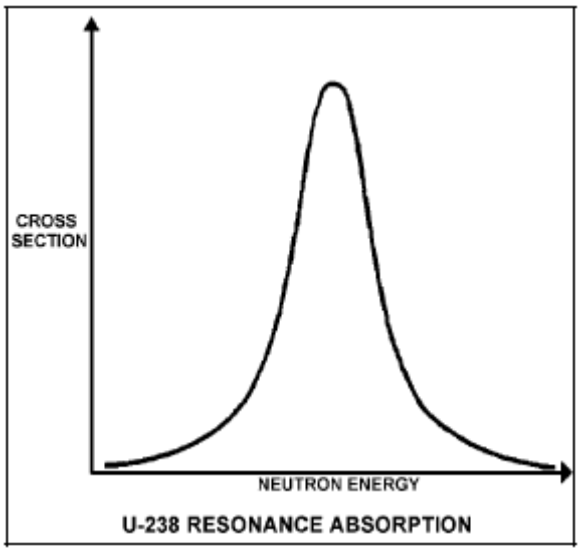
A. 增加；增加

B. 增加；維持不變

C. 減少；減少

D. 減少；維持不變

答案：B.



科目： 192004
知能類：K1.08 [3.1/3.1]
序號： P253

Which one of the following groups contain parameters that, if varied, will each have a direct effect on the power coefficient?

A. Control rod position, reactor power, moderator voids

B. Moderator temperature, RCS pressure, Xenon level

C. Fuel temperature, xenon level, control rod (CEA) position

D. Moderator voids, fuel temperature, moderator temperature

ANSWER: D.

下列何組參數若產生變化，將分別對功率係數造成直接影響？

A. 控制棒位置、反應器功率、緩和劑空泡

B. 緩和劑溫度、RCS 壓力、氙毒量

C. 燃料溫度、氙毒量、控制棒(CEA)位置

D. 緩和劑空泡、燃料溫度、緩和劑溫度

答案：D.

科目： 192004
知能類：K1.08 [3.1/3.1]
序號： P652

Which one of the following adds the most positive reactivity following a reactor trip/scram from full power at the beginning of core life? (Assume reactor coolant system parameters stabilize at their normal post-trip values.)

A. Void coefficient

B. Pressure coefficient

C. Fuel temperature coefficient

D. Moderator temperature coefficient

ANSWER: C.

一部處於爐心壽命初期的反應器，若於全功率運轉時急停，下列何者將在急停後加入最大的正反應度？(假設反應器冷卻水系統參數於急停後穩定在正常數值)

A. 空泡係數

B. 壓力係數

C. 燃料溫度係數

D. 緩和劑溫度係數

答案：C.

科目： 192004
知能類：K1.08 [3.1/3.1]
序號： P851

Which one of the following groups contains only parameters that, if varied, will each have a direct effect on the power defect?

A. Control rod position, reactor power, and moderator voids

B. Moderator voids, fuel temperature, and moderator temperature

C. Fuel temperature, xenon concentration, and control rod position

D. Moderator temperature, reactor coolant pressure, and xenon concentration

ANSWER: B.

下列何組參數在發生變化時，都會對功率欠缺(power defect)造成直接影響？

A. 控制棒位置、反應器功率及緩和劑空泡

B. 緩和劑空泡、燃料溫度及緩和劑溫度

C. 燃料溫度、氙毒濃度及控制棒位置

D. 緩和劑溫度、反應器冷卻水壓力及氙毒濃度

答案：B.

科目： 192004
知能類：K1.08 [3.1/3.1]
序號： P1353

A nuclear reactor is exactly critical at the point of adding heat during a xenon-free reactor startup at the beginning of core life. Reactor power is ramped to 50% over the next 4 hours.

During the power increase, most of the positive reactivity added by the operator is necessary to overcome the negative reactivity associated with the...

A. buildup of core Xe-135.

B. increased fuel temperature.

C. burnout of burnable poisons.

D. increased reactor coolant temperature.

ANSWER: B.

無氙毒核子反應器在爐心壽命初期啟動時，於加熱點正好臨界。反應器功率於 4 小時內攀升至 50%。

功率增加期間，運轉員所加入之正反應度大多用以抵消與下列何者相關的負反應度……

A. Xe-135 於爐心累積。

B. 燃料溫度增加。

C. 可燃性毒物燃盡。

D. 反應器冷卻水溫度上升。

答案：B.

科目： 192004
知能類：K1.08 [3.1/3.1]
序號： P1551

A nuclear reactor has been operating at steady state 50% power for one month following a refueling outage. Reactor power is ramped to 100% over the next 2 hours.

During the power increase, most of the positive reactivity added by the operator is necessary to overcome the negative reactivity associated with the...

