

# BFN-17

TABLE 1.7-1

(Sheet 1)

## COMPARISON OF NUCLEAR SYSTEM DESIGN CHARACTERISTICS (Data in this table has not been updated to reflect the power uprate at Browns Ferry)

(Parameters are related to Rated Power Output for a single plant unless otherwise noted)

| <u>THERMAL AND HYDRAULIC DESIGN</u>                | <u>BROWNS FERRY<br/>UNITS 1/2/3</u> | <u>HATCH UNIT 1</u>  | <u>VERMONT<br/>YANKEE</u> | <u>COOPER<br/>STATION</u> | <u>DUANE ARNOLD<br/>ENERGY CENTER</u> |
|--|-------------------------------------|----------------------|---------------------------|---------------------------|---------------------------------------|
| Rated Power, MWt                                   | 3293                                | 2436                 | 1593                      | 2381                      | 1593                                  |
| Design Power, MWt                                  | 3440                                | 2537                 | 1665                      | 2500                      | 1670                                  |
| Steam Flow Rate, lb/hr                             | $13.37 \times 10^6$                 | $10.03 \times 10^6$  | $6.43 \times 10^6$        | $9.81 \times 10^6$        | $6.847 \times 10^6$                   |
| Core Coolant Flow Rate, lb/hr                      | $102.5 \times 10^6$                 | $75.5 \times 10^6$   | $48.5 \times 10^6$        | $74.5 \times 10^6$        | $48.5 \times 10^6$                    |
| Feedwater Flow Rate, lb/hr                         | $13.315 \times 10^6$                | $10.445 \times 10^6$ | $6.43 \times 10^6$        | $9.81 \times 10^6$        | $6.77 \times 10^6$                    |
| Feedwater Temperature, °F                          | 378.4                               | 387.4                | 372                       | 367                       | 420                                   |
| System Pressure, Nominal in Steam Dome, psia       | 1020                                | 1020                 | 1020                      | 1020                      | 1020                                  |
| Average Power Density, kW/liter                    | 49.69/49.46/<br>49.2                | 51.2                 | 50.8                      | 51.2                      | 50.9                                  |
| Maximum Thermal Output, kW/ft                      | 18.5 (7x7)/13.4<br>(8x8)            | 18.3                 | 18.37                     | 18.5                      | 18.5                                  |
| Average Thermal Output, kW/ft                      | 7.050 (7x7)/<br>5.59 (8x8)          | 7.114                | 7.1                       | 7.079                     | 7.079                                 |
| Average Heat Flux, Btu/hr-ft <sup>2</sup>          | 148937/142007/<br>143635            | 164,734              | 163,900                   | 164,500                   | 163,933                               |
| Maximum UO <sub>2</sub> Temperature, °F            | 4430                                | 4430                 | 4430                      | 4430                      | 4430                                  |
| Average Volumetric Fuel Temperature, °F            | 1210                                | 1210                 | 1210                      | 1210                      | 1210                                  |
| Average Fuel Rod Surface Temperature, °F           | 560                                 | 560                  | 560                       | 560                       | 560                                   |
| Minimum Critical Power Ratio (MCPR) <sup>(1)</sup> | >1.07                               | >1.9                 | >1.9                      | >1.9                      | >1.9                                  |
| Coolant Enthalpy at Core Inlet, Btu/lb             | 521.3                               | 526.2                | 522.9                     | 520.1                     | 525.6                                 |
| Core Maximum Exit Voids Within Assemblies          | 79                                  | 79                   | 79                        | 79                        | 79                                    |
| Core Average Exit Quality, % Steam                 | 13.2                                | 13.9                 | 13.6                      | 13.2                      | 14.3                                  |

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TABLE 1.7-1

(Sheet 2)

## COMPARISON OF NUCLEAR SYSTEM DESIGN CHARACTERISTICS (Data in this table has not been updated to reflect the power uprate at Browns Ferry)

(Parameters are related to Rated Power Output for a single plant unless otherwise noted)

