



**Entergy  
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2CAN029304

U. S. Nuclear Regulatory Commission  
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Washington, DC 20555

Subject: Arkansas Nuclear One - Unit 2  
Docket No. 50-368  
License No. NPF-6  
1992 Annual Report For the Activity of the Primary Coolant

Gentlemen:

Arkansas Nuclear One, Unit 2 (ANO-2) Technical Specification 6.9.1.5.e requires an annual submittal of the results of the specific activity analysis in which the primary coolant exceeded the limits of Specification 3.4.8. The specific activity of the primary coolant, as required by Specification 3.4.8, shall be limited to a) less than or equal to 1.0 microcurie per gram DOSE EQUIVALENT I-131, and b) less than or equal to 100/E (Average Disintegration Energy) microcuries per gram. The purpose of this letter is to provide this information for 1992.

The limits of Specification 3.4.8 were exceeded on March 9, 1992 for approximately eight hours beginning at 2220 hours, and again on September 5, 1992, also for approximately eight hours, beginning at 0345 hours. The first occurrence began during the reduction in power for the forced outage to repair a leaking steam generator tube (2F92) and the second during the reduction in power prior to the ANO-2 ninth refueling outage (2R9). The cause for exceeding the limit each time was failed fuel pins in the Cycle 9 core. These failed fuel pins were removed from the core during 2R9.

It is known that fuel pellets will thermally expand more than the pin cladding and will also swell under operation, closing the gap between the pellets and the inner surface of the fuel pin cladding. ANO believes that during the runs at steady power prior to each shutdown, the swelling of the fuel pellets closed off much of the free path available for fission products and their daughters to exit the fuel pins through the defects. During the runs at steady power, an amount of radioisotopes being produced was being stored up within the defective fuel pins. Each of the times the reactor was shutdown, the fuel pellets thermally contracted, opening up the gap area and allowing a portion of this inventory of radioisotopes to exit the fuel pins.

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1/1

The coolant activity reached a maximum of 1.23 microcuries per milliliter (gram) during the March 9, 1992 occurrence and a maximum of 1.37 microcuries per gram during the September 5, 1992 occurrence.

The following attachments provide the information as requested by Technical Specification 6.9.1.5.e. Attachments 1 through 4 pertain to the March 9, 1992 occurrence; Attachments 5 through 8 to the September 5, 1992 occurrence.

Attachments 1 and 5 provide the reactor power history starting 48 hours prior to the first sample in which the limit was exceeded for each occurrence.

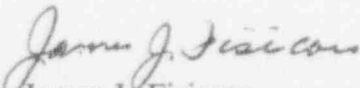
The results of the last isotopic analysis for radioiodine performed prior to exceeding the limit, the results of the analysis while the limit was exceeded, and the results of one analysis when the activity was subsequently reduced below the limits are provided in Attachments 2 and 6.

The history of the letdown system flow is in Attachments 3 and 7. These histories start at least 48 hours prior to the first sample exceeding the limit during each occurrence.

Attachments 4 and 8 include graphs of I-131, I-133 and the Iodine Dose Equivalent (IDE) concentration as a function of sample time for the duration of the specific activity above steady state levels.

This letter completes the 1992 annual reporting requirements for Technical Specification 6.9.1.5.e. Should you have any questions regarding this submittal, please contact me.

