

REFILL TEST PROGRAM

PROGRAM: REFTEST95a.EXE

INTRODUCTION: The Refill Test program tests the reservoir and system refill of a HYSSR study according to the definition of refill established in Section 7 of the Pacific Northwest Coordination Agreement (PNCA). A study fails the refill test when the system energy fails to reach 98% full in 95% of the years being studied and has produced secondary energy during the January through July refill period of the failing years. The Refill Test program will total the secondary energy produced during the January through July period (in previous PNCA studies, secondary generation in May was not included in the total January through July because of Water Budget considerations, however in most recent years it is included.) . The program tests the refill in terms of storage energy or storage content and lists the failure amounts in terms by year for each project and for the system.

The Refill Test program is an ancillary program to the HYSSR regulator program. It uses the results of a HYSSR regulation by reading information from the TABOUT file (the HYSSR output file). The Study Characteristics file, which was input to the HYSSR regulation which created the TABOUT file, is also required as input.

INPUT. The Refill Test program executes in batch mode, so it requires a control file named **C:\HYSSR\CONFILES\REFTEST.CON**. This control file defines the names of the input data file, the output file for the printer, the Study Characteristics file, the output table of projects which did not refill, and the TABOUT file. A sample control file follows:

SAMPLE CONTROL FILE:

```
* C:\HYSSR\DATA\REFTEST.CON
*
* Unit 5 is the input file
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* Unit 6 is the output file which may be directed to the printer
* Unit 7 is the Study Characteristics file
* Unit 8 is the output table of projects not refilling
* Unit 14 is the TABOUT from a previous HYSSR run
*
*   FORMAT   T4, I2, T7, A26, T34, A11, T46, A7, T54, A10, T65, I4
*
*-----*-----*-----*-----*-----*
*UNIT FILE NAME                FORMAT      STATUS  ACCESS  RECL
*-----*-----*-----*-----*-----*
  5 C:\REFILL93\REFILL2.TST     FORMATTED  OLD
  6 C:\REFILL93\REFST.PRN      FORMATTED  UNKNOWN
  7 C:\REFILL93\STCHAR93.STY   UNFORMATTED  OLD
  8 C:\REFILL93\REFILL.TAB     FORMATTED  UNKNOWN
 14 C:\REFILL93\TABOUT.93      BINARY     OLD      DIRECT  104
*-----*-----*-----*-----*-----*

```

The input data file specifies: the name of the study and description, the run options, changes to project full and empty from the values in the Study Characteristics file, 31 July target elevations for storage projects, average critical period H/K values for storage energy test, and Brownlee and Kootenay regulated multi-year end of period elevations (record codes 86) for AOP studies. All of this data is input on 80 column records using the standard HYSSR format (unless specified differently). A sample of the input file is found on page the record code descriptions.

STANDARD HYSSR RECORD FORMAT

COLS 1-2	Record code
COLS 8-10	Project number
COLS 19-20	Year
COLS 21-23	Period identifier or run option
COLS 24-32	Data value
COLS 33-35	Period identifier or run option
COLS 36-44	Data value
COLS 45-47	Period identifier or run option
COLS 48-56	Data value
COLS 57-59	Period identifier or run option
COLS 60-68	Data value
COLS 69-71	Period identifier or run option
COLS 72-80	Data value

Blank Record Code: The information on this record is used as the heading on each page of output. Heading information might consist of the study name and/or a description of the study. The first two columns of this record must be blank, and the heading information may appear in columns 2 through 80.

Record code 01: This record type defines the basic run options. The first option appears in **columns 17 - 20** and determines whether refill should be examined in terms of energy or storage. **"STOR"** measures refill in

units of storage content (thousand acre feet), and "ENER" measures refill in units of energy (megawatt-months). If no value appears in columns 17 - 20, the program defaults to energy. When refill is examined in units of energy, the program also requires average critical period H\K values on record code 39. The other run options appear in standard HYSSR format and are as follows:

RUN OPTIONS

<u>Identifier</u>	<u>Definition</u>	<u>Default</u>
TRG	Mica's 31 July target content (KSFD) A target is used for PNCA refill test, not an AOP refill test.	SUB (full)
TOL	Allowable value for total secondary energy produced in January - July (does <u>not</u> include May's secondary energy during PNCA refill test, but does include May's secondary energy during AOP refill test) and not be considered a refill failure	80 Mw
AOP	Indicates that this is an AOP study so do include May's secondary energy production in that year's total. As of 03-04, use this trigger for PNCA tests also.	Not AOP
6TG	Insert any number to trigger the program to use the elevations on the 86 cards for Kootenay Lake and Brownlee as full. Use this trigger for AOP refill tests, but not for PNCA refill tests.	SUB
DFO	Dworshak's 31 July target elevation (ft)	SUB

Record code 20: This record code defines changes to be made to a project's characteristics. These changes need only be made when changes were made to a project's characteristics at execution time of the HYSSR regulation. These characteristics are identified by each project's external project number.

