The transfer of heat from the reactor fuel pellets to the fuel cladding during normal plant operation is an example of _____ heat transfer.

A. conduction

B. convection

C. radiant

D. two-phase

ANSWER: A.

在電廠正常運轉期間，從反應器燃料丸傳熱至燃料護套的情形，即是_____熱傳的例子。

A. 傳導(conduction)

B. 對流

C. 輻射

D. 雙相流

答案：A.

Refer to the drawing of a fuel rod and coolant flow channel at beginning of core life (see figure below).

Which one of the following is the <u>primary</u> method of heat transfer through the gap between the reactor fuel and the fuel clad?

A. Conduction
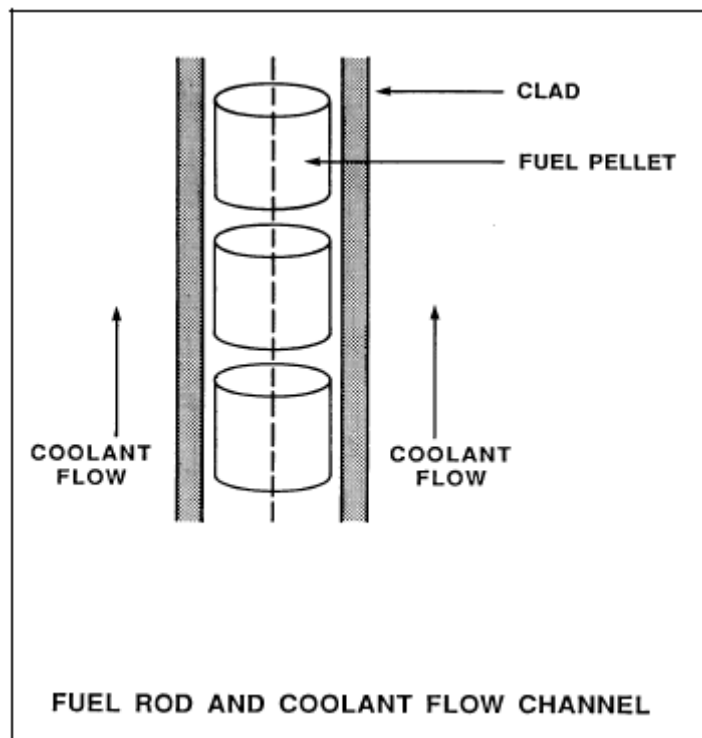
B. Convection

C. Radiation

D. Natural circulation

ANSWER: A.

請參照下圖中，處於爐心壽命初期的燃料棒和冷卻水流通道(channel)。

下列何者為在反應器燃料和燃料護套之間隙熱傳的<u>主要</u>方法？

A. 傳導

B. 對流

C. 輻射

D. 自然循環

答案：A.

FUEL ROD AND COOLANT FLOW CHANNEL

科目： 193007
知能類：K1.01 [2.5/2.5]
序號： P784

During a loss-of-coolant accident, which one of the following heat transfer mechanisms provides the most core cooling when fuel elements are not in contact with the coolant?

A. Radiation

B. Emission

C. Convection

D. Conduction

ANSWER: A.

發生冷卻水流失事故時，下列哪項熱傳機制能在燃料元件未接觸冷卻水時，提供最大的爐心冷卻效果？

A. 輻射

B. 放射

C. 對流

D. 傳導

答案：A.

The fuel rods are normally charged with _____ gas to improve the heat transferred by _____ from the fuel pellets to the cladding.

A. helium; convection

B. helium; conduction

C. nitrogen; convection

D. nitrogen; conduction

ANSWER: B.

燃料棒一般會充_____氣以改善燃料丸至護套的_____熱傳。

A. 氦；對流

B. 氦；傳導

C. 氮；對流

D. 氮；傳導

答案：B.

A nuclear power plant is operating at 60% power. Which one of the following is the primary heat transfer mechanism responsible for the transfer of heat from the outer surface of the steam generator tubes to the feedwater?

A. Radiolysis

B. Radiation

C. Conduction

D. Convection

ANSWER: D.

已知核能電廠以 60%功率運轉。下列何者為從蒸汽產生器 U 形管外表面傳熱至飼水的主要熱傳機制？

A. 輻射分解

B. 輻射

C. 傳導

D. 對流

答案：D.

Which one of the following describes a heat transfer process in which convection is the most significant heat transfer mechanism?

A. From the reactor fuel to the core barrel during core uncovery

B. Through the tube walls in a steam generator during normal operation at 100% power

C. From the reactor fuel to the steam generators following a loss of all RCPs

D. From the fuel pellet centerline to the fuel clad during normal operation at 100% power

ANSWER: C.

下面敘述的哪項熱傳過程中，對流是最明顯的熱傳機制？

A. 爐心外露時，從反應器燃料到爐心筒(core barrel)。

B. 以100%功率正常運轉時，從蒸汽產生器管壁傳出。

C. 所有反應器冷卻水泵(RCP)失效後，從反應器燃料至蒸汽產生器。

D. 以100%功率正常運轉時，從燃料丸中心到燃料護套。

答案：C.