A. increased reactor coolant temperature.

B. buildup of core Xe-135.

C. burnout of burnable poisons.

D. increased fuel temperature.

ANSWER: D.

一部核子反應器在更換燃料大修後，以 50%功率穩態運轉一個月。之後，該反應器功率於 2 小時內攀升至 100%。

功率增加期間，運轉員所加入之正反應度大多用以抵消與下列何者相關的負反應度……

A. 反應器冷卻水溫度上升。

B. Xe-135 於爐心累積。

C. 可燃性毒物燃盡。

D. 燃料溫度增加。

答案：D.

科目： 192004
知能類：K1.09 [2.8/2.9]
序號： P552

As reactor coolant boron concentration is reduced differential boron reactivity worth (ΔK/K per ppm) becomes...

A. less negative due to the increased number of water molecules in the core.

B. more negative due to the increased number of water molecules in the core.

C. less negative due to the decreased number of boron molecules in the core.

D. more negative due to the decreased number of boron molecules in the core.

ANSWER: D.

隨著反應器冷卻水的硼濃度降低，微分硼反應度本領(ΔK/K/ppm)……

A. 變成較小負值(less negative)，因為爐心的水分子數增加。

B. 變成較大負值(more negative)，因為爐心的水分子數增加。

C. 變成較小負值(less negative)，因為爐心的硼分子數減少。

D. 變成較大負值(more negative)，因為爐心的硼分子數減少。

答案：D.

科目： 192004
知能類：K1.09 [2.8/2.9]
序號： P1350

With higher concentrations of boron in the reactor coolant, the core neutron flux distribution shifts to _____ energies where the absorption cross-section of boron is _____.

A. higher; lower

B. higher; higher

C. lower; lower

D. lower; higher

ANSWER: A.

反應器冷卻水的硼濃度若增加，爐心的中子通率分佈會偏移至_____能量，此處的硼吸收截面_____。

A. 較高；較低

B. 較高；較高

C. 較低；較低

D. 較低；較高

答案：A.

科目： 192004
知能類：K1.10 [2.9/2.9]
序號： P1152

Differential boron reactivity worth will become _____ negative as moderator temperature increases because, at higher moderator temperatures, a 1 ppm increase in reactor coolant system boron concentration will add _____ boron atoms to the core.

A. more; fewer

B. more; more

C. less; fewer

D. less; more

ANSWER: C.

微分硼反應度本領將隨著緩和劑溫度增加而變成_____，這是因為在較高的緩和劑溫度下，反應器冷卻水系統的硼濃度每增加 1 ppm，將在爐心加入_____硼原子。

A. 較大負值(more negative)；較少

B. 較大負值(more negative)；較多

C. 較小負值(less negative)；較少

D. 較小負值(less negative)；較多

答案：C.

科目： 192004
知能類：K1.10 [2.9/2.9]
序號： P1252

Differential boron worth (ΔK/K/ppm) becomes more negative as...

A. burnable poisons deplete.

B. boron concentration increases.

C. moderator temperature increases.

D. fission product poison concentration increases.

ANSWER: A.

微分硼本領(ΔK/K/ppm)將於何時變成較大負值(more negative)？

A. 可燃性毒物耗盡。

B. 硼濃度增加。

C. 緩和劑溫度上升。

D. 分裂產物毒素濃度增加。

答案：A.

科目： 192004
知能類：K1.10 [2.9/2.9]
序號： P3552

The following are the initial conditions for a nuclear power plant:

Reactor power is 50%.
Average reactor coolant temperature is 570°F.

After a power increase, current plant conditions are as follows:

Reactor power is 80%.
Average reactor coolant temperature is 582°F.

Assume that the initial and current reactor coolant boron concentrations are the same. Which one of the following describes the current differential boron worth (DBW) in comparison to the initial DBW?

A. The current DBW is more negative because a 1°F increase in reactor coolant temperature will remove more boron-10 atoms from the core.

B. The current DBW is more negative because a 1 ppm increase in reactor coolant boron concentration will add more boron-10 atoms to the core.

C. The current DBW is less negative because a 1°F increase in reactor coolant temperature will remove fewer boron-10 atoms from the core.

D. The current DBW is less negative because a 1 ppm increase in reactor coolant boron concentration will add fewer boron-10 atoms to the core.

ANSWER: D.

下面是核能電廠的初始條件：

反應器功率為 50%
反應器冷卻水平均溫度為 570°F

增加電廠功率後，電廠的現有條件如下：

反應器功率為 80%
反應器冷卻水平均溫度為 582°F

假設初始與現有反應器冷卻水硼濃度都相同，相較於初始的微分硼本領(DBW)，下列何者描述了現有 DBW？

A. 現有 DBW 為較大負值(more negative)，因為反應器冷卻水溫度每增加 1°F，爐心失去的硼-10 原子更多。

B. 現有 DBW 為較大負值(more negative)，因為反應器冷卻水硼濃度每增加 1 ppm，加入爐心的硼-10 原子更多。

C. 現有 DBW 為較小負值(less negative)，因為反應器冷卻水溫度每增加 1°F，爐心失去的硼-10 原子更少。

D. 現有 DBW 為較小負值(less negative)，因為反應器冷卻水硼濃度每增加 1 ppm，加入爐心的硼-10 原子更少。

答案：D.

