Georgia Power

POWER GENERATION DEPARTMENT

VOGTLE ELECTRIC GENERATING PLANT

TRAINING LESSON PLAN

TITLE:	SAFETY LIMITS AND LIMITING SAFETY SYSTEM SETTINGS	NUMBER:	LO-LP-39203-00
PROGRAM:	LICENSED OPERATOR TRAINING	REVISION:	0
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INSTRUCTOR GUIDELINES:

1. OVERHEAD TRANSPARENCY MACHINE
2. WHITE BOARD AND MARKERS

MASTER COPY

I. PURPOSE STATEMENT:

TEACH THE STUDENT THE APPLICABILITY AND ACTIONS STATEMENTS OF SAFETY LIMITS AND L.S.S.S.

II. LIST OF OBJECTIVES:

1. Students will be able to determine if they are exceeding the core safety limit curve.
2. The students will be able to give the setpoints for the RCS pressure safety limit and all L.S.S.S.
3. The student will know the action requirements from memory for exceeding any safety limit.
4. The student should be familiar with the reactor core safety limit curve.
5. SRO students should be able to explain the bases for each section of the reactor core safety limit curve.

REFERENCES:

1. TECHNICAL SPECIFICATIONS
   SECTION 2 SAFETY LIMITS & L.S.S.S

2. FSAR CHAPTER 15

III. LESSON OUTLINE:

NOTES

I. PRESENTATION

A. Safety Limits

1. Bases for safety limits in 10 CFR 50.36

a) Protect barriers against release

2. Core Safety Limits

a. Designed to protect fuel clad

b. Based on two characteristics

1) Power level of fuel

2) Heat transfer capability of water

a) Temperature - Tave

b) Pressure of RCS

c. Tech Spec. 2.1.1

1) Combination of power pressure and Tavg not exceed limits

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d. T. S. 6.7.1

1) Reporting requirements for Safety Limit violation

e. Bases for curve, Section 1

1) Low power level of curve

a) Corresponds to T_H at saturation

b) Delta-T is no longer valid indication of power

c) OPdeltaT and OTdeltaT no longer provide protection

f. Bases for curve, Section 2

1) DNBR of 1.30 at 15% quality

2) Only limiting at high pressures

III. LESSON OUTLINE:

NOTES

3) Ask why DNBR of 1.3 is bad

4) As long as DNBR is greater than or equal to 1.3

a) 95% of fuel is not experiencing DNB

b) At a 95% confidence level (95/100 tests)

5) DNB drives down heat transfer coefficient

a) Fuel temperature increases

b) Clad damage likely

g. Bases for curve, Section 3

DNBR of 1.30

h. Restrictions of curve

1) Only applicable to 4 loop flow

a) P-8 based on staying within curve on RCP trip

b) Delta-I within the target band

i. Protection Provided

1) S/G safeties protect at low powers

2) OTdeltaT and P.R. high flux protect at high powers

3) OTdeltaT protects open area not protected by others

a) Lowers setpoint as delta-I exceeds band

b) Lowers setpoint as Tave increases

c) Lowers setpoint as pressure decreases

3. RCS Pressure Safety Limit

a. Designed to protect the RCS integrity

b. Based on limiting maximum RCS pressure

III. LESSON OUTLINE:

NOTES

c. Read 2.1.2 RCS Pressure Safety Limit

d. Actions for Modes 3, 4, and 5 more restrictive

1) Brittle fracture more likely at low temperature

e. Protection Provided

1) Pressurizer code safety valves

a) Lift settings of 2485 psig

B. Limiting Safety System Setpoints

1. Purpose

a. Prevent reaching Rx core and RCS safety limits during:

1) Normal operations

2) Design bases anticipated operational occurrences

b. Assist ESFAS in mitigating accidents

2. Reactor Trip System Instrumentation

a. Manual reactor trip

1) Bases - gives operator manual trip capability

b. Power Range neutron flux

1) High setpoint - $\leq$ 109%

a) Allowable value - $\leq$ 111.1%

2) Low setpoint - $\leq$ 25%

a) Allowable value - $\leq$ 27.1%

3) Bases

a) Low setpoint - provide protection against a power excursion from low power levels.