Which one of the following describes a heat transfer flow path in which conduction is the most significant heat transfer mechanism?

A. From the reactor fuel to the core barrel during core uncovery

B. From the main turbine exhaust steam to the atmosphere via main condenser cooling water and a cooling tower during normal operation

C. From the reactor fuel to the steam outlet of the steam generators during a station blackout

D. From a fuel pellet to the fuel clad via the fuel rod fill gas during normal operation

ANSWER: D.

在下列熱傳流徑中，那一項的主要熱傳機制為傳導？

A. 爐心外露時，從反應器燃料到爐心筒(core barrel)。

B. 正常運轉時，從主汽機排出的蒸汽，經由主冷凝器冷卻水及冷卻塔至大氣中。

C. 核能電廠全黑時，從反應器燃料到蒸汽產生器的蒸汽出口。

D. 正常運轉時，從燃料丸經由燃料棒之充氣到燃料護套。

答案：D.

If excessive amounts of air are entrained/dissolved in the cooling water passing through a single-phase (liquid) heat exchanger, the overall heat transfer coefficient of the heat exchanger will decrease because the...

A. laminar layer thickness will decrease.

B. laminar layer thickness will increase.

C. thermal conductivity of the cooling fluid will decrease.

D. thermal conductivity of the cooling fluid will increase.

ANSWER: C.

若有過量氣體夾帶/混入通過單相(液體)熱交換器的冷卻水，該熱交換器的整體熱傳係數將降低，因為……

A. 層流水膜(laminar layer)厚度將減少。

B. 層流水膜(laminar layer)厚度將增加。

C. 冷卻水的熱傳導性將降低。

D. 冷卻水的熱傳導性將增加。

答案：C.

Why is bulk boiling in the tubes of a single-phase heat exchanger undesirable?

A. The bubble formation will break up the laminar layer in the heat exchanger tubes.

B. The turbulence will restrict fluid flow through the heat exchanger tubes.

C. The ΔT across the tubes will decrease through the heat exchanger.

D. The thermal conductivity of the heat exchanger tubes will decrease.

ANSWER: B.

為何單相熱交換器的管內，不希望發生整體沸騰(bulk boiling)？

A. 形成的泡泡將破壞熱交換器管內的薄片層。

B. 擾流(turbulence)將限制熱交換器管內的液體流動。

C. 熱交換器管兩端的ΔT將減少。

D. 熱交換器管的熱傳導性將降低。

答案：B.

Which one of the following pairs of fluids undergoing heat transfer in typical cross-flow design heat exchangers will yield the greatest heat exchanger overall heat transfer coefficient?

A. Oil to water in a lube oil cooler

B. Air to water in an air compressor after-cooler

C. Steam to water in a turbine exhaust steam condenser

D. Water to water in a cooling water heat exchanger

ANSWER: C.

下列哪組液體在典型的交流型(cross-flow)熱交換器進行熱傳時，其熱交換器整體熱傳係數將最大？

A. 潤滑油冷卻器內油至水的熱傳。

B. 空壓機後冷卻器內空氣至水的熱傳。

C. 汽機排汽冷凝器內蒸汽至水的熱傳。

D. 冷卻水熱交換器內水至水的熱傳。

答案：C.

Which one of the following pairs of fluids undergoing heat transfer in typical cross-flow design heat exchangers will yield the smallest heat exchanger overall heat transfer coefficient?

A. Oil to water in a lube oil cooler

B. Air to water in an air compressor after-cooler

C. Steam to water in a turbine exhaust steam condenser

D. Water to water in a cooling water heat exchanger

ANSWER: B.

下列哪組液體在典型的交流型(cross-flow)熱交換器進行熱傳時，其熱交換器整體熱傳係數將最小？

A. 潤滑油冷卻器內油至水的熱傳。

B. 空壓機後冷卻器(after-cooler)內空氣至水的熱傳。

C. 汽機排汽冷凝器內蒸汽至水的熱傳。

D. 冷卻水熱交換器內水至水的熱傳。

答案：B.

科目： 193007
知能類：K1.04 [2.8/3.0]
序號： P3384 (B3383)

A nuclear power plant was operating at a steady-state power level with the following main condenser parameters:

    Main condenser pressure: 1.2 psia
    Cooling water inlet temperature: 60°F
    Cooling water outlet temperature: 84°F

As a result of increased condenser air inleakage, the overall heat transfer coefficient of the main condenser decreases by 25%. Main condenser heat transfer rate and cooling water temperatures are unchanged. Which one of the following is the approximate resulting pressure in the main condenser?

A. 1.7 psia

B. 2.3 psia

C. 3.0 psia

D. 4.6 psia

ANSWER: A.

核能電廠以穩態功率運轉時，主冷凝器的參數如下：

    主冷凝器壓力：   1.2 psia
    冷卻水進口溫度：60°F
    冷卻水出口溫度：84°F

冷凝器的滲入空氣增加，導致主冷凝器的整體熱傳係數降低25%。主冷凝器熱傳率和冷卻水溫度若不變，改變後的主冷凝器壓力約為多少？

A. 1.7 psia

B. 2.3 psia

C. 3.0 psia

D. 4.6 psia

答案：A.

