TOPIC: 193007
KNOWLEDGE: K1.01 [2.5/2.5]
QID: P283

The transfer of heat from the reactor fuel pellets to the fuel cladding during normal plant operation is primarily accomplished via _____ heat transfer.

A. conduction

B. convection

C. radiant

D. two-phase

ANSWER: A.

TOPIC: 193007
KNOWLEDGE: K1.01 [2.5/2.5]
QID: P584 (B882)

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

Which one of the following is the primary method of heat transfer through the gap between the fuel pellets and the fuel cladding?

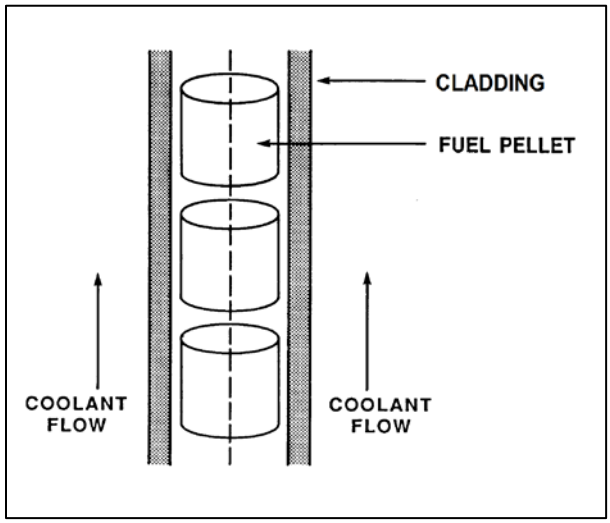
A. Conduction

B. Convection

C. Radiation

D. Natural circulation

ANSWER: A.



TOPIC: 193007
KNOWLEDGE: K1.01 [2.5/2.5]
QID: P784

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

A. Radiation

B. Emission

C. Convection

D. Conduction

ANSWER: A.

TOPIC: 193007
KNOWLEDGE: K1.01 [2.5/2.5]
QID: P985 (B1982)

Reactor fuel rods are normally charged with _____ gas; which improves heat transfer by _____.

A. helium; convection

B. helium; conduction

C. nitrogen; convection

D. nitrogen; conduction

ANSWER: B.

TOPIC: 193007
KNOWLEDGE: K1.01 [2.5/2.5]
QID: P1884

A nuclear power plant is operating at 60 percent power. Which one of the following is the primary method of heat transfer from the outer surface of the steam generator tubes to the bulk feedwater?

A. Radiolysis

B. Radiation

C. Convection

D. Conduction

ANSWER: C.

TOPIC: 193007
KNOWLEDGE: K1.01 [2.5/2.5]
QID: P2284

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

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

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

C. From the fuel rods to the steam generators 24 hours after a trip of all reactor coolant pumps.

D. From the fuel pellet centerline to the fuel cladding during normal operation at 100 percent power.

ANSWER: C.

TOPIC: 193007
KNOWLEDGE: K1.01 [2.5/2.5]
QID: P2884 (B2882)

Which one of the following describes a heat transfer flow path in which conduction is the dominant mode of heat transfer?

A. From the fuel rods 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 fuel rods to the steam outlet of the steam generators during a station blackout.

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

ANSWER: D.

TOPIC: 193007
KNOWLEDGE: K1.04 [2.8/3.0]
QID: P83

If excessive amounts of air are entrained/dissolved in the cooling water passing through a 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.

TOPIC: 193007
KNOWLEDGE: K1.04 [2.8/3.0]
QID: P1184 (B1882)

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 thermal conductivity of the heat exchanger tubes will decrease.

C. The differential temperature across the tubes will decrease through the heat exchanger.

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

ANSWER: D.

TOPIC: 193007
KNOWLEDGE: K1.04 [2.8/3.0]
QID: P2184 (B2184)

Which one of the following pairs of fluids undergoing heat transfer in identical heat exchangers will yield the <u>greatest</u> heat exchanger overall heat transfer coefficient?

A. Oil to water.

B. Air to water.

C. Steam to water.

D. Water to water.

ANSWER: C.

TOPIC: 193007
KNOWLEDGE: K1.04 [2.8/3.0]
QID: P2384 (B2383)

Which one of the following pairs of fluids undergoing heat transfer in identical heat exchangers will yield the smallest heat exchanger overall heat transfer coefficient?

A. Oil to water.

B. Air to water.

C. Steam to water.

D. Water to water.

ANSWER: B.

TOPIC: 193007
KNOWLEDGE: K1.04 [2.8/3.0]
QID: P3084 (B3084)

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 = 7.5×10^5 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. 3.8×10^7 Btu/hr

B. 8.6×10^7 Btu/hr

C. 5.4×10^8 Btu/hr

D. 7.2×10^8 Btu/hr

ANSWER: C.

