科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P77

Overall nuclear power plant thermal efficiency will decrease if...

A. additional moisture is removed from the steam entering the turbine.

B. the temperature of the feedwater entering the steam generator is increased.

C. the amount of condensate depression (subcooling) in the main condenser is decreased.

D. the temperature of the steam at the turbine exhaust is increased.

ANSWER: D.

下列何者將降低核能電廠的整體熱效能？

A. 從進入汽機的蒸汽移除額外水分。

B. 進入蒸汽產生器的飼水溫度升高。

C. 主冷凝器的冷凝水次冷度降低。

D. 汽機排放蒸汽溫度升高。

答案：D.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P277

Which of the following will cause overall nuclear power plant thermal efficiency to increase?

A. Increasing total steam generator blowdown from 30 gpm to 40 gpm

B. Changing steam quality from 99.7% to 99.9%

C. Bypassing a feedwater heater during normal plant operations

D. Increasing condenser pressure from 1 psia to 2 psia

ANSWER: B.

下列何者將導致核能電廠的整體熱效能增加？

A. 蒸汽產生器總沖放率從 30 gpm 增至 40 gpm。

B. 蒸汽乾度從 99.7%變成 99.9%。

C. 於電廠正常運轉期間旁通飼水加熱器。

D. 冷凝器壓力從 1 psia 增至 2 psia。

答案：B.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P378 (B3578)

Steam turbines X and Y are identical 100% efficient turbines that exhaust to a condenser at 1.0 psia. Saturated steam at 250 psia enters turbine X. A moisture separator/reheater supplies turbine Y with superheated steam at 250 psia and 500°F.

Which one of the following lists the percentage of moisture at the exhaust of turbines X and Y?

| | Turbine X | Turbine Y |
|---|---|---|
| A. | 24.5% | 20.5% |
| B. | 26.3% | 13.0% |
| C. | 24.5% | 13.0% |
| D. | 26.3% | 20.5% |

ANSWER: A.

汽機X和Y為效率100%的相同汽機，兩者均排汽至壓力為1.0 psia的冷凝器。250 psia的飽和蒸汽進入汽機X。汽水分離/再熱器供應250 psia、500˚F的過熱蒸汽給汽機Y。

下列何者為汽機X和Y的排汽含水率？

| | 汽機X | 汽機Y |
|---|---|---|
| A. | 24.5% | 20.5% |
| B. | 26.3% | 13.0% |
| C. | 24.5% | 13.0% |
| D. | 26.3% | 20.5% |

答案：A.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P379

Which one of the following actions will decrease overall nuclear power plant thermal efficiency?

A. Reducing turbine inlet steam moisture content

B. Reducing condensate depression

C. Increasing turbine exhaust pressure

D. Increasing temperature of feedwater entering the steam generators

ANSWER: C.

下列何者將降低核能電廠的整體熱效能？

A. 汽機進口蒸汽含水量減少。

B. 冷凝水壓抑(condensate depression)降低。

C. 汽機排汽壓力升高。

D. 進入蒸汽產生器的飼水溫度升高。

答案：C.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P478

To achieve maximum overall nuclear power plant thermal efficiency, feed water should enter the steam generator (S/G) _____ and the pressure difference between the S/G and the condenser should be as _____ as possible.

A. as subcooled as practical; great

B. as subcooled as practical; small

C. close to saturation; great

D. close to saturation; small

ANSWER: C.

為求將核能電廠的整體熱效能提高至最大，飼水應以_____進入蒸汽產生器(S/G)，S/G與冷凝器之間的壓差，盡可能_____愈好。

A. 盡可能達到的次冷度；愈大

B. 盡可能達到的次冷度；愈小

C. 接近飽和；愈大

D. 接近飽和；愈小

答案：C.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P878

Feed water heating increases overall nuclear power plant thermal efficiency because...

A. the average temperature at which heat is transferred in the steam generators is increased.

B. less steam flow passes through the turbine, thereby increasing turbine efficiency.

C. increased feed water temperature lowers the temperature at which heat is rejected in the condenser.

D. less power is required by the feed water pumps to pump the warmer feed water.

ANSWER: A.