Which one of the following pairs of fluids undergoing heat transfer in typical cross-flow design heat exchangers will yield the greatest heat exchanger overall heat transfer coefficient? (Assume comparable heat exchanger sizes and fluid flow rates.)

A. Oil to water in a lube oil cooler

B. Steam to water in a feedwater heater

C. Water to air in a ventilation heating unit

D. Water to water in a cooling water heat exchanger

ANSWER: B.

下列哪組液體在典型的交流型(cross-flow)熱交換器進行熱傳時，熱交換器的整體熱傳係數將最大(假設熱交換器尺寸和液體流量相似)？

A. 潤滑油冷卻器內油至水的熱傳。

B. 飼水加熱器內蒸汽至水的熱傳。

C. 空調箱內水至空氣的熱傳。

D. 冷卻水熱交換器內水至水的熱傳。

答案：B.

During steady state power operation, core thermal power can be most accurately determined by multiplying the total mass flow rate of the...

A. reactor coolant by the change in temperature across the core.

B. reactor coolant by the change in enthalpy in the steam generators.

C. feedwater by the change in enthalpy in the steam generators.

D. feedwater by the change in temperature across the core.

ANSWER: C.

核子反應器以穩態功率運轉時，利用下列何者決定出來的爐心熱功率最準確？

A. 反應器冷卻水的總質量流率，乘以爐心兩端的溫度變化。

B. 反應器冷卻水的總質量流率，乘以蒸汽產生器的焓變化。

C. 飼水的總質量流率，乘以蒸汽產生器的焓變化。

D. 飼水的總質量流率，乘以爐心兩端的溫度變化。

答案：C.

科目： 193007
知能類：K1.05 [2.7/2.9]
序號： P785

A nuclear reactor is producing 200 MW of core thermal power. Reactor coolant pumps are adding 10 MW of additional thermal power into the coolant system based on heat balance calculations. The core is rated at 1,330 MW thermal power.

Which one of the following is the core thermal power in percent?

A. 14.0%

B. 14.3%

C. 15.0%

D. 15.8%

ANSWER: C.

一部核子反應器產生 200 MW 的爐心熱功率。根據熱平衡算式，反應器冷卻水泵加入 10 MW 熱功率至冷卻水系統。爐心的額定熱功率為 1,330 MW。

下列何者為爐心熱功率百分比？

A. 14.0%

B. 14.3%

C. 15.0%

D. 15.8%

答案：C.

The power range nuclear instruments have been adjusted to 100% based on a calculated heat balance. Which one of the following will result in indicated reactor power being greater than actual reactor power?

A. The reactor coolant pump heat input term was omitted from the heat balance calculation.

B. The water flow rate used in the heat balance calculation were 10% lower than actual flow rates.

C. The steam pressure used in the heat balance calculation was 50 psi higher than actual steam pressure.

D. The enthalpy of the feed water was miscalculated to be 10 Btu/lbm higher than actual feed water enthalpy.

ANSWER: A.

功率階核能儀器按照算出的熱平衡調整至 100%。下列何者將導致反應器功率指示值大於實際功率？

A. 計算熱平衡時，忽略了反應器冷卻水泵的熱輸入值。

B. 計算熱平衡所用的水流率，較實際流率低 10%。

C. 計算熱平衡所用的蒸汽壓力，較實際蒸汽壓力高 50 psi。

D. 飼水熱焓誤算成較實際飼水熱焓高出 10 Btu/lbm。

答案：A.

Which one of the terms in the equation, Q= UA(T1-T2), is affected the most, and therefore most responsible for the initial increase in heat transfer rate from the reactor fuel during a minor (3%) steamline break? (Assume <u>no</u> initial change in reactor power.)

A. U

B. A

C. T1

D. T2

ANSWER: D.

蒸汽管路出現小破裂(3%)時，反應器燃料傳出的熱傳率初步增加，請問下列方程式：Q＝UA(T1-T2)之中，哪一項受此破裂影響最大，所以對熱傳率增加的影響最大？(假設反應器初始功率<u>沒有</u>改變)

A. U

B. A

C. T1

D. T2

答案：D.

The power range nuclear instruments have been adjusted to 100% based on a calculated calorimetric (secondary heat balance). Which one of the following will result in actual reactor power being less than indicated reactor power?

A. The feedwater temperature used in the calorimetric calculation is higher than actual feedwater temperature.

B. The reactor coolant pump heat input term is omitted from the calorimetric calculation.

C. The feedwater flowrate used in the calorimetric calculation is lower than actual feedwater flowrate.

D. The steam pressure used in the calorimetric calculation is higher than actual steam pressure.

ANSWER: B.