| <u>THERMAL AND HYDRAULIC DESIGN (Cont-d)</u>                    | <u>BROWNS FERRY<br/>UNITS 1/2/3</u>                   | <u>HATCH UNIT 1</u>      | <u>VERMONT<br/>YANKEE</u> | <u>COOPER<br/>STATION</u> | <u>DUANE ARNOLD<br/>ENERGY CENTER</u> |
|---|---|--------------------------|---------------------------|---------------------------|---------------------------------------|
| <u>Design Power Peaking Factors</u>                             |   |                          |                           |                           |                                       |
| Transverse Peaking Factor                                       | 1.4   | 1.4                      | 1.4                       | 1.4                       | 1.405                                 |
| Local Peaking Factor  | ≤ 1.24  | 1.24                     | 1.24                      | 1.24                      | 1.24                                  |
| Axial Peaking Factor  | 1.5   | 1.5                      | 1.5                       | 1.5                       | 1.5                                   |
| Total Peaking Factor  | ≤ 2.63  | 2.6                      | 2.6                       | 2.6                       | 2.6                                   |
| <u>NUCLEAR DESIGN (First Core)</u>                              |   |                          |                           |                           |                                       |
| Water/UO <sub>2</sub> Volume Ratio (Cold)                       | 2.43 Type I<br>2.53 Type II & III                     | 2.41                     | 2.41                      | 2.41                      | 2.41                                  |
| Reactivity with Strongest Control Rod<br>Out, k <sub>eff</sub>  | <0.99   | <0.99                    | <0.99                     | <0.99                     | <0.99                                 |
| Moderator Temperature Coefficient<br>At 68°F, Δk/k - °F Water   | -3.5 x 10 <sup>-5</sup>                               | -3.5 x 10 <sup>-5</sup>  | -5.0 x 10 <sup>-5</sup>   | -3.5 x 10 <sup>-5</sup>   | -3.5 x 10 <sup>-5</sup>               |
| Hot, no voids, Δk/k - °F Water                                  | -11.6 x 10 <sup>-5</sup>                              | -11.6 x 10 <sup>-5</sup> | -17.0 x 10 <sup>-5</sup>  | -11.6 x 10 <sup>-5</sup>  | -11.6 x 10 <sup>-5</sup>              |
| Moderator Void Coefficient<br>Hot, no voids, Δk/k - % Void      | -8.7 x 10 <sup>-4</sup>                               | -8.7 x 10 <sup>-4</sup>  | -1.0 x 10 <sup>-3</sup>   | -8.7 x 10 <sup>-4</sup>   | -8.7 x 10 <sup>-4</sup>               |
| At Rated Output, Δk/k - % Void                                  | -1.05 x 10 <sup>-3</sup>                              | -1.05 x 10 <sup>-3</sup> | -1.5 x 10 <sup>-3</sup>   | -1.05 x 10 <sup>-3</sup>  | -1.05 x 10 <sup>-3</sup>              |
| Fuel Temperature Doppler Coefficient<br>At 68°F, Δk/k - °F Fuel | -0.9 x 10 <sup>-5</sup>                               | -1.3 x 10 <sup>-5</sup>  | -1.3 x 10 <sup>-5</sup>   | -1.3 x 10 <sup>-5</sup>   | -1.3 x 10 <sup>-5</sup>               |
| Hot, No Void, Δk/k - °F Fuel                                    | -1.0 x 10 <sup>-5</sup>                               | -1.2 x 10 <sup>-5</sup>  | -1.2 x 10 <sup>-5</sup>   | -1.2 x 10 <sup>-5</sup>   | -1.2 x 10 <sup>-5</sup>               |
| At Rated Output, Δk/k - °F Fuel                                 | -0.9 x 10 <sup>-5</sup>                               | -1.3 x 10 <sup>-5</sup>  | -1.3 x 10 <sup>-5</sup>   | -1.3 x 10 <sup>-5</sup>   | -1.3 x 10 <sup>-5</sup>               |
| Initial Average U-235 Enrichment, W/O                           | 2.19%   | 2.30%                    | 2.50%                     | 2.15%                     | 2.25%                                 |
| Fuel Average Discharge Exposure, MWD/Ton                        | 19,000  | 19,000                   | 19,000                    | 19,000                    | 18,350                                |
| Nuclear Design (Reload Core)                                    | See applicable Nuclear Design Reports. <sup>(6)</sup> |                          |                           |                           |                                       |

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TABLE 1.7-1

(Sheet 3)

## COMPARISON OF NUCLEAR SYSTEM DESIGN CHARACTERISTICS (Data in this table has not been updated to reflect the power uprate at Browns Ferry)

(Parameters are related to Rated Power Output for a single plant unless otherwise noted)

| <u>CORE MECHANICAL DESIGN</u>                  | <u>BROWNS FERRY<br/>UNITS 1/2/3</u>             | <u>HATCH UNIT 1</u>                        | <u>VERMONT<br/>YANKEE</u>     | <u>COOPER<br/>STATION</u>     | <u>DUANE ARNOLD<br/>ENERGY CENTER</u>      |
|--|---|--|-------------------------------|-------------------------------|--|
| <u>Fuel Assembly</u>                           |   |  |                               |                               |  |
| Number of Fuel Assemblies                      | 764   | 560  | 368                           | 548                           | 368  |
| Fuel Rod Array                                 | 7 x 7 or 8 x 8                                  | 7 x 7                                      | 7 x 7                         | 7 x 7                         | 7 x 7                                      |
| Overall Dimensions, inches                     | 175.98  | 175.98                                     | 175.98                        | 175.98                        | 175.98                                     |
| Weight of UO <sub>2</sub> per Assembly, pounds | See applicable<br>Nuclear Design<br>(6) Reports | Undished -<br>490.35<br>Dished -<br>483.42 | Undished -<br>487.4           | 487.4                         | Undished -<br>490.35<br>Dished -<br>483.42 |
| Weight of Fuel Assembly, pounds                | 681   | Undished -<br>681.48<br>Dished -<br>674.55 | Undished -<br>682             | 682                           | Undished -<br>681.48<br>Dished -<br>674.55 |
| <u>Fuel Rods</u>                               |   |  |                               |                               |  |
| Number per Fuel Assembly                       | 49 or 64*<br>(mixed cores)<br>1.483             | 49   | 49                            | 49                            | 49   |
| Outside Diameter, inch                         | 0.563   | 0.563                                      | 0.563                         | 0.563                         | 0.563                                      |
| Clad Thickness, inch                           | 0.032   | 0.032                                      | 0.032                         | 0.032                         | 0.032                                      |
| Gap - Pellet to Clad, inch                     | 0.006/0.009                                     | 0.006                                      | 0.006                         | 0.006                         | 0.006                                      |
| Length of Gas Plenum, inches                   | 16/9.48   | 16   | 16                            | 16                            | 16   |
| Clad Material                                  | Zircaloy-2                                      | Zircaloy-2                                 | Zircaloy-2                    | Zircaloy-2                    | Zircaloy-2                                 |
| Cladding Process                               | Free standing<br>loaded tubes                   | Free standing<br>loaded tubes              | Free Standing<br>loaded tubes | Free Standing<br>loaded tubes | Free Standing<br>loaded tubes              |