科目： 192004
知能類：K1.11 [2.9/3.1]
序號： P351

The amount of boric acid required to increase the reactor coolant boron concentration by 50 ppm at the beginning of core life (1200 ppm) is approximately _____ as the amount of boric acid required to increase boron concentration by 50 ppm at the end of core life (100 ppm).

A. the same

B. four times as large

C. eight times as large

D. twelve times as large

ANSWER: A.

處於爐心壽命初期(1200 ppm)的反應器冷卻水硼濃度增加 50 ppm 所需的硼酸量，相較於在爐心壽命末期(100 ppm)增加硼濃度 50 ppm 所需的硼酸量……

A. 壽命初期等於壽命末期

B. 壽命初期為壽命末期的 4 倍

C. 壽命初期為壽命末期的 8 倍

D. 壽命初期為壽命末期的 12 倍

答案：A.

科目： 192004
知能類：K1.11 [2.9/3.1]
序號： P1050

The amount of pure water required to decrease the reactor coolant boron concentration by 20 ppm at the end of core life (100 ppm) is approximately _____ the amount of pure water required to decrease reactor coolant boron concentration by 20 ppm at the beginning of core life (1000 ppm).

A. one-tenth

B. the same as

C. 10 times

D. 100 times

ANSWER: C.

欲讓爐心壽命末期(100 ppm)的反應器冷卻水硼濃度減少 20 ppm 所需的純水量，相較於在爐心壽命初期(1000 ppm)減少反應器冷卻水硼濃度 20 ppm 所需的純水量……

A. 壽命末期為壽命初期的十分之一

B. 壽命末期等於壽命初期

C. 壽命末期為壽命初期的 10 倍

D. 壽命末期為壽命初期的 100 倍

答案：C.

科目： 192004
知能類：K1.12 [2.7/2.7]
序號： P52

A reactivity coefficient measures a/an _____ change in reactivity while a reactivity defect measures a _____ change in reactivity due to a change in the measured parameter.

A. integrated; total

B. integrated; differential

C. unit; total

D. unit; differential

ANSWER: C.

反應度係數量測反應度的_____變化；反應度欠缺(reactivity defect)則是量測所測參數變化而導致的反應度_____變化。

A. 積分；總

B. 積分；微分

C. 單位；總

D. 單位；微分

答案：C.

科目： 192004
知能類：K1.12 [2.7/2.7]
序號： P352

Given the following initial parameters, select the final reactor coolant boron concentration required to decrease average coolant temperature by 4°F. (Assume no change in rod position or reactor/turbine power).

Initial reactor coolant system boron concentration	= 600 ppm
Moderator temperature coefficient	= -0.015% ΔK/K per °F
Differential boron worth	= -0.010% ΔK/K per ppm
Inverse boron worth	= -100 ppm/% ΔK/K

A. 606 ppm

B. 603 ppm

C. 597 ppm

D. 594 ppm

ANSWER: A.

已知下列初始參數，為了讓冷卻水平均溫度降低 4°F，反應器冷卻水的最終硼濃度需為多少？(假設棒位或反應器/汽機功率沒有改變)

反應器冷卻水系統初始硼濃度	= 600 ppm
緩和劑溫度係數	= -0.015% ΔK/K/°F
微分硼本領	= -0.010% ΔK/K/ppm
逆硼本領(Inverse boron worth)	= -100 ppm/% ΔK/K

A. 606 ppm

B. 603 ppm

C. 597 ppm

D. 594 ppm

答案：A.

科目： 192004
知能類：K1.12 [2.7/2.7]
序號： P852

Given the following initial parameters, select the final reactor coolant boron concentration required to increase average coolant temperature by 6°F. (Assume no change in rod position or reactor/turbine power.)

Initial boron concentration	= 500 ppm
Moderator temperature coefficient	= -0.012% ΔK/K per °F
Differential boron worth	= -0.008% ΔK/K per ppm
Inverse boron worth	= -125 ppm/% ΔK/K

A. 491 ppm

B. 496 ppm

C. 504 ppm

D. 509 ppm

ANSWER: A.