功率階核能儀器按照算出的熱量(二次側熱平衡)調整為100%。下列何者將導致反應器功率指示值大於實際功率？

A. 計算熱量所用的飼水溫度，比實際飼水溫度高。

B. 計算熱量時，遺漏了反應器冷卻水泵的熱輸入。

C. 用來計算熱量的飼水流率比實際飼水流率低。

D. 用來計算熱量的蒸汽壓力比實際蒸汽壓力高。

答案：B.

A nuclear reactor is operating at 80% power with a core ΔT of 48°F when a station blackout occurs. Natural circulation is established and core ΔT stabilizes at 40°F. If mass flow rate is 3%, which one of the following is the current decay heat level?

A. 1%

B. 2%

C. 3%

D. 4%

ANSWER: B.

一部核子反應器以 80%功率運轉，其爐心 ΔT 為 48°F，此時發生電廠全黑。建立自然循環後，爐心 ΔT 穩定在 40°F。如果質量流率為 3%，目前的衰變熱為多少？

A. 1%

B. 2%

C. 3%

D. 4%

答案：B.

A nuclear power plant is operating at 100% power with the following reactor coolant system (RCS) and steam generator (S/G) parameters:

    RCS average coolant temperature: 575°F
    RCS hot leg temperatures: 600°F
    RCS cold leg temperatures: 550°F
    S/G pressures: 885 psig

The reactor is shut down and a maintenance outage is performed in which 7% of the tubes in each S/G are plugged. The reactor is restarted and power is ramped to 100%. To establish the same S/G pressure at 100% power, RCS average coolant temperature will have to be increased to...

A. 584°F.

B. 582°F.

C. 580°F.

D. 578°F.

ANSWER: D.

核能電廠以 100%功率運轉，其反應器冷卻水系統(RCS)和蒸汽產生器(S/G)的參數如下：

    RCS 冷卻水平均溫度： 575°F
    RCS 熱端溫度：   600°F
    RCS 冷端溫度：   550°F
    S/G 壓力：   885 psig

反應器停機以進行大修，每部 S/G 均有 7%的管子被塞管。接著重新啟動反應器，功率亦攀升至 100%。欲在 100%功率下，建立相同的 S/G 壓力，RCS 冷卻水的平均溫度，必須升高至……

A. 584°F

B. 582°F

C. 580°F

D. 578°F

答案：D.

科目： 193007
知能類：K1.06 [3.1/3.3]
序號： P1384

A secondary heat balance calculation is being performed at 90% reactor power to calibrate reactor power instrumentation. Which one of the following will result in a calculated reactor power that is <u>less</u> than actual reactor power?

A. Steam generator pressure is indicating 20 psi above actual steam generator pressure.

B. Steam generator water level is indicating 3% below actual steam generator water level.

C. Feedwater flow rate is indicating 3% above actual feedwater flow rate.

D. Feedwater temperature is indicating 20°F below actual feedwater temperature.

ANSWER: A.

根據反應器功率為 90%的狀況來計算二次側熱平衡，藉此校正反應器功率儀器。下列何者將導致算出的反應器功率<u>少於</u>實際功率？

A. 蒸汽產生器壓力指示值，較實際壓力高 20 psi。

B. 蒸汽產生器水位指示值，較實際水位低 3%。

C. 飼水流率指示值較實際流率高 3%。

D. 飼水溫度指示值較實際溫度低 20°F。

答案：A.

A nuclear power plant with two steam generators (S/Gs) is operating at 90% power with the following S/G and reactor coolant system (RCS) parameters:

RCS average coolant temperature = 575°F
RCS hot leg temperatures = 600°F
RCS cold leg temperatures = 550°F
S/G pressures = 885 psig

The reactor is shut down and a maintenance outage is performed in which multiple tubes are plugged in each S/G. The reactor is restarted with 98% of the RCS flow that existed prior to the outage.

If RCS hot leg temperatures are maintained at 600°F at 90% power, the RCS cold leg temperatures will be...

A. 546°F.

B. 547°F.

C. 548°F.

D. 549°F.

ANSWER: D.

裝有兩部蒸汽產生器(S/G)的核能電廠以90%功率運轉，其S/G與反應器冷卻水系統(RCS)的參數如下：

RCS 冷卻水平均溫度： 575°F
RCS 熱端溫度： 600°F
RCS 冷端溫度： 550°F
S/G 壓力： 885 psig

反應器停機以進行大修，每部 S/G 有數根管子被塞管。重新啟動反應器後的 RCS 流量維持於 98%額定流率，與大修前流率相同。

在 90%功率下，RCS 熱端的溫度若維持在 600°F，RCS 冷端溫度為……

A. 546°F

B. 547°F

C. 548°F

D. 549°F

答案：D.

The power range nuclear instruments have been adjusted to 100% based on a calculated heat balance. Which one of the following will result in indicated reactor power being <u>lower</u> than actual reactor power?

A. The feed water temperature used in the heat balance calculation was 20°F higher than actual feed water temperature.

B. The reactor coolant pump heat input term was omitted from the heat balance calculation.

C. The feed water flow rate used in the heat balance calculation was 10% higher than actual flow rate.

D. The steam pressure used in the heat balance calculation was 50 psi lower than actual steam pressure.

ANSWER: A.

