Q. Please provide a copy of the completed preventive maintenance and corrective maintenance documentation for Bay d'Espoir Unit 3 for 2018.

A. Please refer to PUB-NLH-033, Attachment 1, a zip file, for the 2018 Preventive Maintenance and Corrective Maintenance documentation for Bay d'Espoir Unit 3.

ENTERED

W/O #: 1347652

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 2 Rev. No.: 0 Rev. Date: 01-01-19 Index No.: 2180 Binder No.: 63

PM Checksheet No.: PM8-59278-ENGBDE
JDE Item No. & Description: 59278 - Runner - Turbine No. 3 - BDE
Type of Inspection: PM8 (Minor)
Department: Engineering
Inspection Start Date: Insp. Comp. Date:
Supervisor's Review Signature & Date: BP. Peddle JAN 22 '20 Planner's Review Signature & Date:
Reference Drawing and Manuals:

ACTIVITIES (Initial Box Upon Completion)	REMARKS

1. Runner Turbine

a) Check for loose or missing bolts on runner cone. (BP)

READING BY: BRENT PEDDLE

DATE: _____

CHECKED BY: _____

APPROVED BY: _____

HOUR METER READING: _____

Non-Destructive Testing of the Radii Between the Band/Crown/Blade and Blade at the Discharge Side.

RUNNER BLADE NO.: _____

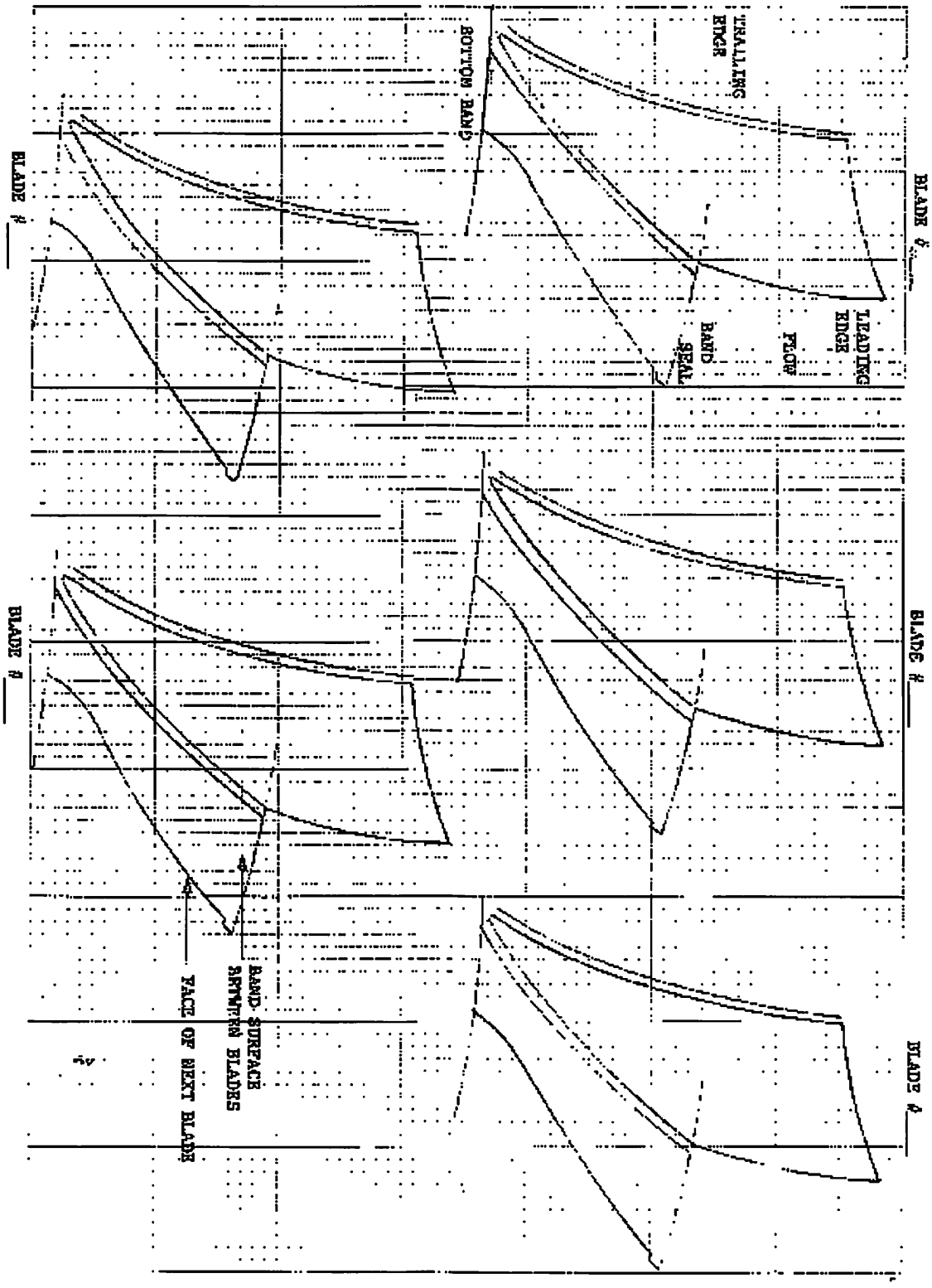
DYE PENETRANT PERFORMED? YES: _____ NO: _____

COMMENTS: VISUAL CHECK.

Runner inspection Completed by B. Peddle M. Lanken

BPEDDLE
-D CAVITATION ON HIGH SIDE SOME AREAS. NO REPAIRS REQUIRED. FURTHER REVIEW DURING NEXT PM OK. SCHEDULED.

PM Checksheet No.:	BDE-Runner-Turbine No. 3 - 59278	Sheet: 2 of 2
Type of Inspection:	PM8 (Minor)	Rev. No.:
Department:	Engineering	Rev. Date:
		Index No.: 2180 Binder No.: 63



45 0700

ENTERED

W/O #: 1324940

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 2 Rev. No.: 0 Rev. Date: 08-04-22 Index No.: 2444 Binder No.: 67

PM Checksheet No.: PM6/PM8/PM9 – 59115 - ENGBDE
Item No. & Description: 59115 - Turbine/Generator Unit No. 3 - Visual Inspection
Type of Inspection: PM6/PM8/PM9
Department: Engineering — Asset Approval: BRENT PEDDLE
Inspection Start Date: — Insp. Comp. Date:
Supervisor's Review Signature and Date: BP. JAN 22, 2019
Reference Drawing and Manuals:

VISUAL INSPECTION PRIOR TO START OF PHYSICAL WORK.

Prior to start of physical maintenance work on turbine/generator unit, a comprehensive visual inspection will be conducted by a team of employees consisting of engineers, tradesperson, and frontline supervisors. These inspections shall be conducted as soon a s unit is shutdown and prior to any cleaning activity. All items inspected shall require a remark of some nature. Any abnormalities found will be reported and prioritized using JDE work order system.
NOTE: Rotor is not removed for this inspection.

ACTIVITIES (Initial Box Upon Completion)		REMARKS
1. STATOR COILS		
a) Check coils for end distortion, cracked insulation or any other mechanical damage.	(RW)	
b) Check for signs of corona discharge.	(RW)	
c) Check for dirt, contamination and identify all areas requiring cleaning.	(RW)	Some oil on bottom of Stator
d) Check for signs of coil movement.	( )	
e) Check stator frame sole plates for signs of movement.	(RW)	
f) Check lashings and ties for looseness, movement or deterioration.	(RW)	Shrouds not removed
g) Check slot packing for tightness, signs of migration of slot fillers.	( )	
h) Check punchings at fingers for looseness or fretting corrosion.	(RW)	
i) Check generator neutral lead insulation.	(RW)	

PM Checksheet No.: 59115-Turbine/Generator Unit No. 3 Visual Inspection Type of Inspection: PM6/PM8/PM9 Department: Engineering	Sheet: 2 of 2 Rev. No.: 0 Rev. Date: 08-04-22 Index No.: 2444 Binder No.: 67
ACTIVITIES (Initial Box Upon Completion)	REMARKS
2. GENERATOR SLIP RING ASSEMBLY	
a) Check slip rings for pitting, discoloration or scouring. (RW)	Minor Wear
b) Check condition of slip ring insulation. (RW)	
c) Check all mounting hardware for tightness. (RW)	
d) Check wear on slip ring and determine if machining is required. (RW)	
3. ROTOR	
a) Check rotor for cleanliness and recommend cleaning if required. ( )	Shrouds not removed some oil on bottom
b) Check all fasteners such as bolts, pole keys, etc. for all connections. (RW)	
c) Check field pole connection; taping and insulation on all coil connections. (RW)	
d) Check rotor carefully for distress at welds including rim supports. (RW)	
e) Check ventilation duct and spaces for foreign materials or obstruction. (RW)	
f) Check rotor bus leads. (RW)	
g) Check brake plates for signs of movement distortion or scouring. (RW)	
4. GENERATOR BEARING ASSEMBLY	
a) Check exterior bearing assembly for oil leaks. (RW)	R-Ring Hose Installed
b) Check main bracket securing bolts to ensure they are tight. (RW)	

Maintenance Work Order Report
The Nalcor Group of Companies

Date 2019-03-26
Time 14:27:40

Order Number	1356067	WO Types	1 Corrective WO (Repair)	Priority	3 Planned
Parent W.O. No	01356067	Business Unit	1293	Branch	1824
Description	UNIT 3 GEN BRG OIL SAMPLE				

Status	99 Closed - Gone to History	Equipment ID/Asset No.	59169 THRUST/GUIDE BEARING ASBLYBDE3
Status Comment		Originator	79176 Lambert, Matthew
Est. Hours	1.00	Supervisor/Section	17090 BDE Mechanical Dept
Total Est. Cost	107.11	Assigned To	

Subsidiary		Start Date	2018-10-29	Requested	2018-11-01
Phase Code	.	Planned Comp			
Spare 02	.	BOM Inventory No.			
WO Sub Type	.	Reference	59115		
Condition Req'd	.	Secondary Location	125068 BDE HG Turbine/Generator 3		
Equip Type	GA1 Generator				

WORK ORDER ATTACHMENTS

PARTS DETAIL

PART NUMBER	DESCRIPTION	UM	QUANTITY ORDERED	PARTS LIST
22300001	BOTTLE,OIL SAMPLE - WEARCHECK	EA	1.00	

LABOUR DETAIL

WORK CENTER/CRAFT	OPER SEQ #	DESCRIPTION	EST. HOURS	MESSAGE NUMBER	ROUTING
BDECRMM	1.00	BDE MILLWRIGHT Mechanical Crew	1.00		

WORK ORDER INSTRUCTIONS

WORK ORDER DESCRIPTION	DATE ASSOCIATED

MEDIA OBJECT

MEDIA OBJECT TEXT
Oil Resample required. WC sample WC118587 indicates abnormal particles.

Maintenance Work Order Report
The Nalcor Group of Companies

Date 2019-03-26
Time 14:26:45

Order Number	1355002	WO Types	1 Corrective WO (Repair)	Priority	4 Required
Parent W.O. No	01355002	Business Unit	1293	Branch	1824
Description	BDE TURBINE/SEAL MAIN CW SUPPL				

Status	99 Closed - Gone to History	Equipment ID/Asset No.	333501 COOLING WATER SYSTEM - BDE3
Status Comment		Originator	83743 Dollimont, David
Est. Hours	10.00	Supervisor/Section	17090 BDE Mechanical Dept
Total Est. Cost	986.72	Assigned To	

Subsidiary		Start Date	2018-11-26	Requested	2018-11-30
Phase Code	.	Planned Comp			
Spare 02	.	BOM Inventory No.			
WO Sub Type	Safety Consideration	Reference	59111		
Condition Req'd	.	Secondary Location	125068 BDE HG Turbine/Generator 3		
Equip Type	GA1 Generator				

WORK ORDER ATTACHMENTS

PARTS DETAIL

PART NUMBER	DESCRIPTION	UM	QUANTITY ORDERED	PARTS LIST
51000015	PIPE,CS 2 S40	FT	10.00	
52000187	ELBOW,CS 2 90 SCRD	EA	1.00	
523	UNION, 2" SCRD #3000	EA	1.00	
52000468	UNION,MI 2 SCRD	EA	2.00	
52000045	ELBOW,MI 2 90 SCRD	EA	1.00	
52000465	TEE,MI 2 SCRD	EA	1.00	
54200059	VALVE,GATE 2 BRS SCRD	EA	1.00	
54600014	VALVE,BALL 3/4 NPTF	EA	1.00	
52000016	BUSHING,MI 2X3/4	EA	1.00	
52000334	NIPPLE,CS 3/4X4 S40	EA	1.00	
52000064	NIPPLE,CS 2X3 S40	EA	2.00	

LABOUR DETAIL

WORK CENTER/CRAFT	OPER SEQ #	DESCRIPTION	EST. HOURS	MESSAGE NUMBER	ROUTING
BDECRMM	1.00	BDE MILLWRIGHT Mechanical Crew	10.00		

WORK ORDER INSTRUCTIONS

WORK ORDER DESCRIPTION	DATE ASSOCIATED

MEDIA OBJECT

MEDIA OBJECT TEXT

LEAKAGE ON THE ELBOW NEAR THE BYPASS V87 OF THE MAIN TURBINE/SEAL CW SUPPLY CONNECTED TO PENSTOCK 2.
****

R Saunders 18/10/22, Union @ BDE Stores
LOC: 12-D6
****

NEW ELBOW<PIPE and UNION INSTALLED
R Fudge
2018/11/13

Maintenance Work Order Report
The Nalcor Group of Companies

Date 2019-03-26
Time 14:25:48

Order Number	1353311	WO Types	1 Corrective WO (Repair)	Priority	.
Parent W.O. No	01353311	Business Unit	1293	Branch	1824
Description	BDE UNIT 3 REQUIRES GREASE				

Status	99 Closed - Gone to History	Equipment ID/Asset No.	388996 AUTOGREASE SYSTEM - BDE UNIT 3
Status Comment		Originator	11176 Farrell, Brett R.
Est. Hours	2.00	Supervisor/Section	17090 BDE Mechanical Dept
Total Est. Cost	1334.22	Assigned To	

Subsidiary		Start Date	2018-10-03	Requested	2018-10-03
Phase Code	.	Planned Comp			
Spare 02	.	BOM Inventory No.			
WO Sub Type	.	Reference	59151		
Condition Req'd	.	Secondary Location	125068 BDE HG Turbine/Generator 3		
Equip Type	TB1 Turbine				

WORK ORDER ATTACHMENTS

PARTS DETAIL

PART NUMBER	DESCRIPTION	UM	QUANTITY ORDERED	PARTS LIST
89200143	GREASE,VSG GRADE 1 55KG	CT	1.00	

LABOUR DETAIL

WORK CENTER/CRAFT	OPER SEQ #	DESCRIPTION	EST. HOURS	MESSAGE NUMBER	ROUTING
BDECRMM	1.00	BDE MILLWRIGHT Mechanical Crew	2.00		

WORK ORDER INSTRUCTIONS

WORK ORDER DESCRIPTION	DATE ASSOCIATED

MEDIA OBJECT

MEDIA OBJECT TEXT
BDE UNIT #3 REQUIRES DRUM OF GREASE FOR THE AUTO GREASER

Maintenance Work Order Report
The Nalcor Group of Companies

Date 2019-03-26
Time 14:24:45

Order Number	1348247	WO Types	1 Corrective WO (Repair)	Priority	2 Urgent (High Priority)
Parent W.O. No	01348247	Business Unit	1293	Branch	1824
Description	BDE UNIT #3 GEN OIL TOP UP				

Status	99 Closed - Gone to History	Equipment ID/Asset No.	59115 GENERATOR - UNIT 3
Status Comment		Originator	93561 Costello, Shannon
Est. Hours		Supervisor/Section	17090 BDE Mechanical Dept
Total Est. Cost		Assigned To	

Subsidiary		Start Date	2018-09-07	Requested	2018-09-07
Phase Code	.	Planned Comp			
Spare 02	.	BOM Inventory No.			
WO Sub Type	.	Reference	59111		
Condition Req'd	.	Secondary Location	125068 BDE HG Turbine/Generator 3		
Equip Type	GA1 Generator				

WORK ORDER ATTACHMENTS

PARTS DETAIL

PART NUMBER	DESCRIPTION	UM	QUANTITY ORDERED	PARTS LIST

WORK ORDER INSTRUCTIONS

WORK ORDER DESCRIPTION	DATE ASSOCIATED

MEDIA OBJECT

MEDIA OBJECT TEXT

BDE UNIT #3 GENERATOR OIL LEVEL LOW. TOP UP REQUIRED.

15 litres added
R Fudge

Maintenance Work Order Report
The Nalcor Group of Companies

Date 2019-03-26
Time 14:21:46

Order Number	1343139	WO Types	1 Corrective WO (Repair)	Priority	4 Required
Parent W.O. No	01343139	Business Unit	1293	Branch	1824
Description	BDE UNIT 3 GOVERNOR				

Status	99 Closed - Gone to History	Equipment ID/Asset No.	371804 GOVERNOR SPEED GENERATOR-BDE3
Status Comment		Originator	70473 Organ, Byron G.
Est. Hours	2.00	Supervisor/Section	17091 BDE Elect/Tech Dept
Total Est. Cost	1249.89	Assigned To	85946 Hussey, Corwin

Subsidiary		Start Date	2018-08-06	Requested	2018-10-31
Phase Code	.	Planned Comp			
Spare 02	.	BOM Inventory No.	52165 BOMBDEO27GOVERNORNO1-BDE		
WO Sub Type	.	Reference	59120		
Condition Req'd	SD Unit Outage	Secondary Location	125068 BDE HG Turbine/Generator 3		
Equip Type	GA2 Governor				

WORK ORDER ATTACHMENTS

PARTS DETAIL

PART NUMBER	DESCRIPTION	UM	QUANTITY ORDERED	PARTS LIST
58602105	MOTOR,GOVERNOR SPEED 28 VOLT	EA	1.00	

LABOUR DETAIL

WORK CENTER/CRAFT	OPER SEQ #	DESCRIPTION	EST. HOURS	MESSAGE NUMBER	ROUTING
BDECRPC	1.00	BDE P&C Crew	2.00		

WORK ORDER INSTRUCTIONS

WORK ORDER DESCRIPTION	DATE ASSOCIATED

MEDIA OBJECT

MEDIA OBJECT TEXT
SPEEDER MOTOR STICKING 2018/10/01 - C.Hussey - Adjusted clutch so that hand dial not sticky and movement smooth.

Maintenance Work Order Report
The Nalcor Group of Companies

Date 2019-03-26
Time 14:20:37

Order Number	1315203	WO Types	1 Corrective WO (Repair)	Priority	4 Required
Parent W.O. No	01315203	Business Unit	1293	Branch	1824
Description	BDE3 restoring weighted end				

Status	99 Closed - Gone to History	Equipment ID/Asset No.	59120 GOVERNOR - BDE UNIT 3
Status Comment		Originator	10932 Willcott, Rodney G.
Est. Hours	12.00	Supervisor/Section	17090 BDE Mechanical Dept
Total Est. Cost	661.46	Assigned To	14145 Bay D'Espoir Warehouse

Subsidiary		Start Date	2018-06-18	Requested	2018-06-18
Phase Code	.	Planned Comp			
Spare 02	.	BOM Inventory No.			
WO Sub Type	.	Reference	00059111		
Condition Req'd	.	Secondary Location	125068 BDE HG Turbine/Generator 3		
Equip Type	GA2 Governor				

WORK ORDER ATTACHMENTS

PARTS DETAIL

PART NUMBER	DESCRIPTION	UM	QUANTITY ORDERED	PARTS LIST
58800402	FERRULE,PT702114	EA	2.00	
58608139	CONE,CABLE 1/4	EA	2.00	

LABOUR DETAIL

WORK CENTER/CRAFT	OPER SEQ #	DESCRIPTION	EST. HOURS	MESSAGE NUMBER	ROUTING
BDECRMM	1.00	BDE MILLWRIGHT Mechanical	12.00		

WORK ORDER INSTRUCTIONS

WORK ORDER DESCRIPTION	DATE ASSOCIATED

MEDIA OBJECT

MEDIA OBJECT TEXT

Full Description of Request
BDE3 restoring weighted end
Replace restoring cable weighted end BDE unit 3. The cable
has broken strands.