The project characteristics which may be changed are:

<u>Identifier</u>	<u>Project characteristic</u>
SUB	Storage Upper Bounds (AF)
SLB	Storage Lower Bounds (AF)

Record code 38: These records contain 31 July target elevations for storage projects with operations which often require the projects to be below full on 31 July. The target elevation is considered to be that project's full

for refill and is used to calculate system full for the refill test. Each record contains a project number and its 31 July target elevation in feet. The format for each record is:

<u>Column</u>	<u>Value</u>
1 - 2	38
8 - 10	external project number
24 - 32	31 July target elevation in feet

Record code 39: These records contain each storage project's average critical period H/K (H over K) by its external project number. These H/K values have units of MW/KCFS and are obtained from the Northwest Power Pool for PNCA refill tests and from BPA for AOP refill tests. H/K values must be available for the refill test to be in terms of energy. The external project number must be in columns 8 - 10 and the H/K value in columns 13 - 20.

Record code 86: Beginning with AOP 2011, Steps I, II, and III will treat Brownlee and Kootenay Lake the same. Previously, only Steps II and III used 86 cards for Brownlee, now 86 cards are used for both projects in all three steps. These records contain Brownlee and Kootenay Lake's, July end of month regulated elevations in feet. These are the regulated elevations from the HYSSR run that the refill test is to run against. . The program looks for Brownlee and Kootenay Lake's end of July elevations when the "6TG" option is on the "01" record. The "6TG" option indicates that Kootenay Lake and Brownlee's July 31 storage is included in the system total for refill computations.

SAMPLE INPUT DATA for PNCA refill tests:

```

FR9495 PNCA REFILL STUDY IN STORAGE ENERGY
01      ENERTRG  3456.2AOP
20  1      SLB    0.0
38  19      1280.0
39      18    119.22
39      64    103.13
39      20    70.09
39      10    168.56
39      3     106.43
39      19     86.71
FR9495 PNCA REFILL STUDY IN STORAGE CONTENT
01      STORTRG   3456.2

```

SAMPLE INPUT DATA for STEPs I, II, and III AOP refill test:

```

STEP II AOP9899 REFILL STUDY IN STORAGE ENERGY

```

01		STORAOP	6TG	1743.3
39	19	85.03		
39	10	159.35		
39	3	107.48		
86	6	29JUL	1743.2	
86	6	30JUL	1743.2	
86	6	31JUL	1743.2	
86	6	32JUL	1743.3	
86	6	33JUL	1744.7	
86	6	34JUL	1743.2	
86	21	29JUL	2075.0	
86	21	30JUL	2074.9	
86	21	31JUL	2071.6	
86	21	32JUL	2075.0	
86	21	33JUL	2075.0	
86	21	34JUL	2071.7	

OUTPUT. The Refill Test program produces two types of output: a listing of refill failures and a table of refill failures. The listing of refill failures lists each project and indicates by year the amount that that project failed to refill. Then the program lists the refill failure years and amounts for the system, indicating years that did not refill but are not considered refill failures, because they did not produce secondary energy, with asterisks. The table of refill failures creates a table of project versus year and places an "X" when there is a refill failure

PROGRAM EXECUTION ON THE PC: To execute the Refill Test program, have a copy of **REFTEST95a.EXE** in the local **C:\HYSSR\PGM** subdirectory. Now type **REFTEST95a** while in the **C:\HYSSR\PGM** subdirectory and the program will execute using the datasets named in **REFTEST.CON**. This control file must be in the local **C:\HYSSR\CONFILES** subdirectory and changed to meet the data file naming conventions being used. The existing format of the control file may not be altered.

