Florida Power
CORPORATION

September 3, 1980

File: 3-0-3-a-3

Mr. Robert W. Reid
Branch Chief
Operating Reactors Branch #4
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
NRC Letter Dated July 1, 1980 Requesting
Additional Information on Fuel Assembly Holddown
Springs

Dear Mr. Reid:

By letter dated July 1, 1980, you requested additional information on Fuel Assembly Holddown Springs for Crystal River Unit 3. This letter responds to questions of the subject letter.

Should you have any questions concerning this subject, please contact this office.

Very truly yours,

FLORIDA POWER CORPORATION

Patsy Y. Baynard
Patsy Y. Baynard
Manager
Nuclear Support Services

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STATE OF FLORIDA

COUNTY OF PINELLAS

P. Y. Baynard states that she is the Manager, Nuclear Support Services Department of Florida Power Corporation; that she is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission the information attached hereto; and that all such statements made and matters set forth therein are true and correct to the best of her knowledge, information and belief.

Patsy Y. Baynard
P. Y. Baynard

Subscribed and sworn to before me, a Notary Public in and for the State and County above named, this 3rd day of September, 1980.

Margaret A. Hereford
Notary Public

Notary Public, State of Florida at Large,
My Commission Expires: June 8, 1984

PYB/MAHNotary(DN-98)

FLORIDA POWER CORPORATION RESPONSES TO NRC QUESTIONS ON HOLDDOWN SPRINGS

Question 1: (If the reactor is down for refueling and the reactor vessel head is off) Examine all fuel assembly holddown springs in the core and in the spent fuel pool and report the number and extent of damage on the springs and affected assembly components.

Response: A total of 233 fuel assemblies in the core and spent fuel pools were examined using remote video equipment. This represents all of the fuel previously used for power operation. One broken holddown spring was found. No other damage was observed on any other assembly or component.

Question 2: Provide a discussion of the safety significance of operating with one or more broken springs in the core. Your discussion should include, but not necessarily be limited to the following:

a. Assume the holddown spring is broken, provide an estimate of the flow conditions under which the assemblies would be levitated. (Provide the value of the force required to lift the assembly, the flow conditions under which that force would be supplied, the number of coolant pumps that would be in operation under such conditions, and the schedule of reactor operations under which such conditions might have been achieved.) Contrarily, demonstrate the margin between the assesmbly weight and the calculated maximum applied lift-off force, if there is such margin.

Response: An analysis was performed for Crystal River 3 assuming 112% design flow and no spring holddown force at the condition of 100% power, and also at a condition of 500°F isothermal. The latter condition represents the fourth reactor coolant startup temperature. Holddown requirements are greatest at the lower coolant temperature. At this limiting condition no fuel assemblies in control rod locations are expected to lift. Open core locations require from -23 to + 81 lbs. of holddown force to prevent lift. All broken springs observed in B&W units to date have retained at least 100 lbs. of lift force. Thus it is not expected that fuel assemblies with broken holddown springs will experience lift.

Question b:	Have any loose assembly parts (i.e., broken springs, pieces of cladding) been observed anywhere in the primary system? Describe your methods for loose part detection. Are there installed noise detectors capable of detection of broken springs, pieces of cladding, or vibrating assemblies?
Response:	There has been only one instance of a loose assembly part at CR-3. In March of 1978 a burnable poison rod assembly worked its way from its normal position in the core to the upper tubesheet area of B-OTSG. This incident has been previously reported in detail to the NRC. For this particular loose part event our loose parts monitoring system was able to detect the presence of parts in the steam generator.

The single broken holddown spring found at CR-3 was not considered to be a loose part. The presence of two spring parts would not have been detectable with the LPMS.

The LPMS used at CR3 was designed, installed and tested by B&W. It employs strategically placed accelerometers coupled with signal conditions. Output in the control room consists of alarm modules, meters, audible indication and connection to a real time spectrum analyzer. the system is fully described in B&W's Reactor Diagnostic System Instruction/Technical Manual NSR-109.

The installed loose parts monitoring system has a minimum sensitivity of detecting a .25 lbm part impacting with an energy of .5 ft-lbf. This threshold energy level permits the detection of significant impacts in the RCS. However, not all loose parts or internal component failures (i.e. broken holddown springs) will reach this energy level. Furthermore, the background noise level at some locations tends to mask out potential loose part indications. Therefore, each case of a loose assembly part will be slightly different depending upon type of failure, impact energy level, location and background noise level.

CR-3 neutron noise systems, which is also described in B&W document NSR-109, is capable of detecting and indicating core internals movements. To date there has not been indication of any assembly movement.

Question c.	Have there been any excore or in-core neutron detector indications of levitated assesmblies? Describe the expected reactivity effects that would result from lift-off or reseating of assemblies with broken holddown springs. What efforts are being utilized to detect loose assemblies by either nuclear or mechanical monitoring devices?

Response: There have been no indications of levitated asssemblies by either the in-core or excore neutron detectors. As described in the response to 2a, asssemblies are not expected to experience lift under any operating conditions, therefore, reactivity effects would not be expected. Methods for detecting internals movement are described in the response to 2b.

Question d: Have there been any observed indications of lateral repositioning of loose assemblies? Describe the methods used to detect lateral asssembly motion. Described under 2a, assemblies are not expected to experience lift therefore lateral repositioning effects are not expected.

Response: There have been no indications of loose assemblies or lateral repositioning of any kind. Methods of detecting internals movement are described in the response to 2b. As described under 2a, assemblies are not expected to experience lift, therefore, lateral repositioning effects are not expected.

Question e: (i) Describe the degree of "worst-case" mechanical damage that would be expected as a result of movement of a "loose" assembly (one with a broken spring) against adjacent asssemblies, core baffle, or other core components.

(ii) Discuss the results of flow tests or other experiments that have provided measurements of axial or lateral vibratory motion of an assembly after lift-off or that would otherwise support the response to Q 2.e(1).

Response: As described under 2a, movement of an assembly with a broken spring is not expected. As a result, no mechanical damage would be expected.

Question 3: Provide a description of the cause of the failures and corrective action to reduce the likelihood of future failures at your facility.

Response: The spring failure at Crystal River 3 was caused by metal fatigue which is thought to have propagated from a very small crack in the spring. Attention to the possibility for this type of failure will reduce the likelihood for this type of failure in the future through improvements in spring requirements.