Restoring cable has been replaced without any issues.
Lorne Oxford/ Mitch Neil
18/11/1

Maintenance Work Order Report
The Nalcor Group of Companies

Date 2019-03-26
Time 14:19:04

Order Number	1313076	WO Types	1 Corrective WO (Repair)	Priority	4 Required
Parent W.O. No	01313076	Business Unit	1293	Branch	1824
Description	BDE- # 3 replace restore cable				

Status	99 Closed - Gone to History	Equipment ID/Asset No.	59120 GOVERNOR - BDE UNIT 3
Status Comment		Originator	10932 Willcott, Rodney G.
Est. Hours	36.00	Supervisor/Section	17090 BDE Mechanical Dept
Total Est. Cost	7450.50	Assigned To	14145 Bay D'Espoir Warehouse

Subsidiary		Start Date	2018-05-30	Requested	2018-05-30
Phase Code	.	Planned Comp			
Spare 02	.	BOM Inventory No.			
WO Sub Type	.	Reference	00059111		
Condition Req'd	SD Unit Outage	Secondary Location	125068 BDE HG Turbine/Generator 3		
Equip Type	GA2 Governor				

WORK ORDER ATTACHMENTS

PARTS DETAIL

PART NUMBER	DESCRIPTION	UM	QUANTITY ORDERED	PARTS LIST
37900007	CABLE,AIRCRAFT 1/4 187083	EA	1.00	
58800402	FERRULE,PT702114	EA	2.00	
58608139	CONE,CABLE 1/4	EA	2.00	
58800404	SHEAVE,PT1955066	EA	3.00	
	HOUSING,SHEAVE 90 DEG ASS.	EA	1.00	
	HOUSING,SHEAVE 180 DEG ASS.	EA	1.00	

LABOUR DETAIL

WORK CENTER/CRAFT	OPER SEQ #	DESCRIPTION	EST. HOURS	MESSAGE NUMBER	ROUTING
BDECRMM	1.00	BDE MILLWRIGHT Mechanical	36.00		

WORK ORDER INSTRUCTIONS

WORK ORDER DESCRIPTION	DATE ASSOCIATED

MEDIA OBJECT

MEDIA OBJECT TEXT

Full Description of Request
BDE-3 replace restore cable
Replace the restoring cable on BDE #3. The cable is worn
and freyed in the pit where it is connected to the servo.
Planning Status
WORK PREVIOUSLY PERFORMED ON W.O. 184353
****
?
W.Hartery 2018/04/26
Cable,Ferrules,Cones annd Housings @BDE Stores.LOC:12-C3

****
Cable has been replaced along with the ferrules, cones and housing.
Lorne Oxford/ Mitch Neil
18/11/1

Maintenance Work Order Report
The Nalcor Group of Companies

Date 2019-03-26
Time 14:17:52

Order Number	1298705	WO Types	1 Corrective WO (Repair)	Priority	3 Planned
Parent W.O. No	01298705	Business Unit	1293	Branch	1824
Description	BDE UNIT#3 FIELD FLASHING				

Status	99 Closed - Gone to History	Equipment ID/Asset No.	109965 EXCITER - BDE UNIT 3
Status Comment		Originator	10068 Benoit, Norbert J.
Est. Hours	9.00	Supervisor/Section	17091 BDE Elect/Tech Dept
Total Est. Cost	603.99	Assigned To	14145 Bay D'Espoir Warehouse

Subsidiary		Start Date	2017-12-13	Requested	2017-12-13
Phase Code	.	Planned Comp	2017-12-13		
Spare 02	.	BOM Inventory No.			
WO Sub Type	.	Reference	00059111		
Condition Req'd	SD Unit Outage	Secondary Location	125068 BDE HG Turbine/Generator 3		
Equip Type	EA1 Excitation				

WORK ORDER ATTACHMENTS

PARTS DETAIL

PART NUMBER	DESCRIPTION	UM	QUANTITY ORDERED	PARTS LIST

LABOUR DETAIL

WORK CENTER/CRAFT	OPER SEQ #	DESCRIPTION	EST. HOURS	MESSAGE NUMBER	ROUTING
BDECREM	1.00	BDE Electrical Crew	9.00		

WORK ORDER INSTRUCTIONS

WORK ORDER DESCRIPTION	DATE ASSOCIATED

MEDIA OBJECT

MEDIA OBJECT TEXT

Full Description of Request
BDE UNIT#3 FIELD FLASHING
UNIT#3 FIELD FLASHING DID NOT START UNTIL UNIT WAS AT
300rpm. INVESTIGATE AND REPAIR
2018-10-01 Completed by W.Collier

Maintenance Work Order Report
The Nalcor Group of Companies

Date 2019-03-26
Time 14:16:30

Order Number	1297801	WO Types	1 Corrective WO (Repair)	Priority	3 Planned
Parent W.O. No	01297801	Business Unit	1293	Branch	1824
Description	BDE PH1 UNIT3 SPHER. VLV PIT				

Status	99 Closed - Gone to History	Equipment ID/Asset No.	59146 SPHERICAL VALVE - BDE UNIT 3
Status Comment		Originator	83743 Dollimont, David
Est. Hours	21.00	Supervisor/Section	17091 BDE Elect/Tech Dept
Total Est. Cost	630.72	Assigned To	14145 Bay D'Espoir Warehouse

Subsidiary		Start Date	2017-12-10	Requested	2017-12-10
Phase Code	.	Planned Comp			
Spare 02	.	BOM Inventory No.			
WO Sub Type	.	Reference	00059111		
Condition Req'd	OL Online	Secondary Location	125068 BDE HG Turbine/Generator 3		
Equip Type	SA8 Spherical Valve				

WORK ORDER ATTACHMENTS

PARTS DETAIL

PART NUMBER	DESCRIPTION	UM	QUANTITY ORDERED	PARTS LIST
25000004	ANCHOR,WEDGE 1/4X2-1/4	EA	12.00	

LABOUR DETAIL

WORK CENTER/CRAFT	OPER SEQ #	DESCRIPTION	EST. HOURS	MESSAGE NUMBER	ROUTING
BDECREM	1.00	BDE Electrical Crew	3.00		
BDECRUG	2.00	BDE GEN MTCE General Mtce Crew	9.00		
BDECRUM	3.00	BDE UTIL General Mtce. Crew	9.00		

WORK ORDER INSTRUCTIONS

WORK ORDER DESCRIPTION	DATE ASSOCIATED

MEDIA OBJECT

MEDIA OBJECT TEXT

Full Description of Request
BDE PH1 UNIT3 SPHER. VLV PIT
Repair lighting in valve pit.
2018-10-02 N.Benoit Three LED wallpacks installed

Maintenance Work Order Report
The Nalcor Group of Companies

Date 2019-03-26
Time 14:15:06

Order Number	1294159	WO Types	1 Corrective WO (Repair)	Priority	4 Required
Parent W.O. No	01294159	Business Unit	1293	Branch	1824
Description	BDE Units 3 Alarms				

Status	99 Closed - Gone to History	Equipment ID/Asset No.	59133 AUTO CONTROL PANEL - UNIT 3
Status Comment		Originator	10344 Fudge, Rodney K.
Est. Hours	4.00	Supervisor/Section	17091 BDE Elect/Tech Dept
Total Est. Cost	268.44	Assigned To	14145 Bay D'Espoir Warehouse

Subsidiary		Start Date	2017-11-17	Requested	2017-11-17
Phase Code	.	Planned Comp	2017-11-17		
Spare 02	.	BOM Inventory No.			
WO Sub Type	.	Reference	00059111		
Condition Req'd	.	Secondary Location	125068 BDE HG Turbine/Generator 3		
Equip Type	PB5 Protection, Control & Metering				

WORK ORDER ATTACHMENTS

PARTS DETAIL

PART NUMBER	DESCRIPTION	UM	QUANTITY ORDERED	PARTS LIST

LABOUR DETAIL

WORK CENTER/CRAFT	OPER SEQ #	DESCRIPTION	EST. HOURS	MESSAGE NUMBER	ROUTING
BDECRPC	1.00	P&C Control	4.00		

WORK ORDER INSTRUCTIONS

WORK ORDER DESCRIPTION	DATE ASSOCIATED

MEDIA OBJECT

MEDIA OBJECT TEXT

Full Description of Request
BDE Units 3 Alarms
During the recent trip on Unit 2 it was suggested to block
Gen low bearing oil alarm on shutdown using the contact
from the start relay 4. Should be completed on units 1-6
2018/09/27 - C.Hussey - Modified gen. oil lvl so that 4AGX has to be energized to bring in alarm. Updated drawings and sent request to drafting for new.

Maintenance Work Order Report
The Nalcor Group of Companies

Date 2019-03-26
Time 14:13:41

Order Number	1286796	WO Types	1 Corrective WO (Repair)	Priority	3 Planned
Parent W.O. No	01286796	Business Unit	1293	Branch	1824
Description	BDE-Unit #3 Servo Leak				

Status	99 Closed - Gone to History	Equipment ID/Asset No.	371809 SERVOMOTOR 1 - BDE 3
Status Comment		Originator	81841 Fudge, Roger
Est. Hours	36.00	Supervisor/Section	17090 BDE Mechanical Dept
Total Est. Cost	2069.19	Assigned To	14145 Bay D'Espoir Warehouse

Subsidiary		Start Date	2017-10-16	Requested	2017-10-16
Phase Code	.	Planned Comp			
Spare 02	.	BOM Inventory No.			
WO Sub Type	.	Reference	00371808		
Condition Req'd	SD Unit Outage	Secondary Location	125068 BDE HG Turbine/Generator 3		
Equip Type	GA2 Governor				

WORK ORDER ATTACHMENTS

PARTS DETAIL

PART NUMBER	DESCRIPTION	UM	QUANTITY ORDERED	PARTS LIST
58602393	PACKING,V TYPE 2-EASY	EA	1.00	
89200029	OIL,TURBINE 46 (205L)	DR	1.00	

LABOUR DETAIL

WORK CENTER/CRAFT	OPER SEQ #	DESCRIPTION	EST. HOURS	MESSAGE NUMBER	ROUTING
BDECRMM	1.00	BDE MILLWRIGHT Mechanical	36.00		

WORK ORDER INSTRUCTIONS

WORK ORDER DESCRIPTION	DATE ASSOCIATED

MEDIA OBJECT

MEDIA OBJECT TEXT

Full Description of Request
BDE-Unit #3 Servo Leak
Investigate and Repair Opening Servo Leak
Left Hand Servo Looking Upstream
Actual Work Performed
Checked servo and found seal to be just weeping depending
on unit loading. Outage time was not available to change
seals. Note Seals were changed on the Overhaul in 2017.
Svcouring was observed on the shaft and may be the reason fo
the weepage,
R Fudge
2017/10/24

Seals were changed on outage, an extra ring was added to the exsisting set to ensure leak would be stopped. This has been done in previous years with good results. Shaft was noticed to have gouges in it.
Chad Smith
18/11/1

Maintenance Work Order Report
The Nalcor Group of Companies

Date 2019-03-26
Time 14:12:05

Order Number	1233208	WO Types	1 Corrective WO (Repair)	Priority	3 Planned
Parent W.O. No	01233208	Business Unit	1293	Branch	1824
Description	bde unit 3 generator				

Status	99 Closed - Gone to History	Equipment ID/Asset No.	59115 GENERATOR - UNIT 3
Status Comment		Originator	10372 Evans, Roger P.
Est. Hours	4.00	Supervisor/Section	17090 BDE Mechanical Dept
Total Est. Cost	377.89	Assigned To	14145 Bay D'Espoir Warehouse

Subsidiary		Start Date	2017-04-10	Requested	2017-04-10
Phase Code	.	Planned Comp			
Spare 02	.	BOM Inventory No.			
WO Sub Type	.	Reference	00059111		
Condition Req'd	SD Unit Outage	Secondary Location	125068 BDE HG Turbine/Generator 3		
Equip Type	GA1 Generator				

WORK ORDER ATTACHMENTS

PARTS DETAIL

PART NUMBER	DESCRIPTION	UM	QUANTITY ORDERED	PARTS LIST
71900014	CORD,RECTANGULAR	FT	30.00	
92200018	CLEANER,ELECT PRESOLVE	CT	1.00	
88900023	ABSORBENT,OIL (ROLL)	RL	1.00	

LABOUR DETAIL

WORK CENTER/CRAFT	OPER SEQ #	DESCRIPTION	EST. HOURS	MESSAGE NUMBER	ROUTING
BDECRMM	1.00	INVESTIGATE LEAK	4.00		

WORK ORDER INSTRUCTIONS

WORK ORDER DESCRIPTION	DATE ASSOCIATED

MEDIA OBJECT

MEDIA OBJECT TEXT

Full Description of Request
bde unit 3 generator
BDE. PH.#1.INVESTAGATE UNIT # 3 GENERATOR OIL LEAK.

IF THE LEAK IS FOUND IN A DOOR AND IT TURNS OUT THE O-RING IS NOT RECTANGULAR, CHANGE ALL DOORS TO THE RECTANGULAR TYPE

Investigated leak and found the unit had o-rings on doors. Replaced all o-rings with rectangular rings and tightned all glands.
Rodney Walsh
18/11/1

ENTERED

W/O 1333949

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 2 Rev. No.: 0 Rev. Date: 18-01-29 Index No.: 3067 Binder No.: 26

PM Checksheet No.: PM6 – 59111 - BDEELEC
Item No. & Description: 59111 - Turbine/Generator Unit #3 – Pre-Winter Checks-Bay d'Espoir
PM Type: PM6 (Annual)
Department: Electrical — Asset Approval: Bob Woodman
Inspection Start Date: — Insp. Comp. Date:
Supervisor's Review Signature and Date: Nov 19, 2018
Reference Drawing and Manuals:

ACTIVITIES (Initial Box Upon Completion)	REMARKS
1. Check slip ring brushes for cracks and any other abnormalities. Measure and record all slip ring brushes. Replace if there is .500" or less from the brush box back to the end of the carbon brush. Record how many brushes were replaced. (RB ZB KH)	
2. Visually check slip ring hardware and insulators. (RB ZB KH)	
3. Visually check slip ring for pitting or discolouration. (RB ZB KH)	
4. Visually check all brush holders, springs and pigtail connections. Ensure there is enough clearance between the brush box and slip ring. (RB)	
5. Visually check flex leads. (RB ZB)	
6. Remove SSG cover. Visually check all speed switches. Lubricate links and pivot points. Check drive pins and ensure they are not loose. (ZB KH)	
7. Check water in oil detector. Drain if oil is discoloured and there is a small amount of water present. (RB)	

JDE Item No. & Description:	59111 – Generator – Unit #3 – Pre-Winter	Sheet: 2 of 2
Type of Inspection:	PM6	Rev. No.: 0
Department:	Electrical	Rev. Date: 18-01-29
		Index No.: 3067 Binder No.: 26

Date of Check: Nov 8/18 Checked By: ZB/BB/KH

BRUSH MEASUREMENT (CLOCKWISE)

Unit hour meter reading: _____ Hours accumulated since last inspection: _____

Number of brushes replaced: _____

	Top Ring		Bottom Ring	
#	Top	Bottom	Top	Bottom
1	.765	1.092	1.009	.975
2	.915	1.036	1.205	1.033
3	.838	.991	1.070	1.036
4	1.268	.906	1.084	1.001
5	1.072	.892	1.084	.963
6	.781	1.013	.930	.952
7	.973	.946	1.325	.993
8	.908	.988	1.148	1.007
9	.847	.962	1.150	.908
10	1.211	.901	1.062	.963
11	.791	.890	1.193	.980
12	.782	1.330	1.064	.967
13	.880	.889	1.096	1.011
14	.896	.985	1.109	.978
15	.924	1.008	.850	1.049
16	.973	.927	1.055	.979
17	.803	.881	1.026	.885
18	.810	.887	1.200	1.004
19	.650	.856	1.199	.787

ENTERED

W/O #: 1324929

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 4 Rev. No.: 1 Rev. Date: 16-02-01 Index No.: 2449 Binder No.: 67

PM Checksheet No.: PM6/PM8/PM9-59115-BDE
Item No. & Description: 59115 - BDE Turbine/Generator Unit No. 3 - Pre-Start-Up Inspection
Type of Inspection: PM6/PM8/PM9
Department: BDE Ops/Mech/Elect
Asset Approval: B. Woodman
Inspection Start Date:
Insp. Comp. Date: 2018/10/02
Supervisor's Review Signature and Date: Oct 3/18
Reference Drawing and Manuals:

ACTIVITIES (Initial Box Upon Completion)	REMARKS

SCOPE:
This Inspection is required after all annual minor or major PM Outages or after any major work or inspection on turbine/generator equipment. Check only what is applicable to the inspection.

OBJECTIVE:
The objective of the inspection is to ensure that a thorough visual inspection is completed prior to placing unit back in service, to ensure any loose or forging material is removed, to ensure that areas of the machine worked on are free of hazards or debris that may cause damage during operation.

STANDARD:
Responsibility for ensuring that the start-up inspection is completed is the responsibility of the Operations Supervisor for the particular unit.

The inspection shall be completed by the Operations, Mechanical and Electrical Supervisors prior to unit start up. If no Supervisor is present, the Lead Hand in the particular discipline is responsible for this inspection. The Operations Supervisor responsible for start up can also request the service of plant engineering and in scope employees.

Prior to doing this inspection, all objects such as coins, keys wallets, pagers, pens, etc. must be removed from your pockets and boots should also be checked for foreign objects.

The unit will not be placed in operation until the inspection results have been reviewed and accepted by the supervisor responsible for the start up.

The attached inspections will be used as a guide for this inspection.

PRIOR TO INSTALLATION OF SHROUDS	CHECKED BY
1. Ensure no loose bolts or any foreign material is in the unit that may be covered once the shrouds are in place.	N/A
2. Ensure no foreign material or tools is left anywhere around top of stator frame area.	M
3. Ensure all pole key retainers are securely in place.	M

PM Checksheet No.: BDE Turbine/Generator Unit No. 3 Pre-Start-Up Insp. Type of Inspection: PM6/PM8/PM9 Department: BDE Ops/Mech/Elect	Sheet: 2 of 4 Rev. No.: 1 Rev. Date: 16-02-01 Index No.: 2449 Binder No.: 67
ACTIVITIES (Initial Box Upon Completion)	REMARKS

PRIOR TO INSTALLATION OF SHROUDS (Cont'd) — **CHECKED BY**

4. Ensure top of poles are free from foreign objects. M
5. Visually inspect v-bolts between poles for any foreign objects or abnormalities. M
6. Check the back area of the poles where material can be conveniently placed. M
7. Thoroughly inspect top end windings. M
8. Thoroughly inspect bottom end windings. M
9. Check the air gap between the riser (Rotor) and stator, for any sign of abnormalities. M

PRIOR TO UNIT START-UP — **CHECKED BY**

Inspect the following areas:

1. Brush gear assembly. M
2. Upper bracket. M
3. Main bracket. M
4. Top covers of thrust/guide bearing assembly. M
5. Top of upper shrouds. N/A
6. Top of stator. M
7. Check the security of the shroud locking plates, angle iron supports and bolts. N/A
8. Between upper shrouds and rotor. N/A
9. Stub shaft bolts. M
10. Security of sprinkler system piping. M
11. Rotor ventilation slots. M
12. Rotor spider for tools, welding slag, etc. Note: Do not move/remove any weights that may be present. M

PM Checksheet No.: BDE Turbine/Generator Unit No. 3 Pre-Start-Up Insp. Type of Inspection: PM6/PM8/PM9 Department: BDE Ops/Mech/Elect	Sheet: 3 of 4 Rev. No.: 1 Rev. Date: 16-02-01 Index No.: 2449 Binder No.: 67
ACTIVITIES (Initial Box Upon Completion)	REMARKS

PRIOR TO UNIT START-UP (Cont'd)	CHECKED BY
13. Between rotor and lower shrouds.	N/A
14. Security of lower shrouds.	N/A
15. Check drain cocks, valve positions, piping connections, etc.	M
16. Check all bearing oil levels, governor sump levels and accumulator tank oil levels.	DA
17. Check for foreign matter between wicket gates.	M
18. Check spiral case area for cleanliness.	M
19. Check draft tube scaffold removal, door closed and bolted.	M
20. Check spiral case door closed and bolted.	M
21. Ensure rotor has been jacked. 1900 HRS 2018/10/02	M
22. Check position of creep detector and grounding brush.	M
23. Check duplex panels in Control Room for reminder notes.	DA
24. Check to ensure links, valves, etc. that were worked on have been returned to normal position.	DA
25. Thoroughly inspect turbine pit area.	M
26. Thoroughly inspect spherical valve pit area.	DA
27. Thoroughly inspect duplex and TG panels.	DA
28. List all deficiencies that must be corrected prior to running of unit.	
29. Check surface air coolers, i.e.: positions of valves, air relief valves, plugs, etc.	M
30. Check valve on H.P. lift pump to ensure it is open.	N/A
31. Check positions of all valves in brake circuit to ensure all is in correct position.	M
32. Verify oil level in turbine bearing and generator guide bearing.	DA

PM Checksheet No.: BDE Turbine/Generator Unit No. 3 Pre-Start-Up Insp. Type of Inspection: PM6/PM8/PM9 Department: BDE Ops/Mech/Elect	Sheet: 4 of 4 Rev. No.: 1 Rev. Date: 16-02-01 Index No.: 2449 Binder No.: 67
ACTIVITIES (Initial Box Upon Completion)	REMARKS

PRIOR TO UNIT START-UP (Cont'd) — **CHECKED BY**

33. Check to ensure all penstock hatches are closed. — AA
34. Check to ensure all temporary grounds are removed. — DA
35. Check to ensure all external work is completed. — AA

HOUSEKEEPING

1. Conduct inspection on generator floor and turbine floor. — DA
2. Remove tools, equipment, excess materials and place in appropriate location. — DA

DESCRIPITON	RESPONSIBILITY	DATE/TIME
Sign Off Signatures		
Electrical Supervisor/Designate		
Mechanical Supervisor/Designate		Oct 3/18
Operations Supervisor/Designate		Oct 3/18

1. Check Cooling water
2. Sph Valve in manual
3. Emergency water valve closed
4. Wicket gate lock ON
5. Emergency Brakes ON.
6. B2T3-1 disc manual only.

