

NUCLEAR REGULATORY COMMISSION

[Docket No. 50-302; NRC-2016-0048]

Duke Energy Florida, Inc. Crystal River, Unit 3

AGENCY: Nuclear Regulatory Commission.

ACTION: Exemption; issuance.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is issuing an exemption from the requirement to maintain a specified level of onsite property damage insurance in response to a request from Duke Energy Florida, Inc. (DEF or the licensee) dated December 17, 2015. This exemption would permit the licensee to reduce its onsite property damage insurance from \$1.06 billion to \$50 million at the Crystal River Unit 3 Nuclear Generating Station (CR-3) based on the reduced risks and consequences of a nuclear incident at a decommissioning nuclear power reactor.

DATE: March 31, 2016.

ADDRESSES: Please refer to Docket ID NRC-2016-0048 when contacting the NRC about the availability of information regarding this document. You may obtain publicly-available information related to this document using any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2016-0048. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

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- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: John B. Hickman, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington DC 20555-0001; telephone: 301-415-3017; e-mail: John.Hickman@nrc.gov.

SUPPLEMENTARY INFORMATION:

I. Background

The CR-3 facility is a decommissioning power reactor located in Citrus County, Florida. The licensee, DEF, is the holder of CR-3 Facility Operating License No. DPR-72. The license provides, among other things, that the facility is subject to all rules, regulations, and orders of the NRC now or hereafter in effect.

By letter dated February 20, 2013 (ADAMS Accession No. ML13056A005), DEF submitted to the NRC a certification in accordance with section 50.82(a)(1)(i) of title 10 of the *Code of Federal Regulations* (10 CFR) indicating it would permanently cease power operations, and with 10 CFR 50.82(a)(1)(ii) that it had permanently defueled the reactor vessel at CR-3. On May 28, 2011, DEF completed the final removal of fuel from the reactor vessel at CR-3. Because CR-3 is a permanently shutdown and defueled facility, and in accordance with section 50.82(a)(2), DEF is no longer authorized to operate the reactor or emplace nuclear fuel into the reactor vessel. The licensee is still authorized to possess and store irradiated (i.e., spent) nuclear fuel. The spent fuel is currently being stored onsite in a spent fuel pool (SFP).

II. Request/Action

Under 10 CFR 50.12, "Specific exemptions," DEF requested an exemption from 10 CFR 50.54(w)(1) by a letter dated December 17, 2015 (ADAMS Accession No. ML15351A490). The exemption from the requirements of 10 CFR 50.54(w)(1) would permit DEF to reduce the amount of its onsite property damage insurance from \$1.06 billion to \$50 million.

The regulation in 10 CFR 50.54(w)(1) requires each licensee to have and maintain onsite property damage insurance to stabilize and decontaminate the reactor and reactor site in the event of an accident. The onsite insurance coverage must be either \$1.06 billion or whatever amount of insurance is generally available from private sources (whichever is less).

The licensee states that the risk and consequences of an accident at a permanently shutdown and defueled reactor are much less than the risk and consequences from an accident at an operating power reactor. In addition, since reactor operation is no longer authorized at CR-3, no events could occur that would require the stabilization of reactor conditions after an accident. Similarly, the risk of an accident that would result in significant onsite contamination at

CR-3 is also much lower than the risk of such an event at operating reactors. Therefore, DEF is requesting an exemption from 10 CFR 50.54(w)(1) to reduce its onsite property damage insurance from \$1.06 billion to \$50 million, commensurate with the reduced risk of an accident at the permanently shutdown and defueled CR-3 site.

III. Discussion

Under 10 CFR 50.12, the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR part 50 when: 1) the exemptions are authorized by law, will not present an undue risk to public health or safety, and are consistent with the common defense and security; and 2) any of the special circumstances listed in 10 CFR 50.12(a)(2) are present.

The financial protection limits of 10 CFR 50.54(w)(1) were established after the Three Mile Island accident in 1979 out of concern that licensees may be unable to financially cover onsite cleanup costs in the event of a major nuclear accident. The NRC based the \$1.06 billion coverage amount requirement on an analysis of an accident at a nuclear reactor operating at power that results in a large fission product release and requires significant resource expenditures to stabilize the reactor conditions and ultimately decontaminate and remediate the site. These activities would be similar to the stabilization and cleanup activities at the Fukushima Daiichi nuclear power facility following the damage from a severe earthquake and tsunami.