功率階核能儀器依據算出的熱平衡調整到100%。下列何者將導致反應器功率指示值<u>小於</u>實際功率？

A. 用來計算熱平衡的飼水溫度比實際飼水溫度高20˚F。

B. 計算熱平衡時遺漏了反應器冷卻水泵的熱輸入。

C. 用來計算熱平衡的飼水流率比實際飼水流率高10%。

D. 用來計算熱平衡的蒸汽壓力比實際蒸汽壓力低50 psi。

答案：A.

The power range nuclear instruments have been adjusted to 100% based on a heat balance calculation. Which one of the following will result in indicated reactor power being higher than actual reactor power?

A. The feedwater temperature used in the heat balance calculation was 20°F higher than actual feedwater temperature.

B. The reactor coolant pump heat input term was omitted from the heat balance calculation.

C. The feedwater flow rate used in the heat balance calculation was 10% lower than actual feedwater flow rate.

D. The ambient heat loss term was omitted from the heat balance calculation.

ANSWER: B.

功率階核能儀器依據算出的熱平衡調整到100%。下列何者將導致反應器功率指示值高於實際功率？

A. 用來計算熱平衡的飼水溫度比實際飼水溫度高20°F。

B. 計算熱平衡時遺漏了反應器冷卻水泵的熱輸入。

C. 用來計算熱平衡的飼水流率比實際飼水流率低10%。

D. 計算熱平衡時遺漏了周圍熱損失的項目。

答案：B.

The power range nuclear instruments have been adjusted to 100% based on a heat balance calculation. Which one of the following will result in indicated reactor power being <u>lower</u> than actual reactor power?

A. The feedwater temperature used in the heat balance calculation was 20°F higher than actual feedwater temperature.

B. The reactor coolant pump heat input term was omitted from the heat balance calculation.

C. The feedwater flow rate used in the heat balance calculation were 10% higher than actual flow rates.

D. The operator miscalculated the enthalpy of the steam exiting the steam generators to be 10 Btu/lbm higher than actual.

ANSWER: A.

功率階核能儀器依據算出的熱平衡調整到100%。下列何者將導致反應器功率指示值<u>小於</u>實際功率？

A. 用來計算熱平衡的飼水溫度比實際飼水溫度高20°F。

B. 計算熱平衡時，遺漏了反應器冷卻水泵的熱輸入。

C. 用來計算熱平衡的飼水流率比實際流率高10%。

D. 運轉員誤算了離開蒸汽產生器的蒸汽焓，讓其較實際數值高出10 Btu/lbm。

答案：A.

The power range nuclear instruments have been adjusted to 100% based on a calculated heat balance. Which one of the following will result in indicated reactor power being <u>lower</u> than actual reactor power?

A. The feed water temperature used in the heat balance calculation was 20°F lower than actual feed water temperature.

B. The reactor coolant pump heat input term was omitted from the heat balance calculation.

C. The ambient heat loss value used in the heat balance calculation was only half the actual ambient heat loss.

D. The feed water flow rates used in the heat balance calculation were 10% higher than actual flow rates.

ANSWER: C.

功率階核能儀器依據算出的熱平衡調整到100%。下列何者將導致反應器功率指示值<u>小於實際功率</u>？

A. 用來計算熱平衡的飼水溫度比實際飼水溫度低20˚F。

B. 計算熱平衡時遺漏了反應器冷卻水泵的熱輸入。

C. 計算熱平衡時使用的周圍熱損失值，只有實際周圍熱損失值的一半。

D. 用來計算熱平衡的飼水流率比實際飼水流率高10%。

答案：C.

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

Immediately after the MSIV closure, the cold leg temperature (Tc) in the reactor coolant loop with the closed MSIV will _____; and the Tc in a loop with an open MSIV will immediately _____.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

ANSWER: B.

一座多迴路核能電廠以 50%功率運轉，控制棒處於手動模式，此時，一部蒸汽產生器的主蒸汽隔離閥(MSIV)意外關閉。假設反應器沒有急停，亦無發生其他保護動作，運轉員也沒有採取行動。

就在 MSIV 關閉後，在 MSIV 關閉的反應器冷卻水迴路冷端溫度(Tc)，將立刻_____；至於 MSIV 維持開啟的迴路中的 Tc 將立刻_____。

A. 升高；升高

B. 升高；降低

C. 降低；升高

D. 降低；降低

答案：B.

The power range nuclear instruments have been adjusted to 100% based on a calculated heat balance. Which one of the following will result in indicated reactor power being lower than actual reactor power?

A. The feedwater temperature used in the heat balance calculation was 10°F lower than actual feed water temperature.

B. The reactor coolant pump heat input term was omitted from the heat balance calculation.

C. The feedwater flow rate used in the heat balance calculation was 10% lower than actual feedwater flow rate.

D. The steam pressure used in the heat balance calculation was 50 psi lower than actual steam pressure.

ANSWER: C.

