



General Electric Company
175 Curtin Avenue, San Jose, CA 95125

February 16, 1993

Docket No. STN 52-001

Chet Poslusny, Senior Project Manager
Standardization Project Directorate
Associate Directorate for Advanced Reactors
and License Renewal
Office of the Nuclear Reactor Regulation

Subject: **Submittal Supporting Accelerated ABWR Review Schedule - SSAR Chapter 14, Initial Test Program**

Dear Chet:

Enclosed is the GE follow-up action to the February 11, 1993 phone call with the NRC Staff pertaining to SSAR Chapter 14, Initial Test Program.

Sincerely,

Jack Fox
Advanced Reactor Programs

cc: John Chambers (GE)
Norman Fletcher (DOE)
H. J. Yang (GE)

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GE Follow-up Action to 2/11/93 Phone Call with NRC Staff
re: SSAR Chapter 14 - Initial Test Program

Item 1 - Applicability of Reg Guide 1.140

Staff Comment - The staff noted that in Section 14.2.7, "Conformance of Test Program with Regulatory Guides", Reg Guide 1.140, "Design, Testing and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light Water Cooled Nuclear Power Plants", was included as being applicable while in Table 1.8-20, "RGs Applicable to ABWR", it was listed as being not applicable.

GE Response - Table 1.8-20 is correct. The ABWR does not include any "normal" atmosphere cleanup systems. The only atmosphere cleanup systems that exist in the ABWR design are the Standby Gas Treatment System and a dedicated portion of the Main Control Room ventilation system. These are ESF systems and therefore subject to Reg Guide 1.52, "Design, Testing and Maintenance Criteria for Post Accident Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants". No other ABWR ventilation systems perform an atmosphere cleanup function, and thus they have no equipment (HEPA filters, charcoal beds, etc.) subject to the requirements of Reg Guide 1.140. Therefore, the reference to RG 1.140 in Section 14.2.7 of the SSAR will be deleted in a future Amendment (see attached markup).

Item 2 - Radioactive Waste Systems

NRC Comment - Section 14.2.12.2.38, "Radioactive Waste Systems Performance" describes the power ascension testing for both gaseous and liquid radwaste systems while Table 14.2-1, "Power Ascension Test Matrix", includes only an entry entitled "Liquid RadWaste Systems Performance".

GE Response - The entry in Table 14.2-1 was intended to include testing of both gaseous and liquid radwaste systems. This intent will be clarified in a future SSAR amendment (see attached markup).

Item 3 - COL Items

NRC Comment - In Section 14.2.13, "COL License Information - Initial Test Program", it is stated that the COL applicant is to provide the final list of tests proposed to be exempt from license conditions requiring NRC preapproval of changes to the testing specified. *Justification* for each item on this list should also be provided.

GE Response - GE agrees. This is what was intended, although not explicitly stated. This will be clarified, via addition of an explicit requirement, in a future SSAR amendment (see attached markup).

Item 4 - Cross-Reference to Utility Organization

NRC Comment - In Section 14.2.2.1, "Normal Plant Staff", a reference is made back to Chapter 13 for information regarding the plant owner/operator's organization. However, in the ABWR SSAR, that particular information is listed as being out of scope.

GE Response - GE will revise the wording of 14.2.2.1 to clarify that such information is the responsibility of the COL applicant, and thus will be supplied at a later date (see attached markup).

- (7) Regulatory Guide 1.52--*Design, Testing, and Maintenance Criteria for Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants.*
- (8) Regulatory Guide 1.56--*Maintenance of Water Purity in Boiling Water Reactors.*
- (9) Regulatory Guide 1.95--*Protection of Nuclear Power Plant Control Room Operators Against an Accidental Chlorine Release.*
- (10) Regulatory Guide 1.108--*Periodic Testing of Diesel Generators Used as Onsite Electric Power Systems at Nuclear Power Plants.*
- (11) Regulatory Guide 1.139--*Guidance for Residual Heat Removal.*
- (12) Regulatory Guide 1.140--*Design, Testing and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Absorption Units of Light Water Cooled Nuclear Power Plants.*

14.2.8 Utilization of Reactor Operating and Testing Experience in the Development of Test Program

Since every reactor/plant in a GE BWR product line is an evolutionary development of the previous plant in the product line (and each product line is an evolutionary development from the previous product line), it is evident that the ABWR plants have the benefits of experience acquired with the successful and safe startup of more than 30 previous BWR/1/2/3/4/5/6 plants. The operational experience and knowledge gained from these plants and other reactor types has been factored into the design and test specifications of GE supplied systems and equipment that will be demonstrated during the preoperational and startup test programs. Additionally, reactor operating and testing experience of similar nuclear power plants obtained from NRC Licensee Event Reports and through other industry sources will be utilized to the extent practicable in developing and carrying out the initial test program.