已知下列初始參數，為了讓冷卻水平均溫度升高 6°F，反應器冷卻水的最終硼濃度需為多少？(假設棒位或反應器/汽機功率沒有改變)

反應器冷卻水系統初始硼濃度	= 500 ppm
緩和劑溫度係數	= -0.012% ΔK/K/°F
微分硼本領	= -0.008% ΔK/K/ppm
逆硼本領(Inverse boron worth)	= -125 ppm/% ΔK/K

A. 491 ppm

B. 496 ppm

C. 504 ppm

D. 509 ppm

答案：A.

科目： 192004
知能類：K1.12 [2.7/2.7]
序號： P953

Given the following initial parameters:

Total power coefficient = -0.016% ΔK/K/%
Boron worth = -0.010% ΔK/K/ppm
Rod worth = -0.030% ΔK/K/inch inserted
Initial reactor coolant system
(RCS) boron concentration = 500 ppm

Which one of the following is the final RCS boron concentration required to support increasing plant power from 30% to 80% by boration/dilution with 10 inches of outward control rod motion. (Assume no change in xenon reactivity.)

A. 390 ppm

B. 420 ppm

C. 450 ppm

D. 470 ppm

ANSWER: C.

已知下列初始參數：

總功率係數 = -0.016% ΔK/K/%
硼本領 = -0.010% ΔK/K/ppm
控制棒本領 = -0.030% ΔK/K/inch inserted
反應器冷卻水系統
(RCS)初始硼濃度 = 500 ppm

藉著抽出控制棒 10 吋及調整硼濃度，使電廠功率從 30%增至 80%時，RCS 的最終硼濃度為多少？(假設氙毒反應度沒有變化)

A. 390 ppm

B. 420 ppm

C. 450 ppm

D. 470 ppm

答案：C.

科目： 192004
知能類：K1.12 [2.7/2.7]
序號： P1553

Given the following initial parameters, select the final reactor coolant boron concentration required to decrease average coolant temperature by 6°F. (Assume no change in rod position or reactor/turbine power.)

Initial boron concentration	= 500 ppm
Moderator temperature coefficient	= -0.012% ΔK/K per °F
Differential boron worth	= -0.008% ΔK/K per ppm
Inverse boron worth	= -125 ppm/% ΔK/K

A. 509 ppm

B. 504 ppm

C. 496 ppm

D. 491 ppm

ANSWER: A.

已知下列初始參數，為了讓冷卻水平均溫度降低 6°F，反應器冷卻水的最終硼濃度需為多少？(假設棒位或反應器/汽機功率沒有改變)

初始硼濃度	= 500 ppm
緩和劑溫度係數	= -0.012% ΔK/K/°F
微分硼本領	= -0.008% ΔK/K/ppm
逆硼本領(Inverse boron worth)	= -125 ppm/% ΔK/K

A. 509 ppm

B. 504 ppm

C. 496 ppm

D. 491 ppm

答案：A.

科目： 192004
知能類：K1.12 [2.7/2.7]
序號： P1753

Given the following initial parameters:

Total power coefficient = -0.020% ΔK/K/%
Boron worth = -0.010% ΔK/K/ppm
Rod worth = -0.025% ΔK/K/inch inserted
Initial reactor coolant system
(RCS) boron concentration = 500 ppm

Which one of the following is the final RCS boron concentration required to support increasing plant power from 30% to 80% by boration/dilution with 10 inches of outward control rod motion?(Assume no change in xenon reactivity.)

A. 425 ppm

B. 450 ppm

C. 550 ppm

D. 575 ppm

ANSWER: A.

已知下列初始參數：

總功率係數 = -0.020% ΔK/K/%
硼本領 = -0.010% ΔK/K/ppm
控制棒本領 = -0.025% ΔK/K/inch inserted
反應器冷卻水系統
(RCS)初始硼濃度 = 500 ppm

藉著抽出控制棒 10 吋及調整硼濃度，使電廠功率從 30%增至 80%時，RCS 的最終硼濃度為多少？(假設氙毒反應度沒有變化)

A. 425 ppm

B. 450 ppm

C. 550 ppm

D. 575 ppm

答案：A.

科目： 192004
知能類：K1.12 [2.7/2.7]
序號： P2353

Given the following initial parameters:

Total power coefficient = -0.020% ΔK/K/%
Boron worth = -0.010% ΔK/K/ppm
Rod worth = -0.025% ΔK/K/inch inserted
Initial reactor coolant system
(RCS) boron concentration = 500 ppm

Which one of the following is the final RCS boron concentration required to support decreasing plant power from 80% to 30% by boration/dilution with 10 inches of inward control rod motion?(Assume no change in xenon reactivity.)

A. 425 ppm

B. 475 ppm

C. 525 ppm

D. 575 ppm

ANSWER: D.