功率階核能儀器依據算出的熱平衡調整到100%。下列何者將導致反應器功率指示值小於實際功率？

A. 用來計算熱平衡的飼水溫度比實際飼水溫度低10˚F。

B. 計算熱平衡時遺漏了反應器冷卻水泵的熱輸入。

C. 用來計算熱平衡的飼水流率比實際飼水流率低10%。

D. 用來計算熱平衡的蒸汽壓力比實際蒸汽壓力低50 psi。

答案：C.

In a two-loop PWR nuclear power plant, indicated feedwater flow to each steam generator (S/G) is 3.3 x 10^6 lbm/hr at an enthalpy of 419 Btu/lbm. The steam exiting each S/G is at 800 psia with 100% steam quality.

What is the core thermal power? (Ignoring blowdown and pump heat)

A. 677 MWt

B. 755 MWt

C. 1,334 MWt

D. 1,510 MWt

ANSWER: D.

在二迴路壓水式反應器(PWR)核能電廠內，進入各蒸汽產生器(S/G)的飼水流率指示值為 3.3 x 10^6 lbm/hr，熱焓為 419 Btu/lbm。離開各蒸汽產生器的蒸汽壓力為 800 psia，蒸汽乾度為 100%。

請問爐心熱功率為多少(忽略沖放和泵熱)？

A. 677 MWt

B. 755 MWt

C. 1,334 MWt

D. 1,510 MWt

答案：D.

Reactor coolant enters a nuclear reactor core at 545°F and leaves at 595°F. If the reactor coolant flow rate is 6.6 x 10^7 lbm/hour and the specific heat capacity of the coolant is 1.3 Btu/lbm-°F, what is the core thermal power? (1 watt = 3.4127 Btu/hour)

A. 100.6 MWt

B. 125.7 MWt

C. 1005.7 MWt

D. 1257.1 MWt

ANSWER: D.

進入核子反應器爐心的反應器冷卻水溫為 545°F，離開時的水溫為 595°F。如果反應器冷卻水流率為 6.6 x 10^7 lbm/hr，該冷卻水的比熱容量為 1.3 Btu/lbm-°F，爐心熱功率為多少(1 瓦特 ＝3.4127 Btu/hr)？

A. 100.6 MWt

B. 125.7 MWt

C. 1005.7 MWt

D. 1257.1 MWt

答案：D.

A nuclear reactor is operating with the following parameters:

    Reactor power   = 100%
    Core ΔT   = 42°F
    Reactor coolant system flow rate = 100%
    Average coolant temperature   = 587°F

A station blackout occurs and natural circulation is established with the following stable parameters:

    Decay heat   = 2%
    Core ΔT   = 28°F
    Average coolant temperature   = 572°F

What is the core mass flow rate in percent?

A. 2.0%

B. 2.5%

C. 3.0%

D. 4.0%

ANSWER: C.

一部核子反應器的運轉參數如下：

    反應器功率   = 100%
    爐心ΔT   = 42°F
    反應器冷卻水系統流率= 100%
    冷卻水平均溫度   = 587°F

電廠全黑且建立自然循環後，穩定參數如下：

    衰變熱   = 2%
    爐心ΔT   = 28°F
    冷卻水平均溫度= 572°F

爐心的質量流率百分比為多少？

A. 2.0%

B. 2.5%

C. 3.0%

D. 4.0%

答案：C.

During a nuclear power plant outage, 5% of all steam generator (S/G) tubes were plugged due to wall thinning. Full-power reactor coolant system flow rate and average coolant temperature (T_{ave}) have not changed. Given the following 100% power conditions before the outage:

T_{ave} = 578°F
$T_{S/G}$ = 538°F

Which one of the following will be the approximate S/G pressure when the plant is returned to 100% power after the outage?

A. 960 psia

B. 930 psia

C. 900 psia

D. 870 psia

ANSWER: B.

核能電廠大修期間，基於管壁變薄，所有蒸汽產生器(S/G)的 5%管子被塞管。全功率反應器冷卻水系統流率和冷卻水平均溫度(T_{ave})維持不變。已知大修前的 100%功率運轉條件如下：

T_{ave} = 578°F
$T_{S/G}$ = 538°F

大修後，電廠恢復至 100%功率時，蒸汽產生器的壓力約為多少？

A. 960 psia

B. 930 psia

C. 900 psia

D. 870 psia

答案：B.

科目： 193007
知能類：K1.08 [3.1/3.4]
序號： P1782

A nuclear power plant is operating with the following parameters:

    Reactor power: 100%
    Core ΔT: 60°F
    Reactor coolant system flow rate: 100%
    Average coolant temperature: 587°F

A station blackout occurs and natural circulation is established with the following stable parameters:

    Decay heat: 1%
    Core ΔT: 30°F
    Average coolant temperature: 572°F

What is the core mass flow rate in percent?

A. 2.0%

B. 2.5%

C. 3.0%

D. 4.0%

ANSWER: A.

核能電廠的運轉參數如下：

    反應器功率 ：   100%
    爐心ΔT：   60°F
    反應器冷卻水系統流率：100%
    冷卻水平均溫度：   587°F

電廠全黑且建立自然循環後，穩定參數如下：

    衰變熱 ：   1%
    爐心ΔT：   30°F
    冷卻水平均溫度：572°F

爐心的質量流率百分比為多少？

A. 2.0%

B. 2.5%

C. 3.0%

D. 4.0%

答案：A.

