Heat Balance Diagrams
& Table Data

Standard Conditions:
VWO / 1000 MSH no sprays / 1000 HRH no sprays
Backpressure: (actual ΔP)
Reheat Pressure Drop: actual
NO BD NO MU NO FGR NO APR
Standard Defn for NTC HR

1) GE Original Design HBD (latest revision) w/FGR w/APH
2) GE Design corrected to standard conditions 2400
3) GE Design 580P 2520 / VWO

4) GE Guaranteed Conditions 820 / 2400 / VWO
for reference (nameplate)

Acceptance Testing

5 6 U1 + U2 2400 / VWO test conditions w/FGR w/APH
7 8 → correct to standard conditions no sprays no FGR no APH
9 10 U1 + U2 2520 / VWO test conditions
11 12 → correct to standard conditions

Current Conditions

13 14 U1 + U2 2400 / VWO test conditions
15 16 → correct to standard conditions
17 18 U1 + U2 2520 / VWO test conditions
19 20 → correct to standard conditions

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Key Info Needed

MW

Steam flow

throttle press

M Stm temp

HRH temp

BPA

B

C

NTC HR

HP Turb η

MW

% MW_{total}

IP Turb η

MW

% tot

LP Turb η

MW

% tot

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New Turbine Design

Use U1 / U2 existing conditions

Use 91% / 92 / 93 HP turbine η Efficiency

(although we don't have their turb design details) assume we can bring our existing turbines to that η

Study 1 hold steam flow / how much additional MW?

hold MW / how much additional perf (NTCHR) → HHR

Study 2 increase steam flow

93% HP 2400 / 6300 MW ____

2400 / 6600 MW ____

2400 / 6900 MW ____

Study 3 establish conditions

92% HP MW ____ / 2400 Steamflow ____

MW ____ / 2375 Steamflow ____

MW ____ / 2350 Steam flow ____

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HP Turbine Replacement

Concerns

1) Extraction Points
   HTR 8 HTR 7

2) Cooling Steam IP rotor
   dummy leakoff - balancing drum

Model

Heat Balance Diagrams

Background

guarantee	820 (2400) / VWO / OP	+ APH	+ FGR	flows	press
design	~860 ?? NP OP	w/o	w/o		

Corrected Mst Flow Load

acceptance testing

U1/U2	VWO/2400	w/FGR
U1/U2	VWO/~~2400~~ 2520	

current testing

U1/U2	VWO/2400	w/o FGR w/o APH
U1/U2	VWO/2520	

MW

HP JP LP's

New Turbine Model

@ 91% Steam flow / Load ??

Need new turbine Design

FIND HINTS 171.8 19th

Turbine Steam Flow

Table 1 thro

~~Turbo Backend~~

Loading Study

need flow passing Press Drops

current max → 6.6

@ 2520 / VWO

19

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Inc MW and ↓ Safety Valve rating

Question: where set steam flow + press
2400 psi / 6,600 - MW? ↓η open it
@ 6,900 - where is press 2350? MW (fix)
2400 psi / 6,900 - MW

Don't have their HP design info

New HP Turb Design

take current conditions U1 + U2 model + upgrade

#1) HP η 85% (88) → 92% (also run 91 + 93%)

How much additional MW (same steam flow)

How much HR (same MW)

#2) w/ 92% and steam flow @ 6,900 Kpph

How much MW

NTCHR?

#3) where extractions

IP cooling steam / dummage leakage

Backend Loading Study

trying to determine maximum steam flow (+ pressure drop) across LP turbine

concern is buckets + diaphrams (dishing)

- can determine design / guarantee / acceptance / current from SDP tests

1) 92% HP 2400 psi / 6,300 MW ____

current 2400 / 6,600 MW ____

2400 / 6,900 MW ____

Where to set design

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TURBINE CYCLE - HEAT BALANCE DIAGRAMS

- New HP turbine design review (HP nozzle block)

What do we get from acceptance test to projected current condition

HR/MW

plus utilize higher steam flow passing capabilities

(Heat Balance Diagram)

original design ~860 MW |2400| provided HBD

original design recalc ?? MW |2400| w/o APH w/o FGR standard TCNU HR

⇒ original design 50P ?? MW |2520| " " "

guarantee HBD 820 MW |2400 provided HBD

recalc ?? w/o APH w/o FGR

reference

guarantee w/ 50P

acceptance test (best represent or average) U1 ?? |2400 corrected conditions w/o APH w/o FGR

U2 |2400

50P U1 |2520

50P U2 |2520

current condition U1 2400 steam flow - opend HP

U2 2400

50P U1 2520

50P U2 2520

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MW

TCNUHR

% HP

IP

LP

% MW

% Power

Steam flow

Press drops

TPM

DS

Table / Spreadsheet

	Steam flow passing	% drop	press	ΔP	% drop
Stages 1					
}					
19					

IP7010300

safety valve

transformer

generator - cooling

pulverizer

CT

BFP Vibr

925
Limitations

Research Results Engr

crystal river

got references

GE

GEC

On-line FW flow (inspect)

Testing IBSC need to install BFPT extr flow measurement

Condensate flow nozzle

IP7010301

CT

helper CT's

lower basin drop curb

increase area

Turbine Model

modes

design

HP

Turbine
considerations
↑mw coupling bolts
N-2 dummy flows
IP rotor cooling stm

IP7010303