Very truly yours,

  
James J. Fisicaro  
Director, Licensing

JJF/JJD  
Attachments

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## ATTACHMENT 1

Arkansas Nuclear One - Unit 2  
Power History

| Date      | Time | % Power | Date      | Time | % Power |
|-----------|------|---------|-----------|------|---------|
| 07-Mar-92 | 100  | 99.865  | 08-Mar-92 | 2000 | 99.861  |
| 07-Mar-92 | 200  | 99.821  | 08-Mar-92 | 2100 | 99.894  |
| 07-Mar-92 | 300  | 99.984  | 08-Mar-92 | 2200 | 99.100  |
| 07-Mar-92 | 400  | 100.010 | 08-Mar-92 | 2300 | 99.910  |
| 07-Mar-92 | 500  | 100.080 | 09-Mar-92 | 0    | 99.910  |
| 07-Mar-92 | 600  | 99.858  | 09-Mar-92 | 100  | 99.888  |
| 07-Mar-92 | 700  | 99.872  | 09-Mar-92 | 200  | 99.927  |
| 07-Mar-92 | 800  | 99.875  | 09-Mar-92 | 300  | 99.804  |
| 07-Mar-92 | 900  | 100.100 | 09-Mar-92 | 400  | 100.110 |
| 07-Mar-92 | 1000 | 99.859  | 09-Mar-92 | 500  | 99.955  |
| 07-Mar-92 | 1100 | 100.030 | 09-Mar-92 | 600  | 99.963  |
| 07-Mar-92 | 1200 | 99.920  | 09-Mar-92 | 700  | 100.040 |
| 07-Mar-92 | 1300 | 99.850  | 09-Mar-92 | 800  | 99.818  |
| 07-Mar-92 | 1400 | 99.948  | 09-Mar-92 | 900  | 99.842  |
| 07-Mar-92 | 1500 | 99.861  | 09-Mar-92 | 1000 | 100.110 |
| 07-Mar-92 | 1600 | 100.110 | 09-Mar-92 | 1100 | 99.908  |
| 07-Mar-92 | 1700 | 100.010 | 09-Mar-92 | 1200 | 100.000 |
| 07-Mar-92 | 1800 | 100.070 | 09-Mar-92 | 1300 | 99.918  |
| 07-Mar-92 | 1900 | 100.050 | 09-Mar-92 | 1400 | 99.818  |
| 07-Mar-92 | 2000 | 99.884  | 09-Mar-92 | 1500 | 99.743  |
| 07-Mar-92 | 2100 | 99.989  | 09-Mar-92 | 1600 | 99.755  |
| 07-Mar-92 | 2200 | 99.878  | 09-Mar-92 | 1700 | 99.651  |
| 07-Mar-92 | 2300 | 99.880  | 09-Mar-92 | 1800 | 99.739  |
| 08-Mar-92 | 0    | 99.917  | 09-Mar-92 | 1900 | 99.954  |
| 08-Mar-92 | 100  | 100.140 | 09-Mar-92 | 2000 | 52.418  |
| 08-Mar-92 | 200  | 99.875  | 09-Mar-92 | 2100 | 1.894   |
| 08-Mar-92 | 300  | 99.999  | 09-Mar-92 | 2200 | 0.000   |
| 08-Mar-92 | 400  | 100.010 | 09-Mar-92 | 2300 | 0.000   |
| 08-Mar-92 | 500  | 99.865  |           |      |         |
| 08-Mar-92 | 600  | 99.896  |           |      |         |
| 08-Mar-92 | 700  | 99.930  |           |      |         |
| 08-Mar-92 | 800  | 99.928  |           |      |         |
| 08-Mar-92 | 900  | 99.886  |           |      |         |
| 08-Mar-92 | 1000 | 99.857  |           |      |         |
| 08-Mar-92 | 1100 | 99.836  |           |      |         |
| 08-Mar-92 | 1200 | 99.869  |           |      |         |
| 08-Mar-92 | 1300 | 99.846  |           |      |         |
| 08-Mar-92 | 1400 | 99.917  |           |      |         |
| 09-Mar-92 | 1500 | 99.912  |           |      |         |
| 08-Mar-92 | 1600 | 99.963  |           |      |         |
| 08-Mar-92 | 1700 | 99.846  |           |      |         |
| 08-Mar-92 | 1800 | 99.936  |           |      |         |
| 08-Mar-92 | 1900 | 99.902  |           |      |         |