\*Two different 8 x 8 fuel bundle arrangements are used. One uses 63 fuel rods and 1 water rod; the other uses 62 fuel rods and 2 water rods.

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(Sheet 4)

## COMPARISON OF NUCLEAR SYSTEM DESIGN CHARACTERISTICS (Data in this table has not been updated to reflect the power uprate at Browns Ferry)

(Parameters are related to Rated Power Output for a single plant unless otherwise noted)

| <u>CORE MECHANICAL DESIGN (Cont'd)</u>            | <u>BROWNS FERRY<br/>UNITS 1/2/3</u>                     | <u>HATCH UNIT 1</u>                                     | <u>VERMONT<br/>YANKEE</u>                               | <u>COOPER<br/>STATION</u>                               | <u>DUANE ARNOLD<br/>ENERGY CENTER</u>                   |
|---|---|---|---|---|---|
| <u>Fuel Pellets</u>                               |   |   |   |   |   |
| Material  | Uranium Dioxide   | Uranium Dioxide   | Uranium Dioxide   | Uranium Dioxide   | Uranium Dioxide   |
| Density, % of theoretical                         | 94%   | 93%   | 93%   | 93%   | 93%   |
| Diameter, inch                                    | 0.410   | 0.487   | 0.487   | 0.487   | 0.487   |
| Length, inch                                      | 0.410   | 0.75  | 0.75  | 0.75  | 0.75  |
| <u>Fuel Channel</u>                               |   |   |   |   |   |
| Overall Dimension, inches (length)                | 166.906   | 166.906   | 166.906   | 166.096   | 166.906   |
| Thickness, inch                                   | 0.080   | 0.080   | 0.080   | 0.080   | 0.080   |
| Cross-Section Dimensions, inches                  | 5.438 x 5.438   | 5.438 x 5.438   | 5.438 x 5.438   | 5.438 x 5.438   | 5.438 x 5.438   |
| Material  | Zircaloy-4  | Zircaloy-4  | Zircaloy-4  | Zircaloy-4  | Zircaloy-4  |
| <u>Core Assembly</u>                              |   |   |   |   |   |
| Fuel Weight as UO <sub>2</sub> , pounds           | 361,837   | 272,849   | 179,370   | 267,095   | 179,298   |
| Zirconium Weight, pounds<br>(Zr.2 + Zr.4 Spacers) | 140,397   | 96,370  | 63,300  | 94,305  | 63,300  |
| Core Diameter (equivalent), inches                | 187.1   | 160.2   | 129.9   | 158.5   | 129.9   |
| Core Height (Active Fuel), inches                 | 144 - 150   | 144   | 144   | 144   | 144   |
| <u>Reactor Control System</u>                     |   |   |   |   |   |
| Method of Variation of Reactor Power              | Movable Control<br>Rods and Variable<br>Coolant Pumping | Movable Control<br>Rods and Variable<br>Coolant Pumping | Movable Control<br>Rods and Variable<br>Coolant Pumping | Movable Control<br>Rods and Variable<br>Coolant Pumping | Movable Control<br>Rods and Variable<br>Coolant Pumping |
| Number of Movable Control Rods                    | 185   | 137   | 89  | 137   | 89  |
| Shape of Movable Control Rods                     | Cruciform   | Cruciform   | Cruciform   | Cruciform   | Cruciform   |
| Pitch of Movable Control Rods                     | 12.0  | 12.0  | 12.0  | 12.0  | 12.0  |

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TABLE 1.7-1

(Sheet 5)

## COMPARISON OF NUCLEAR SYSTEM DESIGN CHARACTERISTICS

(Data in this table has not been updated to reflect the power uprate at Browns Ferry)

