ARTIFICIAL ISLAND
STABILITY LIMITATION
OPERATING RESTRICTIONS

OI 7-B-04
Sheet 1 of 6

Introduction

This instruction will serve to provide operating guidance concerning the stable operation of Artificial Island during the extended outage of Keeney-Hope Creek 5015.

General

Generator Stability Limits

Concern for stability is based on the need to operate the system in a manner which will allow generators to remain synchronized with the bulk power system. Remaining in synchronism is very much dependent on transmission system configuration and generatiion. The proper control of voltage plays an important role in helping to maintain stability in the system as well.

Rapid changes in the system (such as the loss of a major load center, a large generator, line switching, or a fault occurrence, etc.) have the potential to upset generator synchronism. As a System Operator, the safe and reliable operation of the system depends on the ability to recognize that load, excitation levels and var requirements all influence the ability of generating units to remain synchronized under adverse conditions.

Increased Mvar output is necessary to maintain stable operation should the next worst contingency happen (such as the loss of the Salem-Deans line, 5021). Under contingency conditions, the system may not be able to handle full Mw output from the island; therefore, output must be reduced. The stability guidelines for each machine must be carefully followed by both System Operators and Plant Operators. These are provided at the end of this instruction. The voltage regulator <u>will not</u> provide minimum coverage for this case.

Due to the extreme importance of maintaining Mw and Mvar limits, one system operator will be assigned solely to monitor and control system voltages.

5021/Salem No. 1 Cross Trip

The cross trip scheme has been installed, where the trip of 5021 or the opening of both 5021-500 Kv breakers at Salem or Deans causes Salem No. 1 to trip, which eases overall operating restrictions. The cross trip should be in service at all times except as outlined below. Following operation

Date Written	Written by	Distribution
3-20-87	LJM:edl	Gen. Mgr. - Salem
Date Revised	Approval by	Gen. Mgr. - Hope Creek
	Rwo	Mgr. - Planning
*Denotes Changes		Mgr. - Substation

of the cross tripping, the remaining units (Salem No. 2 and Hope Creek No. 1) will remain stable on 5023 and 5024. This will allow all three units to operate at an island total of approximately 3100 gross Mw (from Appendix B).

Cross trip is to be in service except under the following conditions:

a. Island gross total is below 2330 Mw due to unit reductions or unit outages with all 500 Kv lines in service (refer to Appendix B)
b. Thunder and lightning
c. Ice/winter storms
d. High winds
e. Forest fires
f. Required maintenance work

With the return of a unit, enable the cross trip when the island total reaches 2330 Mw (790 Mw on each Salem unit and 750 Mw at Hope Creek). If the cross trip is unavailable when a unit is returning to service, begin reducing the in-service units after the returning unit is synchronized, to maintain an island gross Mw output not to exceed 2330 Mw.

Cross Trip Disable

To reduce the risk of unnecessary outages on Salem No. 1, adhere to the following guidelines:

- Total Island Mw Output Reductions
  Whenever the island gross total is less than 2330 Mw due to a unit outage or reduction, and all 500 Kv lines are available, follow the attached guidelines for the appropriate Mw levels. The cross trip shall be disabled at both Salem and Deans when Mw reductions are complete.

- Storm Situations

  a. Thunder and lightning--Whenever storms are within 50 miles of Salem, New Freedom or Deans (as indicated by contracted weather services, Atlantic Electric back-up or DPL storm scope). The machines will be reduced to the appropriate guidelines for 3-machine/3-line operation with no cross trip. The cross trip scheme shall be disabled upon reaching final Mw values.

b. Ice/Winter storm--Whenever icing conditions are predicted by the weather service or confirmed by field reports in either Camden, Trenton, or Brunswick Division, the appropriate Mw reductions will be made for 3-machine/3-line operation and the cross trip disabled. Similar action should be taken during any winter storm condition if transmission security is in jeopardy.

c. High winds/Hurricane--Whenever winds are in excess of 50 mph as measured at Camden Switching Station, Deans Switching Station or Artificial Island, the appropriate Mw reductions will be made and the cross tripping scheme will be disabled.

d. Forest Fires--Whenever forest fires are reported in the area of the Salem/Deans/New Freedom right-of-ways, the appropriate Mw reductions will be made and the cross tripping will be disarmed.

- <u>500 Kv line outage</u>
  If any one of the three remaining lines comes out of service, reduce all three units to 650 Mw gross and a minimum of 100 Mvars per machine.

- <u>Voltage Regulator Out of Service</u>
  If a voltage regulator is out of service, reduce 200 Mw on the affected unit until the regulator is returned to service.

- <u>Emergency Repairs/Forced outages</u>
  Emergency repairs may be performed on a priority basis without additional action, except those facilities associated with 5021.

  5021 - any work affecting 5021 will require the cross tripping scheme to be disabled and appropriate MW reductions made:

  a. any relaying on 5021-regular and back-up relays and transfer trips.

b. breakers - Salem 500 KV-Section 1-8, 2-8
Deans 500 KV-Section 1-5, 2-5
Deans 230 KV-Section 2-8, 7-8
Deans 500-2 transformer and any disconnects associated with these bus sections.

To further insure system integrity, T&D has increased the frequency of line patrols with specific emphasis on the cross over area near New Freedom.

- Maintenance Work
No routine work on the facilities listed in Appendix A will be performed, especially where human error may be a factor. Specifically this includes:

a. No line outages

b. No in-service relay work--the relay technicians are discouraged from working at locations where any mishap may have an impact.

c. No hot line work

d. No substation work (i.e. breakers, disconnects) at any 500 Kv station

e. GETAC work by the laboratory must be carefully evaluated. Request a relay technician to assist in the repair or diagnosis.

Cross Trip Disable/Enable Procedure
The two cutoff switches used to disable the cross trip scheme are located one each at Salem and at Deans.

- Disable
a. Whenever it becomes necessary to disable the cross trip scheme, unit output at Salem and Hope Creek must first be reduced to appropriate levels.

b. Request an operator at Salem and Deans to turn the cutoff switches to the "off" position and apply a red blocking tag for the system operator. (5021/Salem No. 1 cross tripping cutoff switch)

c. Log all information in the South Switching log.

d. Verify via the ESOC computer alarms that both cutoff switches are in the "off" position.

e. Notify the Salem and Hope Creek senior shift supervisors that the cross trip scheme has been disabled.

- Enable

a. Request an operator at Salem and Deans to turn the cutoff switches to the "on" position and remove the red blocking tag for the system operator.

b. Log all information in the South Switching log.

c. Verify via the ESOC computer alarms that both cutoff switches are in the "on" position.

d. Notify the Salem and Hope Creek senior shift supervisor that the cross trip scheme has been enabled.

e. Increase unit output at Salem and Hope Creek to appropriate levels.

CONDITION	SAL 1	SAL 2	H/C
Cross Trip Available	1162	1000	1000
Cross Trip Unavailable	790	790	750
One Line Out of Service	650	650	650

NOTE: Incorporated into documents given to the NRC.

Date Written
3-20-87
Date Revised

*Denotes Changes

Written by
LJM:edl
Approval by
RWW

Distribution
Gen. Mgr. - Salem
Gen. Mgr. - Hope Creek
Mgr. - Planning
Mgr. - Substation

APPENDIX A

NO ROUTINE WORK ON THE FOLLOWING LINES:

500KV

5023	Hope Creek-New Freedom
5024	Salem-New Freedom
5021	Salem-Deans
5019	Deans-Branchburg
5016	Branchburg-Alburtis
5017	Branchburg-Elroy
5018	Branchburg-Ramapo

230kV

K-2237	New Freedom-Beaver Brook
R-2244	New Freedom-Monroe
W-2223	New Freedom-Cox's Corner
C-2255	New Freedom-Silver Lake
I-2235	Beaver Brook-Gloucester
P-2242	Gloucester-Deptford
O-2241	Deptfort-Mickleton
E-2231	Cox's Corner-Camden
U-2247	Silver Lake-Cox's Corner
C-220-29	Richmond-Camden
D-220-30	Cox's Corner-Burling-Croydon
2304	Monroe-Mickleton
220-38	Mickleton-Trainer
220-53	Chichester-Train
220-35	Waneeta-Richmond

Auto Transformer

500-2,3&4	New Freedom
500-1,2&3	Deans
500-1&2	Branchburg

500kV - Philadelphia Electric

5014	Peach Bottom-Keeney
5010	Peach Bottom-Limerick
5030	Whitpain-Limerick
5029	Whitpain-Elroy

Date Written
3-20-87
Date Revised

*Denotes Changes

Written by
LJM:edl
Approval by
RWW

Distribution
Gen. Mgr. - Salem
Gen. Mgr. - Hope Creek
Mgr. - Planning
Mgr. - Substation