飼水加熱將導致核能電廠的整體熱效能增加，因為……

A. 蒸汽產生器進行熱傳時的平均溫度升高。

B. 通過汽機的蒸汽流量較少，汽機效能為之提高。

C. 飼水溫度升高造成冷凝器排熱溫度降低。

D. 飼水泵打出溫度較高飼水所需的功率較低。

答案：A.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P978

Which one of the following changes will cause an increase in overall nuclear power plant thermal efficiency?

A. Decreasing the temperature of the water entering the steam generators

B. Decreasing the superheat of the steam entering the low pressure turbines

C. Decreasing the circulating water flow rate through the main condenser

D. Decreasing the concentration of noncondensible gases in the main condenser

ANSWER: D.

下列哪項變化將導致核能電廠的整體熱效能增加？

A. 進入蒸汽產生器的水溫降低。

B. 進入低壓汽機的蒸汽過熱度降低。

C. 通過主冷凝器的循環水流量減少。

D. 主冷凝器的不凝結氣體濃度降低。

答案：D.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P1078

A nuclear power plant is operating at full power with 0°F of condensate subcooling. If main condenser cooling water inlet temperature increases by 3°F, the overall nuclear power plant thermal efficiency will...

A. decrease due to a degraded main condenser vacuum.

B. increase due to an improved main condenser vacuum.

C. decrease due to increased main condenser heat rejection.

D. increase due to decreased main condenser heat rejection.

ANSWER: A.

核能電廠以全功率運轉，冷凝水次冷度為 0°F。如果主冷凝器的冷卻水進口溫度升高 3°F，核能電廠的整體熱效能將.....

A. 降低，因為主冷凝器真空劣化。

B. 增加，因為主冷凝器真空改善。

C. 降低，因為主冷凝器排熱量升高。

D. 增加，因為主冷凝器排熱量降低。

答案：A.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P1378

Which one of the following actions will result in a decrease in overall nuclear power plant thermal efficiency?

A. Increasing steam quality by adding additional heat to the steam prior to entering the turbine

B. Increasing the temperature of the feed water entering the steam generator

C. Decreasing the amount of condensate depression in the main condenser

D. Decreasing the amount of turbine steam extracted for feed water heating

ANSWER: D.

下列哪項動作將導致核能電廠的整體熱效能降低？

A. 蒸汽於進入汽機前另外加熱，藉此提高蒸汽乾度。

B. 進入蒸汽產生器的飼水溫度升高。

C. 主冷凝器的冷凝水壓抑(condensate depression)降低。

D. 用以加熱飼水而抽出的汽機蒸汽量減少。

答案：D.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P1478

Turbine X and turbine Y are ideal steam turbines that exhaust to a condenser at 1.0 psia. Turbine X is driven by saturated steam (100% quality) at 900 psia. Turbine Y is driven by superheated steam at 500 psia and 620°F.

The greatest amount of work is being performed by turbine _____, and the greatest moisture content exists in the exhaust of turbine _____.

A. X; Y

B. X; X

C. Y; Y

D. Y; X

ANSWER: D.

汽機X和Y為理想汽機，並排汽至壓力為1.0 psia的冷凝器。汽機X以900 psia的飽和蒸汽(乾度為100%)驅動，汽機Y由500 psia、620°F的過熱蒸汽驅動。

汽機_____做的功最大，汽機_____的排汽含水量最高。

A. X；Y

B. X；X

C. Y；Y

D. Y；X

答案：D.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P1678

Turbine X and turbine Y are ideal steam turbines that exhaust to a condenser at 1.0 psia. Turbine X is driven by saturated steam (100% quality) at 500 psia. Turbine Y is driven by saturated steam (100% quality) at 700 psia.

The greatest amount of specific work is being performed by turbine _____; the greatest moisture content exists in the exhaust of turbine _____.

A. X; X

B. X; Y

C. Y; X

D. Y; Y

ANSWER: D.