(Parameters are related to Rated Power Output for a single plant unless otherwise noted)

| <u>CORE MECHANICAL DESIGN</u> (Cont'd)      | <u>BROWNS FERRY</u><br><u>UNITS 1/2/3</u>             | <u>HATCH UNIT 1</u>                                   | <u>VERMONT</u><br><u>YANKEE</u>                            | <u>COOPER</u><br><u>STATION</u>                       | <u>DUANE ARNOLD</u><br><u>ENERGY CENTER</u>           |
|---|---|---|--|---|---|
| <u>Reactor Control System</u> (Cont'd)      |   |   |  |   |   |
| Control Material in Movable Rods            | B <sub>4</sub> C granules<br>Compacted<br>in SS Tubes | B <sub>4</sub> C granules<br>Compacted<br>in SS Tubes | B <sub>4</sub> C granules<br>Compacted<br>in SS Tubes      | B <sub>4</sub> C granules<br>Compacted<br>in SS Tubes | B <sub>4</sub> C granules<br>Compacted<br>in SS Tubes |
| Type of Control Rod Drives                  | Bottom Entry,<br>Locking Piston                       | Bottom Entry,<br>Locking Piston                       | Bottom Entry,<br>Locking Piston                            | Bottom Entry,<br>Locking Piston                       | Bottom Entry,<br>Locking Piston                       |
| Supplementary Reactivity Control            | Grandolinia<br>Burnable Poison                        |   | 156<br>Flat, boron-<br>stainless steel<br>control curtains |   |   |
| <u>In-Core Neutron Instrumentation</u>      |   |   |  |   |   |
| Number of In-Core Neutron Detectors (Fixed) | 172   | 124   | 80   | 124   | 80  |
| Number of In-Core Detector Assemblies       | 43  | 31  | 20   | 31  | 20  |
| Number of Detectors Per Assembly            | 4   | 4   | 4  | 4   | 4   |
| Number of Flux Mapping Neutron Detectors    | 5   | 4   | 3  | 4   | 3   |
| Range (and Number) of Detectors             |   |   |  |   |   |
| Source Range Monitor                        | Source to<br>0.001% power<br>(4)                      | Source to<br>0.001% power<br>(4)                      | Source to<br>0.001% power<br>(4)                           | Source to<br>0.001% power<br>(4)                      | Source to<br>0.001% power<br>(4)                      |
| Intermediate Range Monitor                  | 0.0001% to 10%<br>power (8)                           | 0.0001% to 10%<br>power (8)                           | 0.0001% to 10%<br>power (8)                                | 0.0001% to 10%<br>power (8)                           | 0.0001% to 10%<br>power (8)                           |
| Local Power Range Monitor                   | 5% to 125%<br>power (172)                             | 5% to 125%<br>power (124)                             | 5% to 125%<br>power (80)                                   | 5% to 125%<br>power (124)                             | 5% to 125%<br>power (80)                              |
| Average Power Range Monitor                 | 2.5% to 125%<br>power (U1-6; U2-4;<br>U3-6)           | 2.5% to 125%<br>power (6)                             | 2.5% to 125%<br>power (6)                                  | 2.5% to 125%<br>power (6)                             | 2.5% to 125%<br>power (6)                             |

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TABLE 1.7-1

(Sheet 6)

## COMPARISON OF NUCLEAR SYSTEM DESIGN CHARACTERISTICS

(Data in this table has not been updated to reflect the power uprate at Browns Ferry)

(Parameters are related to Rated Power Output for a single plant unless otherwise noted)

|   | BROWNS FERRY<br>UNITS 1/2/3 | HATCH UNIT 1  | VERMONT<br>YANKEE | COOPER<br>STATION | DUANE ARNOLD<br>ENERGY CENTER |
|---|-----------------------------|---|-------------------|-------------------|-------------------------------|
| <u>REACTOR VESSEL DESIGN</u>                |                             |   |                   |                   |                               |
| Material                                    |                             | Carbon Steel/Clad Stainless Steel (ASME SA-336 & SA-302B) |                   |                   |                               |
| Design pressure, psia                       | 1265                        | 1265  | 1265              | 1265              | 1265                          |
| Design Temperature, °F                      | 575                         | 575   | 575               | 575               | 575                           |
| Inside Diameter ft-in.                      | 20 - 11                     | 18 - 2  | 17 - 2            | 18 - 2            | 15 - 3                        |
| Inside Height, ft-in.                       | 73 - 11-1/2                 | 69 - 4  | 63 - 1.5          | 69 - 4            | 66 - 4                        |
| Side Thickness (including clad)             | 6.313                       | 5.531   | 5.187             | 5.531             | 5.625                         |
| Minimum Clad Thickness, inches              | 1/8                         | 1/8   | 1/8               | 1/8               | 1/8                           |
| <u>REACTOR COOLANT RECIRCULATION DESIGN</u> |                             |   |                   |                   |                               |
| Number of Recirculation Loops               | 2                           | 2   | 2                 | 2                 | 2                             |
| Design Pressure                             |                             |   |                   |                   |                               |
| Inlet Leg. psig                             | 1148                        | 1148  | 1175              | 1148              | 1148                          |
| Outlet Leg. psig                            | 1326                        | 1274  | 1274              | 1274              | 1268                          |
| <u>CORE MECHANICAL DESIGN</u>               |                             |   |                   |                   |                               |
| Design Temperature, °F                      | 562                         | 562   | 562               | 562               | 562                           |
| Pipe Diameter Max. inches                   | 28                          | 28  | 28                | 28                | 22                            |
| Pipe Material                               | 304/316                     | 304/316   | 304/316           | 304/316           | 304/316                       |
| Recirculation Pump flow Rate, GPM           | 45,200                      | 45,200  | 32,500            | 45,200            | 27,100                        |
| Number of Jet Pumps in Reactor              | 20                          | 20  | 20                | 20                | 16                            |
| <u>MAIN STEAM LINES</u>                     |                             |   |                   |                   |                               |
| Number of Steam Lines                       | 4                           | 4   | 4                 | 4                 | 4                             |
| Design Pressure, psig                       | 1146                        | 1146  | 1146              | 1146              | 1146                          |
| Design Temperature, °F                      | 563                         | 563   | 563               | 563               | 563                           |
| Pipe Diameter, inches                       | 26                          | 24  | 20                | 24                | 20                            |
| Pipe Material                               |                             | Carbon Steel (ASTM A155 KC70 or ASTM A106 Grade B)        |                   |                   |                               |

