



SOUTHERN CALIFORNIA  
**EDISON**

An EDISON INTERNATIONAL™ Company

A Edward Scherer  
Manager of Nuclear  
Oversight and Regulatory Affairs

October 11, 2000

Mr. Ivan Kingsley  
Sonalysts, Inc.  
215 Parkway North  
Waterford, CT 06385

**Subject: Docket Nos. 50-361 and 50-362  
Comments on Answer Key for  
Generic Fundamentals Exam  
San Onofre Nuclear Generating Station**

Gentlemen:

On October 4, 2000, the written portion of the Generic Fundamentals Exam was administered at San Onofre with the exam results being transmitted to Sonalysts (via Fedex) on October 5, 2000. Sonalysts provided San Onofre with the exam answer key on October 6, 2000, and requested comments to be provided by October 11, 2000. The attachment to this letter provides the requested comments.

If you have any questions or require additional information, please contact Mr. Clay E. Williams at (949) 368-6707.

Sincerely,

A handwritten signature in black ink, appearing to read "A. Scherer".

cc: NRC Document Control Desk  
Glenn M. Tracy, Chief, Operator Licensing, Human Performance and Support  
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M003

## **Attachment**

## **Comment 1**

**Question:** 23 - Form A

This question gives four families of pump curves to choose from as possible results when centrifugal pump speed is decreased. Although Family 2 (response B) is the only possible correct answer, the curves shown are poor representations of the actual result as they imply a near linear relationship between the pump flow rate and the pump speed and head. In reality we would expect to see a significantly greater decrease in the pump head than in pump speed. As pump head varies with the square of the change in the pump speed, if the pump speed is reduced to one half of the original speed, pump head is decreases to one quarter of the original head.

**Recommendation:** Modify pump curves to more accurately reflect actual results.

## Comment 2

Question: 55 - Form A

Which one of the following events will cause control rod worth to become less negative?

- A. Fuel temperature decreases as the pellets come into contact with the fuel clad.
- B. RCS boron concentration increases by 5 ppm at 80% power with no rod motion.
- C. Reactor power is decreased from 100% to 90% with no rod motion.
- D. Early in core life, the concentration of burnable poison decreases.

Key Answer            B.      RCS boron concentration increases by 5 ppm at 80% power with no rod motion.

Recommendation: While response B is clearly a correct answer, response C is also a possibility. As power is decreased the neutron flux pattern shifts upward in the core due to the reduction in core  $\Delta T$  and a flatter temperature profile. The flatter temperature profile may result in a flatter axial flux profile which may actually reduce the flux in the vicinity of the controlling rod bank and hence decrease rod worth. Recommend changing response C to make it more clearly incorrect.

### Comment 3

Question: 93 - Form A

Which one of the following is the approximate percentage of total reactor vessel coolant flow that bypasses the fuel coolant channels in a reactor operating at 100% power?

- A. 0.01%
- B. 0.1%
- C. 1%
- D. 10%

Key Answer: D. 10%

Recommendation: Core bypass flow at SONGS 2 and 3 is given as 2.7%. None of the responses matches our stated flow rates. If our candidates had to choose one of the given responses, they would pick the response that was closest to our own value, response C. However, actual values for core bypass flow are not taught as part of GFE. We do not introduce plant specific values until we teach plant primary systems, we therefore believe that this question is inappropriate for a GFE examination. Recommend deleting this question from the current examination and from the exam bank.

#### **Comment 4**

Question: 95 - Form A

Which one of the following describes the basis for the Emergency Core Cooling Systems design criterion that maximum fuel clad temperature will not exceed 2200 °F in an accident?

- A. 2200 °F is approximately 500 °F below the fuel clad melting temperature.
- B. The rate of the zircaloy-steam reaction increases significantly above 2200 °F.
- C. If the fuel clad temperature reaches 2200 °F, departure from nucleate boiling is imminent.
- D. The differential expansion between the fuel pellets and the fuel clad becomes excessive above 2200 °F.

Key Answer: B. The rate of the zircaloy-steam reaction increases significantly above 2200 °F.

Recommendation: This question seems to go beyond the scope of GFE training and examines material which we do not teach until we present Mitigation of Core Damage (MCD). Recommend deleting this question from the current examination and the exam bank as it is inappropriate to GFE training.