汽機X和Y為理想汽機，並排汽至壓力為1.0 psia的冷凝器。汽機X以500 psia的飽和蒸汽(乾度為100%)驅動，汽機Y由700 psia的飽和蒸汽(乾度為100%)驅動。

汽機_____做的比功(specific work)最大，汽機_____的排汽含水量最高。

A. X；X

B. X；Y

C. Y；X

D. Y；Y

答案：D.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P1878 (B1879)

A nuclear power plant is operating at 85% reactor power when the extraction steam to a highpressure feedwater heater is isolated. After the transient, the operator returns reactor power to 85% and stabilizes the plant. Compared to conditions just prior to the transient, current main turbine generator output (MWe) is...

A. higher because increased steam flow is causing the turbine to operate at a higher speed.

B. lower because decreased steam flow is causing the turbine to operate at a lower speed.

C. higher because plant thermal efficiency has increased.

D. lower because plant thermal efficiency has decreased.

ANSWER: D.

核能電廠以 85%反應器功率運轉，此時隔離高壓飼水加熱器的抽汽。經過此暫態後，運轉員將反應器功率恢復至 85%以穩定電廠。相較於暫態前的狀況，目前的發電量(MWe)……

A. 較高，因為蒸汽流量增加而導致汽機以較高速度運轉。

B. 較低，因為蒸汽流量減少而導致汽機以較低速度運轉。

C. 較高，因為電廠熱效能增加。

D. 較低，因為電廠熱效能減少。

答案：D.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P1980 (B1679)

What is the steady state effect of isolating extraction steam to a high-pressure feedwater heater while at 85% of rated power? (Assume a constant turbine load.)

A. Reactor power (MWt) increases and overall plant efficiency increases.

B. Reactor power (MWt) increases and overall plant efficiency decreases.

C. Reactor power (MWt) decreases and overall plant efficiency increases.

D. Reactor power (MWt) decreases and overall plant efficiency decreases.

ANSWER: B.

以85%額定功率運轉時，隔離高壓飼水加熱器的抽汽，會有什麼長期影響(假設汽機負載固定)？

A. 反應器功率(MWt)增加，電廠整體效能提高。

B. 反應器功率(MWt)增加，電廠整體效能降低。

C. 反應器功率(MWt)降低，電廠整體效能提高。

D. 反應器功率(MWt)降低，電廠整體效能降低。

答案：B.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P2078

A nuclear power plant is operating at 90% of rated power. Main condenser pressure is 1.7 psia and hotwell condensate temperature is 120°F.

Which one of the following describes the effect of a 5% decrease in cooling water flow rate through the main condenser?

A. Overall steam cycle efficiency will increase because the work output of the turbine will increase.

B. Overall steam cycle efficiency will increase because condensate depression will decrease.

C. Overall steam cycle efficiency will decrease because the work output of the turbine will decrease.

D. Overall steam cycle efficiency will decrease because condensate depression will increase.

ANSWER: C.

核能電廠以 90%額定功率運轉。主冷凝器的壓力為 1.7 psia，熱井冷凝水溫度為 120°F。

通過主冷凝器的冷卻水流量減少 5%時，將發生下列何種效應？

A. 因為汽機輸出功增加，蒸汽循環的整體效能提高。

B. 因為冷凝水壓抑(condensate depression)降低，蒸汽循環的整體效能提高。

C. 因為汽機輸出功減少，蒸汽循環的整體效能降低。

D. 因為冷凝水壓抑(condensate depression)增加，蒸汽循環的整體效能降低。

答案：C.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P2178 (B2178)

If superheating of the inlet steam to a low pressure turbine is reduced, low pressure turbine work output will _____ and low pressure turbine exhaust steam moisture content will _____. (Assume steam flow rate does not change.)

A. remain the same; increase

B. remain the same; decrease

C. decrease; increase

D. decrease; decrease

ANSWER: C.