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TABLE 1.7-1

(Sheet 7)

## COMPARISON OF NUCLEAR SYSTEM DESIGN CHARACTERISTICS

(Data in this table has not been updated to reflect the power uprate at Browns Ferry)

(Parameters are related to Rated Power Output for a single plant unless otherwise noted)

|   | BROWNS FERRY<br>UNITS 1/2/3   | HATCH UNIT 1        | VERMONT<br>YANKEE   | COOPER<br>STATION   | DUANE ARNOLD<br>ENERGY CENTER |
|---|---|---------------------|---------------------|---------------------|-------------------------------|
| <u>CORE STANDBY COOLING SYSTEMS</u>                 |   |                     |                     |                     |                               |
| (These systems are sized on design power)           |   |                     |                     |                     |                               |
| <u>Core Spray System</u>                            |   |                     |                     |                     |                               |
| Number of Loops                                     | 2   | 2                   | 2                   | 2                   | 2                             |
| Flow Rate (gpm)                                     | 6250 at<br>105 psid   | 4625 at<br>120 psid | 3000 at<br>136 psid | 4500 at<br>115 psid | 3020 at<br>127 psid           |
| <u>High Pressure Coolant Injection system (No.)</u> |   |                     |                     |                     |                               |
|   | 1   | 1                   | 1                   | 1                   | 1                             |
| Number of Loops                                     | 1   | 1                   | 1                   | 1                   | 1                             |
| Flow Rate (gpm)                                     | 5000  | 4250                | 4250                | 4220                | 2980                          |
| Automatic Depressurization system (No.)             | 1   | 1                   | 1                   | 1                   | 1                             |
| <u>Low Pressure Coolant Injection (No.)</u>         |   |                     |                     |                     |                               |
|   | 1   | 1                   | 1                   | 1                   | 1                             |
| Number of Pumps                                     | 4   | 4                   | 4                   | 4                   | 4                             |
| Flow Rate (gpm/pump)                                | 10,800 gpm<br>(1 pump per loop)<br>20,000 gpm<br>(2 pumps per loop) | 7700 at<br>20 psid  | 4800 at<br>20 psid  | 7000 at<br>20 psid  | 4800 at<br>20 psid            |
| <u>AUXILIARY SYSTEMS</u>                            |   |                     |                     |                     |                               |
| <u>Residual Heat Removal System</u>                 |   |                     |                     |                     |                               |
| Reactor Shutdown Cooling (number of pumps)          | 4   | 4                   | 4                   | 4                   | 4                             |
| Flow Rate (gpm/pump) <sup>(2)</sup>                 | 10,000  | 7,700               | 7,000               | 7,700               | 4,800                         |
| Capacity (Btu/hr/heat exchanger) <sup>(3)</sup>     | 70 x 106  | 32 x 106            | 57.5 x 106          | 70 x 106            | 35 x 106                      |
| Number of heat exchangers                           | 4   | 2                   | 2                   | 2                   | 2                             |
| Primary Containment Cooling                         |   |                     |                     |                     |                               |
| Flow rate (gpm) <sup>(4)</sup>                      | 32,000  | 30,800              | 28,000              | 30,800              | 19,200                        |

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(Sheet 8)

## COMPARISON OF NUCLEAR SYSTEM DESIGN CHARACTERISTICS (Data in this table has not been updated to reflect the power uprate at Browns Ferry)