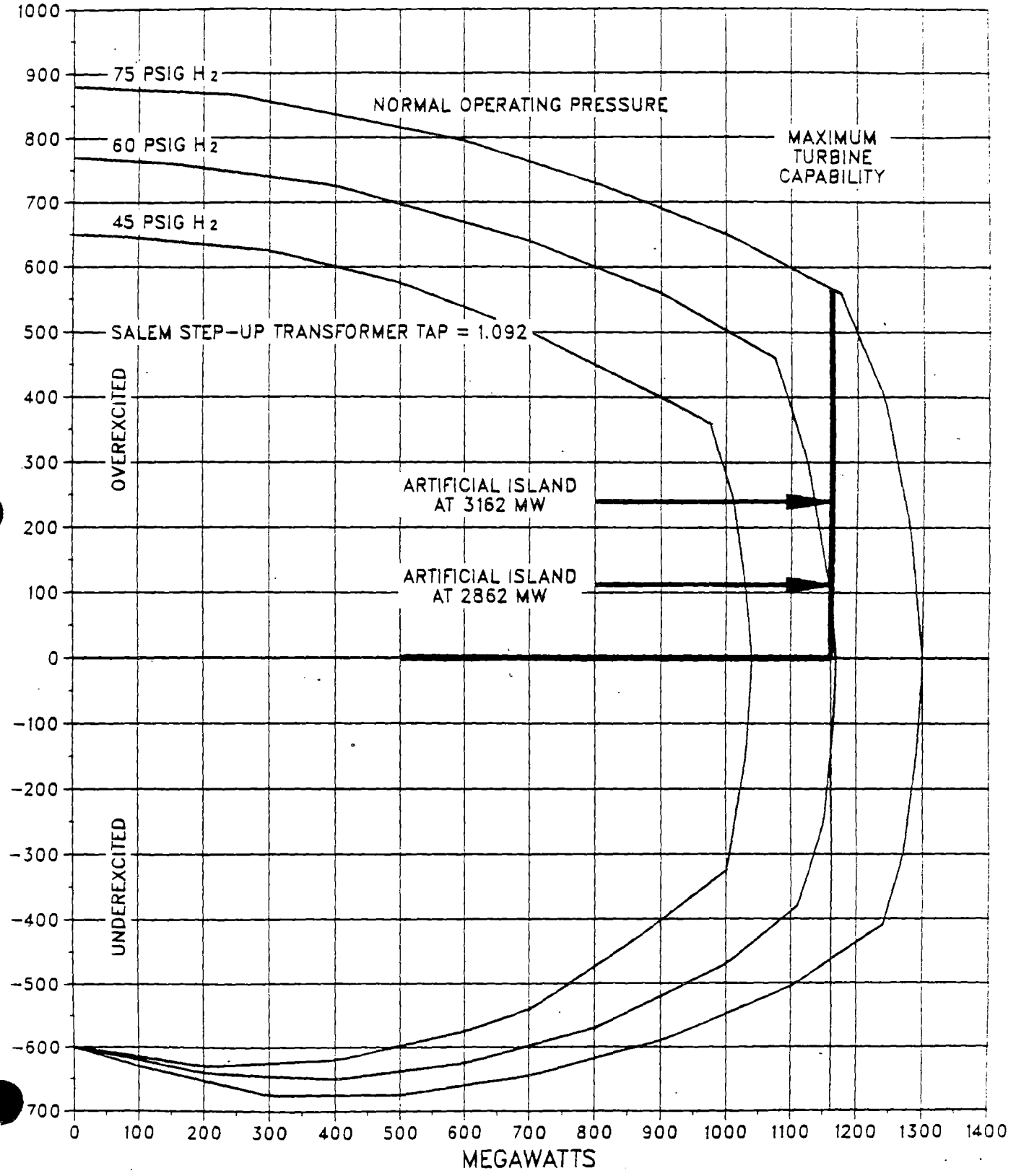
APPENDIX B
03/20/87 RWW

CURVE NO. 101
01 7-B-04:

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT

SALEM 1 OPERATING GUIDE
WITH SALEM CROSS TRIPPING SCHEME
SALEM 2 ON AND HOPE CREEK 1 ON

OUTAGE:
5015 (HOPE CREEK – KEENEY)



513CROSS

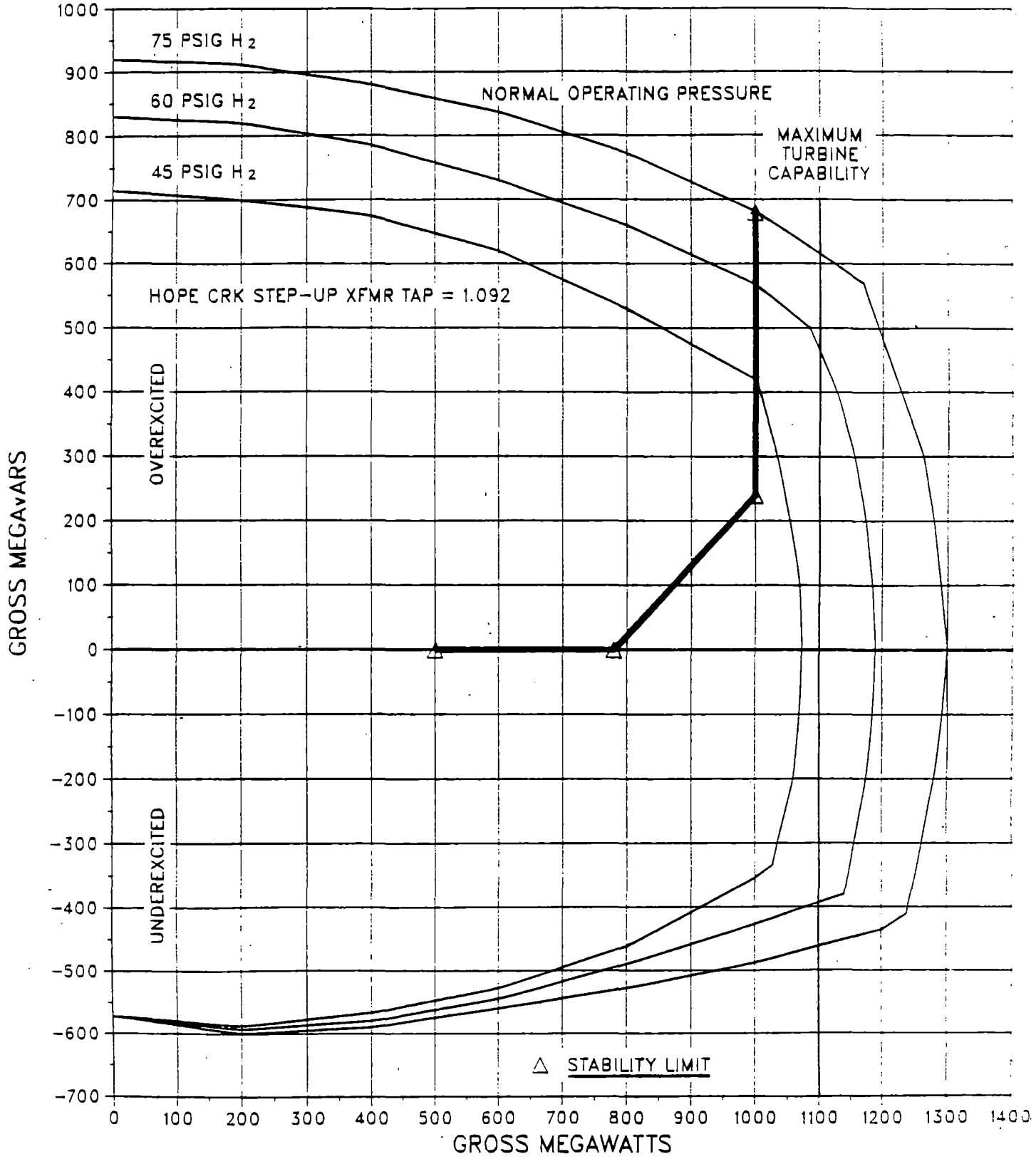
APPENDIX B
03/20/87 Rev

HOPE CREEK 1 OPERATING GUIDE
WITH SALEM CROSS TRIPPING SCHEME
SALEM 2 ON AND SALEM 1 ON

OUTAGE:
5015 (HOPE CREEK – KEENEY)

017-8-04

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT



HC3CROSS

APPENDIX B
03/20/87 RJW

CURVE NO. 103
017-8-04:

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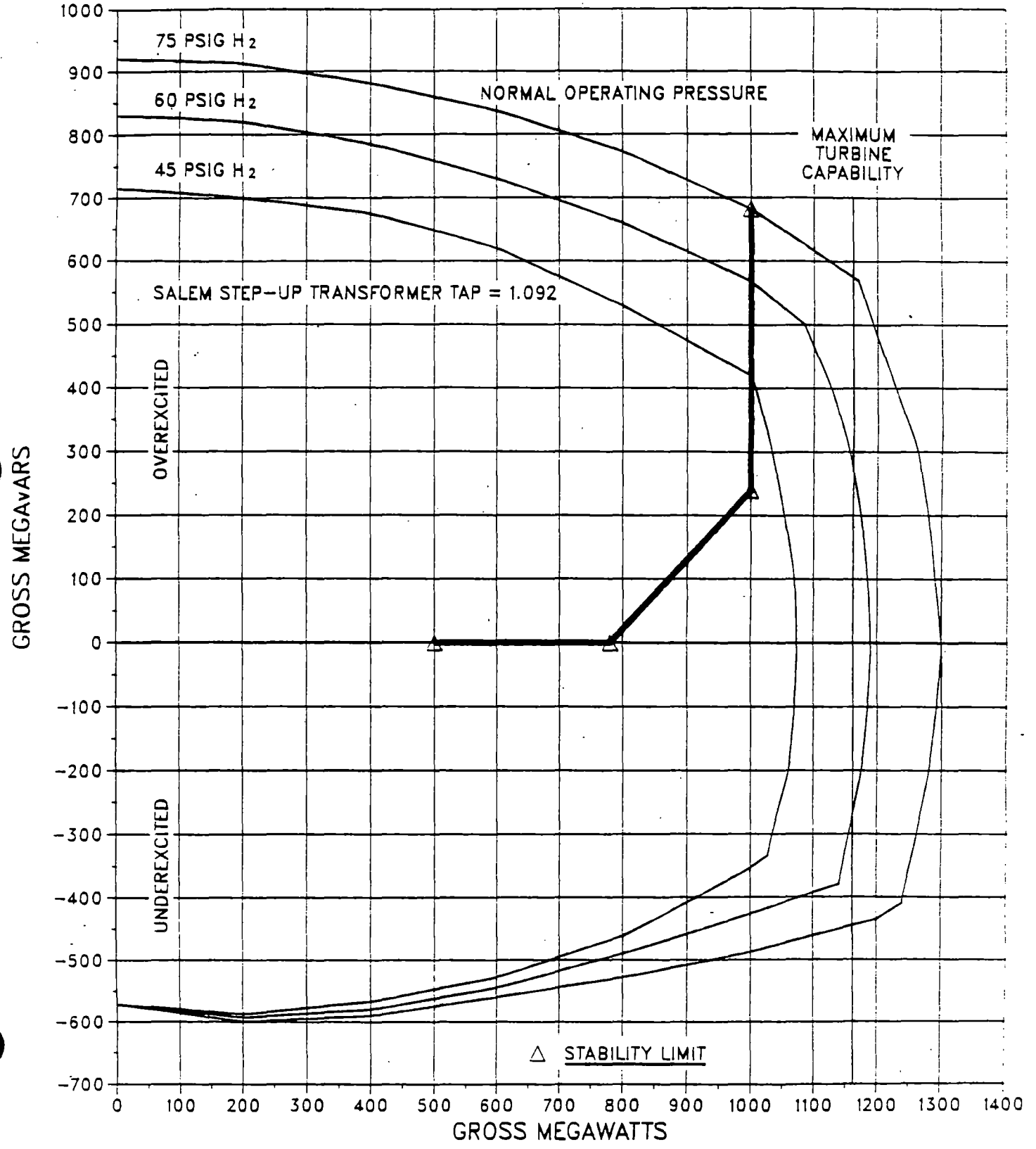
SYSTEM PLANNING
DEPARTMENT

SALEM 2 OPERATING GUIDE
WITH SALEM CROSS TRIPPING SCHEME
SALEM 1 ON AND HOPE CREEK 1 ON

OUTAGE:
5015 (HOPE CREEK – KEENEY)



S23CROSS

3/20/87

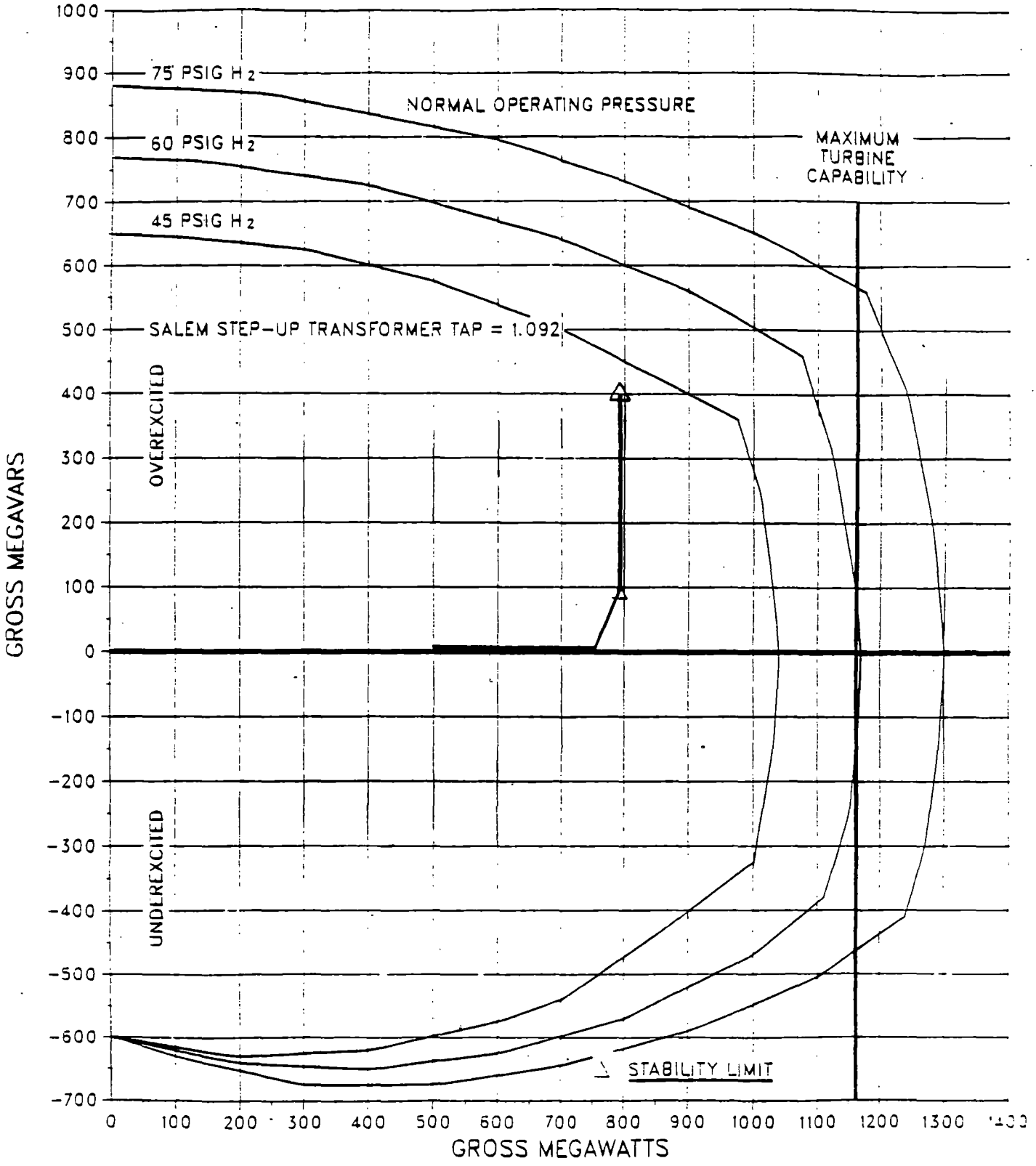
SALEM 1 OPERATING GUIDE

SALEM 2 ON AND HOPE CREEK 1 ON

OUTAGE:
5015 (HOPE CREEK – KEENEY)

CURVE NO. 104
01 7-8-04:

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT



S1OP

3/20/87 RWV

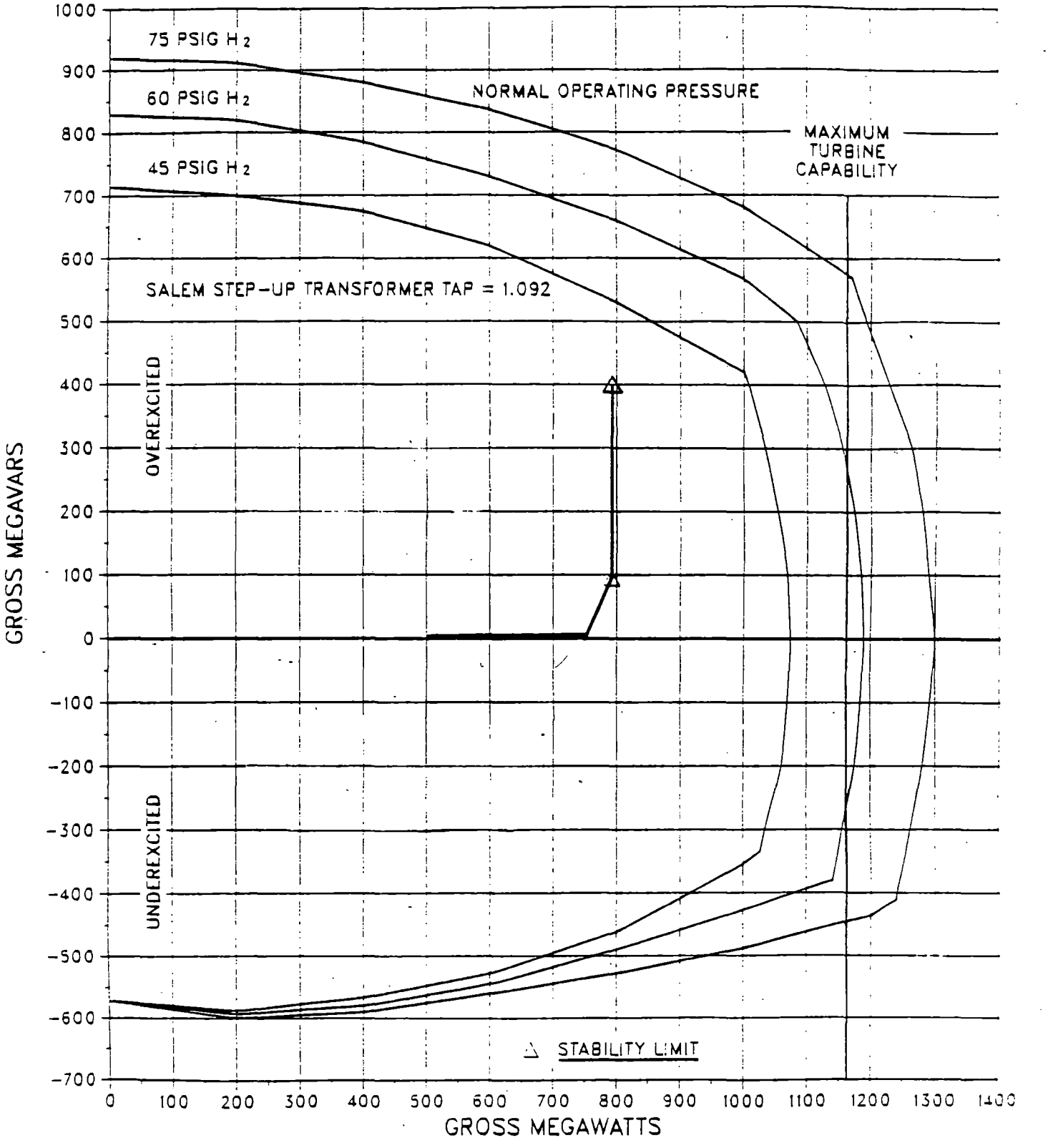
SALEM 2 OPERATING GUIDE

SALEM 1 ON AND HOPE CREEK 1 ON

OUTAGE:
5015 (HOPE CREEK – KEENEY)

CURVE NO.. 105
01 7-8-04:

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT



S20P

3/20/86

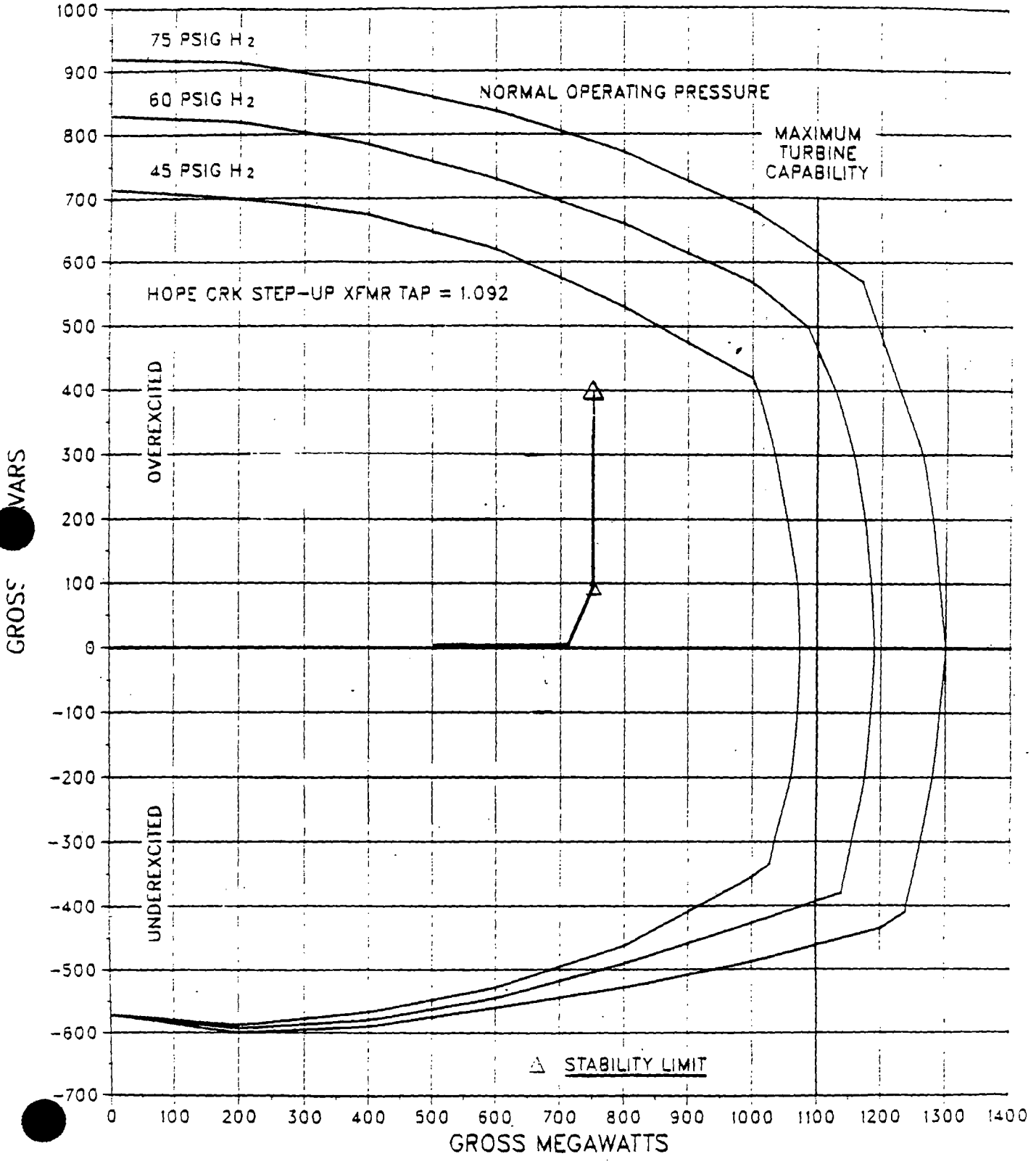
HOPE CREEK 1 OPERATING GUIDE

SALEM 2 ON AND SALEM 1 ON

OUTAGE:
5015 (HOPE CREEK – KEENEY)

CURVE NO.. 106
OI 7-8-04:

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT



COP

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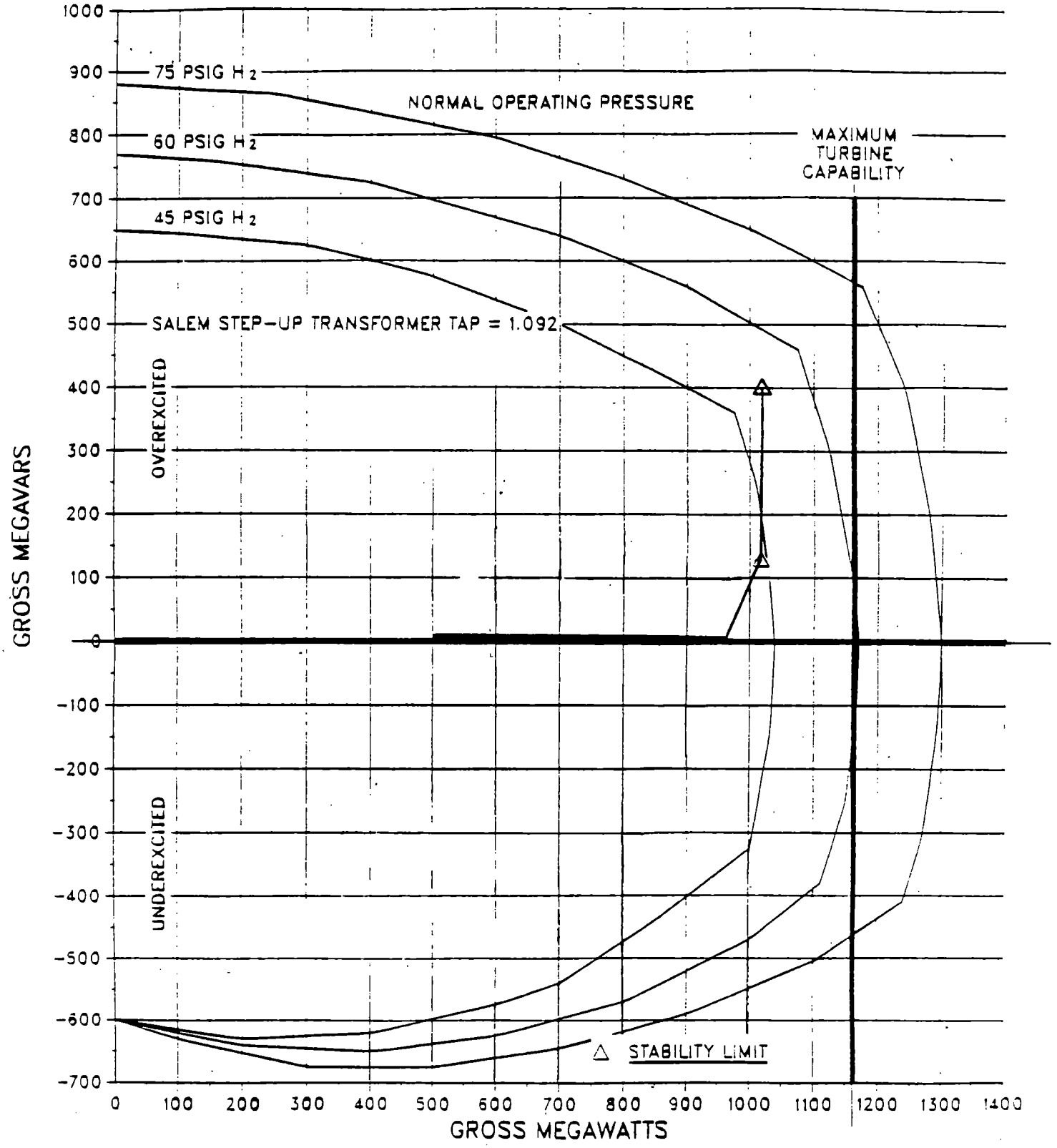
SALEM 1 OPERATING GUIDE
SALEM 2 OFF AND HOPE CREEK 1 ON