III. LESSON OUTLINE:

NOTES

b) High setpoint - provide protection against a power excursion from low power levels.

c. Power Range neutron flux high positive rate

1) Setpoint - $\leq$ 5% / 2 seconds

2) Allowable value - $\leq$ 6.3%/ 2 seconds

3) Bases - rod ejection accident

d. Power range neutron flux high negative rate

1) Setpoint - $\leq$ 5%/ 2 seconds

2) Allowable value - $\leq$ 6.3% / 2 seconds

3) Bases - prevent excessive local flux peaking resulting in DNBR $<$ 1.3 for all single or multiple dropped rods.

e. Intermediate Range High Flux -

1) Setpoint - $\leq$ 25%

2) Allowable value - $\leq$ 30.9%

3) Bases - uncontrolled rod withdrawal from subcritical condition

f. Source Range High Flux

1) Setpoint - $\leq 1 \times 10^5$ cps

2) Allowable value - $\leq 1.4 \times 10^5$ cps

3) Bases - same as IR

g. OT delta I

1) Setpoint - variable

2) Allowable value - __ setpoint + 2.6%

3) Bases - DNB protection for slow transients with pressure in band.

III. LESSON OUTLINE:

NOTES

h. OP delta T

1) Setpoint - variable

2) Allowable value - $\leq$ setpoint + 3.6%

3) Bases - has three

a) Protect fuel integrity

b) Limits required range of OT delta T

c) Backup to PR High Flux high setpoint

i. Pressurizer low pressure

1) Setpoint - $\geq$1960 psig

2) Allowable value - $\geq$ 1948 psig

3) Bases - DNB protection

j. Pressurizer high pressure

1) Setpoint - $\leq$2385 psig

2) Allowable value - $\leq$ 2397 psig

3) Bases - protect RCS integrity

k. Pressurizer high level

1) Setpoint - $\leq$ 92%

2) Allowable value - $\leq$ 93.8%

3) Bases - prevent water relief through Code Safeties.

l. Loss of flow

1) Setpoint - $\geq$ 90% of design loop flow

2) Allowable - $\geq$ 88.7% of design loop flow

3) Bases - DNB protection

III. LESSON OUTLINE:

NOTES

m. S/G low - low level

1) Setpoint - $\geq$ 17% N.R.

2) Allowable value - $\geq$ 15.3% N.R.

3) Bases - prevent loss of heat sink

n. RCP undervoltage

1) Setpoint - $\geq$ 70% bus voltage (9660 vac)

2) Allowable value - $\geq$ 69% bus voltage (9522 vac)

3) Bases - DNB protection

o. RCP underfrequency

1) Setpoint - $\geq$ 57.2 H_2

2) Allowable - $\geq$ 57.1 H_2

3) Bases - DNB protection

p. Turbine trip

1) Setpoints

a) ETS Fluid low pressure - $\geq$ 600 psig

b) Turbine Stop Values closure - $\geq$ 97.6% open

2) Allowable values

a) ETS fluid low pressure - $\geq$ 500 psig

b) Turbine stop values closure - $\geq$ 97.6% open

3) Bases - initiate reactor trip, no other bases given

q. SI input from ESF

1) Bases - backup to RPS on accident

III. LESSON OUTLINE:

NOTES

3. Reactor Trip System Interlocks

   a. P-6

      1) Setpoint - __ 1×10^{-10} Amps

      2) Allowable - __ 6×10^{-11} Amps

      3) Bases - allow manual block of SR high flux trip and deenergize SR detectors.

   b. P-7

      1) Setpoints

         a) Input from P-10

         b) Input from P-13

      2) Bases - below setpoint, blocks five reactor trips.