(Parameters are related to Rated Power Output for a single plant unless otherwise noted)

| <u>AUXILIARY SYSTEMS</u> (Cont'd)            | <u>BROWNS FERRY</u><br><u>UNITS 1/2/3</u> | <u>HATCH UNIT 1</u>   | <u>VERMONT</u><br><u>YANKEE</u> | <u>COOPER</u><br><u>STATION</u> | <u>DUANE ARNOLD</u><br><u>ENERGY CENTER</u> |
|--|---|-----------------------|---------------------------------|---------------------------------|---|
| <u>RHR Service Water System</u>              |   |                       |                                 |                                 |   |
| Flow Rate (gpm/pump)                         | 4,500                                     | 8,000                 | 2,700                           | 8,000                           | 2,500                                       |
| Number of pumps                              | 12 <sup>(5)</sup>                         | 4                     | 4                               | 4                               | 4   |
| <u>Reactor Core Isolation Cooling System</u> |   |                       |                                 |                                 |   |
| Flow Rate (gpm)                              | 616 at<br>1120 psid                       | 400 at<br>1120 psid   | 400                             | 416 at<br>1120 psid             | 416   |
| <u>Fuel Pool Cooling and Cleanup system</u>  |   |                       |                                 |                                 |   |
| Capacity (BTU/hr)                            | 8.8 x 10 <sup>6</sup>                     | 3.3 x 10 <sup>6</sup> | 2.37 x 10 <sup>6</sup>          | 3.4 x 10 <sup>6</sup>           | 2.37 x 10 <sup>6</sup>                      |

- (1) The operating MCPR limits are subject to change from one cycle to the next and also from one part of the current cycle to the next. The appropriate value for MCPR may be obtained by consulting the applicable current Reload Licensing Amendment.
- (2) Capacity during reactor flooding mode with three of four pumps running.
- (3) Capacity during post-accident cooling mode with 165°F shell side inlet temperature, maximum service water temperature, and 1 RHR pump and 1 RHR service water pump in operation.
- (4) The existing design requires 16,000 gpm (2 pumps, 1 loop) to ensure torus water temperature is maintained within acceptable limits for following all postulated events.
- (5) For all three units.
- (6) See Appendix N



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TABLE 1.7-2

COMPARISON OF POWER CONVERSION SYSTEMS DESIGN CHARACTERISTICS

(Data in this table has not been updated to reflect the power uprate at Browns Ferry)

| <u>TURBINE GENERATOR</u>                          | <u>Browns Ferry<br/>Each Unit</u> | <u>Hatch Unit 1</u>  | <u>Vermont Yankee</u> | <u>Cooper Station</u> | <u>Duane Arnold<br/>Energy Center</u> |
|---|-----------------------------------|----------------------|-----------------------|-----------------------|---------------------------------------|
| Design Power, MWt                                 | 3440                              | 2537                 | 1665                  | 2487                  | 1670                                  |
| Design Power, MWe                                 | 1152                              | 849                  | 564                   | 836                   | 597                                   |
| Generator Speed, rpm                              | 1800                              | 1800                 | 1800                  | 1800                  | 1800                                  |
| Design Steam Flow, lb/hr                          | $14.035 \times 10^6$              | $10.48 \times 10^6$  | $6.423 \times 10^6$   | $10.049 \times 10^6$  | $6.696 \times 10^6$                   |
| Turbine Inlet Pressure, psia                      | 965                               | 970                  | 950                   | 970                   | 950                                   |
| <u>TURBINE BYPASS SYSTEM</u>                      |                                   |                      |                       |                       |                                       |
| Capacity, percent of turbine<br>design steam flow | 25                                | 25                   | 100                   | 25                    | 25                                    |
| <u>MAIN CONDENSER</u>                             |                                   |                      |                       |                       |                                       |
| Heat removal capacity, Btu/hr                     | $7,770 \times 10^6$               | $5,800 \times 10^6$  | $3,500 \times 10^6$   | $5,367 \times 10^6$   | $3,681 \times 10^6$                   |
| <u>CIRCULATING WATER SYSTEM</u>                   |                                   |                      |                       |                       |                                       |
| Number of Pumps                                   | 3                                 | 3                    | 3                     | 4                     | 2 or more                             |
| Flow Rate gpm/pump                                | 220,000                           | 185,000              | 117,000               | 162,500               | 130,000 or less                       |
| <u>CONDENSATE AND FEEDWATER SYSTEMS</u>           |                                   |                      |                       |                       |                                       |
| Design Flow Rate, lb/hr                           | $13.845 \times 10^6$              | $10.096 \times 10^6$ | $6.4 \times 10^6$     | $9.773 \times 10^6$   | $7.146 \times 10^6$                   |
| Number Condensate Pumps                           | 3                                 | 3                    | 2                     | 3                     | 2                                     |
| Number Condensate Booster Pumps                   | 3                                 | -                    | ---                   |                       |                                       |
| Number Feedwater Pumps                            | 3                                 | 2                    | 2                     | 2                     | 2                                     |
| Condensate Pump Drive                             | AC power                          | AC power             | AC power              | AC power              | AC power                              |
| Condensate Booster Pump Drive                     | AC power                          | -                    | -                     | -                     | -                                     |
| Feedwater Pump Drive                              | Turbine                           | Turbine              | AC power              | Turbine               | AC power                              |