OUTAGE:
5015 (HOPE CREEK – KEENEY)

CURVE NO.: 107
01 7-8-04:

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT



5120P

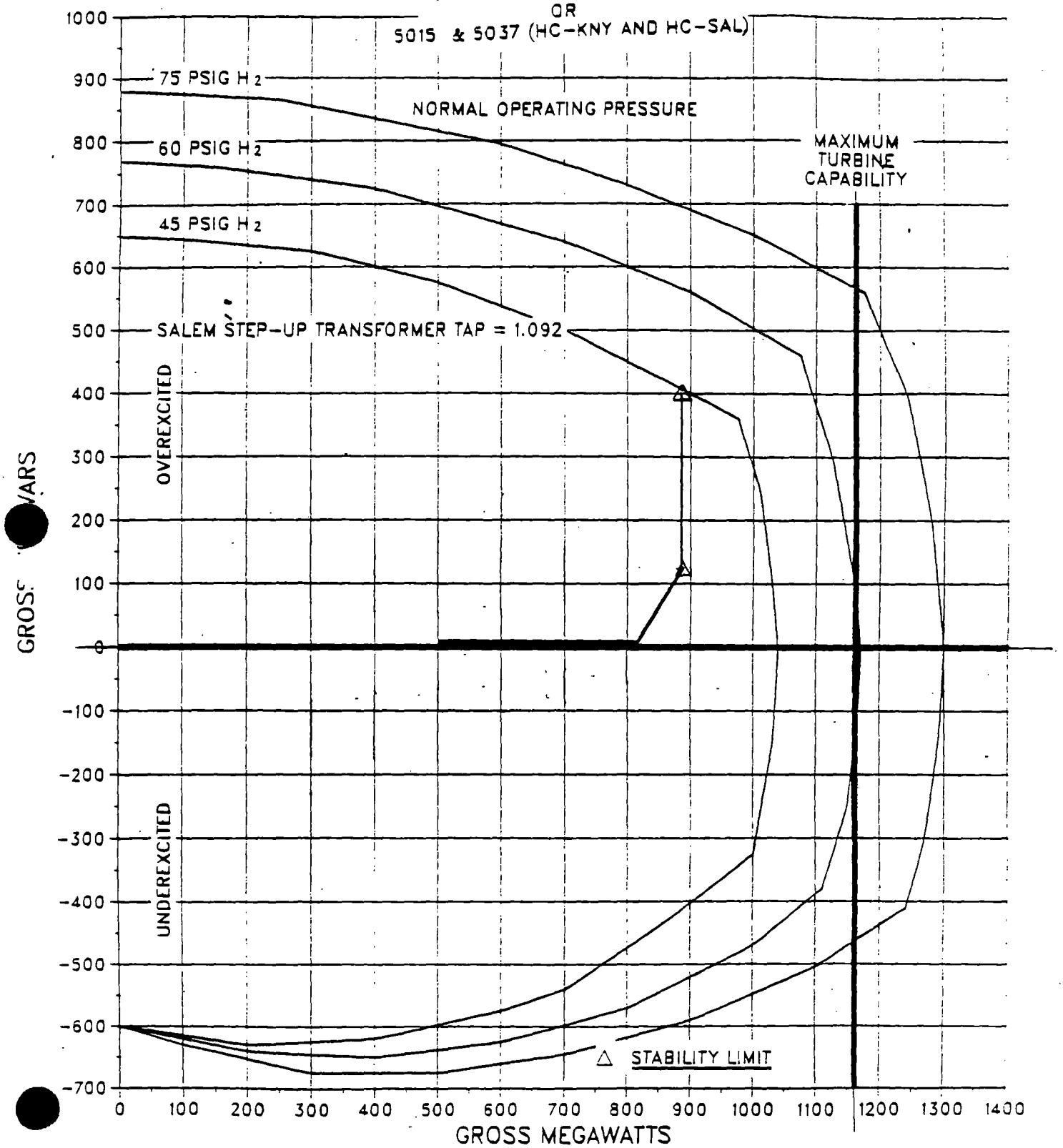
3/20/87

SALEM 1 OPERATING GUIDE
SALEM 2 OFF AND HOPE CREEK 1 ON

CURVE NO. 108
01 7-8-04:

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT

OUTAGE:
5015 & 5021 (HC-KNY AND SAL-DNS)
OR
5015 & 5023 (HC-KNY AND HC-NF)
OR
5015 & 5024 (HC-KNY AND SAL-NF)
OR
5015 & 5037 (HC-KNY AND HC-SAL)



S1202V

3/20/87

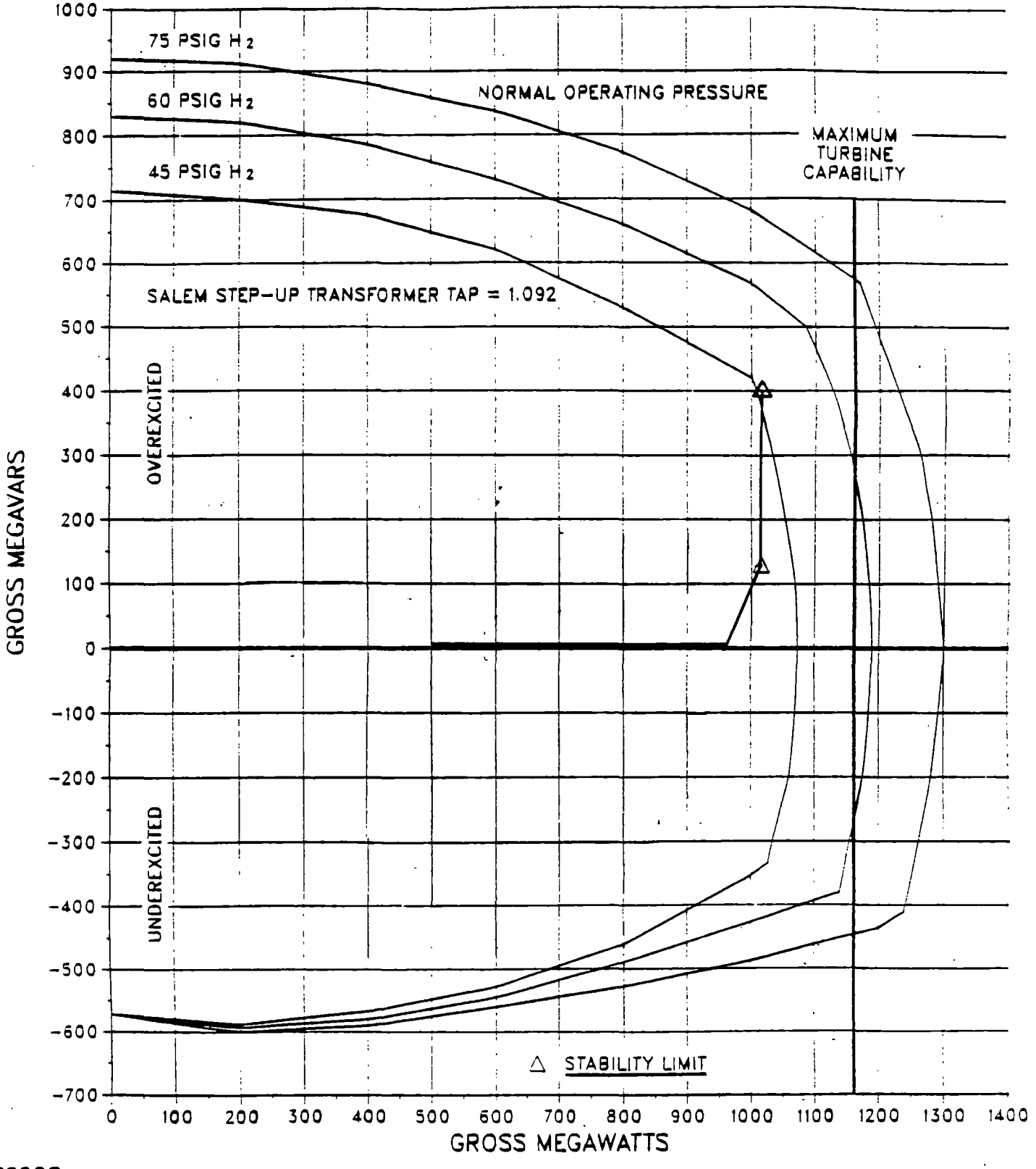
SALEM 2 OPERATING GUIDE

HOPE CREEK 1 ON AND SALEM 1 OFF

OUTAGE:
5015 (HOPE CREEK – KEENEY)