SAMPLE REFILL TEST OUTPUT

G061W REFILL TEST PROGRAM

REFILL TEST IS BASED ON SYSTEM ENERGY

WATER BUDGET WAS PART OF THE REGULATION -- SECONDARY PRODUCED IN MAY IS NOT INCLUDED IN THE JAN-JUL TOTAL

31 JUL TARGET CONTENT AT MICA IS 3356.2 KSF

CORRA LINN DOES NOT HAVE A 31 JULY TARGET - SO CORRA LINN AND BROWNLEE ARE NOT INCLUDED IN THE SYSTEM REFILL TEST

31 JULY TARGET STORAGE CONTENT AT GRAND COULEE IS 8324.7 KAF

31 JULY TARGET STORAGE CONTENT AT DWORSHAK IS 2946.6 KAF

167 WHITE RIVER 98% = 24. MW-MON

YR FAILURE

29	0.	30	2.	31	6.	37	0.	40	0.	41	2.
44	7.	77	6.								

166 TIMOTHY 98% = 128. MW-MON

YR FAILURE

29	76.	30	98.	31	103.	32	30.	33	4.	34	29.
35	19.	36	19.	37	80.	38	3.	39	39.	40	72.
41	97.	42	57.	43	2.	44	105.	45	56.	46	5.
47	9.	49	5.	51	1.	53	0.	56	8.	57	7.
58	19.	59	30.	60	12.	61	9.	62	11.	63	27.
64	40.	65	1.	66	3.	67	53.	68	60.	69	4.
70	9.	71	1.	72	11.	73	67.	74	1.	75	2.
76	4.	77	104.	78	30.						

153 UPPER BAKER 98% = 112. MW-MON

YR FAILURE

29	3.	30	13.	31	30.	37	4.	40	1.	41	12.
44	36.	73	0.	77	33.						

154 LOWER BAKER 98% = 40. MW-MON

YR FAILURE

30	0.	31	5.	44	6.	77	5.				
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150 ROSS 98% = 1282. MW-MON

YR FAILURE

29	193.	30	471.	31	616.	37	235.	40	137.	41	461.
44	665.	73	82.	77	640.						

157 CUSHMAN NO 1 98% = 297. MW-MON

YR FAILURE

29	80.	30	173.	31	196.	37	144.	40	60.	41	168.
44	203.	45	4.	73	39.	77	199.				

155 ALDER 98% = 126. MW-MON

YR FAILURE

29	3.	30	72.	31	27.	34	24.	35	4.	36	2.
37	3.	38	9.	39	4.	40	22.	41	112.	42	8.
44	107	45	10.	47	12.	51	9.	52	2.	57	8.
58	3.	61	4.	62	5.	63	18.	65	5.	67	1.
68	7.	69	6.	70	5.	73	18.	77	48.	78	2.

3 LIBBY 98% = 8469. MW-MON

YR FAILURE

29	3873.	30	4450.	31	5171.	37	4677.	40	1425.	41	4403.
44	5414.	45	1699.	73	892.	77	5288.				

5 DUNCAN 98% = 1938. MW-MON

YR FAILURE

29	1514.	30	1579.	31	1643.	36	531.	37	1523.	39	1085.
40	1503.	41	1574.	44	1665.	45	302.	49	138.	52	476.
58	109.	73	1492.	77	1653.						

6 CORRA LINN 98% = 932. MW-MON

YR FAILURE

29	330.	30	334.	31	352.	32	330.	33	128.	34	330.
35	330.	36	330.	37	330.	38	330.	39	250.	40	56.
41	333.	42	263.	44	359.	45	330.	46	321.	47	330.
48	330.	49	330.	50	148.	52	330.	53	171.	55	51.
56	330.	57	330.	58	330.	59	330.	60	310.	61	330.
62	330.	63	330.	64	330.	65	330.	66	330.	67	330.
68	320.	69	330.	70	330.	71	297.	72	330.	73	156.
74	330.	75	330.	76	180.	77	355.	78	330.		

1 MICA 98% = 9215. MW-MON (TARGET)

YR FAILURE

29	2447.	30	1678.	31	2315.	37	4629.	41	2107.	43	1349.
44	4667.	45	2852.	49	1942.	50	705.	53	1808.	62	711.
70	1432.	71	316.	73	741.	75	735.	77	2830.	78	1915.

2 ARROW 98% = 9828. MW-MON

YR FAILURE

29	2900.	30	4893.	31	5774.	36	486.	37	3212.	39	969.
40	2494.	41	4836.	44	6071.	45	286.	49	80.	58	34.
73	2086.	77	5916.								

10 HUNGRY HORSE 98% = 8209. MW-MON

YR FAILURE

29	4475.	30	5447.	31	5856.	32	995.	35	868.	36	2405.
37	5143.	38	1834.	39	1398.	40	3611.	41	5309.	42	1203.
44	6030.	45	3080.	46	345.	49	1004.	53	1245.	55	706.
57	1309.	58	2309.	61	571.	62	338.	63	1053.	64	937.
67	808.	68	1161.	70	1561.	73	2281.	77	5939.	78	457.