TABLE 1.7-3

COMPARISON OF ELECTRICAL POWER SYSTEM DESIGN CHARACTERISTICS

(Data in this table has not been updated to reflect the power uprate at Browns Ferry)

|

| <u>TRANSMISSION SYSTEM</u>        | <u>BROWNS FERRY<br/>NUCLEAR PLANT</u> | <u>HATCH UNIT 1</u> | <u>VERMONT<br/>YANKEE</u>                 | <u>COOPER<br/>STATION</u> | <u>DUANE ARNOLD<br/>ENERGY CENTER</u> |
|-----------------------------------|---------------------------------------|---------------------|---|---------------------------|---------------------------------------|
| Outgoing lines (number-rating)    | 7-500kV                               | 2-230kV             | 2-345kV                                   | 4-345kV                   | 2-345kV                               |
| <u>NORMAL AUXILIARY AC POWER</u>  |                                       |                     |   |                           |                                       |
| Incoming lines (number-rating)    | 2-161kV                               | 2-230kV             | 2-345kV<br>1-230kV<br>1-115kV<br>1-4160kV | 1-115kV<br>1-69kV         | 2-345kV<br>3-161kV                    |
| Auxiliary transformers            | 3                                     | 1                   | 1   | 1                         | 2                                     |
| Startup transformers              | 2                                     | 2                   | 1   | 2                         | 1                                     |
| <u>STANDBY AC POWER SUPPLY</u>    |                                       |                     |   |                           |                                       |
| Number diesel generators          | 8                                     | 3                   | 2   | 4                         | 2                                     |
| Number of 4160V Shutdown buses    | 8                                     | 3                   | 2   | 2                         | 2                                     |
| Number of 480V Shutdown buses     | 6                                     | 4-660V              | 3   | 3                         | 3                                     |
| <u>DC POWER SUPPLY</u>            |                                       |                     |   |                           |                                       |
| Number of 125V or 250V batteries* | 6                                     | 2                   | 2   | 2                         | 2                                     |
| Number of 125V or 250V buses*     | 6                                     | 4                   | 4   | 4                         | 2                                     |

\*3 of the 6 250V systems are qualified

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TABLE 1.7-4

Sheet 1

COMPARISON OF CONTAINMENT DESIGN CHARACTERISTICS  
(Data in this table has not been updated to reflect the power uprate at Browns Ferry)

| <u>PRIMARY CONTAINMENT*</u>   | <u>BROWNS FERRY<br/>EACH UNIT</u>    | <u>HATCH UNIT 1</u>                  | <u>VERMONT<br/>YANKEE</u>            | <u>COOPER<br/>STATION</u>            | <u>Duane Arnold<br/>Energy Center</u> |
|---|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|---------------------------------------|
| Type  | Pressure<br>Suppression              | Pressure<br>Suppression              | Pressure<br>Suppression              | Pressure<br>Suppression              | Pressure<br>Suppression               |
| Construction<br>Drywell   | Light bulb<br>shape; steel<br>vessel | Light bulb<br>shape; steel<br>vessel | Light bulb<br>shape; steel<br>vessel | Light bulb<br>shape; steel<br>vessel | Light bulb<br>shape; steel<br>vessel  |
| Pressure Suppression Chamber  | Torus; steel<br>vessel               | Torus; steel<br>vessel               | Torus; steel<br>vessel               | Torus; steel<br>vessel               | Torus; steel<br>vessel                |
| Pressure Suppression Chamber<br>Internal Design Pressure (psig)         | 56                                   | 56                                   | 56                                   | 56                                   | 56                                    |
| Pressure Suppression chamber -<br>External Design Pressure (psig)       | 2                                    | 2                                    | 2                                    | 2                                    | 2                                     |
| Drywell-Internal Design Pressure (psig)                                 | 56                                   | 56                                   | 56                                   | 56                                   | 56                                    |
| Drywell-External Design Pressure (psig)                                 | 2                                    | 2                                    | 2                                    | 2                                    | 2                                     |
| Drywell Free Volume (ft <sup>3</sup> )                                  | 159,000                              | 146,400                              | 134,000                              | 145,430                              | 130,930                               |
| Pressure Suppression chamber<br>Free Volume (ft <sup>3</sup> ), minimum | 119,000                              | 101,410                              | 99,000                               | 109,810                              | 94,630                                |
| Pressure Suppression Pool Water<br>Volume (ft <sup>3</sup> ), maximum   | 128,700                              | 86,660                               | 78,000                               | 87,660                               | 61,500                                |
| Submergence of Vent Pipe Below<br>Pressure Pool Surface (ft), nominal   | 4                                    | 4                                    | 4                                    | 4                                    | 4                                     |
| Design Temperature of Drywell (°F)                                      | 281                                  | 281                                  | 281                                  | 281                                  | 281                                   |
| Design Temperature of Pressure<br>Suppression Chamber (°F)              | 281                                  | 281                                  | 281                                  | 281                                  | 281                                   |

\* Where applicable, containment parameters are based on design power.