The NRC developed these cost estimates based on the spectrum of postulated accidents for an operating nuclear reactor and the consequences of a release of radioactive material from the reactor. Although the risk of an accident at an operating reactor is very low, the consequences can be large. In an operating plant, the high temperature and pressure of the

reactor coolant system (RCS), as well as the inventory of relatively short-lived radionuclides, contribute to both the risk and consequences of an accident. With the permanent cessation of reactor operations at CR-3 (i.e., the reactor, RCS, and supporting systems no longer operate) and the permanent removal of the fuel from the reactor core, postulated accidents involving failure or malfunction of the reactor, RCS, or supporting systems are no longer possible.

Additionally, these systems and components cannot support the storage of the irradiated fuel.

During reactor decommissioning, the principal radiological risks are associated with the storage of spent fuel onsite. In its December 17, 2015, exemption request, DEF discusses both design-basis and beyond-design-basis events involving irradiated fuel stored in the SFP. The licensee states that there are no possible design-basis events at CR-3 that could result in a radiological release exceeding the limits established by the U.S. Environmental Protection Agency's (EPA) early-phase Protective Action Guidelines (PAG) of 1 Roentgen Equivalent Man (REM) at the exclusion area boundary. The only accident that might lead to a significant radiological release at the decommissioning reactor is a zirconium fire. The zirconium fire scenario is a postulated, but highly unlikely, beyond-design-basis accident scenario that involves loss of all water inventory from the SFP, resulting in a significant heat-up of the spent fuel, and culminating in substantial zirconium cladding oxidation and fuel damage. The probability of a zirconium fire scenario is related to the decay heat of the irradiated fuel stored in the SFP. Therefore, the risks from a zirconium fire scenario continue to decrease as a function of the time that CR-3 has been permanently shut down.

The licensee provided a detailed analysis of hypothetical beyond-design-basis accidents that could result in a radiological release at CR-3 in its September 6, 2013, emergency planning-related license amendment and exemption requests (ADAMS Accession No. ML13274A584). One of these beyond-design-basis accidents involves a complete loss of SFP water inventory, where cooling of the spent fuel would be primarily accomplished by natural

circulation of air through the uncovered spent fuel assemblies. The licensee's analysis of this accident shows that as of September 26, 2013, air-cooling of the spent fuel assemblies will be sufficient to keep the fuel within a safe temperature range indefinitely without fuel damage or radiological release. This is important because the NRC staff has previously authorized a lesser amount of onsite property damage insurance coverage based on analysis of the zirconium fire risk. In SECY-96-256, "Changes to Financial Protection Requirements for Permanently Shutdown Nuclear Power Reactors, 10 CFR 50.54(w)(1) and 10 CFR 140.11," dated December 17, 1996 (ADAMS Accession No. ML15062A483), the staff recommended changes to the power reactor insurance regulations that would allow licensees to lower onsite insurance levels to \$50 million upon demonstration that the fuel stored in the SFP can be air-cooled. In its Staff Requirements Memorandum to SECY-96-256, dated January 28, 1997 (ADAMS Accession No. ML15062A454), the Commission supported the staff's recommendation that, among other things, would allow permanently shutdown power reactor licensees to reduce commercial onsite property damage insurance coverage to \$50 million when the licensee was able to demonstrate the technical criterion that the spent fuel could be air-cooled if the SFP was drained of water. The staff has used this technical criterion to grant similar exemptions to other decommissioning reactor licensees (e.g., Maine Yankee Atomic Power Station, published in the *Federal Register* on January 19, 1999 (64 FR 2920); Zion Nuclear Power Station, published in the *Federal Register* on December 28, 1999 (64 FR 72700); and Kewaunee Nuclear Power Plant, published in the *Federal Register* on April 13, 2015 (80 FR 19697)). The NRC based these prior exemptions on the licensees' demonstrating that the SFP could be air-cooled, consistent with the technical criterion discussed above.