CURVE NO.: 109
01 7-8-04:

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT



S220P

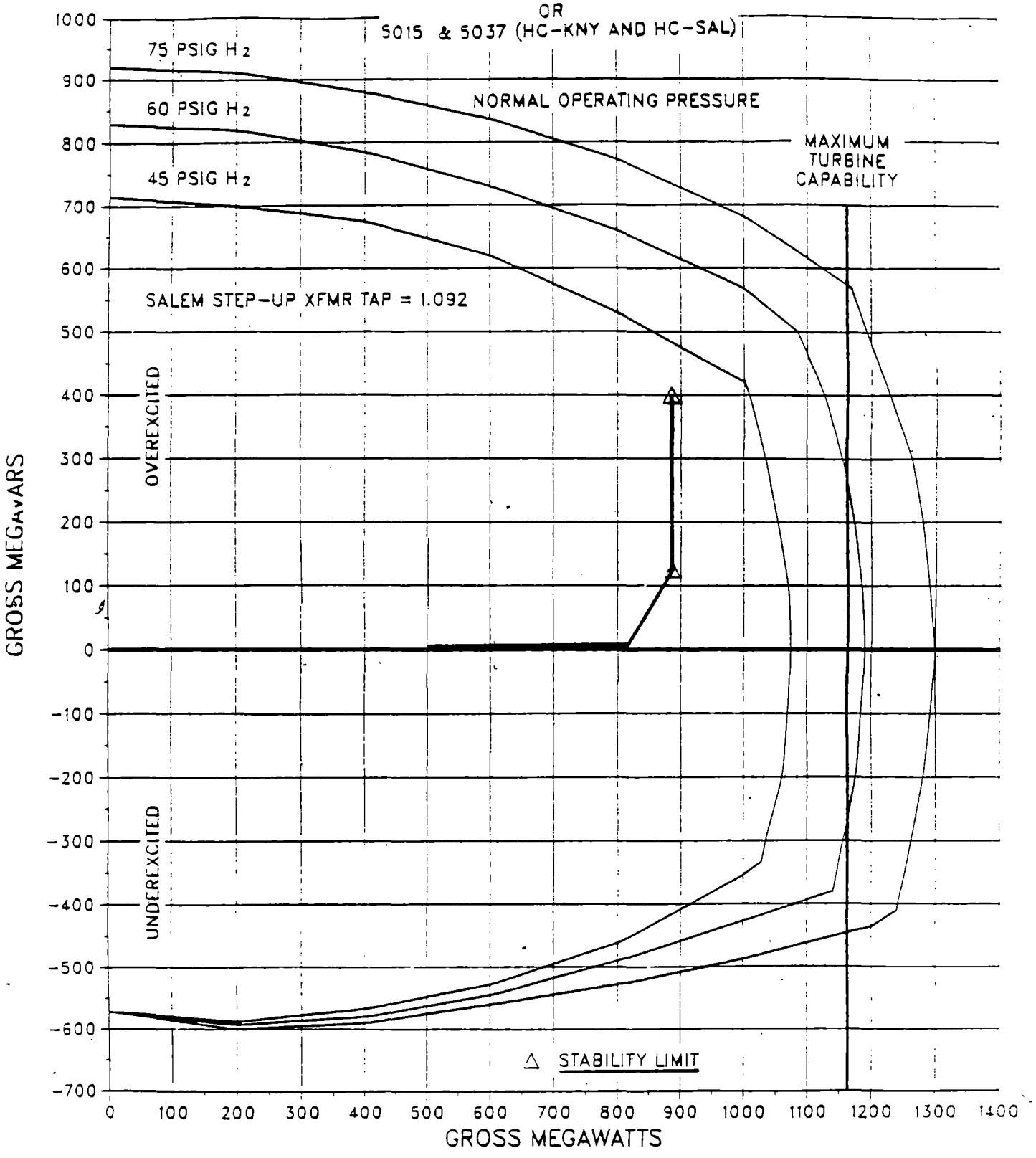
3/20/87

SALEM 2 OPERATING GUIDE
HOPE CREEK 1 ON AND SALEM 1 OFF

OUTAGE:
5015 & 5021 (HC-KNY AND SAL-ONS)
OR
5015 & 5023 (HC-KNY AND HC-NF)
OR
5015 & 5024 (HC-KNY AND SAL-NF)
OR
5015 & 5037 (HC-KNY AND HC-SAL)

CURVE NO.: 110
01 7-8-04:

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT



S2202V

3/20/87

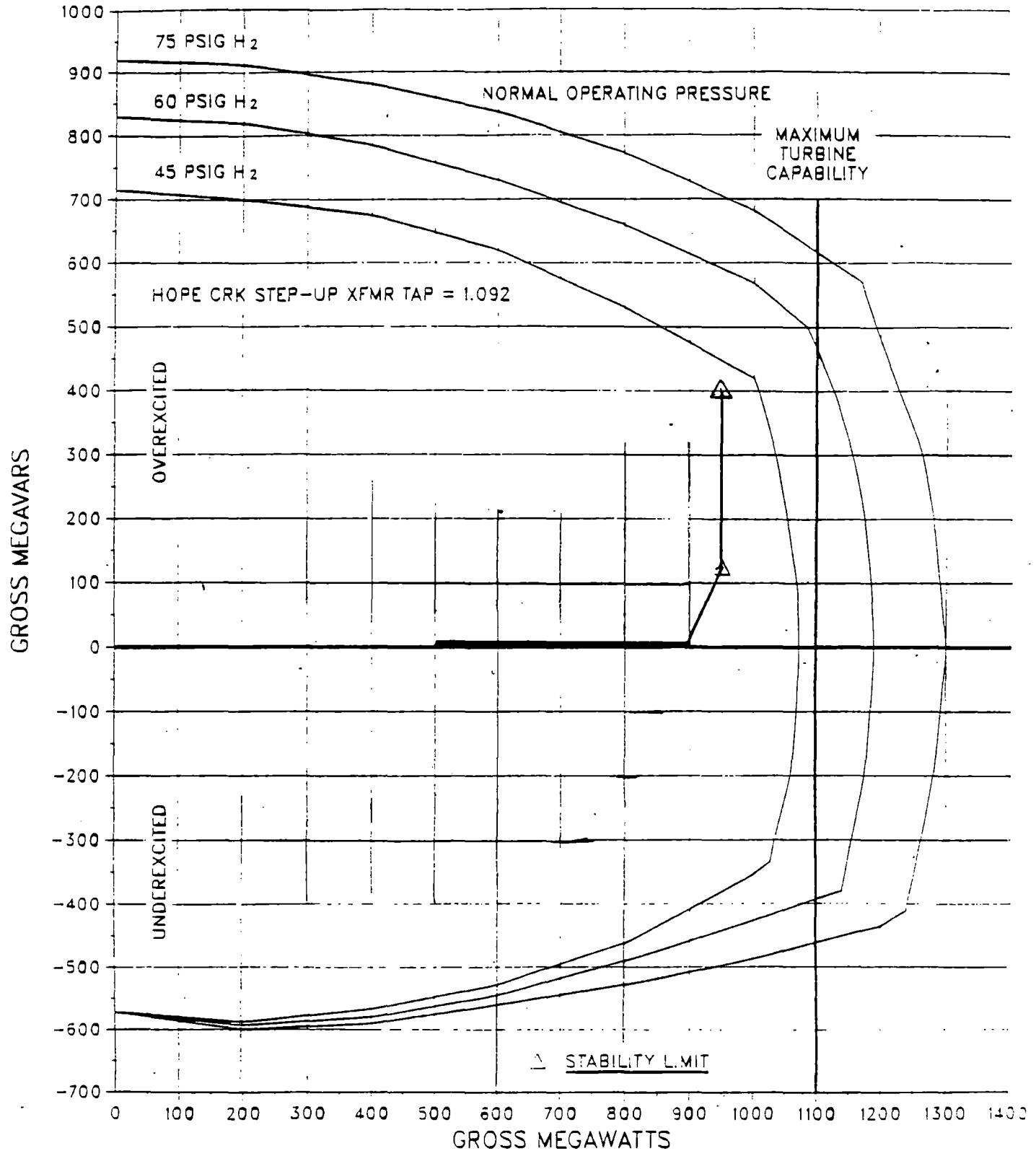
HOPE CREEK 1 OPERATING GUIDE

ONE SALEM UNIT ON AND ONE SALEM UNIT OFF

OUTAGE:
5015 (HOPE CREEK – KEENEY)