已知下列初始參數：

總功率係數 = -0.020% ΔK/K/%
硼本領 = -0.010% ΔK/K/ppm
控制棒本領 = -0.025% ΔK/K/inch inserted
反應器冷卻水系統
(RCS)初始硼濃度 = 500 ppm

藉著插入控制棒 10 吋及調整硼濃度，使電廠功率從 80%降至 30%時，RCS 的最終硼濃度為多少？(假設氙毒反應度沒有變化)

A. 425 ppm

B. 475 ppm

C. 525 ppm

D. 575 ppm

答案：D.

科目： 192004
知能類：K1.12 [2.7/2.7]
序號： P2453 (B2453)

Given the following initial parameters:

Total power coefficient = -0.020% ΔK/K/%
Boron worth = -0.010% ΔK/K/ppm
Rod worth = -0.025% ΔK/K/inch inserted
Initial reactor coolant system
(RCS) boron concentration = 600 ppm

Which one of the following is the final RCS boron concentration required to support increasing plant power from 40% to 80% by boration/dilution with 40 inches of outward control rod motion?(Assume no change in core xenon -135 reactivity.)

A. 420 ppm

B. 580 ppm

C. 620 ppm

D. 780 ppm

ANSWER: C.

已知下列初始參數：

總功率係數 = -0.020% ΔK/K/%
硼本領 = -0.010% ΔK/K/ppm
控制棒本領 = -0.025% ΔK/K/inch inserted
反應器冷卻水系統
(RCS)初始硼濃度 = 600 ppm

藉著抽出控制棒 40 吋及調整硼濃度，使電廠功率從 40%增至 80%時，RCS 的最終硼濃度為多少？(假設爐心的 Xe-135 反應度沒有變化)？

A. 420 ppm

B. 580 ppm

C. 620 ppm

D. 780 ppm

答案：C.

科目： 192004
知能類：K1.12 [2.7/2.7]
序號： P2553

Given the following initial parameters:

Reactor power	= 100%
Total power coefficient	= -0.020% ΔK/K/%
Boron worth	= -0.010% ΔK/K/ppm
Rod worth	= -0.025% ΔK/K/inch inserted
Initial reactor coolant system (RCS) boron concentration	= 500 ppm

Which one of the following is the final RCS boron concentration required to support decreasing plant power to 30% by boration/dilution with 20 inches of inward control rod motion? (Assume no change in xenon reactivity.)

A. 410 ppm

B. 425 ppm

C. 575 ppm

D. 590 ppm

ANSWER: D.

已知下列初始參數：

反應器功率	= 100%
總功率係數	= -0.020% ΔK/K/%
硼本領	= -0.010% ΔK/K/ppm
控制棒本領	= -0.025% ΔK/K/inch inserted
反應器冷卻水系統 (RCS)初始硼濃度	= 500 ppm

藉著插入控制棒 20 吋及調整硼濃度，使電廠功率降至 30%時，RCS 的最終硼濃度為多少？ (假設氙毒反應度沒有變化)？

A. 410 ppm

B. 425 ppm

C. 575 ppm

D. 590 ppm

答案：D.

科目： 192004
知能類：K1.13 [2.9/2.9]
序號： P53

During power operation, while changing power level, core reactivity is affected most quickly by...

A. boron concentration adjustments.

B. power defect (deficit).

C. xenon transients.

D. fuel depletion.

ANSWER: B.

在功率運轉期間，改變功率時，下列何種方式最快影響到爐心反應度？

A. 調整硼濃度。

B. 功率欠缺(不足)。

C. 氙毒暫態。

D. 燃料耗盡。

答案：B.

科目： 192004
知能類：K1.13 [2.9/2.9]
序號： P131

Which one of the following statements concerning the power defect is correct?

A. The power defect necessitates the use of a ramped T_{ave} program to maintain an adequate reactor coolant system subcooling margin.

B. The power defect increases the rod height requirements necessary to maintain the desired shutdown margin following a reactor trip.

C. The power defect is more negative at the beginning of core life because of the higher boron concentration.

D. The power defect causes control rods to be withdrawn as reactor power is decreased.

ANSWER: B.

下列關於功率欠缺的敘述，何者為真？

A. 由於功率欠缺必須運用平均溫度(T_{ave})攀升計畫(ramped T_{ave} program)，才能讓反應器冷卻水系統，維持在適當的次冷餘裕。

B. 為維持反應器急停後所需的停機餘裕，需增加控制棒高度以補償功率欠缺對反應度的影響。

C. 功率欠缺在爐心壽命初期為較大負值(more negative)，這是硼濃度較高所致。

D. 功率欠缺造成必須在反應器功率降低時抽出控制棒。

答案：B.

科目： 192004
知能類：K1.13 [2.9/2.9]
序號： P2071(B2070)

Neglecting the effects of changes in core Xe-135, which one of the following power changes requires the greatest amount of positive reactivity addition?

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: D.