In SECY-00-0145, "Integrated Rulemaking Plan for Nuclear Power Plant Decommissioning," dated June 28, 2000, and SECY-01-0100, "Policy Issues Related to Safeguards, Insurance, and Emergency Preparedness Regulations at Decommissioning

Nuclear Power Plants Storing Fuel in the Spent Fuel Pools,” dated June 4, 2001 (ADAMS Accession Nos. ML003721626 and ML011450420, respectively), the NRC staff discussed additional information concerning SFP zirconium fire risks at decommissioning reactors and associated implications for onsite property damage insurance. As discussed in SECY-00-0145, providing an analysis of when the spent fuel stored in the SFP is capable of air-cooling is one measure that a licensee can use to demonstrate that the probability of a zirconium fire is exceedingly low. More recently, as discussed in SECY-01-0100, the staff has used an additional analysis that bounds an incomplete drain down of the SFP water or some other catastrophic event (such as a complete drainage of the SFP with rearrangement of spent fuel rack geometry and/or the addition of rubble to the SFP). The analysis postulates that decay heat transfer from the spent fuel via conduction, convection, or radiation would be impeded. This analysis is often referred to as an adiabatic heatup analysis.

The DEF analyses, as referenced in DEF’s December 15, 2015, exemption request, demonstrate that under conditions where the SFP water inventory has drained and only air-cooling of the stored irradiated fuel is available, there is reasonable assurance that as of September 26, 2013, the CR-3 spent fuel will remain at temperatures far below those associated with a significant radiological release. In addition, the licensee has also provided an adiabatic heatup analysis, demonstrating that as of September 26, 2013, there will be at least 19.7 hours after the loss of all means of cooling (both air and/or water) before the spent fuel cladding would reach a temperature where the potential for a significant offsite radiological release could occur. The licensee states that should all means to cool the spent fuel be lost, 19.7 hours is sufficient time for personnel to respond with additional resources, equipment, and capability to restore cooling to the SFP, even after a non-credible, catastrophic event.

In the NRC’s March 30, 2015, safety evaluation (ADAMS Accession No. ML15058A906) of the licensee’s request for exemptions from certain emergency planning

requirements, the NRC staff assessed the DEF accident analyses associated with the radiological risks from a zirconium fire at the permanently shutdown and defueled CR-3 site. The staff has confirmed that under conditions where cooling airflow can develop, suitably conservative calculations indicate that as of September 26, 2013, the fuel will remain at temperatures where the cladding will be undamaged for an unlimited period. For the very unlikely beyond-design-basis accident scenario, where the SFP coolant inventory is lost in such a manner that all methods of heat removal from the spent fuel are no longer available, there will be a minimum of 19.7 hours from the initiation of the accident until the cladding reaches a temperature where offsite radiological release might occur. The staff found that 19.7 hours was sufficient time to support deployment of mitigation equipment to prevent the zirconium cladding from reaching a point of rapid oxidation. Even more time would be available now, given that more than two years have passed since the analysis was performed and the risks from a zirconium fire scenario continue to decrease as a function of the time that the fuel has cooled since CR-3 permanently shut down.

In response to a request for additional information related to the licensee's request for exemptions from certain emergency planning requirements, the licensee also provided an analysis of a postulated airborne dispersal of radioactive waste resin upon dropping a High Integrity Container (HIC) outside the power block. Although an airborne release is not expected to occur with a drop, or while in storage awaiting shipment, due to the low flammability and reactivity of the spent resin, a release is nevertheless postulated. The event is based on a release of radioactive material with activity and isotopic mix taken from the resin shipments that occurred during a recent 5-1/2 year period. The licensee reviewed resin shipments made from 2008 through June 2013 and obtained the isotopic distribution (except for Cobalt-60) from the shipment with the highest overall activity. Cobalt-60 activity was taken from a different shipment to assure that the highest activity was used and the dose was

maximized. This created a composite maximum shipment having a total activity of approximately 116 curies, which is approximately twice the activity of the average shipment made during this period. The analysis assumed a release of 10 percent of the total radioactive material inventory and that the release would occur outside of the CR-3 site's Auxiliary Building on the south berm. The analysis of the dropped spent resin HIC consequences indicates that the dose would be 40 mrem total effective dose equivalent at the site boundary over a 2-hour period, which is well below the PAG limit of 1 rem.

