ACTION/EXPECTED RESPONSE | RESPONSE NOT OBTAINED

A. PURPOSE

The purpose of this procedure is to provide a means of determining the quantity of failed fuel based on I-131 Concentration in the NC System.

B. SYMPTOMS

1. Any of the following EMF's in alarm:

   a. 1EMF48 "Reactor Coolant Monitor"
   b. 1EMF18 "Reactor Coolant Filter 1A"
   c. 1EMF19 "Reactor Coolant Filter 1B"

2. Any condition in which the operator suspects failed fuel or want an estimate of the amount of failed fuel.

ACTION/EXPECTED RESPONSE | RESPONSE NOT OBTAINED

C. IMMEDIATE ACTIONS

____ 1. Have Chemistry Obtain A Sample Of The NC System Coolant and determine temperature of sample.

D. SUBSEQUENT ACTIONS

____ 1. Have Chemistry Sample For I-131, Krypton, Xenon, Cesium, Ruthenium And Tellurium.

____ 2. Record Concentrations Of Above Radionuclides And Sample Temperature On Enclosure 1.

____ 3. If I-131 Concentration Is Greater Than 300 uCi/ml, Refer To RP/1/A/5000/01 (EMERGENCY CLASS DETERMINATION).

____ 4. If Iodine Is Present And The Unit Is In A Normal Operational Mode, Go To 8.

____ 5. If Krypton Or Xenon Are Present But Only Small Amounts Of Cesium And An Abnormal Transient Or Suspected Mechanical Induced Failure (i.e., Loose Part) Has Occurred, Go To 11.

____ 6. If Krypton Or Xenon And Large Concentrations Of Cesium Are Present But Ruthenium And Tellurium Are Not And Incore Thermocouples Have Read High For A Short Period Of Time, Go To 13.

____ 7. If All Of The Above Radionuclides Are Present And Incore Thermocouples Are High For A Long Period, Go To 15.

____ 8. Determine The X And Y Correction Factors From Enclosure 2.

ACTION/EXPECTED RESPONSE | RESPONSE NOT OBTAINED

____ 9. Calculate The Amount Of Failed Fuel Using The Following:

Number of Failed Pins Ci/ml = Measured I-131 Concentration uCi/ml · X · Y ÷ 3.5×10^{-3}

_____ = (_____) · ___ · ___ ÷ _____

Percent Failed Pins = Measured I-131 Concentration uCi/ml · X · Y ÷ 1.8 uCi/ml

_____ = (_____) · ___ · ___ ÷ _____

____ 10. Go To 16.

____ 11. Determine The X And Y Correction Factors From Enclosure 2.

Calculate the amount of failed fuel using the following:

Number of Failed Pins Ci/ml = Measured I-131 Concentration uCi/ml · X · Y ÷ 16.5×10^{-2}

_____ = (_____) · ___ · ___ ÷ _____

Percent Failed Pins = Measured I-131 Concentration uCi/ml · X · Y ÷ 83.7 uCi/ml

_____ = (_____) · ___ · ___ ÷ _____

____ 12. Go To 16.

ACTION/EXPECTED RESPONSE | RESPONSE NOT OBTAINED

____ 13. Determine The X And Y Correction Factors From Enclosure 2.

Calculate the amount of failed fuel using the following:

Number of Failed Pins = Measured I-131 Concentration uCi/ml · X · Y ÷ 2.9 uCi/ml

_____ = (_____) · ___ · ___ ÷ _____

Percent Failed Pins = Measured I-131 Concentration uCi/ml · X · Y ÷ 1535 uCi/ml

_____ = (_____) · ___ · ___ ÷ _____

____ 14. Go To 16.

____ 15. Determine The X And Y Correction Factors From Enclosure 2.

Calculate the amount of failed fuel using the following:

Number of Failed Pins = Measured I-131 Concentration uCi/ml · X · Y ÷ 5.5 uCi/ml

_____ = (_____) · ___ · ___ ÷ _____

Percent Failed Pins = Measured I-131 Concentration uCi/ml · X · Y ÷ 2790 uCi/ml

_____ = (_____) · ___ · ___ : _____

____ 16. Refer To Tech Spec 3.4.8 And Ensure I-131 Activity Is Within Guidelines.

a. Refer to appropriate Tech Spec Action Statement.

____ 17. Inform The Shift Supervisor And Performance Section Duty Engineer Of The Results Of This Procedure.

-END-

I-131 Concentration _____ uCi/ml

_____ uCi/gram

	Concentration	Initial/Date
Krypton	_____	____/____
Xenon	_____	____/____
Cesium	_____	____/____
Ruthenium	_____	____/____
Tellurium	_____	____/____
Sample Temperature	_____	____/____

1. X Determination

NC SAMPLE TEMPERATURE °F

NC System Temperature °F	80	90	100
100	.996	.998	1.00
150	.983	.985	.987
200	.966	.968	.970
250	.945	.947	.949
300	.921	.923	.924
350	.894	.895	.897
400	.862	.864	.865
450	.827	.828	.830
500	.787	.788	.790
550	.739	.740	.741
560	.728	.729	.731
570	.717	.718	.719
580	.706	.708	.708
590	.693	.694	.695
600	.680	.681	.683

2. Y Determination

If power change is less than 10% within 22 days

$$Y = \frac{100}{\%\ F.P.\ \text{at time of failure}}$$

Other times

$$Y = \frac{100}{OP\ (e^{-t\lambda}) + NP\ (1 - e^{-t\lambda})}$$

Where:

Y = Correction Factor

OP = The % Full Power Before The Power Change

NP = The % Full Power After The Power Change At Which Time The Fuel Failure Has Occured

λ = Decay Constant For I-131 --- 0.0864 day $^{-1}$

t = One Half The Time To Make The Power Change Plus The Time After The Power Change Until Damage Is Suspected. (In Days)

i.e. 2 Hours For Power Change And 16 Hours To Damage.

$t = \frac{2}{2} + 16 = 17$ Hours = .708 Days