ENTERED

W/O #: 1324948

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 1 Rev. No.: 6 Rev. Date: 15-05-22 Index No.: 477 Binder No.: 26

PM Checksheet No.: PM6-59129-EBDE
Item No. & Description: 59129-Isolated Phase Bus - Unit No. 3 - BDE
Type of Inspection: PM6 (Annual)
Department: ELECTRICAL
Asset Approval: B. Woodman
Inspection Start Date:
Insp. Comp. Date:
Supervisor's Review Signature & Date:
Reference Drawing and Manuals: 107-E-96, BDE-15 & ITE Dwg. #: N-13902

Oct 3, 2018

ACTIVITIES (Initial Box Upon Completion)	REMARKS
CRITICAL PARTS INSPECTION	
1. 13.8 KV Metering & Voltage Regulator P.T. Cubicle	
a. Check all connections and wiring. (L.O)	
b. Check fuses and holders. (L.O)	
c. Clean out cubicle. (L.O)	
d. Check for signs of moisture. (L.O T.D)	
e. Check insulators for signs of cracks or tracking. (L.O T.D)	
f. Inspect surge protection. (L.O T.D)	

W/O #: 1324947

NEWFOUNDLAND & LABRADOR HYDRO
HYDRO GENERATION
PREVENTIVE MAINTENANCE CHECKSHEETS

ENTERED

Sheet: 1 of 6
Rev. No.: 7
Rev. Date: 17-03-07
Index No.: 533 Binder No.: 26

PM Checksheet No.: PM6-59120-EBDE
Item No. & Description: 59120 - Governor - Unit No. 3 - BDE
Type of Inspection: PM6
Department: ELECTRICAL
Inspection Start Date:
Supervisor's Review Signature & Date:

Oct 3, 2018

Asset Approval: B. Woodman
Insp. Comp. Date:

Reference Drawing and Manuals: 107-E-97, 107-E-118, 107-E-94, 107-E-114, 107-E-74, Woodward Governor Manual 07004 & PMG 11002

ACTIVITIES (Initial Box Upon Completion)	REMARKS
CRITICAL PARTS INSPECTION	
1. Governor Oil Pump Motor	
a. Inspect magnetic starter and disconnect for loose/frayed wiring. (T.D)	
b. Meggar governor oil pump motor. 160 + MΩ with 1000volt meggar. (T.D)	
c. Record operating hours of motor. 6928.4 If in excess of 10,000 hours, replace bearings. (T.D)	
d. Check bearing ends for excessive heat. ( )	Start-up
e. Verify operation of the oil pump motor control switches. (LO KH)	
f. Record amperage. A 20.7 B 20.9 C 20.8 Normal 20 amps. (WA ZB)	
2. Ball Head Motor Governor	
a. Visual inspection to check cleanliness of stator. (LO)	
b. Check suppression springs on ball head motor. (LO)	
3. PMG Upper Drive Pins	
a. Check that bolt is not worn or mechanical cracks. (JF LO KH)	
b. Check condition of insulating washer under bolt for cracks or carbon buildup. Replace if worn. (JF LO)	
c. Check condition of locking wire spaghetti insulation. (JF LO KH)	
d. Check condition of brass lockwire for mechanical damage. (JF LO KH)	

PM Checksheet No.: 59120-Governor - Unit No. 3 - BDE Type of Inspection: PM6 Department: ELECTRICAL	Sheet: 2 of 6 Rev. No.: 7 Rev. Date: 17-03-07 Index No.: 533 Binder No.: 26
ACTIVITIES (Initial Box Upon Completion)	**REMARKS**

CRITICAL PARTS INSPECTION (Cont'd)

4. PMG Lower Drive Pins

   a. Check that pins are not mechanically worn. (JF CO KH)

   b. Check that pins are not loose in drive plate. (JF CO KH)

5. PMG Urethane Upper Bushing

   a. Check that bushings are not worn. Replace if worn. (JF CO)

   b. Check that fastening device holds bushing in place. (JF CO)

   c. Clean bushing to prevent carbon tracking. (JF CO)

6. PMG Urethane Lower Bushing

   a. Check that bushings are not worn. Replace if worn. (✓) * replaced

   b. Check that fastening device holds bushing in place. (JF CO)

   c. Clean bushing to prevent carbon tracking. (JF CO)

7. PMG Speed Switches

   Note: Testing of the speed switches after the PMG has been re-installed into the unit shall be performed by manually moving the ballarms.

   a. Check all mounting hardware. (JF CO) ✓

   b. Check all wiring for chafing, loose connections, etc. (JF CO)

   c. Oil all linkages with light lubricating oil. (JF CO KH)

   d. Check condition of teflon drive gears for cracks. Check condition of bearings. Replace if necessary. (JF CO KH)

   e. Check all pins for obstruction in free movements. (JF CO KH)

   f. Check and record speed switch setting as per speed switch support sheet. EM Standard #8. (JF)

   g. Check wiring with PMG installed on unit - 75 rpm and below. (JF)

   BB10 & BB9 (20 AB CCT) BB11 & BB12 (14X CCT)

PM Checksheet No.: 59120-Governor - Unit No. 3 - BDE Type of Inspection: PM6 Department: ELECTRICAL	Sheet: 3 of 6 Rev. No.: 7 Rev. Date: 17-03-07 Index No.: 533 Binder No.: 26
ACTIVITIES (Initial Box Upon Completion)	REMARKS

7. PMG Speed Switches (Cont'd)

h. Check wiring with PMG installed 450 rpm and above. (LO) ✓

BC21 & BC22 (20CR) BC23 & BC24 (alarm)
Input to spherical valve PLC

i. Check wiring with PMG installed 270rpm and above. (JF KH)

BB7 & BB8 (14EX CCT) BB5 & BB6 (25X-1, 25X-2, 25X-3, 25X-4)

j. Check wiring with PMG installed 390 rpm and above. (JF KH)

BC17 & BC18 (86 CCT) BC19 & BC20 (C.W. bypass solenoid)

k. Check hold-down bolts and measure for correct clearance 0.75". (LO) ✓

l. Meggar PMG to ground. 200+ (LO)

m. Check main leads from PMG to governor cabinet. ~~A0~~, ~~B0~~, ~~C0~~ to ensure links closed. (JF)

8. PMG Stator

a. Check condition of PMG stator leads for looseness or mechanical damage. (JF LO KH)

b. Check condition of PMG stator for mechanical damage, insulation cracking and cleanliness. (JF LO)

c. Check and record voltage reading of three phases as per Maintenance Standard settings with unit at: (JF LO KH)

S.N.L. A-B 91.7 B-C 91.7 C-A 91.7

9. PMG Drive Plate

a. Check the hold-down bolts for tightness. Normal 17ft/lbs (LO JF)

b. Check drive pin holds for tightness. (LO JF KH)

10. Power-On Checks

a. Verify correct rotation of ballhead motor. ( )

PM Checksheet No.:	59120 - Governor - Unit No. 3 - BDE	Sheet:	4 of 6
Type of Inspection:	PM6	Rev. No.:	7
Department:	ELECTRICAL	Rev. Date:	17-03-07
		Index No.: 533	Binder No.: 26

Date of Check: 2019-09-25 Checked by: T.D/L.O/J.F/K.H/Z.B

PMG TESTING

* Check all switch operations

	Found at	Adjusted to	Normal
Brake Switch	72.6 rpm	72.6 rpm	75 +/- 2%
Field Flashing	236 rpm	271 rpm	270 +/- 2%
Overspeed Switch	385 rpm	385 rpm	390 +/- 1%
Runaway Switch	469 rpm	451 rpm	450 +/- 1 %

Voltage at rated speed A - B 91.7 volts — Normal at S.N. Load 85

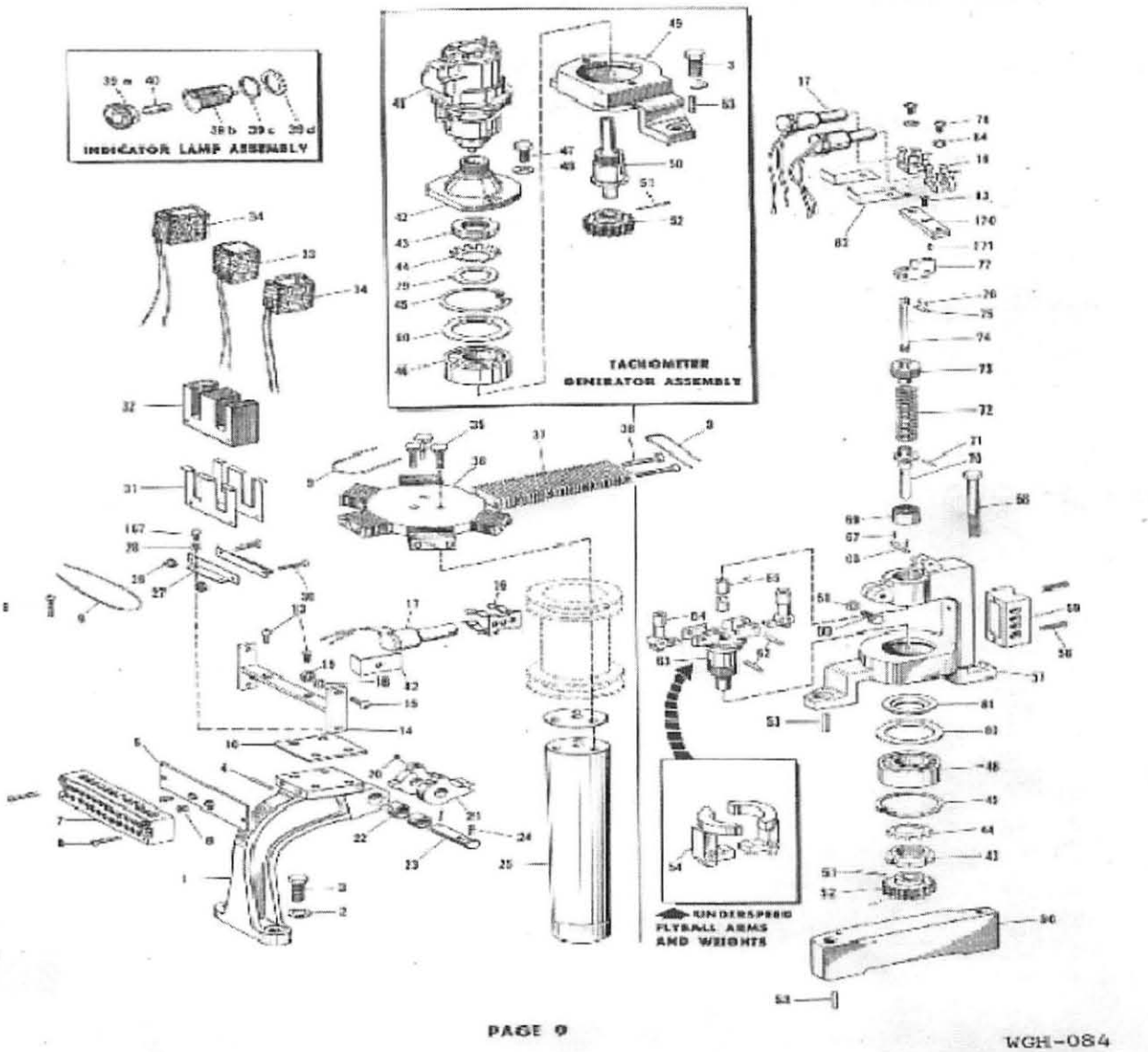
Voltage at rated speed B - C 91.8 volts — Normal at No Load 95 Test Stand

Voltage at rated speed A - C 91.8 volts — Normal Full Load Current 1.9 amps

Voltage can be 10% higher or as much as 20% below.

Comments:

PM Checksheet No.:	59120 - Governor - Unit No. 3 - BDE	Sheet:	5 of 6
Type of Inspection:	PM6	Rev. No.:	7
Department:	ELECTRICAL	Rev. Date:	17-03-07
		Index No.: 533	Binder No.: 26



WOODWARD

INFORMATION AND PARTS REPLACEMENT: When requesting information concerning Permanent Magnet Generator operation, or when ordering replacement parts, it is essential that the following information accompany the request.

1. Permanent Magnet Generator serial number (shown on nameplate).
2. The part reference number as shown in this manual.
3. A description or name of the part.

Parts List for Permanent Magnet Generator Auxiliary Parts.

REF. NO.	PART NAME	NO. REQD.
11002-1	Post	1
11002-2	#6" Shakeproof Washer	As Reqd.
11002-3	#6"-16x1" Hex. Head Cap Screw	As Reqd.
11002-4	1/8"x3/4" Straight Pin	1
11002-5	Terminal Block Mounting Plate	1
11002-6	8-32x3/4" Phillips Flat Head Screw	2
11002-7	12 Pole Terminal Block	1
11002-8	8-32x1" Phillips Round Head Screw	6
11002-9	Brass Lockwire	As Reqd.
11002-10	Laminated Shim	As Reqd.
11002-13	10-32x1/2" Phillips Flat Head Screw	2
11002-14	Mercury Switch Mounting Plate	1
11002-15	8-32x1/4" Phillips Round Head Screw	As Reqd.
11002-16	Switch Clip	As Reqd.
11002-17	Mercury Switch	As Reqd.
11002-18	#8 Shakeproof Washer	As Reqd.
11002-19	8-32 Hex Nut	As Reqd.
11002-20	10-32 Socket Head Set Screw	1
11002-21	Trip Arm	1
11002-22	Ollite Bushing	2
11002-23	Trip Pin	1
11002-24	Cotter Pin	2
11002-25	Rotating Sleeve	1
11002-26	Elastic Stop Nut	2
11002-27	Transformer Mounting Bracket	2
11002-28	3/16" Lockwasher	4
11002-30	10-32x1 3/8" Fillister Head Screw	2
11002-31	Coil Retainer Lamination	2
11002-32	"E" Lamination	42
11002-33	Secondary Coil	1
11002-34	Primary Coil	2
11002-35	1/4"-20x3/4" Drilled Hex. Head Cap Screw	3
11002-36	Lamination Rotor Plate	1
11002-37	"I" Lamination	168
11002-38	10-32x1 3/8" Cad. Fillister Head Screw	8
11002-39a	Indicator Lamp Head Assembly	As Reqd.
11002-39b	Indicator Lamp Body	As Reqd.
11002-39c	Indicator Lamp Lockwasher	As Reqd.
11002-39d	Indicator Lamp Nut	As Reqd.
11002-40	Indicator Lamp Bulb	As Reqd.
11002-41	Tachometer Generator	1
11002-42	Bracket Cover	1
11002-43	Bearing Locknut	As Reqd.
11002-44	Bearing Lockwasher	As Reqd.
11002-45	Snap Ring	As Reqd.
11002-46	Bearing	As Reqd.
11002-47	5/16"-18x3/4" Hex. Head Cap Screw	2
11002-48	5/16" Shakeproof Washer	2
11002-49	Tachometer Generator Bracket	1
11002-50	Tachometer Generator Pinion Shaft	1
11002-51	4/0-5/16" Taper Pin	As Reqd.
11002-52	Micarta Drive Gear	As Reqd.
11002-53	Dowel Pin	As Reqd.
11002-54	Ball arm	As Reqd.
11002-56	Adapter Block	As Reqd.
11002-57	Speed Switch Bracket	As Reqd.
11002-58	10-32x1" Phillips Round Head Screw	As Reqd.
11002-59	4 Pole Terminal Block	As Reqd.
11002-60	1/4"-20x3/4" Hex. Head Cap Screw	As Reqd.
11002-61	1/4" Shakeproof Washer	As Reqd.
11002-62	Ballarm Pin	As Reqd.
11002-63	Ballhead	As Reqd.
11002-64	Ballarm	As Reqd.
11002-65	Ollite Bushing	As Reqd.
11002-66	Rocker Arm Pin	As Reqd.
11002-67	Cotter Pin	As Reqd.
11002-68	1/4"-16 Hex. Head Cap Screw	As Reqd.
11002-69	Thrust Bearing Assembly	As Reqd.
11002-70	Lower Speeder Rod	As Reqd.
11002-71	Lower Speeder Rod Pin	As Reqd.
11002-72	Speed Switch Spring	As Reqd.
11002-73	Speed Setting Plug	As Reqd.
11002-74	Upper Speeder Rod	As Reqd.
11002-75	Upper Speeder Rod Pin	As Reqd.
11002-76	Cotter Pin	As Reqd.
11002-77	Rocker Arm	As Reqd.
11002-78	6-32x1/8" Round Head Screw	As Reqd.
11002-79	Bearing Shield Washer (Plain)	As Reqd.
11002-80	Bearing Shield Washer (Plain)	As Reqd.
11002-81	Bearing Shield Washer (Stepped)	As Reqd.
11002-82	Switch Retainer	As Reqd.
11002-83	8-32x3/8 Phillips Flat Head Screw	As Reqd.
11002-84	No. 0 Shakeproof Washer	As Reqd.
11002-85	Drive [illegible]	1
11002-86	Lower [illegible] Pin	2

ENTERED

W/O #: 1324946

NEWFOUNDLAND & LABRADOR HYDRO
HYDRO GENERATION
PREVENTIVE MAINTENANCE CHECKSHEETS

Sheet: 1 of 5
Rev. No.: 11
Rev. Date: 15-05-22
Index No.: 526 Binder No.: 26

PM Checksheet No.: PM6-59115
Item No. & Description: 59115 - Generator - Unit No. 3 - BDE
Type of Inspection: PM6 (Annual)
Department: Electrical
Inspection Start Date:
Supervisor's Review Signature & Date:
Oct 3, 2018
Asset Approval: B. Woodman
Insp. Comp. Date:
Reference Drawing and Manuals: 107-E-96, 107-E-097, 107-E-126, ED-019, ED-022

ACTIVITIES (Initial Box Upon Completion)		REMARKS
1. Generator Slip Ring Assembly		
NOTE: TORQUE SETTINGS FOR ELECTRICAL CONNECTORS: Bolts ½" – 41ft/lbs – Silicon Bronze Bolts 3/8" – 27+/-3 Ft/Lbs Medium Carbon Steel Bolts ½" – 67+/-7 Ft/Lbs Medium Carbon Steel Bolts 3/8" – 20ft/lbs Silicon Bronze		
a) Check brushes for cracks, uneven surfaces, etc. Replace any brush projecting from a brush box 1/8" or less, before pigtail contact brush box.	(T.B Z.B K.H)	
b) Measure and record lengths of carbon brushes.	(Z.B K.H)	
c) Inspect and clean all slip ring insulators.	(ZB LO)	
d) Check slip rings for pitting, discoloration or scouring.	(ZB KH)	
e) Check all mounting hardware for tightness.	(ZB KH)	
f) Measure and record wear on lower slip ring.	(Z.B K.H)	TT - 0.123 TB - 0.123 BT - 0.113 BB - 0.114
g) Measure and record wear on upper slip ring.	(Z.B K.H)	0° Hex 19005 270: TT - 0.142, TB - 0.131, BT - 0.148, BB - 0.139 90: TT - 0.113, TB - 0.140, BT - 0.136, BB - 0.132 180: TT - 0.119, TB - 0.147, BT - 0.141, BB - 0.158
h) Reverse polarity on slip rings by reversing leads at exciter cubicle.	(J.F K.H)	
i) Check and clean all brush holders, springs and pigtail connections.	(Z.B K.H)	
j) Meggar slip rings. 500volt DC 6000+ Normal >1000mohms.	(TD ZB KH)	
k) Check brush force and freedom of movement, normal force at 3 lbs. If significantly less, spring should be replaced, sticky brushes should be cleaned.	(ZB KH) ✓	→ found few sticky holders Cleaned with rags, works well now.