## ATTACHMENT 2

ARKANSAS NUCLEAR ONE  
UNIT 2  
RCS RADIOCHEMISTRY

| SAMPLE ID | DATE     | TIME | I-131              | I-132             | I-133            | I-134            | I-135             | I-131DE  |
|-----------|----------|------|--------------------|-------------------|------------------|------------------|-------------------|----------|
|           |          |      | 8.04 d<br>(uci/cc) | 2.3 h<br>(uci/cc) | 21 h<br>(uci/cc) | 53 m<br>(uci/cc) | 6.7 h<br>(uci/cc) | (uci/cc) |
| RCS HL    | 02/24/92 | 922  | 6.48E-03           | 3.45E-02          | 2.68E-02         | 4.94E-02         | 3.83E-02          | 1.90E-02 |
| RCS HL    | 02/26/92 | 917  | 6.00E-03           | 3.47E-02          | 2.58E-02         | 5.28E-02         | 3.73E-02          | 1.82E-02 |
| RCS HL    | 02/28/92 | 920  | 6.65E-03           | 3.81E-02          | 2.85E-02         | 5.88E-02         | 4.17E-02          | 2.02E-02 |
| RCS HL    | 03/02/92 | 550  | 9.86E-03           | 4.15E-02          | 3.06E-02         | 6.05E-02         | 4.39E-02          | 2.44E-02 |
| RCS HL    | 03/04/92 | 540  | 6.54E-03           | 3.16E-02          | 2.69E-02         | 4.43E-02         | 3.97E-02          | 1.90E-02 |
| RCS HL    | 03/06/92 | 1750 | 7.02E-03           | 3.62E-02          | 2.76E-02         | 5.04E-02         | 3.89E-02          | 1.99E-02 |
| RCS HL    | 03/09/92 | 850  | 5.85E-03           | 3.75E-02          | 2.78E-02         | 5.37E-02         | 4.16E-02          | 1.91E-02 |
| RCS HL    | 03/09/92 | 2220 | 8.52E-01           | 4.84E-01          | 7.27E-01         | 9.83E-02         | 4.30E-01          | 1.10E+00 |
| RCS HL    | 03/10/92 | 20   | 9.68E-01           | 3.59E-01          | 7.91E-01         | 2.51E-02         | 3.99E-01          | 1.23E+00 |
| RCS HL    | 03/10/92 | 220  | 9.24E-01           | 2.24E-01          | 7.20E-01         |                  | 3.22E-01          | 1.15E+00 |
| RCS HL    | 03/10/92 | 620  | 7.28E-01           | 7.59E-02          | 5.04E-01         |                  | 1.70E-01          | 8.81E-01 |
| RCS HL    | 03/10/92 | 1020 | 5.92E-01           | 3.32E-02          | 3.64E-01         |                  | 9.12E-02          | 6.99E-01 |
| RCS HL    | 03/10/92 | 2020 | 4.04E-01           | 1.63E-02          | 1.83E-01         |                  | 2.26E-02          | 4.56E-01 |
| RCS SDC   | 03/11/92 | 900  | 2.57E-01           | 1.08E-02          | 8.07E-02         |                  | 4.15E-03          | 2.80E-01 |