In SECY-96-256, the NRC staff provided its basis as to why it considers \$50 million to be an adequate level of onsite property damage insurance for a decommissioning reactor, once the spent fuel in the SFP is no longer susceptible to a zirconium fire. The staff has postulated that there is still a potential for other radiological incidents at a decommissioning reactor that could result in significant onsite contamination besides a zirconium fire. In SECY-96-256, the NRC staff cited the rupture of a large contaminated liquid storage tank, causing soil contamination and potential groundwater contamination, as the most costly postulated event to decontaminate and remediate (other than a SFP zirconium fire). The NRC determined that the postulated large liquid radiological waste storage tank rupture event would have a bounding onsite cleanup cost of approximately \$50 million.

The NRC staff has found that DEF's proposed reduction in onsite property damage insurance coverage to a level of \$50 million is consistent with SECY-96-256. In addition, the staff notes that there is a precedent of granting a similar exemption to other permanently shutdown and defueled power reactor licensees. As previously stated, the staff concluded that as of September 26, 2013, sufficient irradiated fuel decay time has elapsed at CR-3 to decrease to negligible levels the probability of an onsite radiological release from a postulated zirconium fire accident. In addition, the licensee's proposal to reduce onsite insurance to a level of \$50

million is consistent with the maximum estimated cleanup costs for the recovery from the rupture of a large liquid radiological waste storage tank.

IV. Regulatory Requirements

A. Authorized by Law

Under 10 CFR 50.12, the Commission may grant exemptions from the regulations in 10 CFR part 50 that the Commission determines are authorized by law. The NRC staff has determined that granting of the licensee's proposed exemption will not result in a violation of the Atomic Energy Act of 1954, as amended, or other laws. Therefore, the exemption is authorized by law.

B. No Undue Risk to Public Health and Safety

The NRC established the onsite property damage insurance requirements of 10 CFR 50.54(w)(1) to provide financial assurance that following a significant nuclear incident, onsite conditions could be stabilized and the site decontaminated. The requirements of 10 CFR 50.54(w)(1) and the existing level of onsite insurance coverage for CR-3 are predicated on the assumption that the reactor is operating. However, CR-3 is a permanently shutdown and defueled facility. As explained in section III of this document, the permanently defueled status of the facility has resulted in a significant reduction in the number and severity of potential accidents, and correspondingly, a significant reduction in the potential for and severity of onsite property damage. The proposed reduction in the amount of onsite insurance coverage does not impact the probability or consequences of potential accidents. The proposed level of insurance coverage is commensurate with the reduced risk and reduced cost consequences of potential

nuclear accidents at CR-3. Therefore, the NRC staff concludes that granting the requested exemption will not present an undue risk to the health and safety of the public.

C. Consistent with the Common Defense and Security

The proposed exemption would not eliminate any requirements associated with physical protection of the site and would not adversely affect DEF's ability to physically secure the site or protect special nuclear material. Physical security measures at CR-3 are not affected by the requested exemption. Therefore, the proposed exemption is consistent with the common defense and security.

D. Special Circumstances

Under 10 CFR 50.12(a)(2)(ii), special circumstances are present if the application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule. The underlying purpose of 10 CFR 50.54(w)(1) is to provide reasonable assurance that adequate funds will be available to stabilize conditions and cover onsite cleanup costs associated with site decontamination, following an accident that results in the release of a significant amount of radiological material. As explained in section III of this document, because CR-3 is permanently shut down and defueled, the radiological consequences of design-basis accidents or other credible events at CR-3 cannot possibly exceed the limits of the EPA PAGs at the exclusion area boundary. The licensee has performed site-specific analyses of highly unlikely, beyond-design-basis zirconium fire accidents involving the stored irradiated fuel in the SFP. The analyses show that as of September 26, 2013, the probabilities of such an accident are minimal. The NRC staff's evaluation of the licensee's analyses confirm this conclusion.