         a) Low flow in more than one loop

         b) RCP undervoltage

         c) RCP underfrequency

         d) Pressurizer low pressure

         e) Pressurizer high level

   c. P-8

      1) Setpoint - __ 47% power

      2) ~~Allowable value - __ 49.2% power~~

      3) Bases - blocks low flow trip in more than one loop

   d. ~~P-9~~

      1) Setpoint - __ 48% power

      2) Allowable - __ 50.2 power

      3) Bases - Blocks reactor trip or turbine trip

III. LESSON OUTLINE:

NOTES

e. P-10

1) Setpoint - $\geq$ 10% power

2) Allowable value - $\geq$ 7.8% power

3) Bases - blocks intermediate and power range low S.P. trips; input to P-7

f. P-13

1) Setpoint - $\leq$ 10% Turbine power

2) Allowable - $\leq$ 12.2% Turbine power

3) Bases - input to P-7

II. SUMMARY

A. Core safety limits protect clad integrity.

B. RCS safety limit protects RCS integrity.

C. LSSS are designed to prevent reaching safety limits.

D. Review objectives.

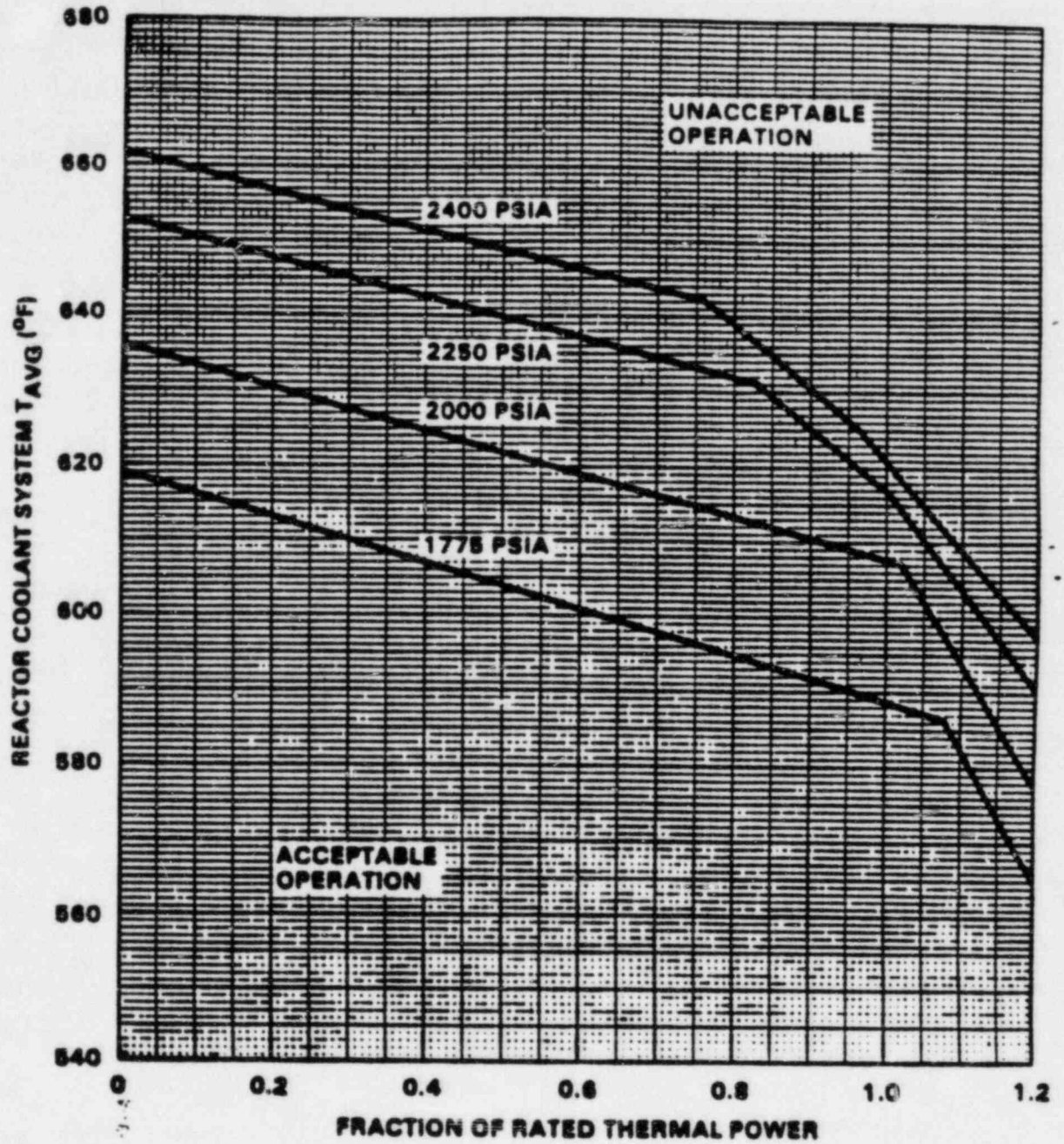

Figure 2.1-1. Reactor Core Safety Limits

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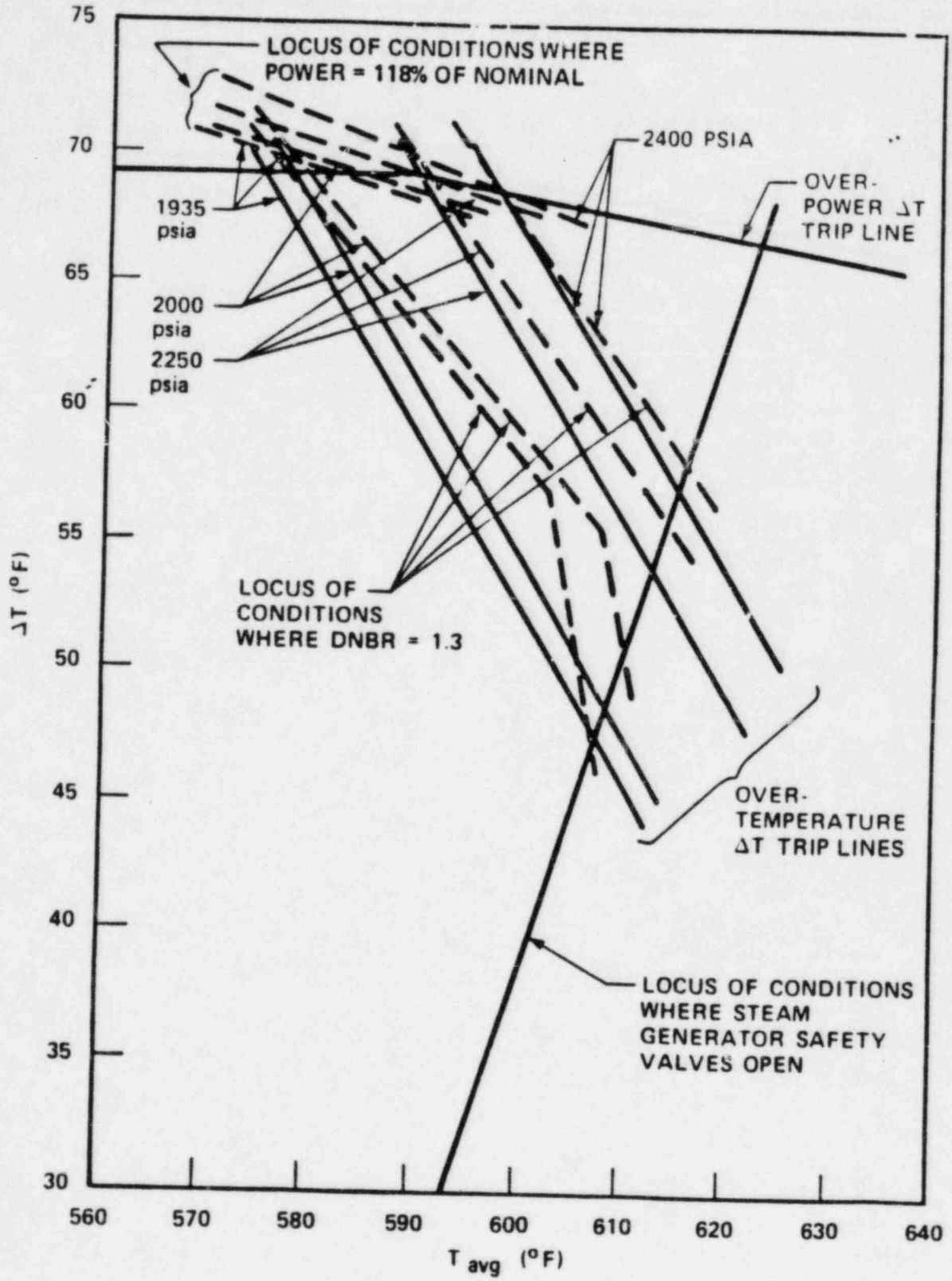

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