PM Checksheet No.: 59115 - Generator - Unit No. 3 - BDE Type of Inspection: PM6 Department: Electrical	Sheet: 2 of 5 Rev. No.: 11 Rev. Date: 15-05-22 Index No.: 526 Binder No.: 26
ACTIVITIES (Initial Box Upon Completion)	REMARKS

1. Generator Slip Ring Assembly (Cont'd)

   l) Check the clearance between the brush boxes and the collection. Minimum of clearance between brush boxes and collection rings. Clearance of 2.0 to 2.5 MM between brush box and collector ring. (TD ZB LO)

   m) Clean the collector. Surface of collector rings shall be clean and free of rust at all times. Take the following precautions: (TD ZB KH)

      i. Avoid finger marks. Skin acids and/or moisture promotes the development of rust on the polished steel surface. (✓)

      ii. If a collector is to be out of service for some long periods of time, completely envelope it in rust inhibiting grease to prevent the condensation of moisture. (✓)

      iii. Clean the ring surfaces with industrial alcohol prior to returning the collection to service. (✓)

2. Rotor

   a) Check rotor bus leads (flexible jumpers) to slip rings:

      i. Check tightness of bolts torque at 67 +/-7 Ft-Lbs. (L.O J.F)

      ii. Visually inspect for abnormal wear and cracks. (T.D)

      iii. Check laminate layers for peeling. (T.D)

   b) Inspect rotor ventilation ducts. Clean if there is excess material. (T.D)

3. Current Transformer Split Phase and Neutral

   a) Check mounting hardware and connections. (T.D L.O)

   b) Wipe down all accessible areas with clean dry cloths. (T.D L.O)

   c) Visually inspect cablings for cracks or mechanical damage. (T.D L.O)

PM Checksheet No.: 59115 - Generator - Unit No. 3 - BDE Type of Inspection: PM6 Department: Electrical	Sheet: 3 of 5 Rev. No.: 11 Rev. Date: 15-05-22 Index No.: 526 Binder No.: 26
ACTIVITIES (Initial Box Upon Completion)	**REMARKS**

4. Generator Shaft Grounding Brush

   a) Check brush for cracks, uneven wear. (T.D L.O)

   b) Check brush for good contact with shaft. (T.D L.O)

   c) Check shaft grounding brush grounding circuit. (T.D L.O)

5. Generator Brake Switches

   a) Check mounting hardware. (LO WC ZB)

   b) Check wiring for loose connections, broken connections and mechanical damage. (LO WC ZB)

   c) Check operation of switches. (WC ZB)

   d) Check brake circuits BG1 - BG8. (WC ZB)

   e) Check brake solenoid wiring for loose connections. (WC ZB)

   f) Check operation of brake solenoid for free movement. (—) → Locked under permit.

   g) Monitor and record braking solenoid coil resistance. (WC ZB) → 19.1 Ω

   h) Check timing of brake application. ( ) → Start-up

   Standard 7 Sec. Record Actual: _____

6. Partial Discharge Equipment

   a) Check coupler mounting hardware for looseness insulation cracking. 15 couplers. (LO)

   b) Check coaxial cable for mechanical damage. (LO)

7. Generator Creep Detector

   a) Check connections on contacts and operation coils. (T.D L.O)

   b) Clean creep detector. (T.D L.O)

   c) Check operation of contacts. (T.D L.O)

   d) Inspect pins and linkage movement. (T.D L.O)

PM Checksheet No.:	59115 - Generator - Unit No. 3 - BDE	Sheet: 4 of 5
Type of Inspection:	PM6	Rev. No.: 11
Department:	Electrical	Rev. Date: 15-05-22
		Index No.: 526 Binder No.: 26

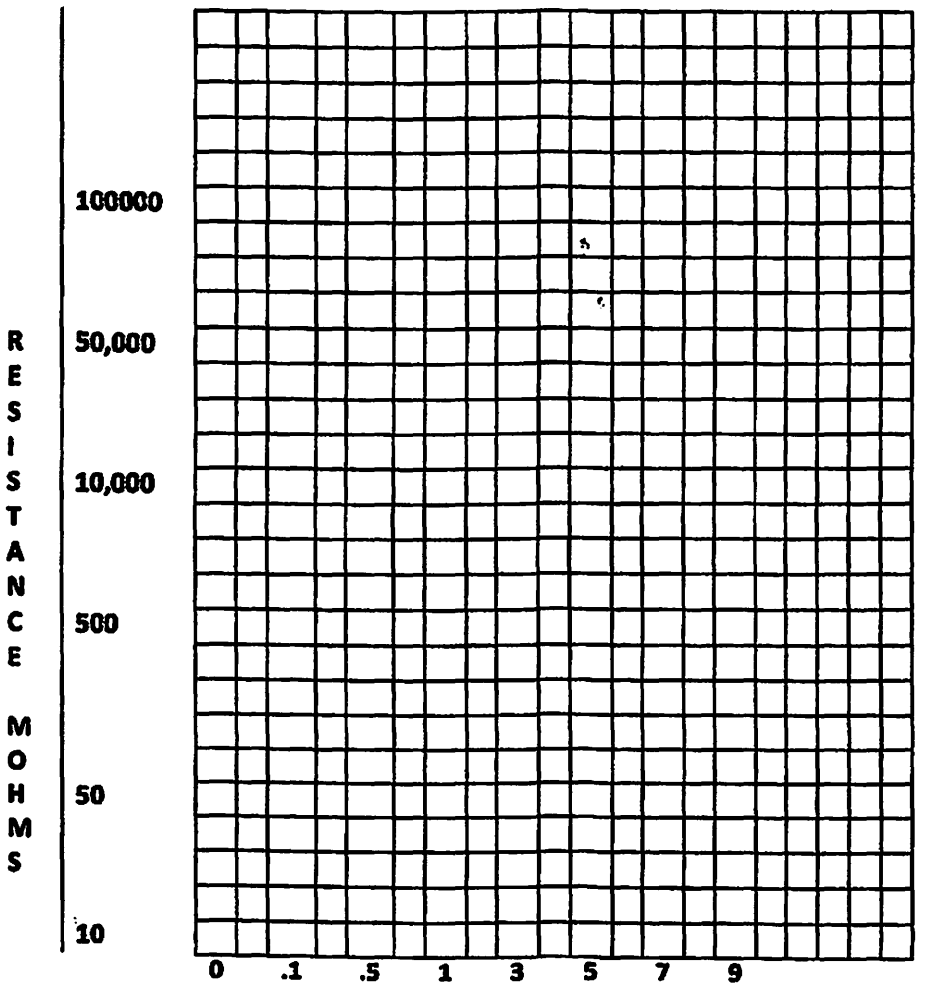
ACTIVITIES (Initial Box Upon Completion)	REMARKS
7. Generator Creep Detector (Cont'd)	
e) Check condition of textolite brush. (T.D L.O)	
f) Check air gap to shaft .003". (LO)	
8. Generator Stator	
a) Inspect stator RTD wiring and connections in RTD box. (LO)	
b) Check coils for end distortion, cracked insulation or any mechanical damage. (LO)	
c) Check for swelling, puffiness, discolouration or tape delamination. This will reveal white powder or yellow marks. (LO)	
d) Check for signs of corona discharge. This will reveal white powder at top of slots or around wedges or around lashings. (LO)	
e) Check for signs of fretting corrosion. This will appear as red dust around bolts, edges of steel laminations, etc. (LO)	
f) Check for dirt contamination by carbon, oil, dust, moisture. Identify any area that requires cleaning. (LO)	
g) Check coil lashing to support rings for signs of movement. Check support ring brackets to stator finger plates. (LO)	
h) Check for signs of packing migrating out of stator slots. This would be an indication of loose wedges. (LO)	
i) Check that rubber cover up booths are in place over neutral connections and split phase CT connections from stator leads. (LO)	

unit 3

PM Checksheet No.: PM6 – 59733 – Elect/P&CBDE **Type of Inspection:** PM6 Annual unit 3 **Department:** Electrical/P&C	**Sheet:** 2 of 2 **Rev. No:** 1 **Rev. Date:** 2 **Index No.:** 2456 **Binder No.:** 26

ACTIVITIES (Initial Box Upon Completion)		REMARKS
GENERATOR	Readings Taken by: TD/KH/LOTF Verified by: Reviewed by: Approved by:	Date: Sept. 24, 2018 Date: Date: Date:

POLARIZATION INDEX TEST



Time	Mohms
15 sec.	381MΩ
30 Sec.	957MΩ
45 sec.	1.33GΩ
1 min.	1.60GΩ
2 min.	2.25GΩ
3 min.	2.67GΩ
4 min.	3.00GΩ
5 min.	3.23GΩ
6 min.	3.43GΩ
7 min.	3.56GΩ
8 min.	3.86GΩ
9 min.	3.84GΩ
10 min.	3.98GΩ

PI = 2.49

Polarization Index: Time, Minutes

Comments:

Submit to Engineering day of test.

Edition

PM Checksheet No.:	59115 - Generator - Unit No. 3 - BDE	Sheet:	5 of 5
Type of Inspection:	PM6	Rev. No.:	11
Department:	Electrical	Rev. Date:	15-05-22
		Index No.: 526	Binder No.: 26

Date of Check: Sept. 25/18 Checked By: Z.B / K.H

BRUSH MEASUREMENT (CLOCKWISE)

Unit hour meter reading: _____ Hours accumulated since last inspection: _____

	Top Ring		Bottom Ring	
	Top	Bottom	Top	Bottom
1	0.775	1.108	1.017	1.014
2	0.913	1.047	1.181	1.050
3	0.819	1.018	1.046	1.074
4	0.654 x	0.948	1.083	1.020
5	1.043	0.887	1.077	0.997
6	0.758	1.045	0.931	0.980
7	0.948	0.979	1.110	1.031
8	0.873	0.997	1.114	1.019
9	0.816	0.942	1.113	0.928
10	0.675 x	0.905	1.030	0.981
11	0.777	0.892	1.167	0.997
12	0.768	0.677 x	1.056	1.012
13	0.866	0.933	1.068	1.044
14	0.895	1.036	1.097	0.994
15	0.931	1.015	0.852	1.090
16	0.993	0.963	1.072	1.025
17	0.829	0.921	1.225	0.935
18	0.930	0.937	1.256	1.044
19	0.685	0.924	1.220	0.858

Comments: Changed 3 Brushes

ENTERED

W/O #: 1324945

NEWFOUNDLAND & LABRADOR HYDRO
HYDRO GENERATION
PREVENTIVE MAINTENANCE CHECKSHEETS

Sheet: 1 of 1
Rev. No.: 6
Rev. Date: 16-02-25
Index No.: 2045 Binder No.: 26

PM Checksheet No.: PM6-109965-EBDE
Item No. & Description: 109965 - Exciter - Unit No. 3 - BDE
Type of Inspection: PM6 (Annual)
Department: ELECTRICAL
Inspection Start Date:
Supervisor's Review Signature & Date:
Reference Drawing and Manuals: ABB Ref. 502-799, 107-E-126

Oct 3, 2018

Asset Approval: B. Woodman
Insp. Comp. Date:

ACTIVITIES (Initial Box Upon Completion)	REMARKS
CRITICAL PARTS INSPECTION	
1. Field Flashing Contactor	
a) Check if contacts are clean as per Operating Instruction FPTC401-773. (T.P)	
2. Air Filters	
a) Check or replace air filters. (J.F KH)	
3. Bus	
a) Inspect Bus Connections. (T.D)	

ENTERED

W/O 1324986

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 1 Rev. No.: 0 Rev. Date: 17-08-16 Index No.: 2928 Binder No.: 26

PM Checksheet No.: PM6 – 393239 - EBDE
Item No. & Description: 393239 – Excitation Transformer – Unit #3 - BDE
PM Type: PM6
Department: Electrical
Inspection Start Date:
Supervisor's Review Signature and Date:
Reference Drawing and Manuals:

Oct 3, 2018

Asset Approval: Bob Woodman
Insp. Comp. Date:

ACTIVITIES (Initial Box Upon Completion)		REMARKS
1. Oil Checks		
a. Check oil levels in main tank and record. 25°	(T.D)	
b. Check for oil leaks and clean up any stains or spills. Report any event through SWOP.	(T.D)	
2. Gas Relay check.	(T.D)	
3. Vacuum pressure gauge KPA: 0	(T.D)	
4. Inspect exciter leads connections to the transformer. Report abnormalities.	(T.D J.H K.H)	* Retouged @ 37 lbs
5. Inspect all oil and winding temperature devices and record findings.	(T.D)	
6. Check explosion vent diaphragm for signs of damage or deterioration.	(T.D)	
7. Check that all equipment grounds are in place and all connections are sound.	(T.D)	
8. Check main tank, radiators and other metal parts for signs of rust penetration.	(T.D)	
9. Control Cabinets and Devices.		
a. Inspect control wiring and terminations for breaks, corrosion, overheating or damage.	(T.D)	
b. Check all cabinet doors for ease of operation. Lubricate as required.	(T.D)	

newfoundland labrador hydro a nalcor energy company	MAINTENANCE DEPARTMENT GUIDELINES	GEN-43 MDG # 014 REV. # 1 REV. DATE June 3, 2003 PAGE 1 of 4
TITLE:	Turbine/Generator Pre Start-Up Inspection	
LOCATION:	UNIT NO. 3	

SCOPE:

This inspection is required after all major overhauls, or after any major work or inspections on the rotor, stator, thrust bearing assembly, spherical valve, spiral case area or turbine pit area.

OBJECTIVE:

The objective of the inspection is to ensure that a thorough visual inspection is completed prior to placing unit back in service, to ensure any loose or foreign material is removed, to ensure that areas of the machine worked on are free of hazards or debris that may cause damage during operation.

STANDARD:

Responsibility for ensuring that the start-up inspection is completed is the responsibility of the Labour Manager.

The inspection must be completed by the Mechanical and Electrical Supervisor, Labour/Operations Superintendent and personnel prior to start up. When possible, in scope employees should participate in the inspection.

Prior to doing this inspection, all objects such as coins, keys, wallets, pagers, pens, etc, must be removed from your pockets.

The unit will not be placed in operation until the inspection results have been discussed with the Labour Manager or designate.

The attached inspection sheet will be used as a guide for this inspection.

Reviewed By: Louis Barnes	Approved By: _____	Issue Date: May 1997

TITLE:	Turbine/Generator Pre Start-Up Inspection
LOCATION:	UNIT NO.

PRIOR TO INSTALLATION OF SHROUDS	CHECKED BY
1. Ensure no loose bolts or any foreign material is left in the unit that may be covered once the shrouds are in place.	NA
2. Ensure no foreign material or tools is left anywhere around top of stator frame area.	RW CS
3. Ensure all pole key retainers are securely in place.	RW CS
4. Ensure top of poles are free from foreign objects.	RW CS
5. Visually inspect v-bolts between poles for any foreign objects or abnormalities.	RW CS
6. Check the back area of the poles where material can be conveniently placed.	RW CS
7. Thoroughly inspect top end windings.	RW CS
8. Thoroughly inspect bottom end windings.	RW CS
9. Check the air gap between the riser and stator, for any sign of abnormalities.	RW CS

PRIOR TO UNIT START-UP	CHECKED BY
Inspect the following areas:	
1. Brush gear assembly.	RW CS
2. Upper bracket.	RW CS
3. Main bracket.	RW CS
4. Top covers of thrust/guide bearing assembly.	RW CS
5. Top of upper shrouds.	NA
6. Top of stator.	RW CS

TITLE:	Turbine/Generator Pre Start-Up Inspection
LOCATION:	UNIT NO.

	PRIOR TO UNIT START-UP	CHECKED BY
7.	Check the security of the shroud locking plates, angle iron supports and bolts.	NA
8.	Between upper shrouds and rotor.	NA
9.	Stub shaft bolts.	RW CS
10.	Security of sprinkler system piping.	RW CS
11.	Rotor ventilation slots.	RW CS
12.	Rotor spider for tools, welding slag, etc.	RW CS
13.	Between rotor and lower shrouds.	NA
14.	Security of lower shrouds.	NA
15.	Check drain cocks, valve positions, piping connections, etc.	RW CS
16.	Check all bearing oil levels, governor sump levels and accumulator tank oil levels.	RW CS
17.	Check for foreign matter between wicket gates.	NA
18.	Check spiral case area for cleanliness.	NA
19.	Check drafttube scaffold removal, door closed and bolted.	NA
20.	Check spiral case door closed and bolted.	NA
21.	Ensure rotor has been jacked.	RW CS
22.	Check position of creep detector and grounding brush.	RW CS
23.	Check duplex panels in control room for reminder notes.	RS
24.	Check to ensure links, valves etc that were worked on have been returned to normal position.	RS

TITLE:	Turbine/Generator Pre Start-Up Inspection
LOCATION:	UNIT NO.

PRIOR TO UNIT START-UP		CHECKED BY
25.	Thoroughly inspect turbine pit area.	RWCS
27.	Thoroughly inspect spherical valve pit area.	RWCS
28.	Thoroughly inspect duplex and T6 panels.	RS
29.	List all deficiencies that must be corrected prior to running of unit.	RS
30.	Check surface air coolers ie; positions of valves, air relief valves, plugs, etc.	RWCS
31.	Check valve on H.P lift pump to ensure it is open.	NA
32.	Check positions of all valves in brake circuit to ensure all is in correct position.	RWCS

DESCRIPTION	RESPONSIBILITY	STATUS
Sign Off Signatures		
Electrical Supervisor	Rob Saxby	Date March 1/18
Mechanical Supervisor		Date Mar 1/18
Labour/Operations Superintendent		Date
Labour Manager		Date

ENTERED

W/O #: 1324950

NEWFOUNDLAND & LABRADOR HYDRO
HYDRO GENERATION
PREVENTIVE MAINTENANCE CHECKSHEETS

Sheet: 1 of 1
Rev. No.: 5
Rev. Date: 15-05-22
Index No.: 498 Binder No.: 26

PM Checksheet No.: PM6-59111-EBDE
Item No. & Description: 59111 - Turbine - Unit No. 3 - BDE
Type of Inspection: PM6 (Annual)
Department: ELECTRICAL
Inspection Start Date:
Supervisor's Review Signature & Date:

Oct 3, 2018

Asset Approval: B. Woodman
Insp. Comp. Date:

Reference Drawing and Manual: 107-E-114, 107-E-171, Howard Martin 92-301-548 and 92-217-111

ACTIVITIES (Initial Box Upon Completion)	REMARKS
CRITICAL PARTS INSPECTION	
1. AUTOGREASER	
a. Check all wiring connections for looseness and mechanical damage. (T.D)	
b. Check operation of micro on distribution block. ( )	
c. Record number of shots since last inspection. _____ (T.D) 1 shot/12 hours 730/year.	Interior Zone 753 Exterior Zone 400
2. SHEARPIN PLUG	
a. Check wiring on each of the plugs for looseness or mechanical damage. (T.D K.H)	* Made repairs to one plug connection.
b. Check condition of plug for proper fitting in shearpin. (T.D K.H)	
c. Check operation of 95X relay for shearpin ground alarm. (T.D L.O)	
d. Check operation of relay 95A for shearpin failure alarm. (T.D L.O)	

ENTERED

W/O #: 1324949

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 6 Rev. No.: 10 Rev. Date: 17-03-06 Index No.: 471 Binder No.: 26

PM Checksheet No.: PM6-59146 - EMBDE
Item No. & Description: 59146 - Spherical Valve - Unit No. 3 - BDE
Type of Inspection: PM6 (Annual)
Department: Electrical/Mechanical
Inspection Start Date: 18/09/12
Supervisor's Review Signature & Date:
Reference Drawing and Manuals: Operating and Maintenance Units 1 – 6, 107-E-151

0.t 17, 2018

Asset Approval: B. Woodman
Insp. Comp. Date:

ACTIVITIES (Initial Box Upon Completion)	REMARKS

CHECK PRIOR TO OPERATING & TESTING VALVES

Note: 1) Mechanical & Electrical Power-off checks to be conducted in parallel.

2) Don't adjust settings without authorization.

3) Requires operations to operate valve.

POWER-ON TESTING

1. Valve Indications

a) With the spherical valve closed, upstream seal off and the downstream seal applied, check that the following indication lamps are lit: (DS) (DH)

Automatic mode, bypass valve closed, upstream seal off, spherical valve closed, downstream seal on, spiral depressurized, 600 volts AC on, power supply (PSI and PS2) on.

Yes ✓ No _____ Very Dim

If no, reason for failure:

b) The pressure gauges located on the upstream wall (DS) (DH)

PG1 1750 KPA Normal 1793 KPA - penstock pressure
PG2 0 KPA Normal 0KPA - U/S seal
PG3 1800 KPA Normal 1793 KPA - D/S seal
PG4 0 KPA Normal 0 KPA - Spiral case

2. Valve opening locally at the PLC control panel. (DS)

a) Time the bypass valve opening using the indicating lights – open/ in motion/close.

Standard - 14 seconds Actual 13

b) Check the bypass motor current. (T.D)

Standard 0.5 Amps – A~~0~~ 0.7 B~~0~~ 0.8 C~~0~~ 0.7

PM Checksheet No.: 59146 Spherical Valve - Unit No. 3 - BDE Type of Inspection: PM6 Department: Electrical/Mechanical	Sheet: 2 of 6 Rev. No.: 10 Rev. Date: 17-03-06 Index No.: 471 Binder No.: 26
ACTIVITIES (Initial Box Upon Completion)	**REMARKS**

POWER-ON TESTING (Cont'd)

3. Spiral Case Indication

   a) Record the time from valve given open pulse until spiral full indication is lit 40 normal 50 secs. ( )

   b) Record pressure on PG4 690 PSI KPA normal 690 KPA. ( )

   Note: Spiral light will come on when level switch, pressure switch and pressure transmitted conditions have been met.

4. Downstream Seal

   a) Record time from spiral full light on until downstream seal is off 45 seconds. Normal 45 seconds. ( )

   b) Verify the change of seal indication. ( )

   c) Record downstream seal pressure gauge PG3 0 kpa. Normal 1793 kpa. ( )

5. Spherical Valve Servo Valve

   a) Verify that the in motion light is on. ( )

   b) Record time that the main valve is opening 82 seconds. Normal time 65 seconds. ( )

   c) Verify that the valve open light is on. ( )

   d) Verify that the bypass valve indication in motion to close is lit. ( )

   e) Record the timing of the bypass valve closing 13 seconds. Normal 14 seconds. ( )

   f) Record spiral case pressure PG4 700 KPA. Normal 1793. ( )

   g) Record differential on downstream filters while servo valve is operating 4 KPA. If greater than 90 KPA for 10 seconds filter is clogged. ( )

   h) Operate supply ball valve on in service filter to cause a blockage alarm. ( ) → NOT GETTING ANY DIFF.

   i) While the valve is opening, initiate an automatic closing from the PLC control panel. ( )

PM Checksheet No.: 59146 - Spherical Valve - Unit No. 3 - BDE Type of Inspection: PM6 Department: Electrical/Mechanical	Sheet: 3 of 6 Rev. No.: 10 Rev. Date: 17-03-06 Index No.: 471 Binder No.: 26
ACTIVITIES (Initial Box Upon Completion)	REMARKS

POWER-ON TESTING (Cont'd)

6. Spherical Valve Piping

   a) Check all piping and connections for leaks. (DH) — Servo Seal Leaking

   b) Check all piping mounting hardware. (DH)

7. Automatic Valve Closing

   a) Close the spherical valve. (RS)

   b) Record the closing time 72. Normal time is 62 seconds. (RS)

   c) Check indication for in motion and closed lights. (RS)

   d) Record time for downstream seal to operate 10. Normally approximately 10 seconds. (RS)

   e) Record PG3 pressure 2000. Normal 1730± 50 KPA. (RS)

   f) Spiral case full light has changed to depressurized. (RS)

8. Upstream Seal

   a) Ensure spherical valve is closed. (RS)

   b) Check off status of U/S seal indicating light. (RS)

   c) Apply upstream seal. (RS)

   d) Check on status of U/S seal indicating light. (RS)

   e) Record differential on in service U/S filter while seal is being applied.
   5 KPA. (RS)

   f) Operate supply ball valve to filters to create a differential alarm. (RS)

   g) With upstream seal applied, open body drain valve and drain body to verify seal is applied and effective. Standard is 10 minutes. (PH)
   Actual 15.52 minutes. WATER STOPPED

   Note: Close body drain valve before removing U/S seal.

   h) Remove upstream seal. (RS)

PM Checksheet No.: 59146 - Spherical Valve - Unit No. 3 - BDE Type of Inspection: PM6 Department: Electrical/Mechanical	Sheet: 4 of 6 Rev. No.: 10 Rev. Date: 17-03-06 Index No.: 471 Binder No.: 26
ACTIVITIES (Initial Box Upon Completion)	REMARKS

POWER-ON TESTING (Cont'd)

9. Alarms

a) Test the following alarms

1) PLC fault, CPU failure, timer failure, I/O module failure. (RS)

- Change battery in PLC (size ½ AA) (RS)

2) Valve pit high water magnetrol.

