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**Comment On:** NRC-2020-0277-0001
Notice of Intent To Conduct Scoping Process and Prepare Environmental Impact Statement; NextEra Energy Point Beach, LLC, Point Beach Nuclear Plant, Units 1 and 2

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## Submitter Information

**Name:** Jan Boudart
**Address:**
Chicago, IL, 60626
**Email:** janboudart1@gmail.com
**Phone:** 415.301.1129

## General Comment

Please see attached file on embrittlement of the reactors at Point Beach NPP

## Attachments

210303JBComments2NRC

SCOPING COMMENTS REGARDING THE PROPOSED LICENSE EXTENSION
FOR THE POINT BEACH NUCLEAR POWER PLANT
Re: Docket ID: NRC-2020–0277 Point Beach Nuclear Plant, Units 1 & 2
MARCH 3, 2021
submitted by

Jan Boudart

## Introduction

This comment is intended to explain why the added risk of reactor-vessel embrittlement must be part of the EIS. Please include scenarios analyzing how accidents that involve cracking of an embrittled reactor vessel would affect the environment and the community and how they would be handled as Point Beach NPP ages.

Point Beach is two (Units 1 and 2) two-loop pressured water reactors. The pressurized loop is used to keep the core cool and transfer heat to a steam generator. The reactor vessel is subject to extreme heat and neutron bombardment for a minimum of 94% of its lifetime. These two factors, heat and neutron bombardment, change the quality of the pressure vessel material, i.e. stainless steel. The change decreases the flexibility of the material and increases its brittleness. It is thought that such a problem can be mitigated by placing the pressure vessel into the conditions present at the manufacture of the stainless-steel alloy (annealing). But such a process would be very expensive and the increase in flexibility of the material might not be certain enough for the utility to countenance such an expense. To my knowledge annealing has not been tried in the U.S.

The danger in a brittle reactor vessel is that it might crack or break in stressful situations like earthquakes or floods. If it did break, it couldn't contain water and temperatures in the fuel rods could increase to the melting point of the fuel and its cladding. As the fuel melts and supporting material breaks down, critical mass of the fuel could generate a nuclear explosion.

But short of the nuclear explosions scenario, a breakdown in the fuel rods, could expose the zircalloy cladding to the extreme temperature where zirconium snatches oxygen out of gaseous water molecules, releasing the hydrogen to form a gas having a powerful expansive force. Such a force could suddenly overcome the strength of both the pressure vessel and the containment structure resulting in Fukushima-like explosions that lifted radionuclides into the air and scattered them in dangerous fallout.