TOPIC: 193007
KNOWLEDGE: K1.04 [2.8/3.0]
QID: P3384 (B3383)

A nuclear power plant is initially 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

Due to increased condenser air inleakage, the overall heat transfer coefficient of the main condenser decreases by 25 percent. Main condenser heat transfer rate and cooling water temperatures are unchanged. Which one of the following is the steady-state main condenser pressure resulting from the reduced heat transfer coefficient?

A. 1.7 psia

B. 2.3 psia

C. 3.0 psia

D. 4.6 psia

ANSWER: A.

TOPIC: 193007
KNOWLEDGE: K1.04 [2.8/3.0]
QID: P3684 (B3684)

Which one of the following pairs of fluids undergoing heat transfer in identical heat exchangers will yield the greatest heat exchanger overall heat transfer coefficient?

A. Oil to water.

B. Steam to water.

C. Air to water.

D. Water to water.

ANSWER: B.

TOPIC: 193007
KNOWLEDGE: K1.04 [2.8/3.0]
QID: P5144 (B5143)

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 = 7.0×10^5 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. 3.2×10^8 Btu/hr

B. 4.8×10^8 Btu/hr

C. 5.3×10^8 Btu/hr

D. 7.9×10^8 Btu/hr

ANSWER: B.

TOPIC: 193007
KNOWLEDGE: K1.05 [2.7/2.9]
QID: P585

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.

TOPIC: 193007
KNOWLEDGE: K1.05 [2.7/2.9]
QID: P785

A reactor is currently producing 200 MW of core thermal power. Reactor coolant pumps are adding an additional 10 MW of thermal power to the reactor coolant system. The core is rated at 1,330 MW.

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

A. 14.0 percent

B. 14.3 percent

C. 15.0 percent

D. 15.8 percent

ANSWER: C.

TOPIC: 193007
KNOWLEDGE: K1.06 [3.1/3.3]
QID: P137

The power range nuclear instruments have been adjusted to 100 percent based on a heat balance calculation. Which one of the following would cause indicated reactor power to be <u>greater</u> than actual reactor power?

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

B. The feedwater flow rate used in the heat balance calculation was lower than actual feedwater flow rate.

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

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

ANSWER: A.

TOPIC: 193007
KNOWLEDGE: K1.06 [3.1/3.3]
QID: P332

Which one of the terms in the equation, $\dot{Q} = UA(T1-T2)$, is affected the most, and therefore most responsible for the initial increase in heat transfer rate from the reactor fuel during a minor (3 percent) steamline break? (Assume no initial change in reactor power.)

A. U

B. A

C. T1

D. T2

ANSWER: D.

TOPIC: 193007
KNOWLEDGE: K1.06 [3.1/3.3]
QID: P384 (B386)

The power range nuclear instruments were just adjusted to 100 percent power, as determined by a heat balance calculation. Which one of the following would result in indicated reactor power being greater than actual reactor power?

A. The feedwater temperature used in the heat balance calculation was 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 lower than actual feedwater flow rate.

D. The steam pressure used in the heat balance calculation was higher than actual steam pressure.

ANSWER: B.

TOPIC: 193007
KNOWLEDGE: K1.06 [3.1/3.3]
QID: P1384

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

A. Steam generator pressure indication is 20 psi greater than actual steam generator pressure.

B. Steam generator water level indication is 3 percent less than actual steam generator water level.

C. Feedwater flow rate indication is 3 percent greater than actual feedwater flow rate.

D. Feedwater temperature indication is 20°F less than actual feedwater temperature.

ANSWER: A.

TOPIC: 193007
KNOWLEDGE: K1.06 [3.1/3.3]
QID: P2185 (B2183)

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 lower 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 percent higher than actual feedwater flow rate.

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

ANSWER: A.

TOPIC: 193007
KNOWLEDGE: K1.06 [3.1/3.3]
QID: P2485 (B2684)

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 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 percent lower than actual feedwater flow rate.

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

ANSWER: B.

TOPIC: 193007
KNOWLEDGE: K1.06 [3.1/3.3]
QID: P2685 (B2284)

The power range nuclear instruments have been adjusted to 100 percent 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 20°F higher than actual feedwater temperature.

B. The reactor coolant pump heat input value used in the heat balance was 10 percent lower than actual reactor coolant pump heat input.

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

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

ANSWER: A.

TOPIC: 193007
KNOWLEDGE: K1.06 [3.1/3.3]
QID: P2885

The power range nuclear instruments have been adjusted to 100 percent 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 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 one-half the actual ambient heat loss.

D. The feedwater flow rate used in the heat balance calculation was 10 percent higher than actual feedwater flow rate.

ANSWER: C.

TOPIC: 193007
KNOWLEDGE: K1.06 [3.1/3.3]
QID: P3944 (B1684)

The power range nuclear instruments were adjusted to 100 percent based on a calculated heat balance. Which one of the following would cause indicated reactor power to be lower than actual reactor power?

A. The feedwater temperature used in the heat balance calculation was 10°F lower 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 percent 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.