- Operate manually and verify the alarm. (TD) → ALARM ALREADY IN. NEEDS TO BE INVESTIGATED

3) Bypass valve AC failure. (RS)

POWER-OFF

MECHANICAL

1. Inspect and clean upstream duplex filters. (DH ER)
2. Inspect and clean downstream duplex filters. (DH ER)
3. Grease the following components:
   a) Main trunions. (DH ER)
   b) Connecting rod pins on piston. (DH ER)
   c) Operating cylinder pivot pin bearing. (DH ER)
   d) Upstream bypass valve. (DH ER)
   e) Downstream bypass valve. (DH ER)

   NOTE: Ensure Rockwell grease is applied to downstream bypass valve.
4. Remove debris from spherical valve pit drains. (DH ER)

ELECTRICAL

1. Meggar bypass motor (1000 volts). 2000+ (T.D)
2. Record torque switch settings on bypass motor. Standard 2.5 for open and close. (T.D)
   5 Open 5 Close.
3. Check 600 volt cable terminations. (T.D)

PM Checksheet No.: 59146 - Spherical Valve - Unit No. 3 - BDE Type of Inspection: PM6 Department: Electrical/Mechanical	Sheet: 5 of 6 Rev. No.: 10 Rev. Date: 17-03-06 Index No.: 471 Binder No.: 26
ACTIVITIES (Initial Box Upon Completion)	**REMARKS**

P&C

1. Measure Power Supplies (RS)
   a) PS1 25.9 Vdc
   b) PS2 23.4 Vdc
2. With laptop, verify CP1 limit switches. (RC)
   a) LS5A (10023) ON / ~~OFF~~ (CLOSED) With Valve Closed
   b) LS5B (10024) ~~OFF~~ / ON (OPEN) With Valve Open (RS)
3. Monitor scroll case/vent chamber instrumentation (RS)
   a) PT1 Set Point (40 100) Found 500 (78) Left at SAME
   b) L1 Vent Chamber Switch (10 001) Found off Left at SAME
   c) PS4 Scroll Case Pressure (10 005) Found 2 Left at SAME kpa

   Normal 1435 kpa.
4. With laptop verify PLC switches from auto to manual on operation of the following valves manual control levers. Follow current procedure.

   NOTE: Valve P applies maintenance seal; to be done only with main valve closed. Valve D-E, S-R, N and P3-M to be checked only during a proper manual
   operating sequence.

   a) Valve D-E (10021) (LS3) (RS)
   b) Valve S-R (10022) (LS4) (RS)
   c) Valve P (10006) (LS7) (RS)
   d) Valve N (10007) (LS9) (RS)
   e) Valve P3-M (10031) (LS10) (RS)
5. a) Open 600 volt disconnect for bypass valve (with valve in closed position). (RS)
   b) Close the U/S manual bypass valve. (This will make the auto valve easier to operate manually). ( )
   c) Check calibration of the valve position feedback by operating the manual handle and reading the indication on the DPI. ( )
   d) Verify that the 0% and 100% positions correspond to the Mechanical closed (0%) and open (100%) positions. ( )

CHECKED 0 – 100% WHILE BYPASS WAS OPENING. Good.

PM Checksheet No.: 59146 - Spherical Valve - Unit No. 3 - BDE Type of Inspection: PM6 Department: Electrical/Mechanical	Sheet: 6 of 6 Rev. No.: 10 Rev. Date: 17-03-06 Index No.: 471 Binder No.: 26
ACTIVITIES (Initial Box Upon Completion)	**REMARKS**
<u>TOOLS</u> 1. Grease gun 1. Stop watch 2. AC/DC clip on ammeter 3. Multimeter 4. 1000 volt meggar 6. Standard tools	

ENTERED

W/O #: 1324949

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 6 Rev. No.: 10 Rev. Date: 17-03-06 Index No.: 471 Binder No.: 26

PM Checksheet No.: PM6-59146 - EMBDE
Item No. & Description: 59146 - Spherical Valve - Unit No. 3 - BDE
Type of Inspection: PM6 (Annual)
Department: Electrical/Mechanical
Inspection Start Date: 18/09/12
Supervisor's Review Signature & Date:
Reference Drawing and Manuals: Operating and Maintenance Units 1 – 6, 107-E-151

0.t 17, 2018

Asset Approval: B. Woodman
Insp. Comp. Date:

ACTIVITIES (Initial Box Upon Completion)	REMARKS

CHECK PRIOR TO OPERATING & TESTING VALVES

Note: 1) Mechanical & Electrical Power-off checks to be conducted in parallel.

2) Don't adjust settings without authorization.

3) Requires operations to operate valve.

POWER-ON TESTING

1. Valve Indications

a) With the spherical valve closed, upstream seal off and the downstream seal applied, check that the following indication lamps are lit: (DS) (DH)

Automatic mode, bypass valve closed, upstream seal off, spherical valve closed, downstream seal on, spiral depressurized, 600 volts AC on, power supply (PSI and PS2) on.

Yes ✓ No _____ Very Dim

If no, reason for failure:

b) The pressure gauges located on the upstream wall (DS) (DH)

PG1 1750 KPA Normal 1793 KPA - penstock pressure
PG2 0 KPA Normal 0KPA - U/S seal
PG3 1800 KPA Normal 1793 KPA - D/S seal
PG4 0 KPA Normal 0 KPA - Spiral case

2. Valve opening locally at the PLC control panel. (DS)

a) Time the bypass valve opening using the indicating lights – open/ in motion/close.

Standard - 14 seconds Actual 13

b) Check the bypass motor current. (T.D)

Standard 0.5 Amps – A~~0~~ 0.7 B~~0~~ 0.8 C~~0~~ 0.7

PM Checksheet No.: 59146 Spherical Valve - Unit No. 3 - BDE Type of Inspection: PM6 Department: Electrical/Mechanical	Sheet: 2 of 6 Rev. No.: 10 Rev. Date: 17-03-06 Index No.: 471 Binder No.: 26
ACTIVITIES (Initial Box Upon Completion)	**REMARKS**

POWER-ON TESTING (Cont'd)

3. Spiral Case Indication

   a) Record the time from valve given open pulse until spiral full indication is lit 40 normal 50 secs. ( )

   b) Record pressure on PG4 690 PSI KPA normal 690 KPA. ( )

   Note: Spiral light will come on when level switch, pressure switch and pressure transmitted conditions have been met.

4. Downstream Seal

   a) Record time from spiral full light on until downstream seal is off 45 seconds. Normal 45 seconds. ( )

   b) Verify the change of seal indication. ( )

   c) Record downstream seal pressure gauge PG3 0 kpa. Normal 1793 kpa. ( )

5. Spherical Valve Servo Valve

   a) Verify that the in motion light is on. ( )

   b) Record time that the main valve is opening 82 seconds. Normal time 65 seconds. ( )

   c) Verify that the valve open light is on. ( )

   d) Verify that the bypass valve indication in motion to close is lit. ( )

   e) Record the timing of the bypass valve closing 13 seconds. Normal 14 seconds. ( )

   f) Record spiral case pressure PG4 700 KPA. Normal 1793. ( )

   g) Record differential on downstream filters while servo valve is operating 4 KPA. If greater than 90 KPA for 10 seconds filter is clogged. ( )

   h) Operate supply ball valve on in service filter to cause a blockage alarm. ( ) → NOT GETTING ANY DIFF.

   i) While the valve is opening, initiate an automatic closing from the PLC control panel. ( )

PM Checksheet No.: 59146 - Spherical Valve - Unit No. 3 - BDE Type of Inspection: PM6 Department: Electrical/Mechanical	Sheet: 3 of 6 Rev. No.: 10 Rev. Date: 17-03-06 Index No.: 471 Binder No.: 26
ACTIVITIES (Initial Box Upon Completion)	REMARKS

POWER-ON TESTING (Cont'd)

6. Spherical Valve Piping

   a) Check all piping and connections for leaks. (DH) — Servo Seal Leaking

   b) Check all piping mounting hardware. (DH)

7. Automatic Valve Closing

   a) Close the spherical valve. (RS)

   b) Record the closing time 72. Normal time is 62 seconds. (RS)

   c) Check indication for in motion and closed lights. (RS)

   d) Record time for downstream seal to operate 10. Normally approximately 10 seconds. (RS)

   e) Record PG3 pressure 2000. Normal 1730± 50 KPA. (RS)

   f) Spiral case full light has changed to depressurized. (RS)

8. Upstream Seal

   a) Ensure spherical valve is closed. (RS)

   b) Check off status of U/S seal indicating light. (RS)

   c) Apply upstream seal. (RS)

   d) Check on status of U/S seal indicating light. (RS)

   e) Record differential on in service U/S filter while seal is being applied.
   5 KPA. (RS)

   f) Operate supply ball valve to filters to create a differential alarm. (RS)

   g) With upstream seal applied, open body drain valve and drain body to verify seal is applied and effective. Standard is 10 minutes. (PH)
   Actual 15.52 minutes. WATER STOPPED

   Note: Close body drain valve before removing U/S seal.

   h) Remove upstream seal. (RS)

PM Checksheet No.: 59146 - Spherical Valve - Unit No. 3 - BDE Type of Inspection: PM6 Department: Electrical/Mechanical	Sheet: 4 of 6 Rev. No.: 10 Rev. Date: 17-03-06 Index No.: 471 Binder No.: 26
ACTIVITIES (Initial Box Upon Completion)	REMARKS

POWER-ON TESTING (Cont'd)

9. Alarms

a) Test the following alarms

1) PLC fault, CPU failure, timer failure, I/O module failure. (RS)

- Change battery in PLC (size ½ AA) (RS)

2) Valve pit high water magnetrol.

- Operate manually and verify the alarm. (TD) → ALARM ALREADY IN. NEEDS TO BE INVESTIGATED

3) Bypass valve AC failure. (RS)

POWER-OFF

MECHANICAL

1. Inspect and clean upstream duplex filters. (DH ER)
2. Inspect and clean downstream duplex filters. (DH ER)
3. Grease the following components:
   a) Main trunions. (DH ER)
   b) Connecting rod pins on piston. (DH ER)
   c) Operating cylinder pivot pin bearing. (DH ER)
   d) Upstream bypass valve. (DH ER)
   e) Downstream bypass valve. (DH ER)

   NOTE: Ensure Rockwell grease is applied to downstream bypass valve.
4. Remove debris from spherical valve pit drains. (DH ER)

ELECTRICAL

1. Meggar bypass motor (1000 volts). 2000+ (T.D)
2. Record torque switch settings on bypass motor. Standard 2.5 for open and close. (T.D)
   5 Open 5 Close.
3. Check 600 volt cable terminations. (T.D)

PM Checksheet No.: 59146 - Spherical Valve - Unit No. 3 - BDE Type of Inspection: PM6 Department: Electrical/Mechanical	Sheet: 5 of 6 Rev. No.: 10 Rev. Date: 17-03-06 Index No.: 471 Binder No.: 26
ACTIVITIES (Initial Box Upon Completion)	**REMARKS**

P&C

1. Measure Power Supplies (RS)
   a) PS1 25.9 Vdc
   b) PS2 23.4 Vdc
2. With laptop, verify CP1 limit switches. (RC)
   a) LS5A (10023) ON / ~~OFF~~ (CLOSED) With Valve Closed
   b) LS5B (10024) ~~OFF~~ / ON (OPEN) With Valve Open (RS)
3. Monitor scroll case/vent chamber instrumentation (RS)
   a) PT1 Set Point (40 100) Found 500 (78) Left at SAME
   b) L1 Vent Chamber Switch (10 001) Found off Left at SAME
   c) PS4 Scroll Case Pressure (10 005) Found 2 Left at SAME kpa

   Normal 1435 kpa.
4. With laptop verify PLC switches from auto to manual on operation of the following valves manual control levers. Follow current procedure.

   NOTE: Valve P applies maintenance seal; to be done only with main valve closed. Valve D-E, S-R, N and P3-M to be checked only during a proper manual
   operating sequence.

   a) Valve D-E (10021) (LS3) (RS)
   b) Valve S-R (10022) (LS4) (RS)
   c) Valve P (10006) (LS7) (RS)
   d) Valve N (10007) (LS9) (RS)
   e) Valve P3-M (10031) (LS10) (RS)
5. a) Open 600 volt disconnect for bypass valve (with valve in closed position). (RS)
   b) Close the U/S manual bypass valve. (This will make the auto valve easier to operate manually). ( )
   c) Check calibration of the valve position feedback by operating the manual handle and reading the indication on the DPI. ( )
   d) Verify that the 0% and 100% positions correspond to the Mechanical closed (0%) and open (100%) positions. ( )

CHECKED 0 – 100% WHILE BYPASS WAS OPENING. Good.

PM Checksheet No.: 59146 - Spherical Valve - Unit No. 3 - BDE Type of Inspection: PM6 Department: Electrical/Mechanical	Sheet: 6 of 6 Rev. No.: 10 Rev. Date: 17-03-06 Index No.: 471 Binder No.: 26
ACTIVITIES (Initial Box Upon Completion)	**REMARKS**
<u>TOOLS</u> 1. Grease gun 1. Stop watch 2. AC/DC clip on ammeter 3. Multimeter 4. 1000 volt meggar 6. Standard tools	

newfoundland labrador hydro a nalcor energy company	MAINTENANCE DEPARTMENT GUIDELINES	GEN-43 MDG # 014 REV. # 1 REV. DATE June 3, 2003 PAGE 1 of 4
TITLE:	Turbine/Generator Pre Start-Up Inspection	
LOCATION:	UNIT NO. 3	

SCOPE:

This inspection is required after all major overhauls, or after any major work or inspections on the rotor, stator, thrust bearing assembly, spherical valve, spiral case area or turbine pit area.

OBJECTIVE:

The objective of the inspection is to ensure that a thorough visual inspection is completed prior to placing unit back in service, to ensure any loose or foreign material is removed, to ensure that areas of the machine worked on are free of hazards or debris that may cause damage during operation.

STANDARD:

Responsibility for ensuring that the start-up inspection is completed is the responsibility of the Labour Manager.

The inspection must be completed by the Mechanical and Electrical Supervisor, Labour/Operations Superintendent and personnel prior to start up. When possible, in scope employees should participate in the inspection.

Prior to doing this inspection, all objects such as coins, keys, wallets, pagers, pens, etc, must be removed from your pockets.

The unit will not be placed in operation until the inspection results have been discussed with the Labour Manager or designate.

The attached inspection sheet will be used as a guide for this inspection.

Reviewed By: Louis Barnes	Approved By: _____	Issue Date: May 1997

TITLE:	Turbine/Generator Pre Start-Up Inspection
LOCATION:	UNIT NO.

PRIOR TO INSTALLATION OF SHROUDS	CHECKED BY
1. Ensure no loose bolts or any foreign material is left in the unit that may be covered once the shrouds are in place.	NA
2. Ensure no foreign material or tools is left anywhere around top of stator frame area.	RW CS
3. Ensure all pole key retainers are securely in place.	RW CS
4. Ensure top of poles are free from foreign objects.	RW CS
5. Visually inspect v-bolts between poles for any foreign objects or abnormalities.	RW CS
6. Check the back area of the poles where material can be conveniently placed.	RW CS
7. Thoroughly inspect top end windings.	RW CS
8. Thoroughly inspect bottom end windings.	RW CS
9. Check the air gap between the riser and stator, for any sign of abnormalities.	RW CS

PRIOR TO UNIT START-UP	CHECKED BY
Inspect the following areas:	
1. Brush gear assembly.	RW CS
2. Upper bracket.	RW CS
3. Main bracket.	RW CS
4. Top covers of thrust/guide bearing assembly.	RW CS
5. Top of upper shrouds.	NA
6. Top of stator.	RW CS

TITLE:	Turbine/Generator Pre Start-Up Inspection
LOCATION:	UNIT NO.

	PRIOR TO UNIT START-UP	CHECKED BY
7.	Check the security of the shroud locking plates, angle iron supports and bolts.	NA
8.	Between upper shrouds and rotor.	NA
9.	Stub shaft bolts.	RW CS
10.	Security of sprinkler system piping.	RW CS
11.	Rotor ventilation slots.	RW CS
12.	Rotor spider for tools, welding slag, etc.	RW CS
13.	Between rotor and lower shrouds.	NA
14.	Security of lower shrouds.	NA
15.	Check drain cocks, valve positions, piping connections, etc.	RW CS
16.	Check all bearing oil levels, governor sump levels and accumulator tank oil levels.	RW CS
17.	Check for foreign matter between wicket gates.	NA
18.	Check spiral case area for cleanliness.	NA
19.	Check drafttube scaffold removal, door closed and bolted.	NA
20.	Check spiral case door closed and bolted.	NA
21.	Ensure rotor has been jacked.	RW CS
22.	Check position of creep detector and grounding brush.	RW CS
23.	Check duplex panels in control room for reminder notes.	RS
24.	Check to ensure links, valves etc that were worked on have been returned to normal position.	RS

TITLE:	Turbine/Generator Pre Start-Up Inspection
LOCATION:	UNIT NO.

PRIOR TO UNIT START-UP		CHECKED BY
25.	Thoroughly inspect turbine pit area.	RWCS
27.	Thoroughly inspect spherical valve pit area.	RWCS
28.	Thoroughly inspect duplex and T6 panels.	RS
29.	List all deficiencies that must be corrected prior to running of unit.	RS
30.	Check surface air coolers ie; positions of valves, air relief valves, plugs, etc.	RWCS
31.	Check valve on H.P lift pump to ensure it is open.	NA
32.	Check positions of all valves in brake circuit to ensure all is in correct position.	RWCS

DESCRIPTION	RESPONSIBILITY	STATUS
Sign Off Signatures		
Electrical Supervisor	Rob Saxby	Date March 1/18
Mechanical Supervisor		Date Mar 1/18
Labour/Operations Superintendent		Date
Labour Manager		Date

ENTERED

W/O #: 1324954

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 4 Rev. No.: 10 Rev. Date: 15-05-20 Index No.: 869 Binder No.: 5

PM Checksheet No.: PM6-59120-MBDE
Item No. & Description: 59120 - Governor - Unit No. 3 – BDE
Type of Inspection: PM6
Department: Mechanical — Asset Approval: B. Woodman
Inspection Start Date: — Insp. Comp. Date:
Supervisor's Review Signature & Date:
Reference Drawing and Manuals: Woodward – Operation & Maintenance – 07079B, ED-009, ED-005 & Dwg. No.: 9980-075 – Schematic Diagram

2013/09/26

ACTIVITIES (Initial Box Upon Completion)	REMARKS
USE ONLY LINT-FREE RAGS S/N 99200027	
ACTUATOR DEPRESSURIZED	
Before starting any work, do a visual inspection of the actuator for oil leaks, any unusual signs of wear, or misalignment of cables, levers, or gears.	
1. Governor Oil Pump	
a) Replace filters. (LO)	MN
S/N: 58602404 Part No.: 07079-664	
2. Dismantle Echelon controls and check for worn parts. Re-assemble and test operation. (LO)	MN
3. Dual Oil Filters	
a) Replace in-service filter. (LO)	MN
S/N: 58601669 Part No.: 07079-556	
4. Remove and clean flow control regulator screen. (LO)	MN
5. Inspect all moveable linkages for worn pivot pins, any binding in the slots. This can be done without any dismantle, by visual and moving the links to check for free play. (LO)	MN
6. Lubricate all moveable linkages with Teresso 46. (LO)	MN
7. Grease all restoring cable bearings. (CS)	

JDE Item No. & Description:	59120 - Governor - Unit No. 3 - BDE	Sheet: 2 of 4
Type of Inspection:	PM6	Rev. No.: 10
Department:	Mechanical	Rev. Date: 15-05-20
		Index No.: 869 Binder No.: 5

ACTIVITIES (Initial Box Upon Completion)		REMARKS
ACTUATOR DEPRESSURIZED (Cont'd)		
8. Sump		
a) Take oil sample.	(LO)	
9. Main Valve		
a) Remove pilot valve bushings and spring. Clean and inspect.	(LO) MN	
b) Check condition of pilot valve restoring pivot lever.	(LO) MN	WORN ON TOP + SOME WEAR ON SIDE
c) Check stop nuts for looseness or any unusual movement.	(LO) MN	Rotated bushing & pins
WARNING: The gate timing adjustments should not be changed without approval of authorized personnel.		
d) Condition of pilot valve restoring lever.	(LO) MN	
e) Move valve servomotor plunger up and down, check for binding.	(LO) MN	
10. Unloader/Relief Valve		
Visually inspect the mechanical unloader/relief valve combo. Check for oil leakage and seal condition.	(LO) MN	
11. Dashpot		
a) Check oil level and general condition of dashpot.	(LO) MN	
b) Visual check small dashpot plunger spring for any change in setting.	(LO) MN	
NOTE: All needle settings on dashpot to remain as before the shutdown.		CC ON #3

JDE Item No. & Description:	59120 - Governor - Unit No. 3 - BDE	Sheet: 3 of 4
Type of Inspection:	PM6	Rev. No.: 10
Department:	Mechanical	Rev. Date: 15-05-20
		Index No.: 869 Binder No.: 5

ACTIVITIES (Initial Box Upon Completion)	REMARKS
ACTUATOR DEPRESSURIZED (Cont'd)	
12. Check run out of the ball head dashpot plunger. (LO)	MN
Max. run out - .002 Found at: .0015 Left at: .0015	
ACTUATOR PRESSURIZED	
1. Check all gauges for proper pressure readings. (LO)	FO
2. Check high pressure pump for noise and vibrations. (LO)	FO
3. Check and record speed of vibration motor. (LO)	FO
Normal speed – 540 RPM Found at: 544 Left at: 544	
4. Check oscillation of distributing valve plunger. (LO)	FO
Normal - .006 - .007 Found at: .005 Left at: .005	
5. Check zero position of gate position indicator. (LO)	new cable Put on & adjusted to 0
Found at: 0 Left at: 0	
6. Record wicket gate squeeze. (LO)	
Normal squeeze - .125" Found at: .160 Left at: .160	
7. Record wicket gate closing time. (LO)	FO
From 80% - 30% = 6 Seconds Found at: 6sec Left at: 6 sec	
From 30% - 80% = 6 Seconds Found at: 6sec Left at: 6sec	
From 100% - 0% Found at: 14sec Left at: 14 sec	
Cushion: Yes ✓ No _____	
8. Check the gate position pointer at fifty percent for proper alignment. Use Standard Procedure as per Woodward instructions. (LO)	FO

JDE Item No. & Description:	59120 - Governor - Unit No. 3 - BDE	Sheet: 4 of 4
Type of Inspection:	PM6	Rev. No.: 10
Department:	Mechanical	Rev. Date: 15-05-20
		Index No.: 869 Binder No.: 5

ACTIVITIES (Initial Box Upon Completion)	REMARKS
ACTUATOR PRESSURIZED (Cont'd)	
9. Record partial gate setting. (LO)	CH FO
a) Using Power Supply, check partial gate. Coordinate with P&C crew. (LO)	CH FO
Normal setting: 25% Found at: 25% Left at: 25%	
10. Check shutdown solenoid. With gates open, latch up solenoid and observe gate position. This will be done after P&C/Electrical have done their electric al checks and both parties should observe the operation. (LO)	CH
11. Lubricate internal dashpot of ballhead motor with dashpot oil. (LO)	FO
12. Observe system pressure when governor pump starts and stops. (LO)	FO
Normal = Start – 310 PSI; Stop = 360 PSI	
Start – 310 PSI – Found at: 320 Left at: 320	
Stop – 360 PSI – Found at: 348 Left at: 348	
13. Check alignment of restoring cable where it enters the ferrule, there should not be any wear on cable entering ferrule. (LO)	FO change two cable
14. Auxiliary Valve	
a) After the gate operation is completed in the dry, using the Main Valve, transfer to Auxiliary Valve and operate gates to check valve for proper operation. (LO)	FO
i) Transfer valve	
Free ✓ Tight _____ (LO)	FO

NOTE: As per Engineering Directive, when the checks and adjustments on this sheet are completed, the person responsible must be assured that the actuator will function in the same condition with respect to on-line settings as it was before the PM Inspection was done. This is accomplished by operating the gates in the dry and checking frequency and unit response at SNL.