ATTACHMENT 3

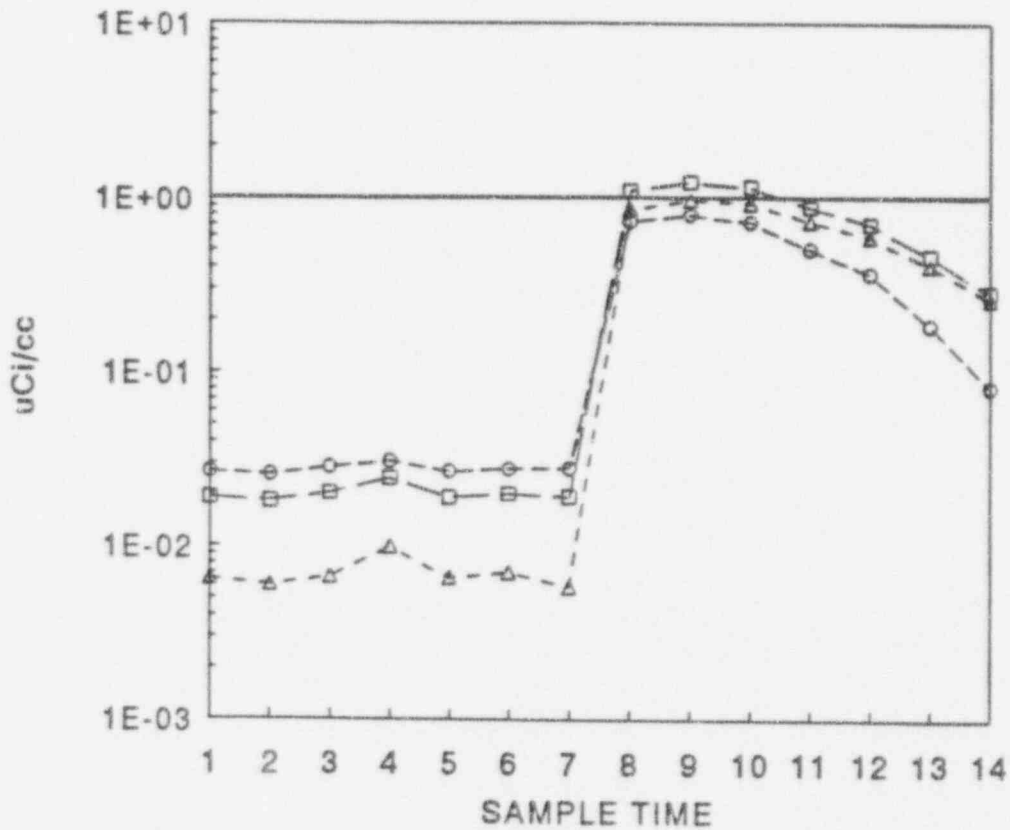
Arkansas Nuclear One - Unit 2

Letdown Flow History

| <u>Date</u> | <u>Time</u> | <u>Letdown<br/>Flow (gpm)</u> |
|-------------|-------------|-------------------------------|
| 02-Mar-92   | 0550        | 39.66                         |
| 04-Mar-92   | 0540        | 38.56                         |
| 06-Mar-92   | 1750        | 39.31                         |
| 09-Mar-92   | 0850        | 41.19                         |
| 09-Mar-92   | 2220        | 2.14                          |
| 10-Mar-92   | 0020        | 13.07                         |

# ATTACHMENT 4

## UNIT TWO REACTOR COOLANT I-131, I-133, IDE



--△-- I-131  
 --○-- I-133  
 --□-- IDE  
 ——— LIMIT

1 = FEB 24, 1992 • 0922  
 2 = FEB 26, 1992 • 0917  
 3 = FEB 28, 1992 • 0920  
 4 = MAR 2, 1992 • 0550  
 5 = MAR 4, 1992 • 0540  
 6 = MAR 6, 1992 • 1750  
 7 = MAR 9, 1992 • 0850  
 8 = MAR 9, 1992 • 2220  
 9 = MAR 10, 1992 • 0020  
 10 = MAR 10, 1992 • 0220  
 11 = MAR 10, 1992 • 0620  
 12 = MAR 10, 1992 • 1020  
 13 = MAR 10, 1992 • 2020  
 14 = MAR 11, 1992 • 0900

## ATTACHMENT 5

## Arkansas Nuclear One - Unit 2

## Power History

| Date      | Time | % Power | Date      | Time | % Power |
|-----------|------|---------|-----------|------|---------|
| 03-Sep-92 | 100  | 99.119  | 04-Sep-92 | 2000 | 96.422  |
| 03-Sep-92 | 200  | 98.753  | 04-Sep-92 | 2100 | 96.384  |
| 03-Sep-92 | 300  | 98.679  | 04-Sep-92 | 2200 | 96.345  |
| 03-Sep-92 | 400  | 98.986  | 04-Sep-92 | 2300 | 96.321  |
| 03-Sep-92 | 500  | 99.236  | 05-Sep-92 | 0    | 96.198  |
| 03-Sep-92 | 600  | 99.142  | 05-Sep-92 | 100  | 44.000  |
| 03-Sep-92 | 700  | 99.192  | 05-Sep-92 | 200  | 0.000   |
| 03-Sep-92 | 800  | 99.302  |           |      |         |
| 03-Sep-92 | 900  | 99.284  |           |      |         |
| 03-Sep-92 | 1000 | 99.058  |           |      |         |
| 03-Sep-92 | 1100 | 99.044  |           |      |         |
| 03-Sep-92 | 1200 | 99.165  |           |      |         |
| 03-Sep-92 | 1300 | 99.034  |           |      |         |
| 03-Sep-92 | 1400 | 98.992  |           |      |         |
| 03-Sep-92 | 1500 | 99.107  |           |      |         |
| 03-Sep-92 | 1600 | 98.844  |           |      |         |
| 03-Sep-92 | 1700 | 98.805  |           |      |         |
| 03-Sep-92 | 1800 | 98.752  |           |      |         |
| 03-Sep-92 | 1900 | 98.842  |           |      |         |
| 03-Sep-92 | 2000 | 98.913  |           |      |         |
| 03-Sep-92 | 2100 | 98.691  |           |      |         |
| 03-Sep-92 | 2200 | 98.771  |           |      |         |
| 03-Sep-92 | 2300 | 98.374  |           |      |         |
| 04-Sep-92 | 0    | 98.462  |           |      |         |
| 04-Sep-92 | 100  | 98.142  |           |      |         |
| 04-Sep-92 | 200  | 97.998  |           |      |         |
| 04-Sep-92 | 300  | 97.818  |           |      |         |
| 04-Sep-92 | 400  | 97.747  |           |      |         |
| 04-Sep-92 | 500  | 97.713  |           |      |         |
| 04-Sep-92 | 600  | 97.767  |           |      |         |
| 04-Sep-92 | 700  | 97.711  |           |      |         |
| 04-Sep-92 | 800  | 97.940  |           |      |         |
| 04-Sep-92 | 900  | 97.714  |           |      |         |
| 04-Sep-92 | 1000 | 97.808  |           |      |         |
| 04-Sep-92 | 1100 | 96.873  |           |      |         |
| 04-Sep-92 | 1200 | 96.926  |           |      |         |
| 04-Sep-92 | 1300 | 96.927  |           |      |         |
| 04-Sep-92 | 1400 | 96.780  |           |      |         |
| 04-Sep-92 | 1500 | 96.480  |           |      |         |
| 04-Sep-92 | 1600 | 96.495  |           |      |         |
| 04-Sep-92 | 1700 | 96.487  |           |      |         |
| 04-Sep-92 | 1800 | 96.609  |           |      |         |
| 04-Sep-92 | 1900 | 96.491  |           |      |         |



