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From:
John Humphrey

TACs:
MD0041

To:
J.E. Dyer

***** YELLOW *****

For Signature of:

Routing:

Description:

Mark I BWR Delta P Method That the NRC Has Successfully Used to Regulate
Operating Plant Safety

Assigned To:
DORL

Contact:
HANEY, CATHERINE

Special Instructions:

YT - DORL
due 3-17-06

Rec 2-9-06

25967 Mar Vista Court
Los Gatos, CA 95033
January 16, 2006

Mr. James Dyer, Director
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Congratulations on the 30th Anniversary of the Mark I BWR Delta P Method
That the NRC Has Successfully Used to Regulate Operating Plant Safety

Dear Mr. Dyer,

I am writing this letter to offer my congratulations to the NRC on the upcoming 2/14/2006 30th Anniversary of the adoption of Mark I BWR Drywell Pressurization used to successfully regulate Mark I operating plant safety and to request confirmation of the current status of Delta P use in the operating Mark I BWR plants.

Background

Thirty years ago while working as a Senior engineer at the General Electric Nuclear Energy division on the Mark I containment program, I invented the Drywell Differential Pressure method to dramatically reduce the vent clearing loads on the wetwell for a postulate DBA. In late 1975 subscale tests at GE had discovered that the downward force on the wetwell was approximately equal to the pressure at the vent exit when the vents cleared (and the pressurized drywell air first entered the torus wetwell) applied over the projected area of the wetwell. Following this downward load, the resulting expanding air bubble accelerated the suppression pool upward, compressed the wetwell air volume and led to a transient upward load on the wetwell.

When the magnitude of these potential DBA pool swell loads became understood and analyzed for the Mark I plants, I recall Vermont Yankee voluntarily shut down on 1/26/76 and other plants were considering similar actions.

I had joined GE two years earlier from aerospace. Whereas the standard approach in power plant design is to design for existing loads, my training in aerospace was to modify the phenomena to reduce the loads. This mindset led me to search for ways to mitigate the postulated Mark I DBA pool swell event. The simplest way to reduce vent clearing pressure would be to reduce the water leg in the downcomers. However reducing the length of the downcomers could also affect their pressure suppression function. At this point the "blowing bubbles with a straw" phenomena occurred to me. Simply creating a small positive differential pressure between the drywell and the wetwell would maintain a reduced water leg in the downcomers which should result in a significantly earlier and lower pressure vent clearing with a substantial mitigation of the pool swell event.

I presented my proposed "phenomena fix" and my fellow GE engineers running the subscale test agree to conduct one "unofficial" test at the end of their current test series. That test with full delta P (zero water leg inside the downcomer) showed a 4:1 reduction in wetwell downward load

and very substantial reduction in upward load. The technical understanding that flowed from that single test and subsequent confirmatory delta P tests allowed GE to document to the NRC that Delta P operation could assure safe short term operation of the Mark I plants. As recorded in the following article from the San Jose Mercury News of Feb 14, 1976, Vermont Yankee was allowed to restart under delta P operation.

6A Sat., Feb. 14, 1976 *San Jose Mercury News*

SAFETY MOVE OKAYED

Yankee A-Plant Fires Up Again

VERNON, Vt. (AP) — The Vermont Yankee Nuclear Power Corp. plant began firing up its reactor Friday afternoon, after being idled for more than two weeks by safety problems.

The 540-megawatt reactor was started immediately after the federal Nuclear Regulatory Commission announced it had approved the company's plans to bolster a safety system that had been questioned.

"We're starting back on immediately. We'll be back on line in 12 hours and at full power in two days," said Vermont Yankee spokesman Lawrence Keyes.

The commission approved Vermont Yankee's proposal to install steel supports around a large doughnut-shaped chamber that's designed to contain radioactive steam in an emergency.