若忽略爐心的 Xe-135 變化效應，下列哪項功率變化需要加入的正反應度最多？

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：D.

科目： 192004
知能類：K1.13 [2.9/2.9]
序號： P2169 (B2669)

Neglecting the effects of core Xe-135, which one of the following power changes requires the smallest amount of positive reactivity addition?

A. 2% power to 5% power

B. 5% power to 15% power

C. 15% power to 30% power

D. 30% power to 50% power

ANSWER: A.

如果忽略爐心的 Xe-135 效應，下列哪項功率變化需要加入的正反應度最少？

A. 2%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 50%功率

答案：A.

科目： 192004
知能類：K1.13 [2.9/2.9]
序號： P2851 (B2470)

Neglecting the effects of core Xe-135, which one of the following power changes requires the greatest amount of positive reactivity addition?

A. 3% power to 10% power

B. 10% power to 25% power

C. 25% power to 60% power

D. 60% power to 100% power

ANSWER: D.

如果忽略爐心的 Xe-135 效應，下列哪項功率變化需要加入的正反應度最多？

A. 3%功率至 10%功率

B. 10%功率至 25%功率

C. 25%功率至 60%功率

D. 60%功率至 100%功率

答案：D.

科目： 192004
知能類：K1.13 [2.9/2.9]
序號： P2953 (N/A)

Neglecting the effects of core Xe-135, which one of the following power changes requires the greatest amount of positive reactivity addition?

A. 3% power to 10% power

B. 10% power to 25% power

C. 25% power to 65% power

D. 65% power to 100% power

ANSWER: C.

如果忽略爐心的 Xe-135 效應，下列哪項功率變化需要加入的正反應度最多？

A. 3%功率至 10%功率

B. 10%功率至 25%功率

C. 25%功率至 65%功率

D. 65%功率至 100%功率

答案：C.

科目： 192004
知能類：K1.13 [2.9/2.9]
序號： P3050 (B3051)

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

Given:

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

What is the approximate power level increase required to offset the reactivity added by the inadvertent rod withdrawal?

A. 3.0%

B. 5.0%

C. 6.7%

D. 7.5%

ANSWER: D.

一部核子反應器處於啟動過程中，並以正常溫度及壓力運轉。反應器功率穩定於加熱起始點時，控制棒發生故障而意外抽出，導致反應度增加 0.3 %ΔK/K。

已知：

所有控制棒都已停止移動
自動系統或運轉員沒有為了抑制功率增加而採取任何行動
功率係數 = -0.04 %ΔK/K/% power
平均有效遲延中子分率 = 0.006

請問功率約得增加多少，才能抵銷控制棒意外抽出而加入的反應度？

A. 3.0%

B. 5.0%

C. 6.7%

D. 7.5%

答案：D.

科目： 192004
知能類：K1.13 [2.9/2.9]
序號： P3753 (B3769)

Neglecting the effects of changes in core Xe-135, which one of the following power changes requires the smallest amount of positive reactivity addition?

A. 3% power to 10% power

B. 10% power to 15% power

C. 15% power to 30% power

D. 30% power to 40% power

ANSWER: B.

如果忽略爐心的 Xe-135 變化效應，下列哪項功率變化需要加入的正反應度最少？

A. 3%功率至 10%功率

B. 10%功率至 15%功率

C. 15%功率至 30%功率

D. 30%功率至 40%功率

答案：B.

科目： 192004
知能類：K1.13 [2.9/2.9]
序號： P4327 (B4325)

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

Given:

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

What is the approximate reactor power level increase required to offset the reactivity added by the inadvertent rod withdrawal?

A. 3.3%

B. 5.0%

C. 6.7%

D. 7.5%

ANSWER: B.

一部核子反應器處於啟動過程中，並以正常溫度及壓力運轉。反應器功率穩定於加熱起始點時，控制棒發生故障而意外抽出，導致反應度增加 0.2 %ΔK/K。

已知：

所有控制棒都已停止移動。
自動系統或運轉員沒有為了抑制功率增加而採取任何行動。
功率係數 = -0.04 %ΔK/K/% power
平均有效遲延中子分率 = 0.006

請問反應器功率約得增加多少，才能抵銷控制棒意外抽出而加入的反應度？

A. 3.3%

B. 5.0%

C. 6.7%

D. 7.5%

答案：B.

科目/題號：192004/1 (2016新增)
知能類：K1.03 [2.9/3.1]
序號：P7637 (B7637)

Which one of the following describes a situation where an increase in moderator temperature can add positive reactivity?

A. At low moderator temperatures, an increase in moderator temperature can reduce neutron leakage from the core sufficiently to add positive reactivity.
B. At low moderator temperatures, an increase in moderator temperature can reduce neutron capture by the moderator sufficiently to add positive reactivity.
C. At high moderator temperatures, an increase in moderator temperature can reduce neutron leakage from the core sufficiently to add positive reactivity.
D. At high moderator temperatures, an increase in moderator temperature can reduce neutron capture by the moderator sufficiently to add positive reactivity.

