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## Duke Energy DOCUMENT TRANSMITTAL FORM

Facility: MCGUIRE NUCLEAR STATION  
SUBJECT  
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## 4.0 DESIGN FEATURES

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### 4.1 Site Location

The McGuire Nuclear Station site is located at latitude 35 degrees, 25 minutes, 59 seconds north and longitude 80 degrees, 56 minutes, 55 seconds west. The Universal Transverse Mercator Grid Coordinates are E 504, 669, 256, and N 3, 920, 870, 471. The site is in northwestern Mecklenburg County, North Carolina, 17 miles north-northwest of Charlotte, North Carolina.

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### 4.2 Reactor Core

#### 4.2.1 Fuel Assemblies

The reactor shall contain 193 fuel assemblies. Each assembly shall consist of a matrix of either Zircalloy, ZIRLO<sup>®</sup>, or Optimized ZIRLO<sup>™</sup> clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO<sub>2</sub>) as fuel material. Limited substitutions of ZIRLO<sup>®</sup>, Optimized ZIRLO<sup>™</sup>, zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions.

#### 4.2.2 Control Rod Assemblies

The reactor core shall contain 53 control rod assemblies. The control material shall be silver indium cadmium (Unit 1) silver indium cadmium and boron carbide (Unit 2) as approved by the NRC.

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### 4.3 Fuel Storage

#### 4.3.1 Criticality

4.3.1.1 The spent fuel storage racks are designed and shall be maintained with:

- a. Fuel assemblies having a maximum nominal U-235 enrichment of 5.00 weight percent;
- b.  $k_{eff} < 1.0$  if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR;
- c.  $k_{eff} \leq 0.95$  if fully flooded with water borated to 800 ppm, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR;

## 4.0 DESIGN FEATURES

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### 4.3 Fuel Storage (continued)

- d. A nominal 10.4 inch center to center distance between fuel assemblies placed in Region 1 and
- e. A nominal 9.125 inch center to center distance between fuel assemblies placed in Region 2.
- f. Neutron absorber (Boral) installed between fuel assemblies in the Region 1 racks.

#### 4.3.1.2 The new fuel storage racks are designed and shall be maintained with:

- a. Fuel assemblies having a maximum nominal U-235 enrichment of 5.00 weight percent,
- b.  $k_{\text{eff}} \leq 0.95$  if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR;
- c.  $k_{\text{eff}} \leq 0.98$  if moderated by aqueous foam, which includes an allowance for uncertainties as described in Section 9.1 of the UFSAR; and
- d. A nominal 21 inch center to center distance between fuel assemblies placed in the storage racks.

#### 4.3.2 Drainage

The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 745 ft.-7 in.

#### 4.3.3 Capacity

The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1463 fuel assemblies (286 total spaces in Region 1 and 1177 total spaces in Region 2).

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