CURVE NO. 111
01 7-8-04:

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT



HC2OP

3/20/87

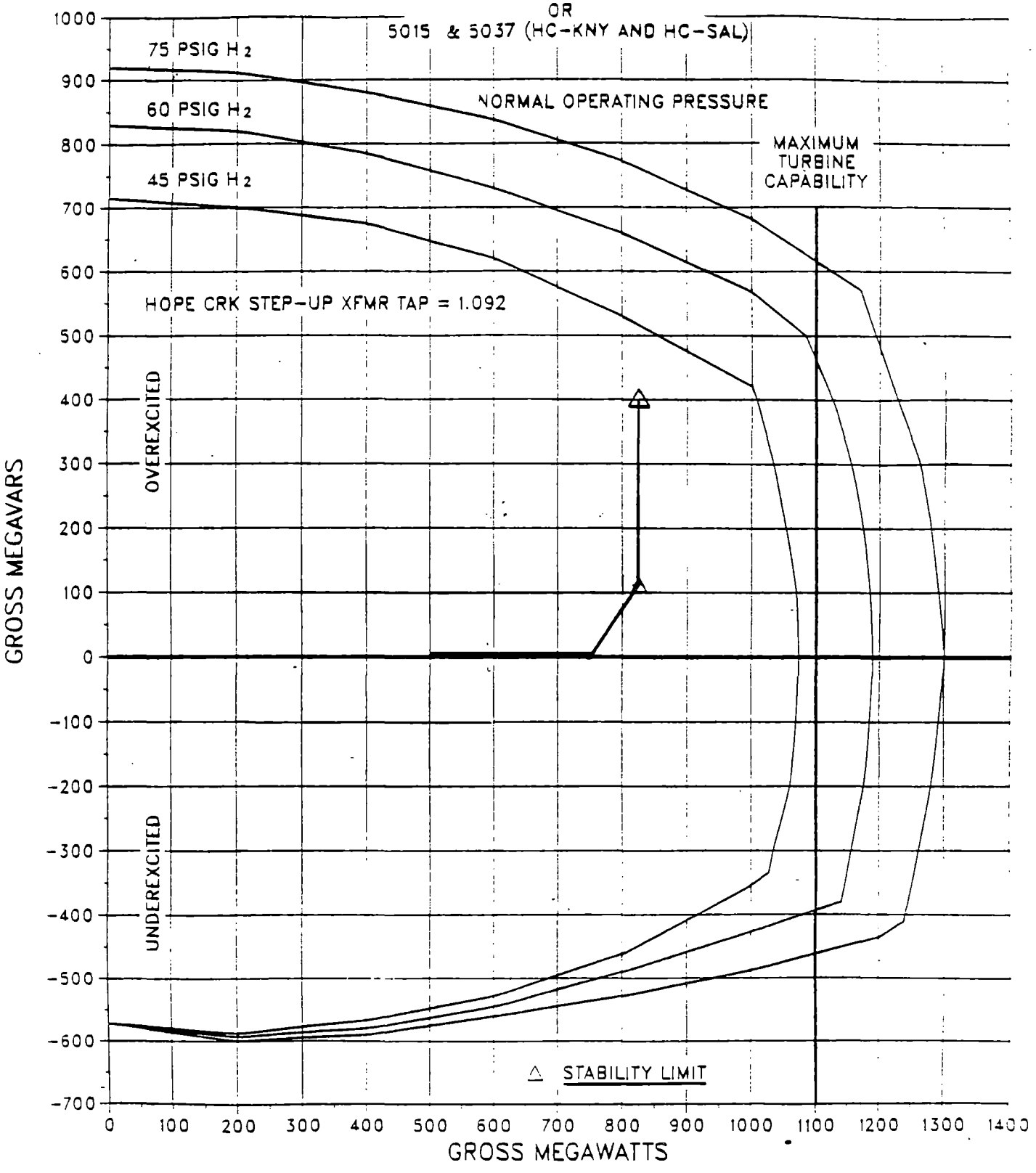
HOPE CREEK 1 OPERATING GUIDE

ONE SALEM UNIT ON AND ONE SALEM UNIT OFF

CURVE NO.: 112
01 7-8-04:

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT

OUTAGE:
5015 & 5021 (HC-KNY AND SAL-DNS)
OR
5015 & 5023 (HC-KNY AND HC-NF)
OR
5015 & 5024 (HC-KNY AND SAL-NF)
OR
5015 & 5037 (HC-KNY AND HC-SAL)



HC202

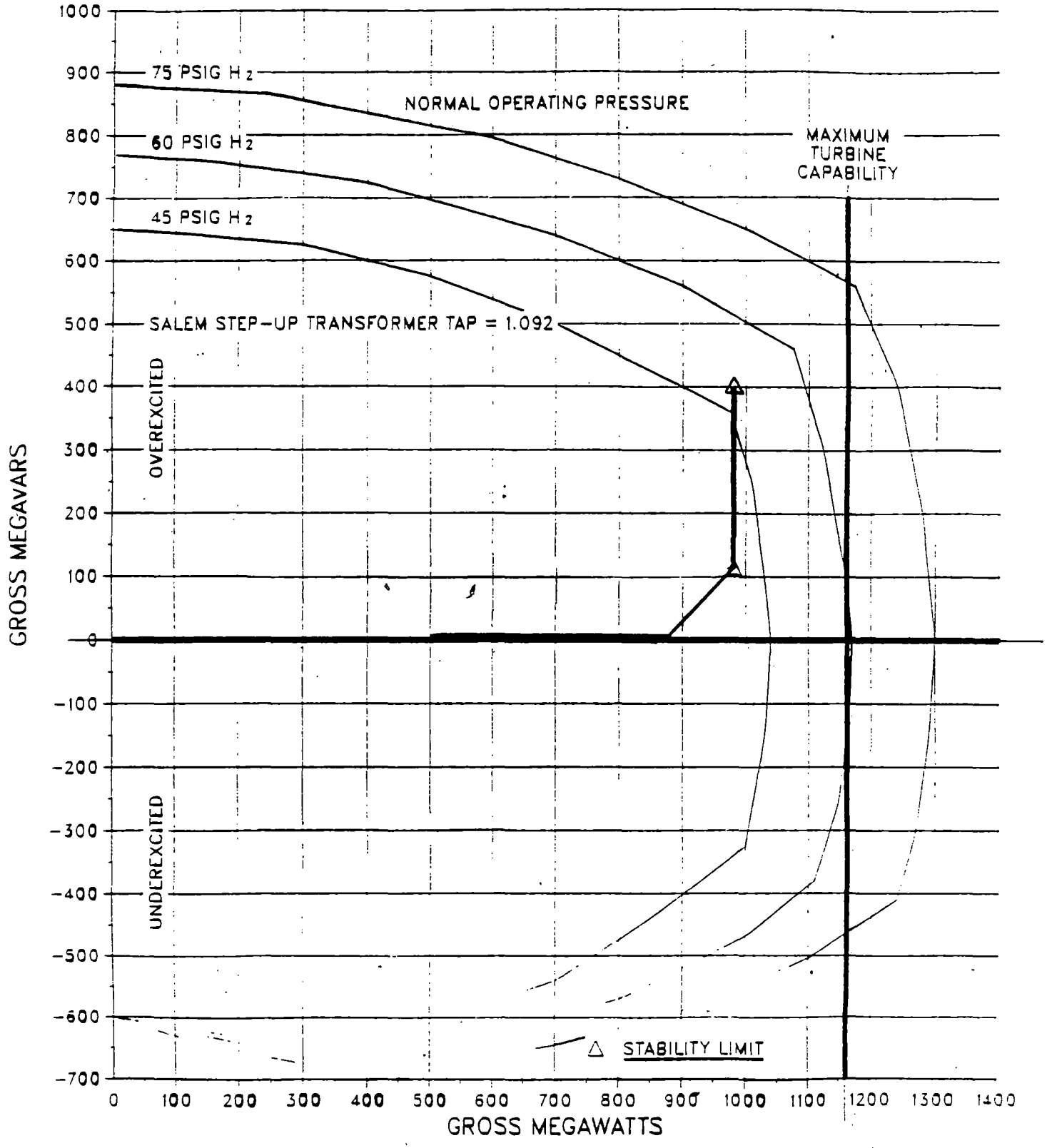
3/20/87

SALEM 1 OPERATING GUIDE
SALEM 2 ON AND HOPE CREEK 1 OFF

OUTAGE:
5015 (HOPE CREEK – KEENEY)