ANSWER: B.

下列何者敘述係當增加緩和劑溫度時能加入正反應度？

A.在低緩和劑溫度時，增加緩和劑溫度能充分的減少爐心中子洩漏而加入正反應度
B.在低緩和劑溫度時，增加緩和劑溫度能充分降低緩和劑中子捕獲而加入正反應度
C.在高緩和劑溫度時，增加緩和劑溫度能充分的減少爐心中子洩漏而加入正反應度
D.在高緩和劑溫度時，增加緩和劑溫度能充分降低緩和劑中子捕獲而加入正反應度

答案： B

科目/題號：192004/2 (2016 新增)
知能類：K1.06〔3.1/3.1〕
序號：P6126

When compared to the beginning of a fuel cycle, the moderator temperature coefficient at 100 percent power near the end of a fuel cycle is...

A. more negative, because fewer boron-10 nuclei are removed from the core for a given moderator temperature increase.
B. less negative, because more boron-10 nuclei are removed from the core for a given moderator temperature increase.
C. more negative, because a smaller fraction of the neutron flux will leak out of the core following a given moderator temperature increase.
D. less negative, because a larger fraction of the neutron flux will leak out of the core following a given moderator temperature increase.

ANSWER: A.

當與燃料週期初期相比較，在接近燃料週期末期 100%功率之緩和劑溫度係數將是…？

A.較大負值，因為對某一假設緩和劑溫度上升時，較少的硼-10 原子核從爐心移除
B.較小負值，因為對某一假設緩和劑溫度上升時，較多的硼-10 原子核從爐心移除
C.較大負值，因為假設緩和劑溫度上升時，從爐心洩漏出去的中子通量比率更小
D.較小負值，因為假設緩和劑溫度上升時，從爐心洩漏出去的中子通量比率更大

答案： A

科目/題號：192004/3 (2016 新增)
知能類：K1.06〔3.1/3.1〕
序號：P7426

How does increasing the reactor coolant boron concentration affect the moderator temperature coefficient (MTC) in an overmoderated reactor?

A. The initially negative MTC becomes more negative.

B. The initially negative MTC becomes less negative.

C. The initially positive MTC becomes more positive.

D. The initially positive MTC becomes less positive.

ANSWER: C.

在一過度緩和的反應器，增加反應器冷卻水硼酸濃度將如何影響緩和劑溫度係數？

A.起初的緩和劑溫度係數負值變的更大
B.起初的緩和劑溫度係數負值變的更小
C.起初的緩和劑溫度係數正值變的更大
D.起初的緩和劑溫度係數正值變的更小

答案： C

科目/題號：192004/4 (2016新增)
知能類：K1.07 [2.9/2.9]
序號：P4826 (B4826)

If the average temperature of a fuel pellet decreases by 50°F, the microscopic cross-section for absorption of neutrons at a resonance energy of U-238 will _____; and the microscopic cross-sections for absorption of neutrons at energies that are slightly higher or lower than a U-238 resonance energy will _____.
A. increase; increase
B. increase; decrease
C. decrease; increase
D. decrease; decrease
ANSWER: B.

假如燃料丸的平均溫度降低 50˚F，則鈾-238 的共振能量吸收中子微觀截面將會____；而且較鈾-238 共振能量稍高或稍低的吸收中子微觀截面將會____。
A.增加；增加
B.增加；減少
C.減少；增加
D.減少；減少

答案： B

科目/題號：192004/5 (2016新增)
知能類：K1.07 [2.9/2.9]
序號：P6626 (B6627)

If the average temperature of a fuel pellet increases by 50°F, the microscopic cross-section for absorption of neutrons at a resonance energy of U-238 will _____; and the microscopic cross-sections for absorption of neutrons at energies that are slightly higher or lower than a U-238 resonance energy will _____.
A. increase; increase
B. increase; decrease
C. decrease; increase
D. decrease; decrease
ANSWER: C.

假如燃料丸的平均溫度增加 50°F，則鈾-238 的共振能量吸收中子微觀截面將會____；而且較鈾-238 共振能量稍高或稍低的吸收中子微觀截面將會____。
A.增加；增加
B.增加；減少
C.減少；增加
D.減少；減少

答案： C

科目/題號：192004/6 (2016新增)
知能類：K1.07 [2.9/2.9]
序號：P6926 (B6926)

Which one of the following 10 percent power level changes produces the largest amount of negative reactivity from the fuel temperature coefficient? (Assume that each power level change produces the same increase/decrease in fuel temperature.)
A. 30 percent to 40 percent
B. 30 percent to 20 percent
C. 80 percent to 90 percent
D. 80 percent to 70 percent
ANSWER: A.