## ATTACHMENT 6

ARKANSAS NUCLEAR ONE  
UNIT 2  
RCS RADIOCHEMISTRY

| SAMPLE ID | DATE     | TIME | I-131              | I-132             | I-133            | I-134            | I-135             | I-131DE  |
|-----------|----------|------|--------------------|-------------------|------------------|------------------|-------------------|----------|
|           |          |      | 8.04 d<br>(uci/cc) | 2.3 h<br>(uci/cc) | 21 h<br>(uci/cc) | 53 m<br>(uci/cc) | 6.7 h<br>(uci/cc) | (uci/cc) |
| RCS HL    | 08/24/92 | 910  | 2.61E-02           | 7.44E-02          | 7.46E-02         | 9.01E-02         | 8.21E-02          | 5.73E-02 |
| RCS HL    | 08/26/92 | 920  | 2.62E-02           | 7.67E-02          | 7.53E-02         | 9.12E-02         | 8.43E-02          | 5.80E-02 |
| RCS HL    | 08/28/92 | 925  | 2.63E-02           | 8.05E-02          | 7.79E-02         | 9.47E-02         | 8.66E-02          | 5.91E-02 |
| RCS HL    | 08/31/92 | 905  | 2.78E-02           | 8.77E-02          | 8.37E-02         | 1.02E-01         | 9.35E-02          | 6.32E-02 |
| RCS HL    | 09/02/92 | 955  | 2.85E-02           | 9.05E-02          | 8.62E-02         | 1.04E-01         | 9.44E-02          | 6.48E-02 |
| RCS HL    | 09/04/92 | 530  | 2.78E-02           | 8.65E-02          | 8.36E-02         | 1.00E-01         | 9.35E-02          | 6.31E-02 |
| RCS HL    | 09/05/92 | 345  | 1.05E+00           | 5.99E-01          | 9.35E-01         | 1.04E-01         | 5.34E-01          | 1.37E+00 |
| RCS HL    | 09/05/92 | 745  | 8.63E-01           | 2.48E-01          | 6.82E-01         | 5.22E-03         | 2.94E-01          | 1.08E+00 |
| RCS HL    | 09/05/92 | 1135 | 7.32E-01           | 1.22E-01          | 5.20E-01         |                  | 1.72E-01          | 8.92E-01 |
| RCS HL    | 09/05/92 | 1345 | 5.44E-01           | 5.99E-02          | 3.60E-01         |                  | 9.75E-02          | 6.52E-01 |
| RCS HL    | 09/06/92 | 145  | 2.40E-01           | 3.48E-03          | 1.11E-01         |                  | 1.34E-03          | 2.73E-01 |
| RCS HL    | 09/07/92 | 430  | 2.29E-02           | 1.15E-02          | 4.82E-03         |                  |                   | 2.46E-02 |