If we do governor work that has the potential to affect governor response, post testing must be done to verify the governor response is still within acceptable limits as per curves established and accepted by System Planning in 2005/2006.

ENTERED

W/O #: 1324929

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 4 Rev. No.: 1 Rev. Date: 16-02-01 Index No.: 2449 Binder No.: 67

PM Checksheet No.: PM6/PM8/PM9-59115-BDE
Item No. & Description: 59115 - BDE Turbine/Generator Unit No. 3 - Pre-Start-Up Inspection
Type of Inspection: PM6/PM8/PM9
Department: BDE Ops/Mech/Elect
Asset Approval: B. Woodman
Inspection Start Date:
Insp. Comp. Date: 2018/10/02
Supervisor's Review Signature and Date: Oct 3/18
Reference Drawing and Manuals:

ACTIVITIES (Initial Box Upon Completion)	REMARKS

SCOPE:
This Inspection is required after all annual minor or major PM Outages or after any major work or inspection on turbine/generator equipment. Check only what is applicable to the inspection.

OBJECTIVE:
The objective of the inspection is to ensure that a thorough visual inspection is completed prior to placing unit back in service, to ensure any loose or forging material is removed, to ensure that areas of the machine worked on are free of hazards or debris that may cause damage during operation.

STANDARD:
Responsibility for ensuring that the start-up inspection is completed is the responsibility of the Operations Supervisor for the particular unit.

The inspection shall be completed by the Operations, Mechanical and Electrical Supervisors prior to unit start up. If no Supervisor is present, the Lead Hand in the particular discipline is responsible for this inspection. The Operations Supervisor responsible for start up can also request the service of plant engineering and in scope employees.

Prior to doing this inspection, all objects such as coins, keys wallets, pagers, pens, etc. must be removed from your pockets and boots should also be checked for foreign objects.

The unit will not be placed in operation until the inspection results have been reviewed and accepted by the supervisor responsible for the start up.

The attached inspections will be used as a guide for this inspection.

PRIOR TO INSTALLATION OF SHROUDS	CHECKED BY
1. Ensure no loose bolts or any foreign material is in the unit that may be covered once the shrouds are in place.	N/A
2. Ensure no foreign material or tools is left anywhere around top of stator frame area.	M
3. Ensure all pole key retainers are securely in place.	M

PM Checksheet No.: BDE Turbine/Generator Unit No. 3 Pre-Start-Up Insp. Type of Inspection: PM6/PM8/PM9 Department: BDE Ops/Mech/Elect	Sheet: 2 of 4 Rev. No.: 1 Rev. Date: 16-02-01 Index No.: 2449 Binder No.: 67
ACTIVITIES (Initial Box Upon Completion)	REMARKS

PRIOR TO INSTALLATION OF SHROUDS (Cont'd) — **CHECKED BY**

4. Ensure top of poles are free from foreign objects. M
5. Visually inspect v-bolts between poles for any foreign objects or abnormalities. M
6. Check the back area of the poles where material can be conveniently placed. M
7. Thoroughly inspect top end windings. M
8. Thoroughly inspect bottom end windings. M
9. Check the air gap between the riser (Rotor) and stator, for any sign of abnormalities. M

PRIOR TO UNIT START-UP — **CHECKED BY**

Inspect the following areas:

1. Brush gear assembly. M
2. Upper bracket. M
3. Main bracket. M
4. Top covers of thrust/guide bearing assembly. M
5. Top of upper shrouds. N/A
6. Top of stator. M
7. Check the security of the shroud locking plates, angle iron supports and bolts. N/A
8. Between upper shrouds and rotor. N/A
9. Stub shaft bolts. M
10. Security of sprinkler system piping. M
11. Rotor ventilation slots. M
12. Rotor spider for tools, welding slag, etc. Note: Do not move/remove any weights that may be present. M

PM Checksheet No.: BDE Turbine/Generator Unit No. 3 Pre-Start-Up Insp. Type of Inspection: PM6/PM8/PM9 Department: BDE Ops/Mech/Elect	Sheet: 3 of 4 Rev. No.: 1 Rev. Date: 16-02-01 Index No.: 2449 Binder No.: 67
ACTIVITIES (Initial Box Upon Completion)	REMARKS

PRIOR TO UNIT START-UP (Cont'd)	CHECKED BY
13. Between rotor and lower shrouds.	N/A
14. Security of lower shrouds.	N/A
15. Check drain cocks, valve positions, piping connections, etc.	M
16. Check all bearing oil levels, governor sump levels and accumulator tank oil levels.	DA
17. Check for foreign matter between wicket gates.	M
18. Check spiral case area for cleanliness.	M
19. Check draft tube scaffold removal, door closed and bolted.	M
20. Check spiral case door closed and bolted.	M
21. Ensure rotor has been jacked. 1900 HRS 2018/10/02	M
22. Check position of creep detector and grounding brush.	M
23. Check duplex panels in Control Room for reminder notes.	DA
24. Check to ensure links, valves, etc. that were worked on have been returned to normal position.	DA
25. Thoroughly inspect turbine pit area.	M
26. Thoroughly inspect spherical valve pit area.	DA
27. Thoroughly inspect duplex and TG panels.	DA
28. List all deficiencies that must be corrected prior to running of unit.	
29. Check surface air coolers, i.e.: positions of valves, air relief valves, plugs, etc.	M
30. Check valve on H.P. lift pump to ensure it is open.	N/A
31. Check positions of all valves in brake circuit to ensure all is in correct position.	M
32. Verify oil level in turbine bearing and generator guide bearing.	DA

PM Checksheet No.: BDE Turbine/Generator Unit No. 3 Pre-Start-Up Insp. Type of Inspection: PM6/PM8/PM9 Department: BDE Ops/Mech/Elect	Sheet: 4 of 4 Rev. No.: 1 Rev. Date: 16-02-01 Index No.: 2449 Binder No.: 67
ACTIVITIES (Initial Box Upon Completion)	REMARKS

PRIOR TO UNIT START-UP (Cont'd) — **CHECKED BY**

33. Check to ensure all penstock hatches are closed. — AA
34. Check to ensure all temporary grounds are removed. — DA
35. Check to ensure all external work is completed. — AA

HOUSEKEEPING

1. Conduct inspection on generator floor and turbine floor. — DA
2. Remove tools, equipment, excess materials and place in appropriate location. — DA

DESCRIPITON	RESPONSIBILITY	DATE/TIME
Sign Off Signatures		
Electrical Supervisor/Designate		
Mechanical Supervisor/Designate		Oct 3/18
Operations Supervisor/Designate		Oct 3/18

1. Check Cooling water
2. Sph Valve in manual
3. Emergency water valve closed
4. Wicket gate lock ON
5. Emergency Brakes ON.
6. B2T3-1 disc manual only.

ENTERED

W/O #: 1324953

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 3 Rev. No.: 13 Rev. Date: 16-02-29 Index No.: 862 Binder No.: 5

PM Checksheet No.: PM6-59151-MBDE
Item No. & Description: 59151 - Turbine - Unit No. 3 - BDE
Type of Inspection: PM6 (Annual)
Department: Mechanical
Inspection Start Date:
Supervisor's Review Signature & Date:
Reference Drawing and Manuals: ED-003

Dwg. Binder 5

Asset Approval: B. Woodman
Insp. Comp. Date:

2018/09/26

ACTIVITIES (Initial Box Upon Completion)	REMARKS
CRITICAL PARTS INSPECTION	Oil sample taken.
1. Turbine Guide Bearing	
a) Check for oil leaks. (SO)	
2. Cooling Coils	
a) Check condition of supply and drain lines - visual. (SO)	
b) Clean orifice. Check readings on Rosemount in Control Room. Record normal and actual. (RW) Normal: 15LPM Actual: _____ Note: PC-14 required if supply water is off.	
c) Clean cooling water Y-strainer, duplex strainer and regulator. (SO) NOTE: Pressure testing of cooling coils will begin when coils are 20 years old. Separate PM's will be initiated to hydrostatic pressure test turbine bearing cooling coils.	
3. Operating Ring/Linkages	
a) Inspect wicket gate linkages for signs of mechanical damage and wear. (LA FO)	
b) Inspect wicket gate packing glands and studs. (LA FO)	
c) Inspect wicket gate shearpins to ensure all are properly in place. (LA FO)	
d) Re-torque eccentric pin locking screws. (LA FO)	
e) Inspect shaft seal piping for leaks and damage. (SO)	

JDE Item No. & Description:	59151 - Turbine - Unit No. 3 - BDE	Sheet: 2 of 3
Type of Inspection:	PM6	Rev. No.: 13
Department:	Mechanical	Rev. Date: 16-02-29
		Index No.: 862 Binder No.: 5

ACTIVITIES (Initial Box Upon Completion)	REMARKS
4. Spiral Case Door	
Inspect spiral case door for signs of leakage, cracks and bolt tightness. Replace door gasket if door is opened. (CS)	
5. Spiral Case Drain	
a) Lubricate valve and check for leaks. (ER)	
b) Check operation of the valve. (ER)	
6. Draft Tube Door	
Inspect draft tube door for signs of leakage, cracks and bolt tightness. Replace door gasket if door is opened. (CS)	
7. Auto Greaser	
a) Check for broken or disconnected lines. Repair if necessary. (ER)	
b) Clean strainer. (SO)	
c) Check operation and build up pressure. (CS)	
d) Check Auto Greaser lubricator oil level. (SO)	
e) Drain moisture trap. (—)	
f) Check grease level. Add if necessary. (SO)	
g) Check regulator pressure. Set to 50psi. (SO)	
8. Check upper and lower primary seal clearances through head cover plugs as per attached form. Plant Mechanical Engineer to evaluate. (LA FO)	

JDE Item No. & Description:	59151 - Turbine - Unit No. 3 - BDE	Sheet: 3 of 3 Rev. No.: 13 Rev. Date: 16-02-29 Index No.: 862 Binder No.: 5
Type of Inspection:	PM6	
Department:	Mechanical	
ACTIVITIES (Initial Box Upon Completion)		REMARKS

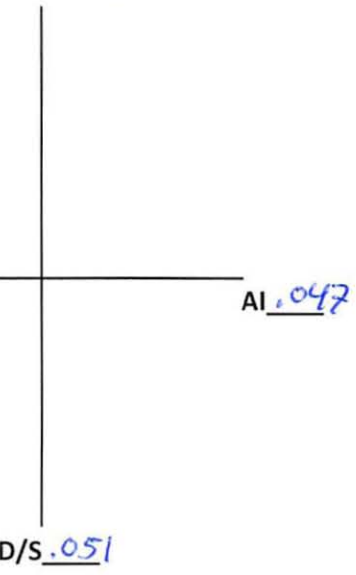
Upper Primary Seal Clearance

LA
FO

U/S .046

AII .055 AI .047

D/S .051

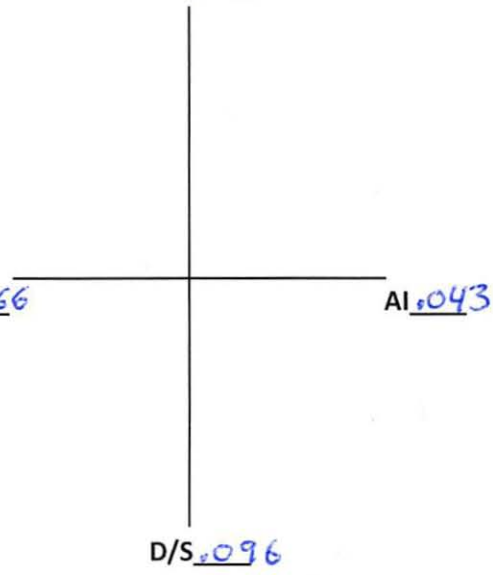


Lower Primary Seal Clearances

U/S .077

AII .066 AI .043

D/S .096



W/O #: 1324952

NEWFOUNDLAND & LABRADOR HYDRO
HYDRO GENERATION
PREVENTIVE MAINTENANCE CHECKSHEETS

ENTERED

Sheet: 1 of 4
Rev. No.: 10
Rev. Date: 15-05-20
Index No.: 851 Binder No.: 5

PM Checksheet No.: PM6-59115-MBDE
Item No. & Description: 59115 - Generator - Unit No. 3 - BDE
Type of Inspection: PM6 (Annual)
Department: Mechanical
Asset Approval: B. Woodman 2018/09/26
Inspection Start Date:
Insp. Comp. Date:
Supervisor's Review Signature & Date:
Reference Drawing and Manuals: G.E. Dwg. #599B112CF, Dwg. #606B820, Torque Table for Grade 2 Medium Carbon Steel, ED-059

ACTIVITIES (Initial Box Upon Completion)		REMARKS
1. Generator Brakes		
a) Check brake pads thickness and record: 3/4 + Minimum wear surface is ¼".	(RW KS)	3/4 Plus
b) Check brake pads for cracks. Report to supervisor immediately if pads need replacement.	(RW KS)	All Good
c) Check brake track for excessive scouring or warpage and check plate bolts for proper torque. _____ 320 Normal (Dry grade 2 medium carbon steel)	(RW KS)	All Good
d) Check spring retaining nuts for looseness, missing set screws. Re-torque.	(RW KS)	All Good
e) Grease brake cylinders. Check for excessive leakage.	(RW KS)	Greased
f) Monitor and record timing of brake release. Normal 7 seconds. Actual 7 sec.	(CS)	
2. Thrust/Guide Bearing Assembly		
a) Clean external bearing assembly. Check for leaks, loose bolts.	(RW)	
b) Check water inlet to bearing coolers for leaks.	(SO RW)	
c) Clean orifice on generator cooling water Rosemount Transducer.	(SO)	
d) Check Rosemount in Control Room or T/G panel. Normal 454 LPM Actual _____	(CS)	
e) Check normal oil level on sight glass. Norma 14mm below top of oil pit. ED-059	(RW)	
3. Main Bracket		
Inspect main bracket assembly for loose bolts and visible cracks. Inspect welding by wiping down welds with rags to remove excess dirt.	(RW KS)	No Loose Bolts

PM Checksheet No.: 59115 – Generator – Unit No. 3 – BDE Type of Inspection: PM6 Department: Mechanical	Sheet: 2 of 4 Rev. No.: 10 Rev. Date: 15-05-20 Index No.: 851 Binder No.: 5
ACTIVITIES (Initial Box Upon Completion)	**REMARKS**
ROUTINE PM INSPECTION 1. Clean orifices on coolers - North & South. (SO)	Oil sample Taken.

BOLTS AND TORQUE SPECS

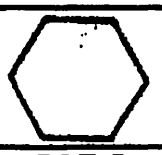
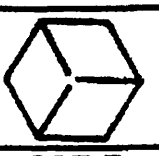
U.S. BOLT TORQUE SPECIFICATIONS
Torque in pounds-foot

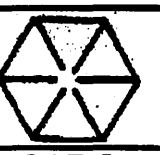
		2	2	5	5	7	7	8	8	Socket head cap screw	Socket head cap screw
Bolt Dia.	Thread per inch	Dry	Oiled	Dry	Oiled	Dry	Oiled	Dry	Oiled	Dry	Oiled
1/4	20	4	3	8	6	10	8	12	9	14	11
1/4	28	6	4	10	7	12	9	14	10	16	13
5/16	18	9	7	17	13	21	16	25	18	29	23
5/16	24	12	9	19	14	24	18	29	20	33	26
3/8	16	16	12	30	23	40	30	45	35	49	39
3/8	24	22	16	35	25	45	35	50	40	54	44
7/16	14	24	17	50	35	60	45	70	55	76	61
7/16	20	34	26	55	40	70	50	80	60	85	68
1/2	13	38	31	75	55	95	70	110	80	113	90
1/2	20	52	42	90	65	100	80	120	90	126	100
9/16	12	52	42	110	80	135	100	150	110	163	130
9/16	18	71	57	120	90	150	110	170	130	181	144
5/8	11	98	78	150	110	190	140	220	170	230	184
5/8	18	115	93	180	130	210	160	240	180	255	204
3/4	10	157	121	260	200	320	240	380	280	400	320
3/4	16	180	133	300	220	360	280	420	320	440	350
7/8	9	210	160	430	320	520	400	600	460	640	510
7/8	14	230	177	470	360	580	440	660	500	700	560
1	8	320	240	640	480	800	600	900	680	980	780
1	12	350	265	710	530	860	666	990	740	1060	845

BOLT TORQUE FACTORS

LUBRICANT OR PLATING	TORQUE CHANGES
Oil	Reduce torque 15% to 25%
Dry Film (Teflon or moly based)	Reduce torque 50%
Dry Wax (Cetyl alcohol)	Reduce torque 50%
Chrome plating	No change
Cadmium plating	Reduce torque 25%
Zinc plating	Reduce torque 15%

U.S. BOLT GRADES



SAE 2	SAE 5	SAE 7	SAE 8

	2	5	7	8	SOCKET HEAD CAP SCREW
I.D. Marks	No markings	3 lines	5 lines	6 lines	Allen head
Material	Low carbon	Medium-carbon, tempered	Medium-carbon, quenched & tempered	Medium-carbon, quenched & tempered	High-carbon, quenched & tempered
Tensile strength (Minimum)	74,000 psi	120,000 psi	133,000 psi	150,000 psi	160,000 psi

ENTERED

W/O 1333948

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 1 Rev. No.: 0 Rev. Date: 18-01-29 Index No.: 3061 Binder No.: 5

PM Checksheet No.: PM6 – 59111 – BDEMECH
Item No. & Description: 59111 – Turbine/Generator Unit #3 – Pre-Winter-Bay d'Espoir
PM Type: PM6 (Annual)
Department: Mechanical — Asset Approval: Bob Woodman
Inspection Start Date: — Insp. Comp. Date:
Supervisor's Review Signature and Date:
Reference Drawing and Manuals:

ACTIVITIES (Initial Box Upon Completion)	REMARKS
1. Check all brakes. Replace if below ¼". (DH)	7/8 +
2. Visually check both generator and turbine for oil leaks. (Governor and bearings.) (DH)	
3. Visually check unit cooling water system for water leaks. (Lines and coolers.) (DH)	
4. Top up the governor dashpot oil. (DH)	
5. Visually check governor for any abnormalities. (DH)	
6. Lubricate the governor linkages; ensure there is no binding in links. (DH)	
7. Inspect turbine pit drains for debris. Remove if necessary. (DH)	

ENTERED

W/O 1332374

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 1 Rev. No.: 0 Rev. Date: 17-03-21 Index No.: 2903 Binder No.: 5

PM Checksheet No.: PM6-59111-UNIT #3-BDE-MTECH
Item No. & Description: 59111-Turbine/Generator Unit #3-Oil Sample-BDE
PM Type: PM6
Department: Mechanical Technologist — Asset Approval: Bob Woodman
Inspection Start Date: — Insp. Comp. Date:
Supervisor's Review Signature and Date:
Reference Drawing and Manuals: Engineering Directive - ED-024

ACTIVITIES (Initial Box Upon Completion)	REMARKS
1. Collect Governor oil sample as per ED-024. (~~JD~~ LO)	
2. Collect Generator Bearing oil sample as per ED-024. (JD)	
3. Collect Turbine Guide Bearing oil sample as per ED-024. (JD)	
4. Fill out Wearcheck Data Sheet – Oil Type, Sample Date, W/O #, etc. (✓)	
5. Bring all samples to Mechanical Technologist for processing. (LO)	

newfoundland labrador hydro a nalcor energy company	MAINTENANCE DEPARTMENT GUIDELINES	GEN-43 MDG # 014 REV. # 1 REV. DATE June 3, 2003 PAGE 1 of 4
TITLE:	Turbine/Generator Pre Start-Up Inspection	
LOCATION:	UNIT NO. 3	

SCOPE:

This inspection is required after all major overhauls, or after any major work or inspections on the rotor, stator, thrust bearing assembly, spherical valve, spiral case area or turbine pit area.