進入低壓汽機的進口蒸汽過熱度降低時，低壓汽機輸出的功將_____，低壓汽機排汽含水量將_____(假設蒸汽流量不變)。

A. 維持不變；增加

B. 維持不變；降低

C. 減少；增加

D. 減少；降低

答案：C.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P2278

If the moisture content of the steam supplied to a main turbine increases, (assume no change in steam pressure, condenser pressure, or control valve position) turbine work will...

A. decrease, because the enthalpy of the steam being supplied to the turbine has decreased.

B. decrease, because moist steam results in more windage losses in the turbine.

C. increase, because the enthalpy of the steam being supplied to the turbine has increased.

D. increase, because moist steam results in less windage losses in the turbine.

ANSWER: A.

如果供應主汽機的蒸汽含水量增加(假設蒸汽壓力、冷凝器壓力或控制閥閥位不變)，汽機的功將……

A. 減少，因為供應汽機的蒸汽焓減少。

B. 減少，因為濕蒸汽造成汽機蒙受的風阻損失(windage losses)增加。

C. 增加，因為供應汽機的蒸汽焓增加。

D. 增加，因為濕蒸汽造成汽機蒙受的風阻損失(windage losses)減少。

答案：A.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P2478

Turbine X is an ideal steam turbine that exhausts to a condenser at 1.0 psia. Turbine X is driven by saturated steam (100% quality) at 500 psia. Which one of the following lists the approximate specific work output of turbine X and the moisture content of the steam exiting turbine X?

| | Specific Work | Moisture Content |
|---|---|---|
| A. | 388 Btu/lbm | 72% |
| B. | 388 Btu/lbm | 28% |
| C. | 817 Btu/lbm | 72% |
| D. | 817 Btu/lbm | 28% |

ANSWER: B.

汽機 X 為理想汽機，排汽至壓力為 1.0 psia 的冷凝器。汽機 X 由 500 psia 的飽和蒸汽(乾度為 100%)驅動。下列何者列出了汽機 X 輸出比功(specific work)的約略值，以及離開汽機 X 的蒸汽含水率？

| | 比功 | 含水率 |
|---|---|---|
| A. | 388 Btu/lbm | 72% |
| B. | 388 Btu/lbm | 28% |
| C. | 817 Btu/lbm | 72% |
| D. | 817 Btu/lbm | 28% |

答案：B.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P2678 (B1978)

If the moisture content of the steam supplied to a main turbine decreases, the overall steam cycle efficiency will increase because the...

A. operating temperature of the turbine blading has increased.

B. reheat capacity of the turbine extraction steam has increased.

C. mass flow rate of the steam through the turbine has increased.

D. enthalpy of the steam being supplied to the turbine has increased.

ANSWER: D.

如果供給主汽機的蒸汽含水量降低，蒸汽循環整體效能將增加，因為_____。

A. 汽機葉片的運轉溫度升高。

B. 汽機抽汽的再熱能力增加。

C. 通過汽機的蒸汽質量流量增加。

D. 供給汽機的蒸汽焓增加。

答案：D.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P2778 (B2774)

The theoretical maximum efficiency of a steam cycle is given by the equation:

$Eff_{thmax} = (1 - T_{out}/T_{in}) \times 100\%$,

where $T_{out}$ is the absolute temperature for heat rejection and $T_{in}$ is the absolute temperature for heat addition. (Fahrenheit temperature is converted to absolute temperature by adding 460°.)

A nuclear power plant is operating with a stable steam generator pressure of 900 psia. What is the approximate theoretical maximum steam cycle efficiency this plant can achieve by establishing its main condenser vacuum at 1.0 psia?

A. 35%

B. 43%

C. 57%

D. 65%

ANSWER: B.