CURVE NO.: 113
01 7-8-04:

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT



S120P2

3/20/87

SALEM 1 OPERATING GUIDE

SALEM 2 ON AND HOPE CREEK 1 OFF

CURVE NO. 114

01 7-8-04:

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT

OUTAGE:
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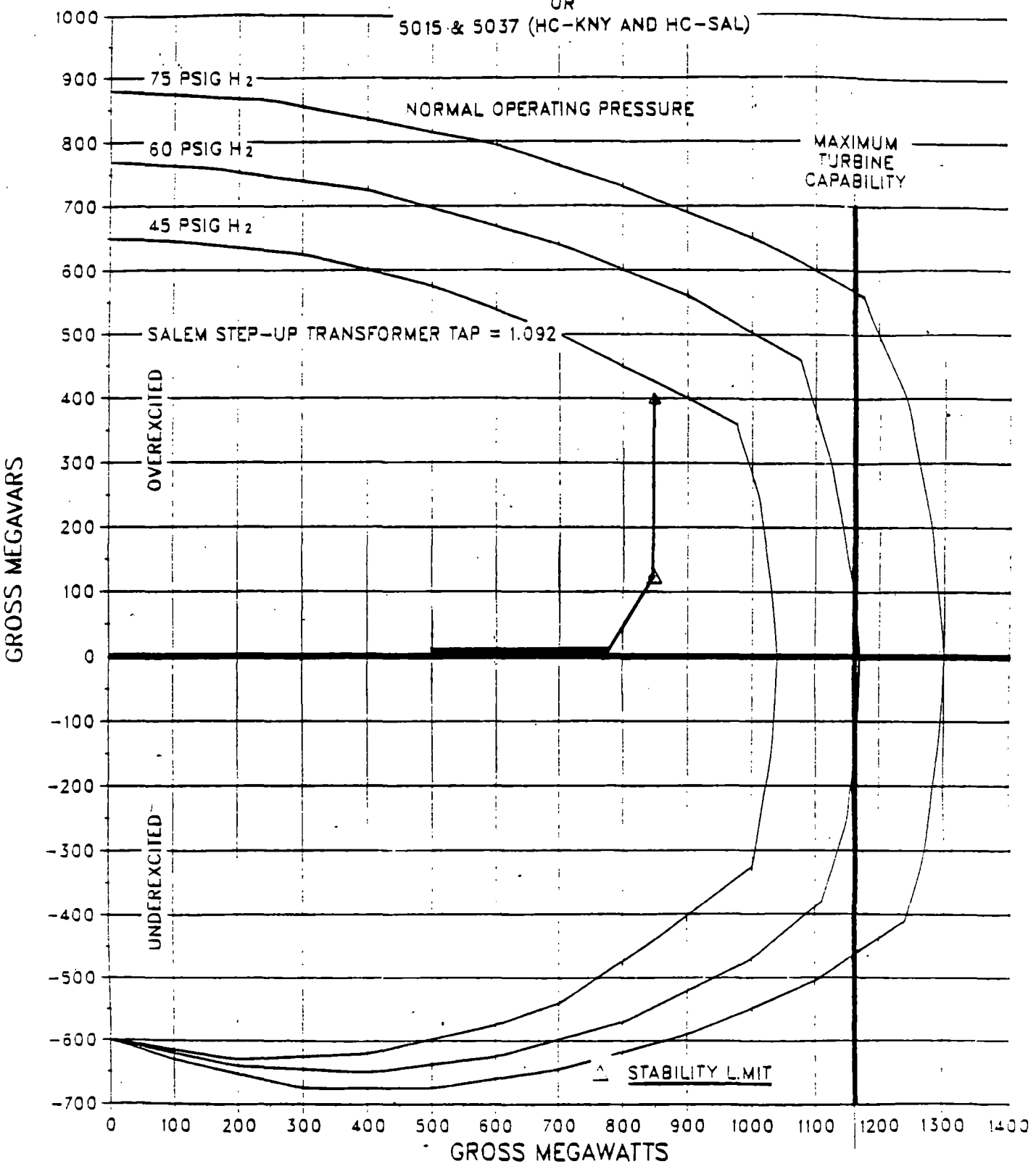
OR
5015 & 5023 (HC-KNY AND HC-NF)
OR
5015 & 5024 (HC-KNY AND SAL-NF)
OR
5015 & 5037 (HC-KNY AND HC-SAL)



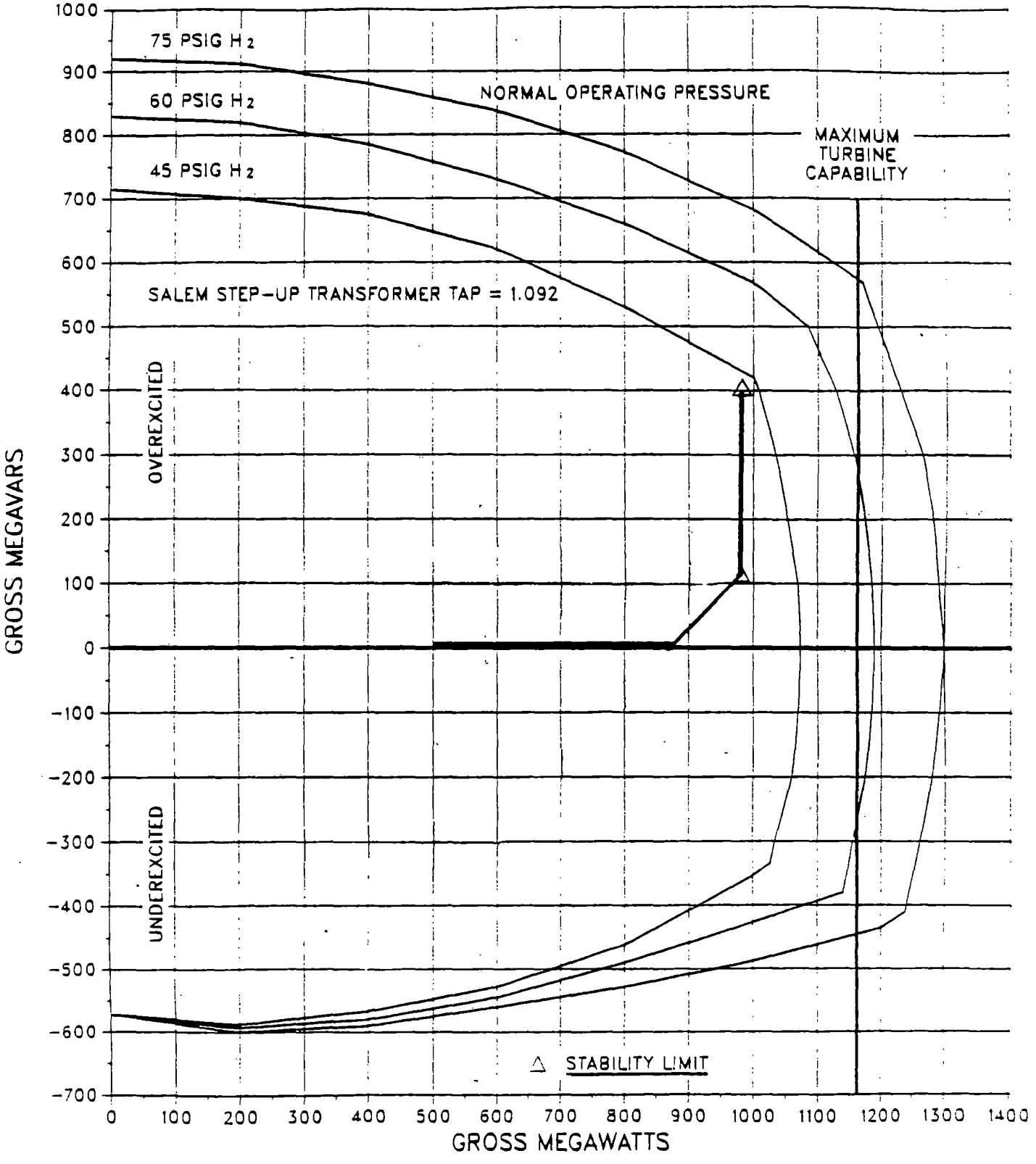
3/20/87

SALEM 2 OPERATING GUIDE
SALEM 1 ON AND HOPE CREEK 1 OFF

OUTAGE:
5015 (HOPE CREEK – KEENEY)

CURVE NO. 115
01 7-8-04:

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT



S220P1

3/20/87

SALEM 2 OPERATING GUIDE
SALEM 1 ON AND HOPE CREEK 1 OFF

CURVE NO. 116
01 7-8-04:

ISSUED BY:
SYSTEM PLANNING
DEPARTMENT

OUTAGE:
5015 & 5021 (HC-KNY AND SAL-DNS)
OR
5015 & 5023 (HC-KNY AND HC-NF)
OR
5015 & 5024 (HC-KNY AND SAL-NF)
OR
5015 & 5037 (HC-KNY AND HC-SAL)