TOPIC: 193007
KNOWLEDGE: K1.06 [3.1/3.3]
QID: P5044

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.

TOPIC: 193007
KNOWLEDGE: K1.06 [3.1/3.3]
QID: P6044 (B6043)

The power range nuclear instruments were adjusted to indicate 100 percent based on a heat balance calculation. Which one of the following would cause indicated reactor power to be 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.

TOPIC: 193007
KNOWLEDGE: K1.06 [3.1/3.3]
QID: P6844

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.

TOPIC: 193007
KNOWLEDGE: K1.06 [3.1/3.3]
QID: P7770

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?

	Feedwater Pressure	Feedwater Mass Flow Rate	Steam Generator Pressure	Steam Generator Mass Flow Rate
A.	Yes	Yes	No	No
B.	No	No	Yes	Yes
C.	Yes	No	No	Yes
D.	No	Yes	Yes	No

ANSWER: D.

TOPIC: 193007
KNOWLEDGE: K1.08 [3.1/3.4]
QID: P84

A PWR nuclear power plant has 2 steam generators (SG). Feedwater enters each SG at 3.3×10^6 lbm/hr with an enthalpy of 419 Btu/lbm. Steam exits each steam generator at 800 psia with 100 percent steam quality.

Ignoring all other heat gains and losses, what is the reactor core thermal power?

A. 667 MW

B. 755 MW

C. 1,334 MW

D. 1,510 MW

ANSWER: D.

TOPIC: 193007
KNOWLEDGE: K1.08 [3.1/3.4]
QID: P285

Reactor coolant enters a reactor core at 545°F and leaves at 595°F. The reactor coolant flow rate is 6.6×10^7 lbm/hour and the specific heat capacity of the coolant is 1.3 Btu/lbm-°F.

What is the reactor core thermal power?

A. 101 MW

B. 126 MW

C. 1,006 MW

D. 1,258 MW

ANSWER: D.

TOPIC: 193007
KNOWLEDGE: K1.08 [3.1/3.4]
QID: P485

A reactor is operating with the following parameters:

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

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

Decay heat rate	=	2 percent
Core ΔT	=	28°F
Average reactor coolant temperature	=	572°F

What is the core mass flow rate in percent?

A. 2.0 percent

B. 2.5 percent

C. 3.0 percent

D. 4.0 percent

ANSWER: C.

TOPIC: 193007
KNOWLEDGE: K1.08 [3.1/3.4]
QID: P685

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.

TOPIC: 193007
KNOWLEDGE: K1.08 [3.1/3.4]
QID: P1485

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

T_{ave} = 578°F
$T_{S/G}$ = 538°F

Which one of the following will be the approximate SG pressure after the outage when the plant is returned to 100 percent power? (Assume the overall heat transfer coefficients for the S/Gs did not change.)

A. 960 psia

B. 930 psia

C. 900 psia

D. 870 psia

ANSWER: B.

TOPIC: 193007
KNOWLEDGE: K1.08 [3.1/3.4]
QID: P1782

A nuclear power plant is operating with the following parameters:

Reactor power	=	100 percent
Core ΔT	=	60°F
Reactor coolant system flow rate	=	100 percent
Average coolant temperature	=	587°F

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

Decay heat	=	1 percent
Core ΔT	=	30°F
Average coolant temperature	=	572°F

What is the core mass flow rate in percent?

A. 2.0 percent

B. 2.5 percent

C. 3.0 percent

D. 4.0 percent

ANSWER: A.

TOPIC: 193007
KNOWLEDGE: K1.08 [3.1/3.4]
QID: P2085

During a nuclear power plant outage, 6 percent of all steam generator (SG) tubes were plugged. Full-power reactor coolant system flow rate and average reactor coolant temperature (T_{ave}) have <u>not</u> changed. Given the following 100 percent 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 SG pressure <u>after</u> the outage when the plant is returned to 100 percent power?

A. 974 psia

B. 954 psia

C. 934 psia

D. 914 psia

ANSWER: A.

TOPIC: 193007
KNOWLEDGE: K1.08 [3.1/3.4]
QID: P2585

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

T_{ave} = 588°F
$T_{S/G}$ = 542°F

Which one of the following will be the approximate SG pressure <u>after</u> the outage when the plant is returned to 100 percent power?

A. 998 psia

B. 979 psia

C. 961 psia

D. 944 psia

ANSWER: C.

TOPIC: 193007
KNOWLEDGE: K1.08 [3.1/3.4]
QID: P2985

A nuclear power plant is operating at power. Total feedwater 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 1,000 psia with 100 percent steam quality.

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

A. 1,335 MW

B. 1,359 MW

C. 1,589 MW

D. 1,612 MW

ANSWER: C.

TOPIC: 193007
KNOWLEDGE: K1.08 [3.1/3.4]
QID: P7639

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 = 1.0×10^7 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.