TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P77

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

A. the temperature of the steam at the turbine exhaust increases.

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

C. the temperature of the feedwater entering the steam generator increases.

D. the amount of condensate depression (subcooling) in the main condenser decreases.

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P277

Which one 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 percent.

C. Bypassing a feedwater heater during normal plant operations.

D. Increasing condenser pressure from 1 psia to 2 psia.

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P378 (B3578)

Steam turbines X and Y are identical 100 percent efficient turbines that exhaust to a condenser at 1.0 psia. Dry saturated steam at 250 psia enters turbine X. Superheated steam at 250 psia and 500°F enters turbine Y.

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%

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: 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.

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P478

To achieve maximum overall nuclear power plant thermal efficiency, feedwater should enter the steam generator (SG) _____ and the pressure difference between the SG and the condenser should be as _____ as possible.

A. close to saturation; great

B. close to saturation; small

C. as subcooled as practical; great

D. as subcooled as practical; small

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P878

Feedwater 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 feedwater temperature lowers the temperature at which heat is rejected in the condenser.

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

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P978

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

A. Decreasing the temperature of the feedwater 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.

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P1378

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

A. Increasing the quality of the steam entering the main turbine.

B. Increasing the temperature of the feedwater entering the steam generator.

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

D. Decreasing the amount of turbine steam extracted for feedwater heating.

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P1478

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

The greater amount of specific work (Btu/lbm) is being performed by turbine _____, and the greater moisture content exists in the exhaust of turbine _____.

A. X; Y

B. X; X

C. Y; Y

D. Y; X

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P1678

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

The greater amount of specific work (Btu/lbm) is being performed by turbine _____; and the greater moisture content exists in the exhaust of turbine _____.

A. X; X

B. X; Y

C. Y; X

D. Y; Y

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P1878 (B1879)

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

A. higher, because increased steam flow to the main turbine caused the main generator to pick up load.

B. lower, because decreased steam flow to the main turbine caused the main generator to reject load.

C. higher, because the steam cycle thermal efficiency has increased.

D. lower, because the steam cycle thermal efficiency has decreased.

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P1980 (B1679)

Initially, a nuclear power plant was operating at steady-state 85 percent reactor power when the extraction steam to a high-pressure feedwater heater became isolated. Main generator load was returned to its initial value. When the plant stabilizes, reactor power will be _____ than 85 percent; and the steam cycle thermal efficiency will be _____.

A. greater; lower

B. greater; higher

C. less; lower

D. less; higher

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P2078

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

If main condenser cooling water flow rate is reduced by 5 percent, overall steam cycle efficiency will...

A. increase, because condensate depression will decrease.

B. decrease, because condensate depression will increase.

C. increase, because the work output of the main turbine will increase.

D. decrease, because the work output of the main turbine will decrease.

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P2178 (B2178)

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

A. remain the same; increase

B. remain the same; decrease

C. decrease; increase

D. decrease; decrease

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P2278 (B2978)

If the moisture content of the steam supplied to a main turbine increases, turbine work will...
(Assume the total mass flow rate does not change.)

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

B. decrease, because moist steam is more likely to leak between turbine stages.

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

D. increase, because moist steam is less likely to leak between turbine stages.

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P2478

Turbine X is an ideal steam turbine that exhausts to a condenser at 1.0 psia. Turbine X is driven by dry saturated steam 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%

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P2678 (B1978)

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

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

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

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

D. the operating temperature of the turbine blades has increased.

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P2778 (B2774)

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

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

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°F.)

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 percent

B. 43 percent

C. 65 percent

D. 81 percent

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P3078 (B3077)

Which one of the following will be caused by a decrease in main condenser vacuum (higher absolute pressure) in a nuclear power plant operating at 100 percent power? (Assume that main steam and main condenser circulating water mass flow rates do not change.)

A. Decrease in the condensate temperature.

B. Decrease in the ideal steam cycle thermal efficiency.

C. Decrease in the condensate pump required net positive suction head.

D. Decrease in the mass of noncondensible gases in the condenser.

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P3378 (B1278)

A nuclear power plant was initially operating at steady-state 90 percent reactor power when extraction steam to the feedwater heaters was isolated. With extraction steam still isolated, reactor power was returned to 90 percent and the plant was stabilized.

Compared to the initial main generator MW output, the current main generator MW 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.

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P4441

Consider the steam cycle 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

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: 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

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P7700 (B7700)

A nuclear reactor has a thermal power rating of 3,200 MW. When the reactor operates at 100 percent power, the main generator produces 1,200 MW at a 0.95 power factor. Modifications are planned that will upgrade major power plant equipment without changing the reactor's thermal power rating. If the modifications improve the power plant's thermal efficiency by 3 percent, what will be the resulting main generator electrical output with the same power factor at 100 percent reactor power?

A. 1,224 MW

B. 1,236 MW

C. 1,264 MW

D. 1,296 MW

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P7720 (B7720)

Initially, a main turbine is being supplied with inlet steam containing 0.25 percent moisture content. If the inlet steam moisture content increases to 0.5 percent at the same pressure and mass flow rate, the main turbine work output will…

A. increase, due to the increased enthalpy of the inlet steam.

B. increase, due to the increased momentum transfer from water droplets impacting the turbine blading.

C. decrease, due to the decreased temperature of the inlet steam.

D. decrease, due to the increased braking action from water droplets impacting the turbine blading.

[redacted]

TOPIC: 193005
KNOWLEDGE: K1.03 [2.5/2.6]
QID: P7790 (B7790)

Initially, a main turbine is being supplied with inlet steam containing 0.5 percent moisture content. If the inlet steam moisture content decreases to 0.25 percent at the same pressure and mass flow rate, the main turbine work output will…

A. increase, due to the increased temperature of the inlet steam.

B. increase, due to the decreased braking action from water droplets impacting the turbine blading.

C. decrease, due to the decreased enthalpy of the inlet steam.

D. decrease, due to the decreased momentum transfer from water droplets impacting the turbine blading.

[redacted]