下列方程式代表蒸汽循環於理論上的最大效能：

$Eff_{thmax} = (1 - T_{out}/T_{in}) \times 100\%$

此處的 $T_{out}$ 為排熱絕對溫度，$T_{in}$ 為加熱絕對溫度(絕對溫度為華氏溫度加上 460°)。

一座運轉中核能電廠的穩定蒸汽產生器壓力為 900 psia。該電廠的主冷凝器真空度若設在 1.0 psia，理論上可達到的最大蒸汽循環效能約為多少？

A. 35%

B. 43%

C. 57%

D. 65%

答案：B.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P3078 (B3077)

Which one of the following will be caused by a decrease in main condenser vacuum (higher absolute pressure) on a nuclear power plant operating at full power? (Assume main steam flow rate and condenser circulating water flow rate are unchanged.)

A. Decrease in the condensate temperature

B. Decrease in the ideal steam cycle efficiency

C. Decrease in the condensate pump required NPSH

D. Decrease in the mass of noncondensable gas in the condenser

ANSWER: B.

對於以全功率運轉的核能電廠而言，其主冷凝器真空度降低(較高的絕對壓力)時，將導致下列何者發生？(假設主蒸汽流量和冷凝器循環水流量維持不變)

A. 冷凝水溫度下降。

B. 理想的蒸汽循環效能降低。

C. 冷凝水泵所需的淨正吸水頭(NPSH)減少。

D. 冷凝器內的不凝結氣體質量減少。

答案：B.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P3378 (B2478)

A nuclear power plant was initially operating normally at 90% reactor power when heating steam (supplied from main turbine extraction steam) to the feedwater heaters was isolated. The plant was stabilized and reactor power was returned to 90%.

As compared to the initial main generator output (MW), the current generator output is...

A. lower, because the steam cycle is less efficient.

B. higher, because the steam cycle is less efficient.

C. lower, because more steam heat energy is available to the main turbine.

D. higher, because more steam heat energy is available to the main turbine.

ANSWER: A.

核能電廠起初以 90%反應器功率正常運轉，此時隔離供應至飼水加熱器的加熱蒸汽(由主汽機抽汽提供)。電廠穩定後，反應器功率恢復至 90%。

相較於主發電機的初始發電量(MW)，目前的發電量……

A. 較低，因為蒸汽循環效能較低。

B. 較高，因為蒸汽循環效能較低。

C. 較低，因為主汽機可使用的蒸汽熱能較多。

D. 較高，因為主汽機可使用的蒸汽熱能較多。

答案：A.

科目： 193005
知能類：K1.03 [2.5/2.6]
序號： P4441

Consider the thermal efficiency of a nuclear power plant operating at rated power.

If the pressure at which saturated steam is produced in the steam generators is increased, thermal efficiency will _____; and if the temperature of the feedwater entering the steam generators is increased, thermal efficiency will _____.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

ANSWER: A.

考慮額定功率運轉的核能電廠熱效能。

如果蒸汽產生器產生飽和蒸汽時的壓力增加，熱效能將_____；進入蒸汽產生器的飼水溫度若升高，熱效能將_____。

A. 增加；增加

B. 增加；減少

C. 減少；增加

D. 減少；減少

答案：A.

科目/題號：193005/1 (2016新增)
知能類：K1.03 [2.5/2.6]
序號：P7241 (B7240)

A nuclear power plant has a thermal power rating of 3,200 MW. When the plant operates at 100 percent power, the main generator produces 1,200 MW at a 0.95 power factor. Plant modifications are planned that will upgrade the feedwater heaters and moisture separator/reheaters without changing the plant's thermal power rating. If the plant modifications improve plant thermal efficiency by 2 percent, what will be the resulting main generator electrical output at 100 percent reactor power with the same power factor?
A. 1,204 MW
B. 1,224 MW
C. 1,244 MW
D. 1,264 MW
ANSWER: D.

一額定熱功率3,200MW的核能電廠。當其以100%的功率運轉，主發電機以0.95的功率因數發電量1,200MW。若電廠計劃在不改變額定熱功率下，進行變更以提升飼水加熱器和汽水分離器/再熱器，使熱效率提高了2%，則在相同功率因數下反應器以100%的功率運轉時，主發電機的輸出將會是多少？
A. 1,204 MW
B. 1,224 MW
C. 1,244 MW
D. 1,264 MW

答案： D.