During a nuclear power plant outage, 6% of all steam generator (S/G) tubes were plugged. Full power reactor coolant system flow rate and average coolant temperature (T$_{ave}$) have not changed. Given the following 100% power conditions <u>before</u> the outage:

T$_{ave}$ = 584°F
T$_{S/G}$ = 544°F

Which one of the following will be the approximate S/G pressure when the plant is returned to 100% power after the outage?

A. 974 psia

B. 954 psia

C. 934 psia

D. 914 psia

ANSWER: A.

核能電廠大修期間，所有蒸汽產生器(S/G)的 6%~~的~~管子被塞管。全功率反應器冷卻水系統流量和冷卻水平均溫度(T$_{ave}$)維持不變。已知大修<u>前</u> 100%功率運轉條件如下：

T$_{ave}$ = 584°F
T$_{S/G}$ = 544°F

大修後，電廠恢復至 100%功率時，蒸汽產生器的壓力約為多少？

A. 974 psia

B. 954 psia

C. 934 psia

D. 914 psia

答案：A.

During a nuclear power plant outage, 5% of all steam generator (S/G) tubes were plugged. Full power reactor coolant system flow rate and average coolant temperature (T_{ave}) have not changed. Given the following 100% power conditions <u>before</u> the outage:

T_{ave} = 588.0°F
$T_{S/G}$ = 542.0°F

Which one of the following will be the approximate S/G pressure when the plant is returned to 100% power after the outage?

A. 998 psia

B. 979 psia

C. 961 psia

D. 944 psia

ANSWER: C.

核能電廠大修期間，所有蒸汽產生器(S/G)的 5%~~的~~管子被塞管。全功率反應器冷卻水系統流量和冷卻水平均溫度(T_{ave})維持不變。已知大修<u>前</u>~~的~~100%功率運轉條件如下：

T_{ave} = 588.0°F
$T_{S/G}$ = 542.0°F

大修後，電廠恢復至 100%功率時，蒸汽產生器的壓力約為多少？

A. 998 psia

B. 979 psia

C. 961 psia

D. 944 psia

答案：C.

A nuclear power plant is operating at power. Total feed water flow rate to all steam generators is 7.0 x 10^6 lbm/hr at a temperature of 440°F. The steam exiting the steam generators is at 1000 psia with 100% steam quality.

Ignoring all other heat gain and loss mechanisms, what is the reactor core thermal power?

A. 1335 MWt

B. 1359 MWt

C. 1589 MWt

D. 1612 MWt

ANSWER: C.

核能電廠功率運轉中。進入所有蒸汽產生器的總飼水流率為7.0 x 10^6 lbm/hr，溫度為440°F。離開蒸汽產生器的蒸汽壓力為1000 psia、蒸汽乾度為100%。

若忽略其它的熱損益機制，請問爐心熱功率為多少？

A. 1335 MWt

B. 1359 MWt

C. 1589 MWt

D. 1612 MWt

答案：C.

A nuclear power plant is operating near 100 percent power. Main turbine extraction steam is being supplied to a feedwater heater. Extraction steam parameters are as follows:

Steam pressure = 414 psia
Steam flow rate = 7.5 x 10^5 lbm/hr
Steam enthalpy = 1,150 Btu/lbm

The extraction steam condenses to saturated water at 414 psia, and then leaves the feedwater heater via a drain line.
What is the heat transfer rate from the extraction steam to the feedwater in the feedwater heater?
A. 3.8 x 10^7 Btu/hr
B. 8.6 x 10^7 Btu/hr
C. 5.4 x 10^8 Btu/hr
D. 7.2 x 10^8 Btu/hr
ANSWER: C.

核能電廠以近100％功率運轉，主汽機的抽汽供給至一飼水加熱器。抽汽的參數如下：

蒸汽壓力= 414 psia
蒸汽流量率=7.5×10^5 lbm/hr
蒸汽熱焓=1,150 Btu/lbm

抽汽在414 psia冷凝成飽和水，然後經洩水管離開飼水加熱器。在飼水加熱器內從抽汽至飼水的熱傳率為多少？
A. 3.8 x 10^7 Btu/hr
B. 8.6 x 10^7 Btu/hr
C. 5.4 x 10^8 Btu/hr
D. 7.2 x 10^8 Btu/hr

答案： C

A nuclear power plant is operating near 100 percent power. Main turbine extraction steam is being supplied to a feedwater heater. Extraction steam parameters are as follows:

　　Steam pressure = 500 psia
　　Steam flow rate = 7.0 x 10^5 lbm/hr
　　Steam enthalpy = 1,135 Btu/lbm

The extraction steam condenses to saturated water at 500 psia, and then leaves the feedwater heater via a drain line.

What is the heat transfer rate from the extraction steam to the feedwater in the feedwater heater?