OBJECTIVE:

The objective of the inspection is to ensure that a thorough visual inspection is completed prior to placing unit back in service, to ensure any loose or foreign material is removed, to ensure that areas of the machine worked on are free of hazards or debris that may cause damage during operation.

STANDARD:

Responsibility for ensuring that the start-up inspection is completed is the responsibility of the Labour Manager.

The inspection must be completed by the Mechanical and Electrical Supervisor, Labour/Operations Superintendent and personnel prior to start up. When possible, in scope employees should participate in the inspection.

Prior to doing this inspection, all objects such as coins, keys, wallets, pagers, pens, etc, must be removed from your pockets.

The unit will not be placed in operation until the inspection results have been discussed with the Labour Manager or designate.

The attached inspection sheet will be used as a guide for this inspection.

Reviewed By: Louis Barnes	Approved By: _____	Issue Date: May 1997

TITLE:	Turbine/Generator Pre Start-Up Inspection
LOCATION:	UNIT NO.

PRIOR TO INSTALLATION OF SHROUDS	CHECKED BY
1. Ensure no loose bolts or any foreign material is left in the unit that may be covered once the shrouds are in place.	NA
2. Ensure no foreign material or tools is left anywhere around top of stator frame area.	RW CS
3. Ensure all pole key retainers are securely in place.	RW CS
4. Ensure top of poles are free from foreign objects.	RW CS
5. Visually inspect v-bolts between poles for any foreign objects or abnormalities.	RW CS
6. Check the back area of the poles where material can be conveniently placed.	RW CS
7. Thoroughly inspect top end windings.	RW CS
8. Thoroughly inspect bottom end windings.	RW CS
9. Check the air gap between the riser and stator, for any sign of abnormalities.	RW CS

PRIOR TO UNIT START-UP	CHECKED BY
Inspect the following areas:	
1. Brush gear assembly.	RW CS
2. Upper bracket.	RW CS
3. Main bracket.	RW CS
4. Top covers of thrust/guide bearing assembly.	RW CS
5. Top of upper shrouds.	NA
6. Top of stator.	RW CS

TITLE:	Turbine/Generator Pre Start-Up Inspection
LOCATION:	UNIT NO.

	PRIOR TO UNIT START-UP	CHECKED BY
7.	Check the security of the shroud locking plates, angle iron supports and bolts.	NA
8.	Between upper shrouds and rotor.	NA
9.	Stub shaft bolts.	RW CS
10.	Security of sprinkler system piping.	RW CS
11.	Rotor ventilation slots.	RW CS
12.	Rotor spider for tools, welding slag, etc.	RW CS
13.	Between rotor and lower shrouds.	NA
14.	Security of lower shrouds.	NA
15.	Check drain cocks, valve positions, piping connections, etc.	RW CS
16.	Check all bearing oil levels, governor sump levels and accumulator tank oil levels.	RW CS
17.	Check for foreign matter between wicket gates.	NA
18.	Check spiral case area for cleanliness.	NA
19.	Check drafttube scaffold removal, door closed and bolted.	NA
20.	Check spiral case door closed and bolted.	NA
21.	Ensure rotor has been jacked.	RW CS
22.	Check position of creep detector and grounding brush.	RW CS
23.	Check duplex panels in control room for reminder notes.	RS
24.	Check to ensure links, valves etc that were worked on have been returned to normal position.	RS

TITLE:	Turbine/Generator Pre Start-Up Inspection
LOCATION:	UNIT NO.

PRIOR TO UNIT START-UP		CHECKED BY
25.	Thoroughly inspect turbine pit area.	RWCS
27.	Thoroughly inspect spherical valve pit area.	RWCS
28.	Thoroughly inspect duplex and T6 panels.	RS
29.	List all deficiencies that must be corrected prior to running of unit.	RS
30.	Check surface air coolers ie; positions of valves, air relief valves, plugs, etc.	RWCS
31.	Check valve on H.P lift pump to ensure it is open.	NA
32.	Check positions of all valves in brake circuit to ensure all is in correct position.	RWCS

DESCRIPTION	RESPONSIBILITY	STATUS
Sign Off Signatures		
Electrical Supervisor	Rob Saxby	Date March 1/18
Mechanical Supervisor		Date Mar 1/18
Labour/Operations Superintendent		Date
Labour Manager		Date

ENTERED

W/O #: 1324929

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 4 Rev. No.: 1 Rev. Date: 16-02-01 Index No.: 2449 Binder No.: 67

PM Checksheet No.: PM6/PM8/PM9-59115-BDE
Item No. & Description: 59115 - BDE Turbine/Generator Unit No. 3 - Pre-Start-Up Inspection
Type of Inspection: PM6/PM8/PM9
Department: BDE Ops/Mech/Elect
Asset Approval: B. Woodman
Inspection Start Date:
Insp. Comp. Date: 2018/10/02
Supervisor's Review Signature and Date: Oct 3/18
Reference Drawing and Manuals:

ACTIVITIES (Initial Box Upon Completion)	REMARKS

SCOPE:
This Inspection is required after all annual minor or major PM Outages or after any major work or inspection on turbine/generator equipment. Check only what is applicable to the inspection.

OBJECTIVE:
The objective of the inspection is to ensure that a thorough visual inspection is completed prior to placing unit back in service, to ensure any loose or forging material is removed, to ensure that areas of the machine worked on are free of hazards or debris that may cause damage during operation.

STANDARD:
Responsibility for ensuring that the start-up inspection is completed is the responsibility of the Operations Supervisor for the particular unit.

The inspection shall be completed by the Operations, Mechanical and Electrical Supervisors prior to unit start up. If no Supervisor is present, the Lead Hand in the particular discipline is responsible for this inspection. The Operations Supervisor responsible for start up can also request the service of plant engineering and in scope employees.

Prior to doing this inspection, all objects such as coins, keys wallets, pagers, pens, etc. must be removed from your pockets and boots should also be checked for foreign objects.

The unit will not be placed in operation until the inspection results have been reviewed and accepted by the supervisor responsible for the start up.

The attached inspections will be used as a guide for this inspection.

PRIOR TO INSTALLATION OF SHROUDS	CHECKED BY
1. Ensure no loose bolts or any foreign material is in the unit that may be covered once the shrouds are in place.	N/A
2. Ensure no foreign material or tools is left anywhere around top of stator frame area.	M
3. Ensure all pole key retainers are securely in place.	M

PM Checksheet No.: BDE Turbine/Generator Unit No. 3 Pre-Start-Up Insp. Type of Inspection: PM6/PM8/PM9 Department: BDE Ops/Mech/Elect	Sheet: 2 of 4 Rev. No.: 1 Rev. Date: 16-02-01 Index No.: 2449 Binder No.: 67
ACTIVITIES (Initial Box Upon Completion)	REMARKS

PRIOR TO INSTALLATION OF SHROUDS (Cont'd) — **CHECKED BY**

4. Ensure top of poles are free from foreign objects. M
5. Visually inspect v-bolts between poles for any foreign objects or abnormalities. M
6. Check the back area of the poles where material can be conveniently placed. M
7. Thoroughly inspect top end windings. M
8. Thoroughly inspect bottom end windings. M
9. Check the air gap between the riser (Rotor) and stator, for any sign of abnormalities. M

PRIOR TO UNIT START-UP — **CHECKED BY**

Inspect the following areas:

1. Brush gear assembly. M
2. Upper bracket. M
3. Main bracket. M
4. Top covers of thrust/guide bearing assembly. M
5. Top of upper shrouds. N/A
6. Top of stator. M
7. Check the security of the shroud locking plates, angle iron supports and bolts. N/A
8. Between upper shrouds and rotor. N/A
9. Stub shaft bolts. M
10. Security of sprinkler system piping. M
11. Rotor ventilation slots. M
12. Rotor spider for tools, welding slag, etc. Note: Do not move/remove any weights that may be present. M

PM Checksheet No.: BDE Turbine/Generator Unit No. 3 Pre-Start-Up Insp. Type of Inspection: PM6/PM8/PM9 Department: BDE Ops/Mech/Elect	Sheet: 3 of 4 Rev. No.: 1 Rev. Date: 16-02-01 Index No.: 2449 Binder No.: 67
ACTIVITIES (Initial Box Upon Completion)	REMARKS

PRIOR TO UNIT START-UP (Cont'd)	CHECKED BY
13. Between rotor and lower shrouds.	N/A
14. Security of lower shrouds.	N/A
15. Check drain cocks, valve positions, piping connections, etc.	M
16. Check all bearing oil levels, governor sump levels and accumulator tank oil levels.	DA
17. Check for foreign matter between wicket gates.	M
18. Check spiral case area for cleanliness.	M
19. Check draft tube scaffold removal, door closed and bolted.	M
20. Check spiral case door closed and bolted.	M
21. Ensure rotor has been jacked. 1900 HRS 2018/10/02	M
22. Check position of creep detector and grounding brush.	M
23. Check duplex panels in Control Room for reminder notes.	DA
24. Check to ensure links, valves, etc. that were worked on have been returned to normal position.	DA
25. Thoroughly inspect turbine pit area.	M
26. Thoroughly inspect spherical valve pit area.	DA
27. Thoroughly inspect duplex and TG panels.	DA
28. List all deficiencies that must be corrected prior to running of unit.	
29. Check surface air coolers, i.e.: positions of valves, air relief valves, plugs, etc.	M
30. Check valve on H.P. lift pump to ensure it is open.	N/A
31. Check positions of all valves in brake circuit to ensure all is in correct position.	M
32. Verify oil level in turbine bearing and generator guide bearing.	DA

PM Checksheet No.: BDE Turbine/Generator Unit No. 3 Pre-Start-Up Insp. Type of Inspection: PM6/PM8/PM9 Department: BDE Ops/Mech/Elect	Sheet: 4 of 4 Rev. No.: 1 Rev. Date: 16-02-01 Index No.: 2449 Binder No.: 67
ACTIVITIES (Initial Box Upon Completion)	REMARKS

PRIOR TO UNIT START-UP (Cont'd) — **CHECKED BY**

33. Check to ensure all penstock hatches are closed. — AA
34. Check to ensure all temporary grounds are removed. — DA
35. Check to ensure all external work is completed. — AA

HOUSEKEEPING

1. Conduct inspection on generator floor and turbine floor. — DA
2. Remove tools, equipment, excess materials and place in appropriate location. — DA

DESCRIPITON	RESPONSIBILITY	DATE/TIME
Sign Off Signatures		
Electrical Supervisor/Designate		
Mechanical Supervisor/Designate		Oct 3/18
Operations Supervisor/Designate		Oct 3/18

1. Check Cooling water
2. Sph Valve in manual
3. Emergency water valve closed
4. Wicket gate lock ON
5. Emergency Brakes ON.
6. B2T3-1 disc manual only.

ENTERED

W/O #: 1324928

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 3 Rev. No.: 2 Rev. Date: 14-05-22 Index No.: 2439 Binder No.: 67

PM Checksheet No.: PM6/PM8/PM9 – 59115 - OBDE
Item No. & Description: 59115 - Turbine/Generator Unit No. 3 – BDE – Pre-shutdown
Type of Inspection: PM6/PM8/PM9
Department: Operations
Asset Approval: Bob Woodman
Inspection Start Date:
Insp. Comp. Date:
Supervisor's Review Signature and Date: 2018-10-05
Reference Drawing and Manuals:

ACTIVITIES (Initial Box Upon Completion)	REMARKS

PRE-SHUTDOWN REQUIREMENTS

Prior to shutting down a Turbine/Generator Unit for an annual, minor or major outage, the following activities shall take place. Those activities shall take place sufficiently in advance of outage to permit activities to be properly planned and scheduled for outage.

1. A set of turbine/generator unit vibration readings shall be taken at SNL, field on, field off and at 10 MW increments up to full load. These readings shall be evaluated immediately by the plant mechanical engineer to determine if there is a requirement for bearing or runner seal clearances or any other action required as a result of the test results. (✓)

2. A unit deceleration curve shall be done by Control Room Operators using established procedures. The results shall be evaluated by the Plant Mechanical Engineer to determine if wicket gate vertical and horizontal clearances are required or other actions required as a result of test results. (✓)

3. Plant Operators shall do an evaluation of all unit cooling water flows, unit temperatures and oil level indications and report any abnormalities sufficiently in advance of outage to allow for proper planning and scheduling of corrective work. Devices inspected shall include thrust/guide bearing alarm/trip temp. meters, turbine guide bearing alarm/trip temp meters, generator and turbine bearing oil level indication systems. Abnormalities shall be reported as work orders in advance of outage so corrective work can be planned and scheduled. (✓)

PM Checksheet No.: 59115-Turbine/Generator Unit #3 – BDE Pre-shutdown Type of Inspection: PM6/PM8/PM9 Department: Operations	Sheet: 2 of 3 Rev. No.: 2 Rev. Date: 14-05-22 Index No.: 2439 Binder No.: 67
ACTIVITIES (Initial Box Upon Completion)	**REMARKS**

4. Plant operators shall also conduct a thorough visual inspection (✓) of turbine pit area for abnormal shaft seal leakage, excessive turbine pit water due to plugged drains, evidence of oil leakage from generator or turbine bearing, faulty instrumentation, cooling water, defects, and auto greasing issues.

   NOTE:

   All documents to be included with annual inspection report :

   a) Vibration Readings
   b) Deceleration Curve
   c) Operations Evaluation of Unit Instrumentation Report

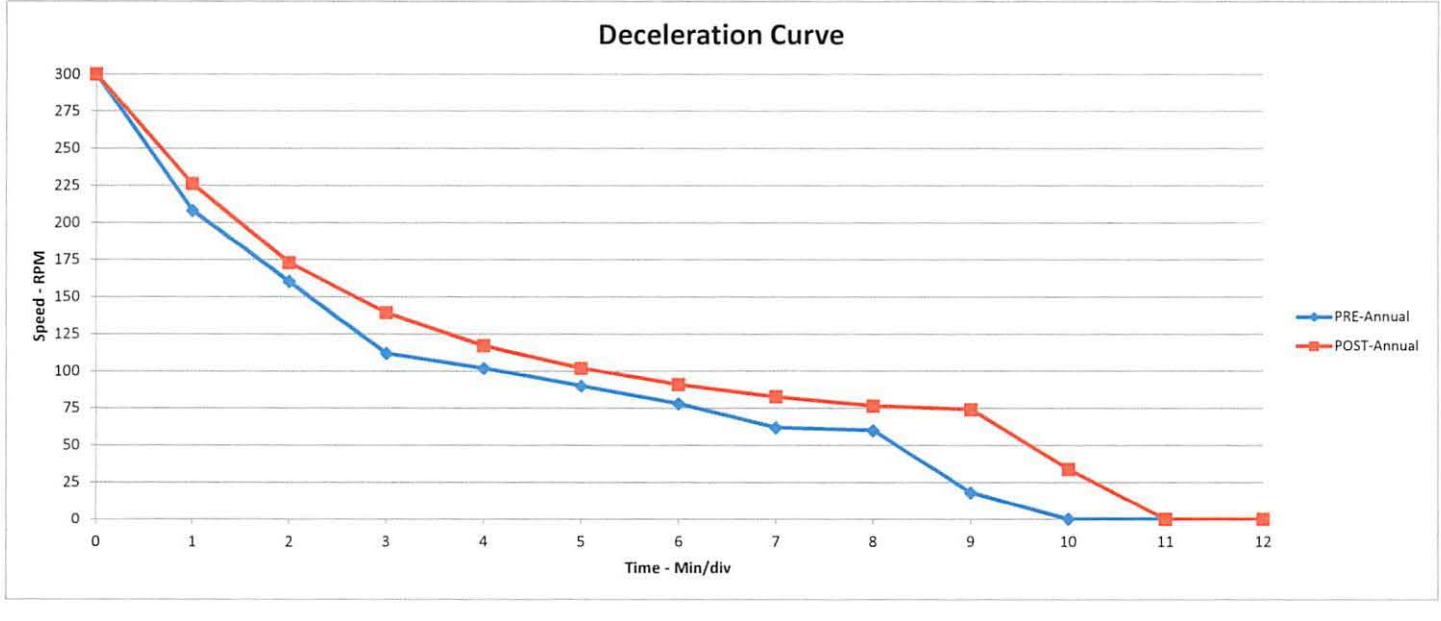
5. Record the following exciter values:

Parameter	Local ECT	Control Room ECT
Generator Volts	13.68 KV	13.77 KV
Generator Amps	2890 A	2900 A
Generator MW	67.3 MW	69 MW
Generator MVARS	-8.9 MVAR	-12.87 MVAR
Exciter Volts DC	77 VDC	75 VDC
Exciter Amps DC	1036 A	950. A

REMARKS: oil leak under servo,

Bay d' Espoir - Unit # 3 Deceleration Curve		
	PRE-Annual	POST-Annual
Date:	9/11/2018	10/4/2018
Brakes on:	58 RPM@8 mins 25 secs	74 RPM@ 8 mins 22 secs
Time given stop:	23:40	
Sph. Valve Intiate Closing:	23:51:41	
Sph. Valve Closed:	23:52:55	
Completed by:		RL/CK/SC

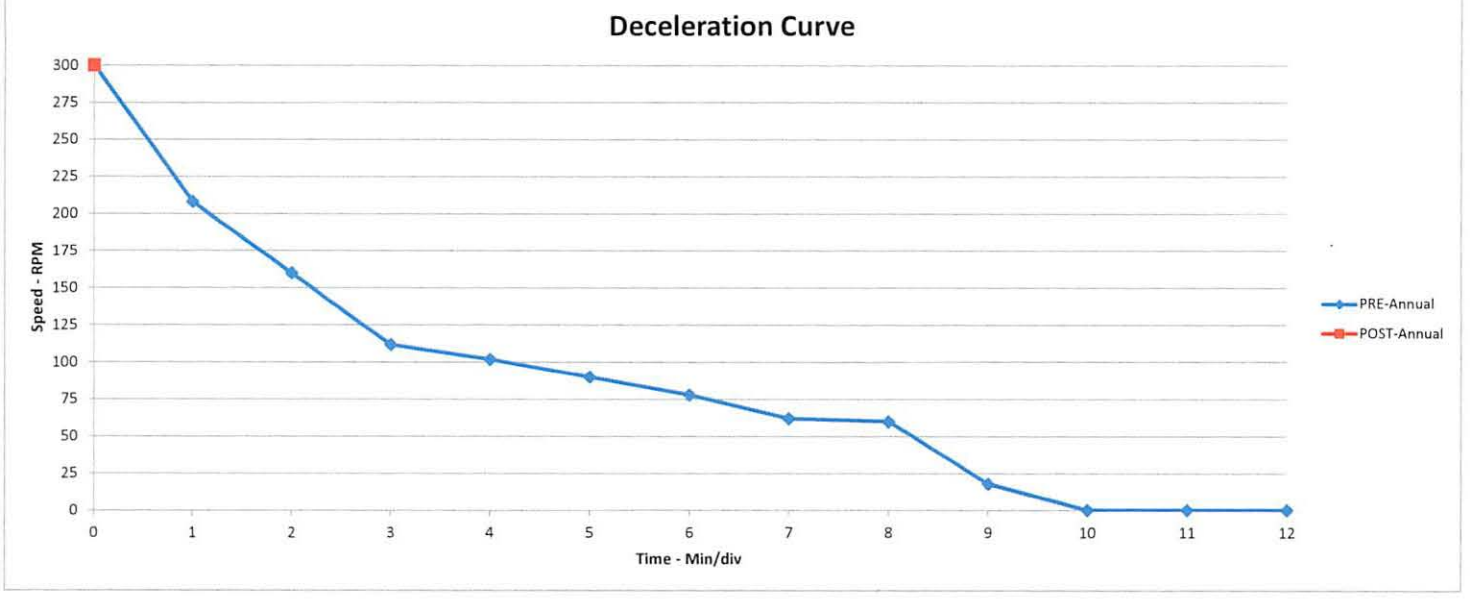
	PRE-Annual	POST-Annual
Time (Min)	Speed (RPM)	
0	300	300
1	208	226.3
2	160	172.9
3	112	139.2
4	102	117
5	90	101.8
6	78	90.7
7	62	82.6
8	60	76.4
9	18	74
10	0	34
11	0	0
12	0	0



w/o 132492

Bay d' Espoir - Unit # 3 Deceleration Curve		
	PRE-Annual	POST-Annual
Date:	9/11/2018	
Brakes on:	58 RPM@8 mins 25 secs	
Time given stop:	23:40	
Sph. Valve Intiate Closing:	23:51:41	
Sph. Valve Closed:	23:52:55	
Completed by:		RL/CK

	PRE-Annual	POST-Annual
Time (Min)	Speed (RPM)	
0	300	300
1	208	
2	160	
3	112	
4	102	
5	90	
6	78	
7	62	
8	60	
9	18	
10	0	
11	0	
12	0	