The NRC staff also finds that DEF's proposed \$50 million level of onsite insurance is consistent with the bounding cleanup and decontamination cost, as discussed in SECY-96-256, to account for hypothetical rupture of a large liquid radiological waste tank at the CR-3 site, should such an event occur. Therefore, the staff concludes that the application of the current requirements in 10 CFR 50.54(w)(1) to maintain \$1.06 billion in onsite insurance coverage is not necessary to achieve the underlying purpose of the rule for the permanently shutdown and defueled CR-3 reactor.

Under 10 CFR 50.12(a)(2)(iii), special circumstances are present whenever compliance would result in undue hardship or other costs that are significantly in excess of those contemplated when the regulation was adopted, or that are significantly in excess of those incurred by others similarly situated. The NRC staff concludes that if the licensee were required to continue to maintain an onsite insurance level of \$1.06 billion, the associated insurance premiums would be in excess of those necessary and commensurate with the radiological contamination risks posed by the site. In addition, such insurance levels would be significantly in excess of other decommissioning reactor facilities that have been granted similar exemptions by the NRC.

The NRC staff finds that DEF's compliance with the existing rule would result in an undue hardship or other costs that are significantly in excess of those contemplated when the regulation was adopted and are significantly in excess of those incurred by others similarly situated.

Therefore, the special circumstances required by 10 CFR 50.12(a)(2)(ii) and 10 CFR 50.12(a)(2)(iii) exist.

E. Environmental Considerations

The NRC approval of the exemption from insurance or indemnity requirements belongs

to a category of actions that the Commission, by rule or regulation, has declared to be a categorical exclusion from further environmental analysis, after first finding that the category of actions does not individually or cumulatively have a significant effect on the human environment. Specifically, the exemption is categorically excluded from further analysis under § 51.22(c)(25).

Under 10 CFR 51.22(c)(25), granting an exemption from the requirements of any regulation in Chapter I of 10 CFR is a categorical exclusion provided that: 1) there is no significant hazards consideration; 2) there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite; 3) there is no significant increase in individual or cumulative public or occupational radiation exposure; 4) there is no significant construction impact; 5) there is no significant increase in the potential for or consequences from radiological accidents; and 6) the requirements from which an exemption is sought involve: surety, insurance, or indemnity requirements.

Utilizing the standards set forth in 10 CFR 50.92, the NRC has determined that approval of the exemption request involves no significant hazards consideration because reducing the licensee's onsite property damage insurance for CR-3 does not: 1) involve a significant increase in the probability or consequences of an accident previously evaluated; or 2) create the possibility of a new or different kind of accident from any accident previously evaluated; or 3) involve a significant reduction in a margin of safety. The exempted financial protection regulation is unrelated to the operation of CR-3. Accordingly, there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite; and no significant increase in individual or cumulative public or occupational radiation exposure. The exempted regulation is not associated with construction, so there is no significant construction impact. The exempted regulation does not concern the source term (i.e., potential amount of radiation in an accident), nor mitigation. Therefore, there is no significant increase in

the potential for, or consequences of, a radiological accident. In addition, there would be no significant impacts to biota, water resources, historic properties, cultural resources, or socioeconomic conditions in the region. The requirement for onsite property damage insurance may be viewed as involving surety, insurance, or indemnity matters.

Therefore, pursuant to 10 CFR 51.22(b) and 51.22(c)(25), no environmental impact statement or environmental assessment need be prepared in connection with the approval of this exemption request.

V. Conclusions

Accordingly, the Commission has determined that pursuant to 10 CFR 50.12(a), the requested exemption is authorized by law, will not present an undue risk to the public health and safety, and is consistent with the common defense and security. Also, special circumstances are present. Therefore, the Commission hereby grants DEF an exemption from the requirements of 10 CFR 50.54(w)(1), to permit the licensee to reduce its onsite property damage insurance to a level of \$50 million.

The exemption is effective upon issuance.

Dated at Rockville, Maryland, this 16th day of March 2016.

For the Nuclear Regulatory Commission.

/RA/

John R. Tappert, Director,
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