A. 3.2 x 10^8 Btu/hr
B. 4.8 x 10^8 Btu/hr
C. 5.3 x 10^8 Btu/hr
D. 7.9 x 10^8 Btu/hr
ANSWER: B.

核能電廠以近100％功率運轉，主汽機的抽汽供給至一飼水加熱器。抽汽的參數如下：

　　蒸汽壓力= 500 psia
　　蒸汽流量率=7.0×10^5 lbm/hr
　　蒸汽熱焓=1135 Btu/lbm

抽汽在500 psia冷凝成飽和水，然後經洩水管離開飼水加熱器。在飼水加熱器內從抽汽至飼水的熱傳率為多少？

A. 3.2 x 10^8 Btu/hr
B. 4.8 x 10^8 Btu/hr
C. 5.3 x 10^8 Btu/hr
D. 7.9 x 10^8 Btu/hr

答案： B

Two of the parameters listed below are used for calculating core thermal power using the standard heat balance method. Which one of the following identifies the two parameters?

	Reactor Coolant Mass Flow Rate	Feedwater Temperature	Steam Generator Pressure	Steam Generator Water Level
A.	Yes	No	Yes	No
B.	No	Yes	Yes	No
C.	Yes	No	No	Yes
D.	No	Yes	No	Yes

ANSWER: B.

有兩個參數用於標準熱平衡計算法計算爐心熱功率。下列何者界定該兩參數？

	反應器冷卻水 質量流量率	飼水 溫度	蒸汽產生器 壓力	蒸汽產生器 水位
A.	Yes	No	Yes	No
B.	No	Yes	Yes	No
C.	Yes	No	No	Yes
D.	No	Yes	No	Yes

答案： B

The power range nuclear instruments have been adjusted to 100 percent based on a heat balance calculation. Which one of the following will result in indicated reactor power being higher than actual reactor power?
A. The steam pressure used in the heat balance calculation was 50 psi higher than actual steam pressure.
B. The ambient heat loss value used in the heat balance calculation was twice the actual ambient heat loss.
C. The feedwater flow rate used in the heat balance calculation was 10 percent lower than actual feedwater flow rate.
D. The feedwater temperature used in the heat balance calculation was 20°F higher than actual feedwater temperature.
ANSWER: B.

以熱平衡功率計算為基準，將核儀功率階調整至100％，以下何者會使指示的反應爐功率比實際反應爐功率高？
A.熱平衡計算時，使用的蒸汽壓力比實際蒸汽壓力高50 psi.
B.熱平衡計算時，使用的環境熱損失值是實際環境的熱損失的兩倍
C.熱平衡計算時，使用的飼水流量率比實際飼水流量率低10％
D.熱平衡計算時，使用的飼水溫度，比實際的飼水溫度高20°F

答案： B

When performing a heat balance calculation to determine core thermal power, the measured thermal power is _____ by a value associated with the reactor coolant pumps (RCPs); the adjustment is needed because _____ of the flow energy added to the reactor coolant by the RCPs is converted to thermal energy of the reactor coolant.
A. decreased; nearly all
B. decreased; a small fraction
C. increased; nearly all
D. increased; a small fraction
ANSWER: A.

當進行熱平衡計算來決定爐心熱功率時，所量測到的熱功率須_____與反應器冷卻水泵(RCPs)相關的值；必須調整的原因，係因RCPs加到反應器冷卻水之流動能量，_____轉換成冷卻水熱能。
A.減少；幾乎全部
B.減少；一小部分
C.增加；幾乎全部
D.增加；一小部分

答案： A

A nuclear power plant is initially operating at 80 percent power with a core ΔT of 48°F when a station blackout occurs. Natural circulation is established and core ΔT stabilizes at 40°F. If reactor coolant mass flow rate is 3 percent, which one of the following is the current core decay heat level?
A. 1 percent
B. 2 percent
C. 3 percent
D. 4 percent
ANSWER: B.

核能電廠最初以48°F爐心ΔT，80％功率運轉，此時電廠發生全黑，已建立自然循環且爐心ΔT穩定在40°F。如果反應器冷卻水的質量流量率是3％，下列何者是目前爐心衰變熱量？
A. 1 %
B. 2 %
C. 3 %
D. 4%

答案： B

A nuclear power plant is operating with the following stable steam generator (SG) and feedwater (FW) parameters:

SG pressure = 1,000 psia

Total SG steam flow rate = 1.0 x 10^7 lbm/hr (dry, saturated steam)

Feedwater inlet temperature = 470°F

Based on the above information, what is the thermal power output of the reactor?

A. 740 MW

B. 1,328 MW

C. 2,169 MW

D. 3,497 MW

ANSWER: C.

核能電廠正以下列穩定的蒸汽產生器(SG)及飼水(FW)參數運轉：

SG壓力=1,000 psia

總SG蒸汽流量率=1.0×10^7 lbm/hr(乾飽和蒸汽)

飼水進口溫度=470°F

依據上述數據，反應器的輸出熱功率是多少？

A. 740 MW

B. 1,328 MW

C. 2,169 MW

D. 3,497 MW

答案： C