14.2.9 Trial Use of Plant Operating and Emergency Procedures

To the extent practicable throughout the pre-operational and initial startup test program, test procedures will utilize operating, emergency, and abnormal procedures where applicable in the performance of tests. The use of these procedures is intended to do the following:

- (1) prove the specific procedure or illustrate changes which may be required;
- (2) provide training of plant personnel in the use of these procedures; and
- (3) increase the level of knowledge of plant personnel on the systems being tested.

A testing procedure utilizing an operating, emergency, or abnormal procedure will reference the procedure directly, extract a series of steps from the procedure, or both in a way that is optimum to accomplishing the above goals while efficiently performing the specified testing.

14.2.10 Initial Fuel Loading and Initial Criticality

Fuel loading and initial criticality are conducted in a very controlled manner in accordance with specific written procedures as part of the startup test phase (see Subsection 14.2.12.2). Approval for commencement of fuel loading is granted by the NRC after it has been verified that all prerequisite testing has been satisfactorily completed. However, there may be unforeseen circumstances that arise that would prevent the completion of all preoperational testing (including the review and approval of the test results) that would not necessarily justify the delay of fuel loading. Under such circumstances, the applicant referencing the ABWR design may decide to request permission from the NRC to proceed with fuel loading. If portions of any preoperational tests are intended to be conducted, or their results approved, after commencement of fuel loading, then the following shall be documented in such a request: (1) list each test; (2) state which portions of each test will be delayed until after fuel loading; (3) provide technical justification for delaying these portions; and (4) state when each test will be completed and the results approved.

Table 14.2-1

POWER ASCENSION TEST MATRIX (Continued)

POWER ASCENSION TEST	TESTING PLATEAU					NOTES
	OV	HU	LP	MP	HP	
Loss of Feedwater Heating					✓	At 80-90% CTP, 100% Flow during HP
Feedwater Pump Trip					✓	
Recirculation Pump Trip						
One RIP Trip				✓	✓	At near rated flow
Two RIP Trip				✓	✓	At near rated flow
Three RIP Trip				✓	✓	At near rated flow
Shutdown from Outside the Control Room			✓			At >10% Generator Load
Loss of Turbine Generator and Offsite Power			✓			At 10-20% rated power
Turbine Trip and Generator Load Rejection						
Load Rejection within Bypass Capacity			✓			
Turbine Trip				✓		
Full Power Load Rejection					✓	
Reactor Full Isolation					✓	
Offgas System Performance		✓	✓	✓	✓	
Power Conversion Equipment Performance		✓	✓	✓	✓	
Loose Parts Monitoring System Baseline Data		✓	✓	✓	✓	
Liquid RadWaste Systems Performance			✓		✓	

(Liquid and Gaseous)

ITEM #2

- ✓ = Testing required in plateau; alternative test conditions or exceptions identified in detailed testing specification
 - ✓ = Testing not specifically required in indicated plateau, but to be done in conjunction with other testing, or at specific testing conditions, generally within indicated plateau; see NOTES column for explanation
- OV = Open Vessel HU = Nuclear Heatup LP = Low Power MP = Mid Power HP = High Power

14.2.13 COL License Information - Initial Test Program

The preceding discussion of preoperational and startup tests were limited to those systems and components within, or directly related to, the ABWR Standard Plant. Other testing, with respect to site specific aspects of the plant will be necessary to satisfy certain ABWR requirements. Testing of such systems and components shall be adequate to demonstrate conformance to such requirements as defined throughout the specific chapters of the SSAR. Below are systems that may require such testing:

- (1) electrical switchyard and equipment;
- (2) the site security plan;
- (3) personnel monitors and radiation survey instruments; and
- (4) the automatic dispatcher control system (if applicable).

Also to be supplied by the COL applicant is the startup administration manual described in Section 14.2.4, which will describe, among other things, what specific permissions are required for the approval of test results and the permission to proceed to the next testing plateau.