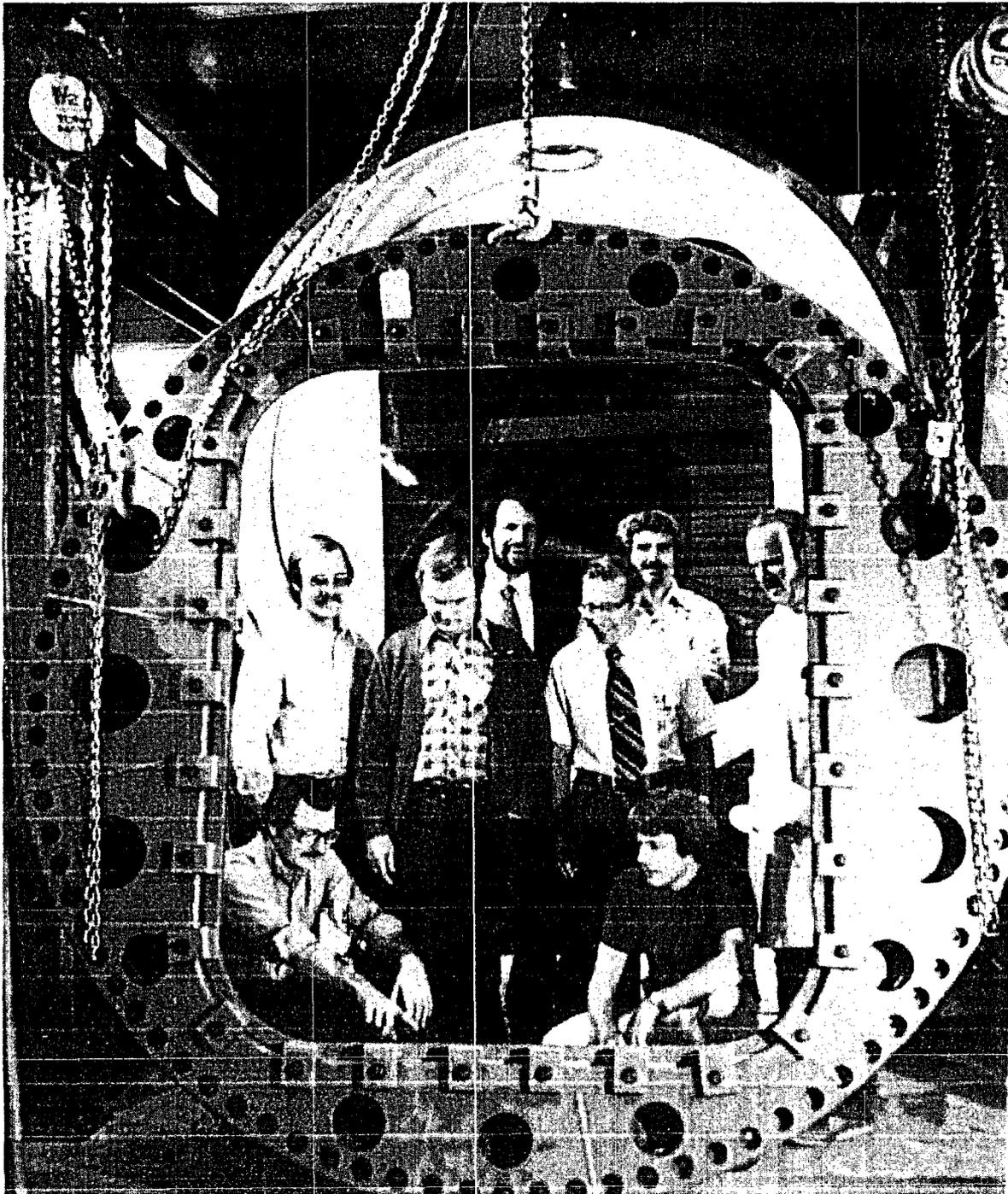
In addition, the commission said the plant could operate for 30 days while the supports were being erected by simply changing the air pressure in its reactor. The pressure change was proposed by Vermont Yankee as a temporary method of eliminating the potential safety hazards in the chamber.

I recall that the NRC subsequently directed the Mark I plants to institute a 1 psi drywell differential pressure as a condition of continued short term plant operation.

As a result, I believe of my Delta P invention, I was appointed Task Manager of the GE's new 1/4 Scale Mark I pressure suppression test facility (QSTF). For the next several years I first directed the design and construction of this facility. The picture below shows the fully constructed QSTF

prior to testing with the key program personnel from GE (I'm second row on the right), Nuclear Services and Aerotherm. I then had the opportunity to direct a comprehensive series of both standard plant and plant unique tests that following NRC review confirmed: 1) that this large scale test facility generated loads defensible for full scale plant analysis and 2) that the plant unique loads (mostly mitigated using positive drywell differential pressurization) provided adequate operating margins.

Now 30 years later the NRC is to be congratulated on this successful regulatory action that restored plant operating margins and enabled these plants to continue providing America's energy needs.



REQUEST: I am now 60 and partially retired. As I look back on my career, I am proud of my contributions to the continued safe operation of the Mark I BWR plants through the invention of the delta P method and its verification in the Mark I QSTF. I asked some of my friends who still work in the nuclear industry how many of the Mark I plants that adopted delta P in 1976 were still operating under delta P. They understood that all but Millstone were still operating and that all those adopting delta P were still using that operating method.

For my career accomplishment records I am requesting the NRC to confirm for me the list of Mark I BWR plants that are still operating with drywell differential pressure.

Thank you again for the NRC's role in assuring safe nuclear power to meet America's energy needs and in advance for providing me this requested information.

Sincerely,



John M. Humphrey

CC: Mr. Bruce Boger, Associate Director of Operating Reactor Oversight and Licensing
By separate original