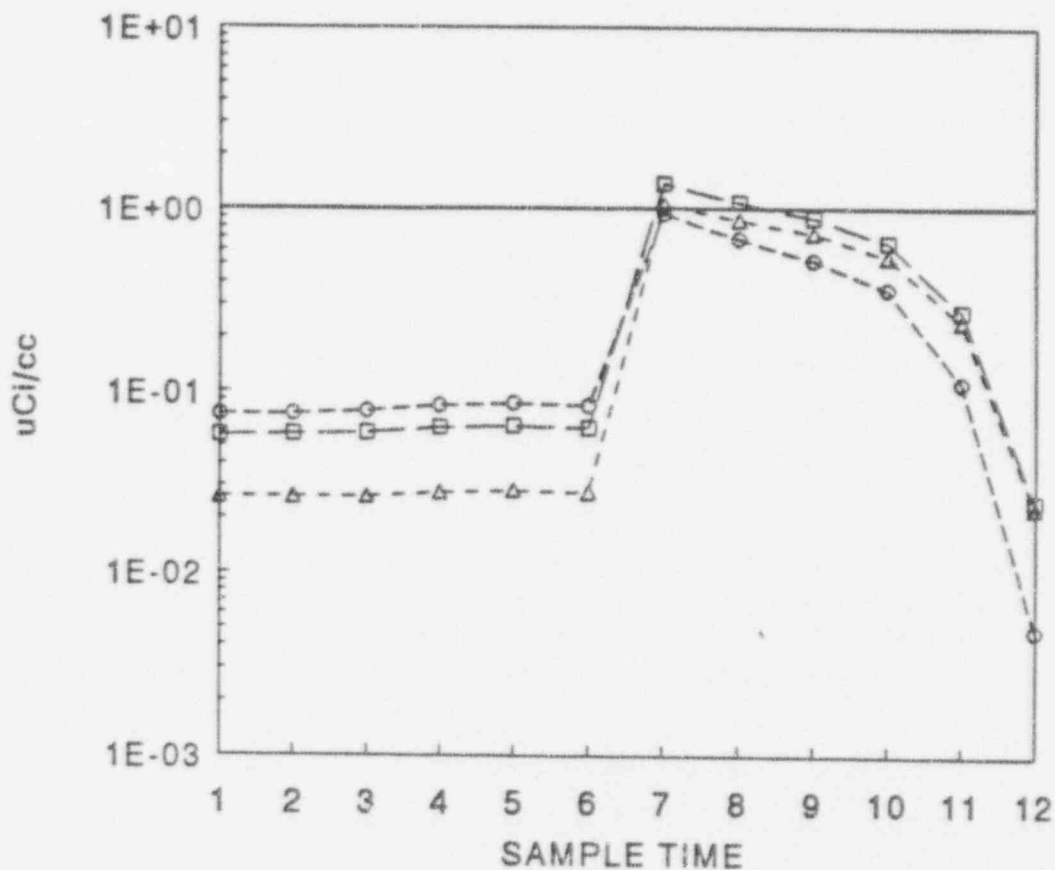
ATTACHMENT 7

Arkansas Nuclear One - Unit 2

Letdown Flow History

| <u>Date</u> | <u>Time</u> | <u>Letdown<br/>Flow (gpm)</u> |
|-------------|-------------|-------------------------------|
| 02-Sep-92   | 0955        | 39.0                          |
| 04-Sep-92   | 0530        | 39.0                          |
| 05-Sep-92   | 0345        | 39.0                          |
| 05-Sep-92   | 0545        | 39.0                          |
| 05-Sep-92   | 0745        | 39.0                          |
| 05-Sep-92   | 1135        | 39.0                          |

# UNIT TWO REACTOR COOLANT I-131, I-133, IDE



--△-- I-131

--○-- I-133

—□— IDE

— LIMIT

1 = AUG 24, 1992 • 0910

2 = AUG 26, 1992 • 0920

3 = AUG 28, 1992 • 0925

4 = AUG 31, 1992 • 0905

5 = SEP 2, 1992 • 0955

6 = SEP 4, 1992 • 0530

7 = SEP 5, 1992 • 0345

8 = SEP 5, 1992 • 0745

9 = SEP 5, 1992 • 1135

10 = SEP 5, 1992 • 1345

11 = SEP 6, 1992 • 0145

12 = SEP 7, 1992 • 0430