The COL applicant shall also provide a list of those tests to be performed as part of the power ascension test phase that are proposed to be exempt from operating license conditions requiring NRC prior approval for major test changes. Reg Guide 1.68 specifies criteria (see Regulatory Position C.1) for determining what structures, systems, components and design features are required to be tested during the power ascension test phase in accordance with the requirements therein. Testing of such structures, systems, components and design features is then subject to license conditions requiring NRC approval for major test changes. For completeness, the testing described in Subsection 14.2.12.2 includes testing of a limited number of ABWR structures, systems, components and design features that do not meet the referenced Reg Guide 1.68 criteria, and are thus exempt from such license conditions.

Of the tests described in Subsection 14.2.12.2 for the ABWR Standard Plant the following tests, or designated portions thereof, are thus candidates for proposed exemptions from operating license conditions requiring NRC prior approval for major test changes:

- (1) 14.2.12.2.13 Recirculation Flow Control - except for those features intended to limit maximum core flow;
- (2) 14.2.12.2.21 Reactor Water Cleanup System Performance
- (3) 14.2.12.2.23 Plant Cooling/Service Water System Performance - those portions pertaining to the turbine building and service water systems;
- (4) 14.2.12.2.24 HVAC System Performance - Those portions pertaining to the normal HVAC system and its associated nonessential chilled water system;
- (5) 14.2.12.2.25 Feedwater Pump Trip; and
- (6) 14.2.12.2.39 Steam and Power Conversion System Performance.

The COL applicant shall provide the final list of tests proposed to be exempt from such license conditions, including adoption or augmentation of the above list, as appropriate.

along with appropriate justifications,

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14.2.1.3 Startup Test Objectives

After the preoperational test phase has been completed, the startup phase begins with fuel loading and extends to commercial operation. This phase may be generally subdivided into the following four parts:

- (1) fuel loading and shutdown power level tests;
- (2) testing during nuclear heatup to rated temperature and pressure (approximately 5% power);
- (3) power testing from 5 to 100% of rated output; and
- (4) warranty demonstration.

The tests conducted during the startup phase consist of major and minor plant transients, steady state tests, and process control system tests all of which are directed towards demonstrating correct performance of the nuclear boiler and the various plant systems while at power.

The general objectives of the startup phase are as follows:

- (1) to achieve an orderly and safe initial core loading;
- (2) to accomplish all testing and measurements necessary to assure that the approach to initial criticality and subsequent power ascension is safe and orderly;
- (3) to conduct low-power physics tests sufficient to ensure that test acceptance criteria have been met;
- (4) to conduct initial heatup and hot functional testing so that hot integrated operation of all systems is shown to meet test acceptance criteria;
- (5) to conduct an orderly and safe power ascension program, with requisite physics and systems testing, to ensure that integrated plant operation at power meets test acceptance criteria;
- (6) to demonstrate, to the extent possible, the

adequacy of the various component, system and plant procedures; and

- (7) to conduct a successful warranty demonstration.

14.2.2 Organization and Staffing

14.2.2.1 Normal Plant Staff

Normal plant staff responsibilities, authorities, and qualifications are given in Chapter 13. During the construction cycle and the various testing phases additional staff is supplied by the plant owner/operator, GE, and others.

outside the scope of the ABWR Standard Plant and will be provided by the COL applicant, as discussed

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14.2.2.2 Startup Group

The startup group is an ad hoc organization created for the purpose of ensuring that the initial test program is conducted in an efficient, safe, and timely manner. The startup group is responsible for the planning, executing and documenting of all startup and testing related activities that occur between the completion of the construction phase and commencement of commercial operation of the plant. At completion of the startup program the startup group is dissolved and the normal plant staff assumes complete responsibility of the plant. Ideally, the startup group will include individuals assigned temporarily from the various departments and disciplines within the normal plant and utility organization. This will assure maximum transfer and retention of experience and knowledge gained during the startup program for the subsequent commercial operation of the plant. It is likely that the startup group will also include an augmented staff of individuals from other concerned parties such as the NSSS vendor (GE), the architect-engineer, and the plant constructor. The normal plant staff will be included in as many aspects of the test programs as is practicable considering their normal duties in the operation and maintenance of the plant.

14.2.2.3 General Electric Company

The General Electric Company (GE) is the supplier of the boiling water reactor (BWR) nuclear steam supply system (NSSS) and is responsible for generic and specific BWR