11 KERR 98% = 2813. MW-MON

YR FAILURE

30	125.	31	607.	41	1030.	44	770.	77	685.		
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38 NOXON 98% = 467. MW-MON

YR FAILURE

30	11.	31	93.	41	6.	44	120.	77	106.		
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16 ALBENI FALLS 98% = 2006. MW-MON

YR FAILURE

29 41. 30 126. 31 463. 34 41. 36 41. 37 41.
39 41. 40 41. 41 104. 44 577. 45 41. 49 41.
57 41. 58 41. 61 41. 73 41. 77 518.

18 POST FALLS 98% = 424. MW-MON

YR FAILURE

30 5. 31 58. 41 1. 44 76. 77 67.

64 LONG LAKE 98% = 172. MW-MON

YR FAILURE

30 5. 31 35. 41 3. 44 45. 77 39.

19 GRAND COULEE 98% = 6094. MW-MON

YR FAILURE

31 403. 44 822. 77 604.

20 CHELAN 98% = 758. MW-MON

YR FAILURE

30 38. 31 167. 41 30. 44 211. 77 188.

21 BROWNLEE 98% = 1452. MW-MON

YR FAILURE

29 265. 30 357. 31 404. 32 272. 33 363. 34 404.
35 404. 36 299. 37 384. 40 404. 41 325. 42 181.
44 114. 45 125. 46 108. 47 192. 48 75. 49 278.
51 81. 54 112. 55 192. 56 68. 57 152. 58 127.
59 283. 60 365. 61 404. 62 252. 63 171. 64 112.
66 395. 67 29. 68 164. 73 85. 77 164.

31 DWORSHAK 98% = 2342. MW-MON

YR FAILURE

29 616. 30 421. 31 619. 37 808. 41 1039. 44 1291.
73 898. 77 1671.

81 JOHN DAY 98% = 536. MW-MON

YR FAILURE

29 74. 30 103. 31 149. 36 10. 37 74. 39 47.
40 74. 41 96. 44 149. 73 74. 77 149.

40 ROUND BUTTE 98% = 212. MW-MON

YR FAILURE

29 13. 30 87. 31 71. 37 112. 40 9. 41 38.
44 81. 73 4. 77 76.

159 SWIFT NO 1 98% = 464. MW-MON

YR FAILURE

29 102. 30 234. 31 256. 37 119. 39 6. 40 79.
41 208. 44 272. 73 56. 77 264.

161 YALE 98% = 93. MW-MON

YR FAILURE

29	25.	30	53.	31	57.	36	4.	37	28.	39	4.
40	19.	41	48.	44	59.	45	4.	49	2.	58	2.
73	14.	77	58.								

162 MERWIN 98% = 40. MW-MON

YR FAILURE

29	12.	30	28.	31	25.	36	1.	37	20.	39	1.
40	10.	41	25.	44	25.	45	1.	49	1.	58	0.
73	7.	77	25.								

163 MOSSYROCK 98% = 707. MW-MON

YR FAILURE

29	208.	30	390.	31	412.	34	175.	36	29.	37	229.
39	72.	40	181.	41	707.	42	115.	44	542.	45	94.
63	169.	66	3.	68	251.	70	35.	73	343.	77	524.

SYSTEM 98% = 56796. MW-MON

YR FAILURE

29	16599.	*30*	20502.	*31*	25159.	32	113.	36	2598.	*37*	21035.
38	773.	39	3263.	40	9008.	*41*	22414.	42	555.	43	556.
44	30016.	45	8288.	49	2914.	53	2426.	57	115.	58	1540.
62	477.	63	64.	64	198.	68	196.	70	2438.	73	9059.
77	27636.	78	1784.								

AVERAGE OF SYSTEM REFILL FAILURES = 8066. MW-MON

"*" INDICATES YEARS THAT SYSTEM DID NOT REFILL BUT NO SURPLUS ENERGY WAS GENERATED IN JAN THRU JUL (EXCLUDING MAY)

" " INDICATES YEARS THAT SYSTEM DID NOT REFILL AND SURPLUS WAS GENERATED IN JAN THRU JUL (EXCLUDING MAY)

*** SYSTEM REFILL FAILURES DO NOT INCLUDE BROWNLEE AND CORRA LINN FAILURE AMOUNTS