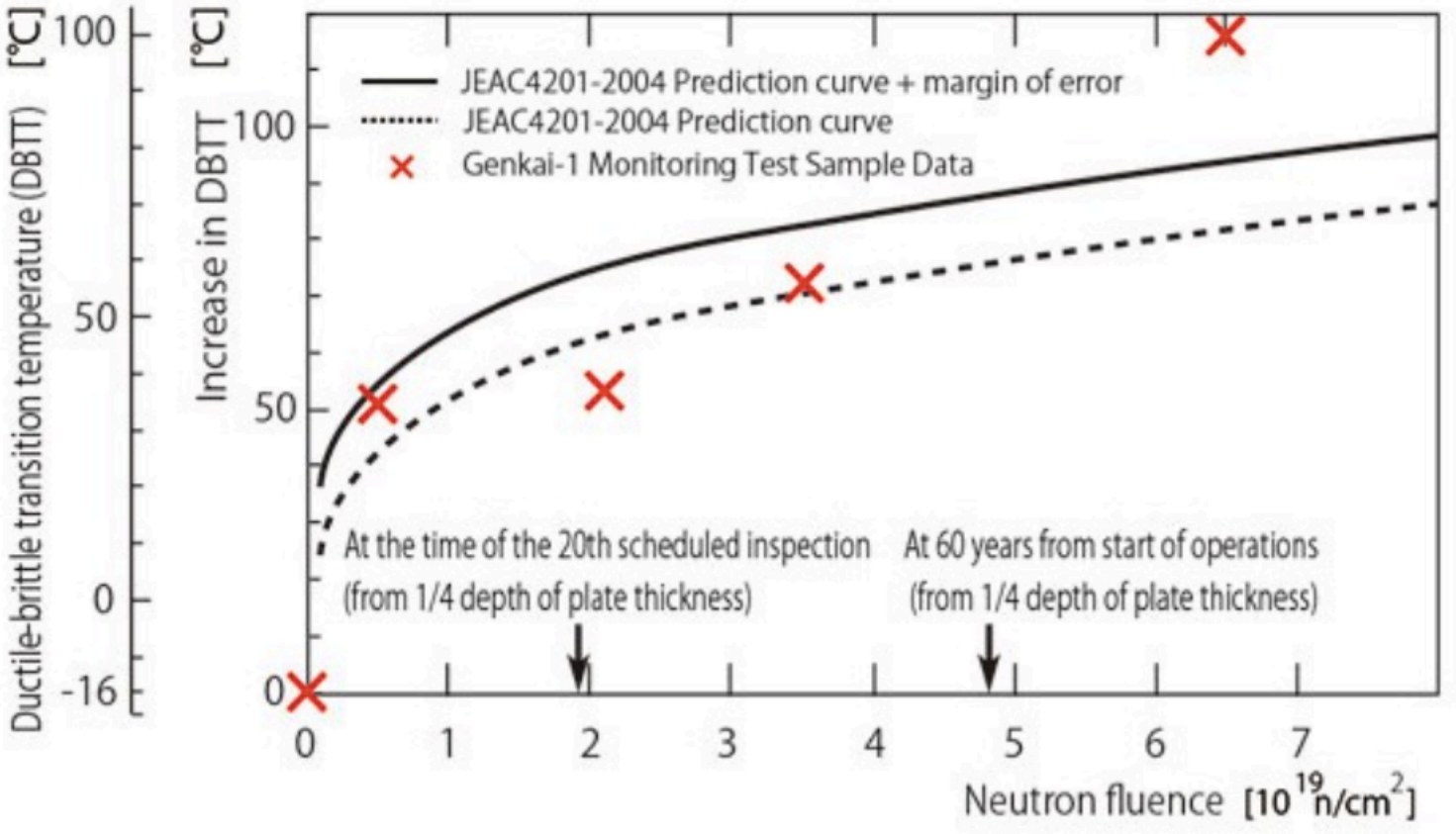
This is why embrittlement of the pressure vessel is recognized as a menace. Allowing the pressure vessel to become embrittled is playing Russian Roulette with a beyond-design, unforeseeable natural phenomenon like an earthquake, a derecho, unexpectedly high water in Lake Michigan, or a loss of water in the primary loop from an undetectable leaky or broken pipe.

## Point Beach specifics

Point beach reactor vessels have become embrittled. But presumably the NRC requires their embrittlement to be monitored by removing "coupons" from the body of the reactor vessel and subjecting these samples to a Charpy test YouTube.com/watch?v=tpGhqQvftAo\ to see if they can tolerate design-basis accidents. However, if the example of Palisades, a one-reactor unit, is any example, such monitoring is wishful thinking. All data from one of the coupon tests has been lost, misplaced or it never existed. After a much-too-long interval a coupon was to be tested in 2019, but the NRC exempted that test because Palisades is scheduled for shut-down in 2022.

But the Japanese, as they began to re-instate their nuclear fleet after the Fukushima episode, have physically tested at least one reactor, the Genkai 1, and found it too brittle to consider starting up as it approached 40 years of operation (commissioned 1975).

The example of Genkai 1 is definitely a cautionary tale. Computer models of embrittlement made a prediction that did not square with the reality of the physical test. In figure 1, the physical tests are shown with red Xs, and the computer model is the solid line (that allows for the margin of error). After




almost 40 years of operation Genkai 1 was above the 70-year level of the curve. Embrittlement did not conform to the algorithms on which predictions were based.

Even if the NRC required Point Beach to perform ASME testing on coupons placed in the reactor vessel, there would not be enough of them to continue the monitoring through to 60 years of reactor life.

Therefore, the EIS must treat the problem of reactor embrittlement including the environmental effect of shutting down Point Beach instead of letting its embrittlement menace be exacerbated by continuing its operation up to 60 or 80 years.