下列何者的 10%功率改變將從燃料溫度係數產生最大的負反應度值？(假設每一個功率的改變在燃料溫度產生相同的增加/減少)
A.30%至 40%
B.30%至 20%
C.80%至 90%
D.80%至 70%

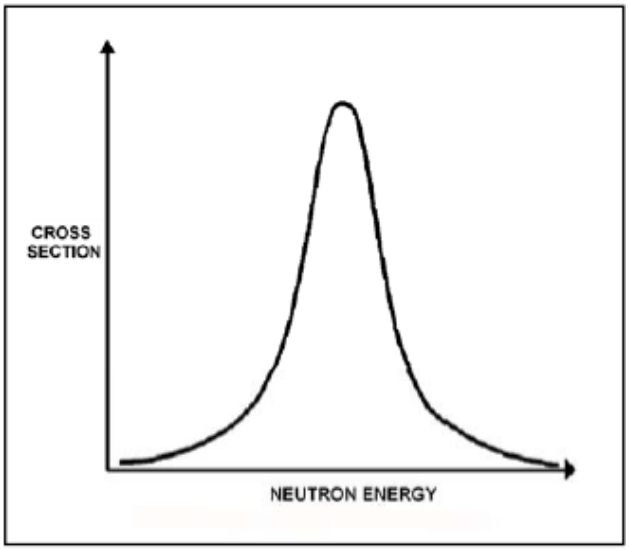
答案： A

科目/題號：192004/7 (2016新增)
知能類：K1.07 [2.9/2.9]
序號：P7648 (B7648)

Refer to the drawing of a curve showing the neutron absorption cross-section for U-238 at a resonance energy (see figure below). The reactor associated with the curve is operating at 80 percent power.
If reactor power is increased to 90 percent over the next few hours, the curve will become _____; and the percentage of the core neutron population lost to resonance capture by U-238 will _____.
A. shorter and broader; increase
B. shorter and broader; decrease
C. taller and more narrow; increase
D. taller and more narrow; decrease
ANSWER: A.

請參考顯示鈾-238 共振能量與中子吸收截面曲線圖(見下圖)，與此圖相關之反應器運轉在 80%功率。假如反應器在其後數小時提升功率至 90%，則曲線圖將會變的____；而且鈾-238 共振捕獲爐內中子數的比例將會____。
A.更矮和更寬；增加
B.更矮和更寬；減少
C.更高和更窄；增加
D.更高和更窄；減少

答案： A



科目/題號：192004/8 (2016 新增)
知能類：K1.12〔2.7/2.7〕
序號：P6527

Given the following initial parameters:

Power coefficient = -0.020 %ΔK/K/percent
Differential boron worth = -0.010 %ΔK/K/ppm
Differential rod worth = -0.020 %ΔK/K/inch
Reactor coolant boron concentration = 600 ppm

Which one of the following is the final reactor coolant boron concentration required to support increasing reactor power from 20 percent to 50 percent with 10 inches of control rod withdrawal? (Ignore any change in fission product poison reactivity.)

A. 520 ppm
B. 560 ppm
C. 640 ppm
D. 680 ppm

ANSWER: B.

已知下列初始參數：

功率係數 = -0.020%△K/K/%功率
微分硼酸本領= -0.010 %ΔK/K/ppm
微分控制棒本領= -0.020 %ΔK/K/inch
反應器冷卻水硼酸濃度=600ppm

下列何者是以抽控制棒 10 -inch，將反應器從 20%功率提升至 50%功率，所必須的最終反應器冷卻水硼酸濃度？(忽略任何分裂產物毒素的反應度變化)

A.520ppm
B.560ppm
C.640ppm
D.680ppm

答案： B

科目/題號：192004/9 (2016新增)
知能類：K1.13 [2.9/2.9]
序號：P6727 (B6736)

With reactor power stable at the point of adding heat, a control rod malfunction causes a short rod withdrawal that increases reactivity by 0.14 %ΔK/K.
Given:

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

What is the approximate power level increase required to offset the reactivity added by the control rod withdrawal? (Ignore any reactivity effects from changes in fission product poisons.)
A. 2.0 percent
B. 5.0 percent
C. 20 percent
D. 50 percent
ANSWER: B.

反應器功率穩定在加熱點，一支控制棒故障引起一支短控制棒抽出增加 0.14 %ΔK/K。
已知：
●所有控制棒的移動已停止
●無自動系統或運轉員行動發生以防止功率增加
●功率係數等於-0.028 %ΔK/K/%
●有效遲延中子分數等於 0.006
需要增加大約多少功率以補償控制棒抽出所加入的反應度？
A. 2.0%
B. 5.0%
C. 20 %
D. 50%

答案： B