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TABLE 1.7-4 (Cont'd)

Sheet 2

COMPARISON OF CONTAINMENT DESIGN CHARACTERISTICS  
(Data in this table has not been updated to reflect the power uprate at Browns Ferry)

| <u>PRIMARY CONTAINMENT*</u>   | <u>BROWNS FERRY<br/>EACH UNIT</u>           | <u>HATCH UNIT 1</u>                  | <u>VERMONT<br/>YANKEE</u>            | <u>COOPER<br/>STATION</u>            | <u>DUANE ARNOLD<br/>ENERGY CENTER</u> |
|---|---|--------------------------------------|--------------------------------------|--------------------------------------|---------------------------------------|
| Downcomer Vent Pressure Loss Factor                                       | 4.1   | 6.21                                 | 6.21                                 | 6.21                                 | 6.21                                  |
| Break Area/total Vent Area  | 0.017                                       | 0.019                                | 0.019                                | 0.019                                | 0.019                                 |
| Calculated Maximum Pressure After Blow-down Drywell (psig)                | 49.6  | 45                                   | 35                                   | 46                                   | 45                                    |
| Pressure Suppression chamber (psig)                                       | 27  | 28                                   | 22                                   | 28                                   | 29                                    |
| Initial Pressure Suppression Pool   | 40  | 50                                   | 35                                   | 50                                   | 50                                    |
| Temperature Rise (°F)   |   |                                      |                                      |                                      |                                       |
| Leakage Rate (% Free Volume/Day at 56 psig and 281°F)                     | 0.5   | 0.5                                  | 0.5                                  | 0.5                                  | 0.5                                   |
| <u>SECONDARY CONTAINMENT</u>  |   |                                      |                                      |                                      |                                       |
| Type  | Controlled Leakage, Elevated Release        | Controlled Leakage, Elevated Release | Controlled Leakage, Elevated Release | Controlled Leakage, Elevated Release | Controlled Leakage, Elevated Release  |
| Construction  | Reinforced Concrete                         | Reinforced Concrete                  | Reinforced Concrete                  | Reinforced Concrete                  | Reinforced Concrete                   |
| Upper Levels  | Steel Super-structure and Siding            | Steel Super-structure and Siding     | Steel Super-structure and Siding     | Steel Super-structure and Siding     | Steel Super-structure and Siding      |
| Roof  | Steel Decking with Builtup Composition Roof | Steel Sheetting                      | Steel Sheetting                      | Steel Sheetting                      | Steel Sheetting                       |
| Internal Design Pressure (psig)   | +7 to -5 in. H <sub>2</sub> O               | 0.25                                 | 0.25                                 | 0.25                                 | 0.25                                  |
| Design Inleakage Rate (% Free Volume/Day at 0.25 inches H <sub>2</sub> O) | 100   | 100                                  | 100                                  | 100                                  | 100                                   |

\* Where applicable, containment parameters are based on design power.

TABLE 1.7-4 (Cont'd)

Sheet 3

COMPARISON OF CONTAINMENT DESIGN CHARACTERISTICS  
 (Data in this table has not been updated to reflect the power uprate at Browns Ferry)

| <u>SECONDARY CONTAINMENT*</u> | <u>BROWNS FERRY<br/>EACH UNIT</u> | <u>HATCH UNIT 1</u> | <u>VERMONT<br/>YANKEE</u> | <u>COOPER<br/>STATION</u> | <u>Duane Arnold<br/>Energy Center</u> |
|-------------------------------|-----------------------------------|---------------------|---------------------------|---------------------------|---------------------------------------|
| <u>ELEVATED RELEASE POINT</u> |                                   |                     |                           |                           |                                       |
| Type                          | Stack                             | Stack               | Stack                     | Stack                     | Stack                                 |
| Construction                  | Reinforced<br>Concrete            | Steel               | Steel                     | Steel                     | Steel                                 |
| Height (above ground)         | 600 feet                          | 150 meters          | 318 feet                  | 100 meters                | 100 meters                            |

\*Where applicable, containment parameters are based on design power.

TABLE 1.7-5

COMPARISON OF CONTAINMENT DESIGN CHARACTERISTICS  
 (Data in this table has not been updated to reflect the power uprate at Browns Ferry)

| <u>SEISMIC DESIGN</u>                     | <u>BROWNS FERRY<br/>NUCLEAR PLANT</u> | <u>HATCH UNIT 1</u> | <u>VERMONT<br/>YANKEE</u> | <u>COOPER<br/>STATION</u> | <u>DUANE ARNOLD<br/>ENERGY CENTER</u> |
|---|---------------------------------------|---------------------|---------------------------|---------------------------|---------------------------------------|
| Operating Basis Earthquake (horizontal g) | 0.10                                  | 0.08                | 0.07                      | 0.10                      | 0.06                                  |
| Design Basis Earthquake (horizontal g)    | 0.20                                  | 0.15                | 0.14                      | 0.20                      | 0.12                                  |
| <u>WIND DESIGN</u>                        |                                       |                     |                           |                           |                                       |
| Maximum sustained (mph)                   | 100                                   | 105                 | 80                        | 100                       | 105                                   |
| Tornadoes (mph)                           | 300                                   | 300                 | 300                       | 300                       | 300                                   |