Vibration on Unit 3

(field off) Gen 3.12
Turbine 2.60

(field on) Gen vib 6.5
Turbine vib 5.8

10 MW -> Gen – 5.27
Turbine – 5.4

20 MW -> Gen – 5.10
Turbine – 5.77

30 MW -> Gen – 5.86
Turbine – 6.41

40 MW -> Gen – 3.95
Turbine – 5.35

50 MW -> Gen – 4.26
Turbine – 4.66

60 MW -> Gen – 4.67
Turbine – 4.90

70 MW -> Gen – 4.96
Turbine – 4.75

ENTERED

W/O #: 1324942

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 6 Rev. No.: 11 Rev. Date: 17-03-08 Index No.: 341 Binder No.: 41

PM Checksheet No.: PM6-59120-P&CBDE
Item No. & Description: 59120 - Governor - Unit No. 3 - BDE
Type of Inspection: PM6 (Annual)
Department: Protection and Control
Inspection Start Date: 2018-10-04
Supervisor's Review Signature & Date: Oct 18, 2018
Asset Approval: B. Woodman
Insp. Comp. Date:
Reference Drawing and Manuals: 107-E-94, 107-E-97, 107-E-114, 107-E-134, ED-064 & ED-065

ACTIVITIES (Initial Box Upon Completion)	REMARKS

CRITICAL PARTS INSPECTION

1. **Shutdown Solenoid Operate Coil**

   a. Check that operate lever latches when operated manually. (CH)

   b. Remove cover and check connections on operate solenoid. (CH)

   c. Check the operate solenoid contacts. Clean and burnish if necessary. (CH)

   d. Check spring adjustment screw. Tighten if necessary, using a lockwasher or loctite. (~~CH~~)

   e. Check resistance of operate coil when latched and unlatched. (CH)

NT Links: BB 52 and 53		Bench	Field
Latched 1.09 Kohms	Actual	1.09kΩ	1.09kΩ
Unlatched 18.7 Ohms	Actual	18.7Ω	19Ω

   f. Check operation of solenoid electrically. (CH)

2. **Shutdown Solenoid Reset Coil**

   a. Check that reset lever resets the operate lever when operated manually. (CH)

   b. Remove cover and check connections on reset solenoid. (CH)

   c. Check the reset solenoid contacts. Clean and burnish if necessary. (CH)

   d. Check spring adjustment screw. Tighten if necessary using a lockwasher or loctite. (CH)

JDE Item No. & Description: 59120 - Governor - Unit No. 3 - BDE Type of Inspection: PM6 Department: Protection & Control	Sheet: 2 of 6 Rev. No: 11 Rev. Date: 17-03-08 Index No.: 341 Binder No.: 41
ACTIVITIES (Initial Box Upon Completion)	**REMARKS**

2. Shutdown Solenoid Reset Coil (Cont'd)

   e. Check resistance of reset coil when latched and unlatched. (CH)

NT Links: BB 50 and 51		Bench	Field
Latched 1.6 Kohms	Actual	1.59kΩ	1.59kΩ
Unlatched 35.2 Ohms	Actual	35Ω	35.5Ω

   f. Check operation of solenoid electrically. (CH)

3. Partial Shutdown Solenoid Operate Coil

   a. Check that operate lever latches when operated manually. (CH)

   b. Remove cover and check connections on operate solenoid. (CH)

   c. Check the operate solenoid contacts. Clean and burnish if necessary. (CH)

   d. Check spring adjustment screw. Tighten if necessary using a lockwasher or loctite. (CH)

   e. Check resistance of operate coil when latched and unlatched. (CH)

NT Links: BB 39 and 38		Bench	Field
Latched 1.08 Kohms	Actual	1.08 kΩ	1.08kΩ
Unlatched 18.8 Ohms	Actual	18.8Ω	19.4Ω

   f. Using power supply check partial gate setting. Coordinate with Mechanical Crew. (CH) → POWER ON

   Normal 25% Actual 25%

   g. Check operation of solenoid electrically. (CH)

4. Partial Shutdown Solenoid Reset Coil

   a. Check that reset lever resets the operate lever when operated manually. (CH)

   b. Remove cover and check connections on reset solenoid. (CH)

   c. Check the reset solenoid contacts. Clean and burnish if necessary. (CH)

JDE Item No. & Description: 59120 - Governor - Unit No. 3 - BDE Type of Inspection: PM6 Department: Protection & Control	Sheet: 3 of 6 Rev. No.: 11 Rev. Date: 17-03-08 Index No.: 341 Binder No.: 41
ACTIVITIES (Initial Box Upon Completion)	**REMARKS**

4. Partial Shutdown Solenoid Reset Coil (Cont'd)

   d. Check spring adjustment screw. Tighten if necessary using a lockwasher or loctite. (CH)

   e. Check resistance of reset coil when latched and unlatched. (CH)

NT Links: BB 38 and 40		Bench	Field
Latched 1.57 Kohms	Actual	1.56kΩ	1.56kΩ
Unlatched 34.9 Ohms	Actual	35.1Ω	36.0Ω

   f. Check operation of solenoid electrically. (CH)

5. Gate Limit Motor, Shaft and Friction Gear Assembly

   a. Check clutch assembly, move gate limit from 0 - 100%; operation should be smooth. (CH)

   b. Check variable resistor connections. (CH)

   c. Check resistance of the resistor used in motor circuit. (CH)

   Resistance 243 Ohms Actual 231Ω

   d. Check condition of motor gears; assembly should be free of grease and dirt. (CH)

6. Speed Adjustment Motor, Shaft and Friction Gear Assembly

   a. Check clutch assembly, move speed adjustment from 0-100%; operation should be smooth. (CH)

   b. Check variable resistor connections. (CH)

   c. Check resistance of the resistor used in motor circuit. (CH)

   Resistance 162 Ohms Actual 162.5Ω

   d Check condition of motor gears; assembly should be free of grease and dirt. (CH)

JDE Item No. & Description: 59120 - Governor - Unit No. 3 - BDE Type of Inspection: PM6 Department: Protection & Control	Sheet: 4 of 6 Rev. No.: 11 Rev. Date: 17-03-08 Index No.: 341 Binder No.: 41
ACTIVITIES (Initial Box Upon Completion)	**REMARKS**

ROUTINE PM INSPECTIONS – Power On

1. **Check operation of the following gate position switches.**
   Note: Refer to drawing to verify check points.

   a. **0 gate - SW1; set to close at 1.5% and below points AA14, AA15.** (CH)

   Closed at 2.5% **% and** down

   b. **Partial gate - SW2; set to close at 25% and up points AA20, AA21.** (CH)

   Closed at 26 **% and** up

   c. **0 gate - SW3; set to close at 1.5% and down Points AA22, AA23.** (CH)

   Closed at .3 **% and** down

2. **Check the following instrumentation on the actuator cabinet:**

   a. **Tachometer. Also check tachometer in control room at the same time. Check and adjust frequency.** ( ) → RUN UP

   _____RPM _____RPM

   b. **Gate limit/gate position indicator on actuator and in the control room. As per attached sheet.** (CH) → SEE CHECK SHEET

   c. **Open current loop for gate position and measure feedback transducer current. Open positive to transducer.** (CH) → SEE CHECK SHEET

3. **Check governor accumulator tank oil level switches.**
   Check drawing to verify points (T.G. panel).

   a. **71 GO high alarm (points AD1, AD2).** (CH) → SPRING WAS MISSING REPAIRED

   b. **71 GO low alarm (points AD3, AD4).** (CH)

   c. **71 GL low trip (points AD5, AD6).** (CH)

4. **Check governor accumulator tank oil pressure switches. Check drawing to verify points (T.G. panel).**

   a. **63 GAP low alarm (points AD7, AD8).** (CH)

   Closes at 2000 (290 psi) kpa and down. Actual 2016 KPA ↓

JDE Item No. & Description: 59120 - Governor - Unit No. 3 - BDE Type of Inspection: PM6 Department: Protection & Control	Sheet: 5 of 6 Rev. No.: 11 Rev. Date: 17-03-08 Index No.: 341 Binder No.: 41
ACTIVITIES (Initial Box Upon Completion)	**REMARKS**

ROUTINE PM INSPECTIONS (Cont'd)

4. **Check governor accumulator tank oil pressure switches. Check drawing to verify points (T.G. panel). (Cont'd)**

   b. **63 GT trip (points AD9, AD10).** (CH)

   Closes at 1850 (268 psi) kpa and down. Actual 1849 KPA ↓

   c. **63 GI CIX-CCT (points AD11, AD12).** (CH)

   Closes at 1960 (284 psi) kpa and up. Actual 1961 KPA ↑

5. **Check all wiring and connections.** (CH)

6. **Speed Droop Indicator** ( )

   Normal 2% Actual _____%

JDE Item No. & Description:	59120 - Governor - Unit No. 3 - BDE	Sheet: 6 of 6
Type of Inspection:	PM6	Rev. No.: 11
Department:	Protection & Control	Rev. Date: 17-03-08
		Index No.: 341 Binder No.: 41

GOVERNOR GATE LIMIT/GATE POSITION CHECKS

Drawing #: _____

Tested By: Corwin Hussey Date: 2019-10-02

	Governor			Control Room				ECC			
	Gate Limit		Gate Position		Gate Limit		Gate Position		Gate Limit		Gate Position	
	Ma Signal		Ma Signal	Found	Left	Found	Left	Found	Left	Found	Left
0	4.02	0	4.02	0		0		0		0	
10	5.52	10	5.64	10		12		10		10	
20	7.14	20	7.30	21		22		19		20	
30	8.76	31	8.97	31		32		29		31	
40	10.31	40	10.50	41		42		40		40	
50	11.89	50	12.05	51		52		49		50	
60	13.49	60	13.59	60		62		59		60	
70	15.08	69	15.13	72		72		69		69	
80	16.67	79	16.69	82		82		78		79	
90	18.30	90	18.29	90		90		88		89	
100	19.93	100	19.98	100		100		98		100	

*Note: Open the +(Positive) to each of the transducers to obtain Ma currents.

Comments:

ENTERED

W/O #: 1324941

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 2 Rev. No.: 9 Rev. Date: 17-11-20 Index No.: 2049 Binder No.: 41

PM Checksheet No.: PM6-109965-P&CBDE
JDE Item No. & Description: 109965 - Exciter - Unit No. 3 - BDE
Type of Inspection: PM6 (Annual)
Department: P&C
Inspection Start Date: 2018-10-04
Supervisor's Review Signature & Date:
Oct 18, 2018
Asset Approval: B. Woodman
Insp. Comp. Date:
Reference Drawing and Manuals: 107-E-127, 107-E-126, 107-E-128 & ABB Ref. 502-799

ACTIVITIES (Initial Box Upon Completion)	REMARKS

CRITICAL PARTS INSPECTION

Step #1

The following checks to be done with power off/unit isolated for inspection:

a. Inspect heatsinks for contamination. (BJ)

b. Inspect printed circuit boards for component discolouration, dirt and dust accumulation, etc. (BJ)

c. Inspect wiring and connections on terminal blocks. (BJ)

d. Check all ribbon cables for damage and proper connection. (BJ)

e. Visual inspection of field flashing contactor. ( )

f. Visual inspection of internal distribution breakers. (BJ)

g. Visual inspection of crowbar assembly. (BJ)

h. Check calibration of timer 14EX: (BJ)

Setting value - 1.0 Sec. Measured value - 1.16 Sec.

i. Check operation of 14x relay. (BJ)

j. Inspect 24V AC/DC power supply (G05) for dust and dirt accumulation. Also check all associated wiring and connections. (BJ)

k. Inspect 24V DC/DC power supply (G15) for dust and dirt accumulation. Also check all associated wiring and connections. (BJ)

l. Inspect all cubicles for any foreign material and clean and vacuum if necessary. (BJ)

JDE Item No. & Description:	109965 - Exciter - Unit No. 3 - BDE	Sheet: 2 of 2
Type of Inspection:	PM6	Rev. No.: 9
Department:	PROTECTION & CONTROL	Rev. Date: 17-11-20
		Index No.: 2049 Binder No.: 41

ACTIVITIES (Initial Box Upon Completion)	REMARKS

Step #2

"Power On" checks:

a. With power on check output voltage of 24V AC/DC power supply (G05). 24.03 (BS)

Measure on W5:1 and W4:1

b. With power on check output voltage of 24 V DC/DC power supply (G15). 24.00 (BS)

Measure on W1:1 and W2:1

c. Check field flashing timer setting. Normal 8.0 seconds ( )

Measured _____

d. With unit at speed no load, perform all the steps previously done in Step #2, i.e.: (BS)

i. Change over from Auto to Manual. (BS)

ii. Change over from Manual to Auto. (BS)

iii. Transfer of bridges. (BS)

iv. Verification of thyristor firing. (BS)

v. Check alarm screen. (BS)

vi. Check voltage raise/lower from Control Room. (BS)

Note: Take all necessary precautions as mentioned in each section of Step #2.

ENTERED

W/O #: 1324943

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 1 Rev. No.: 8 Rev. Date: 17-09-11 Index No.: 365 Binder No.: 41

PM Checksheet No.: PM6 - 59151 - P&CBDE
JDE Item No. & Description: 59151 - Turbine - Unit No. 3 - BDE
Type of Inspection: PM6 (Annual)
Department: Protection & Control
Inspection Start Date: 2018-10-04
Supervisor's Review Signature & Date:
Reference Drawing and Manuals: 107-E-114, 107-E-142, ED-002 & ED-009

Robert Reid
Oct 18, 2018

Asset Approval: B. Woodman
Insp. Comp. Date:

ACTIVITIES (Initial Box Upon Completion)	REMARKS
CRITICAL PARTS INSPECTION	
1. Turbine Bearing Temperature Trip Meter #1	
a. Inspect wiring and connections. (CH)	
2. Turbine Bearing Temperature Trip Meter #2	
a. Inspect wiring and connections. (CH)	
3. Turbine Bearing Temperature Alarm Meter	
a. Inspect wiring and connections. (CH)	
4. Check vibration pickups for turbine and generator. Inspect cables, signal conditioners and set up gap to read -12 VDC. (CH)	TB O/S = -12.04, TBA = -11.71 G O/S = -12.05, GA = -11.60 TACH = -14.83 VDC
5. a. Check calibration of turbine oil level. (CH)	DPI | TAPE 278mm | 276mm
Verify alarms:	MEASURED 470mm 746 - 470 = 276.
Low: 238 mm Actual: 238mm	
High: 377 mm Actual: ———	DID NOT DO HIGH DUE TO POSSIBILITY OF OVER FILLING POT.
Verify Indication: 746 - 470 = 276mm	
b. Remove probe cover and check wiring. Note: Ensure the signal wire from probe is securely connected to circuit board. (BJ) CH	

ENTERED

W/O # 1376813

NEWFOUNDLAND & LABRADOR HYDRO HYDRO GENERATION PREVENTIVE MAINTENANCE CHECKSHEETS	Sheet: 1 of 1 Rev. No.: 1 Rev. Date: 16-03-28 Index No.: 2820 Binder No.: 41

PM Checksheet No.: PM6-388996-P&CBDE
Item No. & Description: 388996-Auto Greasing System- Unit #3-BDE
Department: P&C
Inspection Start Date: Mar 6/19
Supervisor's Review Signature and Date:
Reference Drawing and Manuals:

Mar 6, 2019
Asset Approval: B. Woodman
Insp. Comp. Date:

ACTIVITIES (Initial Box Upon Completion)	REMARKS
1. Confirm auto grease counts and record. (GH/RS) Zone 1(Interior) 720/1cycle Expected same Zone 2(Exterior) 1440/1cycle Expected same	
2. Confirm counter operation by watching counter toggle. G.H (RS)	
3. Confirm the failure alarm at the annunciator. G.H /RS)	
4. Confirm the cycle switch failure to operate. G.H /(R.S)	
5. Confirm the high pressure switch alarm. Jumper input 5. G.H/(RS)	
6. Check the grease barrel low level alarm. G.H/(RS)	
7. Verify the door counters are operating. G.H (RS)	
8. Check indicator lights/confirm operation. G.H/(RS)	
9. Verify the input for unit running. G.H/ (RS)	

W/O #: 1324944

ENTERED

NEWFOUNDLAND & LABRADOR HYDRO
HYDRO GENERATION
PREVENTIVE MAINTENANCE CHECKSHEETS

Sheet: 1 of 6
Rev. No.: 12
Rev. Date: 15-05-14
Index No.: 371 Binder No.: 41

PM Checksheet No.: PM6-59115 - P&CBDE
JDE Item No. & Description: 59115 - Generator - Unit No. 3 - BDE
Type of Inspection: PM6 (Annual)
Department: Protection & Control
Inspection Start Date: 2018 - 10 - 04
Supervisor's Review Signature & Date: Oct 18, 2018
Asset Approval: B. Woodman
Insp. Comp. Date:
Reference Drawing and Manuals: 107-E-114, 107-E-147, 107-E-096, 107-E-097, 107-E-134 & ED-059

ACTIVITIES (Initial Box Upon Completion)		REMARKS
CRITICAL PARTS INSPECTION		
1. Thrust Bearing Temperature Alarm Meter		
a. Inspect wiring and connections.	(CH)	
2. Thrust Bearing Temperature Trip Meter		
a. Inspect wiring and connections.	(CH)	
3. Guide Bearing Temperature Trip Meter #1		
a. Inspect wiring and connections.	(CH)	
4. Guide Bearing Temperature Trip Meter #2		
a. Inspect wiring and connections.	(CH)	
5. Guide Bearing Temperature Alarm Meter		
a. Inspect wiring and connections.	(CH)	
6. Generator Bearing		
a. Check calibration of generator oil level. Verify alarms.	(CH)	→ VERIFIED ALARMS BY REMOVING AND ADDING OIL FROM SIGHT GLASS
Normal Low - 60mm Actual - 60mm		
Normal High – 120mm Actual - 120mm		
Verify Indication		DPI | SIGHT GLASS 58.8mm | 58mm
ROUTINE PM INSPECTIONS		
1. Inspect and clean all relays.	(BB)	
2. Check unit KV meter.	(BB)	

PM Checksheet No.:	59115 - Generator - Unit No. 3 - BDE	Sheet:	2 of 6
Type of Inspection:	PM6	Rev. No.:	12
Department:	Protection & Control	Rev. Date:	15-05-14
		Index No.:	371 Binder No.: 41

GENERATOR PRIMARY PROTECTION FUNCTION TEST

Tested by: _____ Date: _____

BDE Powerhouse Unit Protection and Unit Breaker and Modifications Control DC Schematic Diagrams.

BDE Powerhouse Unit 3-Phase AC Drawings.

ACTIVITIES (Initial Box Upon Completion)

Note: Any block accompanied by an * must have a completed checksheet.

FUNCTION TEST SHEETS (UNIT)

Notes:

1. Work on units and related equipment must be completed and all personnel must be away from the unit and related equipment before function tests are carried out.
2. Tape off adjacent panels so as not to work on wrong units.
3. Note that all primary protection initiates lockout (86). Also, note that 86 trips the main breaker and field breaker and operates the shutdown solenoid. After initial tripping of breaker, leave breaker tripped until all primary protection is checked. Then close breaker to check standby protection. Check voltage on the shutdown solenoid across links BB52 and BB53.
4. Note that standby protection initiates lockout (86S) and 86S trips main breaker and field breaker and operates the shutdown solenoid. Leave breaker tripped until all standby protection is checked, then leave breaker tripped to check mechanical protection. Mechanical protection operates 5 and 5 operates partial shutdown solenoid and trips 86 through 33X contact.
5. Note that for unit #1 and unit #3, lockouts (86) and (86S) also trip station service breaker 52AT-1 and 52AT-2, respectively.
6. Open links to disable oscillograph and close after completion of testing.
7. Note all alarms and/or targets associated with the trips and reset upon completion of testing (control room and exciter).

PM Checksheet No.:	59115 - Generator - Unit No. 3 - BDE	Sheet: 3 of 6
Type of Inspection:	PM6	Rev. No.: 12
Department:	Protection & Control	Rev. Date: 15-05-14
		Index No.: 371 Binder No.: 41

ACTIVITIES (Initial Box Upon Completion)	REMARKS
1. Loss of Field (40G). ( ) Note: Loss of field (40G) just gives alarm.	
2. Split Phase (87SP) Unit. ( )	
Phase A _____ Timed _____ Inst.	
Phase B _____ Timed _____ Inst.	
Phase C _____ Timed _____ Inst.	
3. Differential (87G). ( )	
Phase A _____ Inst.	
Phase B _____ Inst.	
Phase C _____ Inst.	
4. Overvoltage (59G). ( )	
5. Generator Ground. ( )	
64G/I. ( )	
64G/I. ( )	
6. Out of Step (78). ( )	
7. Overspeed (12A/390 rpm). ( )	
8. Excitation System Failure (K-95). ( )	
9. Rectifier Transformer Protection	
a. Gas pressure (63RT). ( )	
b. Overcurrent (50-51RT). ( )	
Phase A _____ Timed _____ Inst.	
Phase B _____ Timed _____ Inst.	
Phase C _____ Timed _____ Inst.	

PM Checksheet No.:	59115 - Generator - Unit No. 3 - BDE	Sheet: 4 of 6
Type of Inspection:	PM6	Rev. No.: 12
Department:	Protection & Control	Rev. Date: 15-05-14
		Index No.: 371 Binder No.: 41

ACTIVITIES (Initial Box Upon Completion)	REMARKS
UNIT STANDBY PROTECTION	
1. Voltage Restraint (51V). ( )	
Phase A_____ Timed	
Phase B_____ Timed	
Phase C_____ Timed	
2. Negative Phase Sequence (46G). ( )	
MECHANICAL PROTECTION	
1. Turbine Bearing Temperature Trip	
a. 38BT-1. ( )	
b. 38BT-2. ( )	
2. Generator Guide Bearing Temperature Trip	
a. 38BT-1. ( )	
b. 38BT-2. ( )	
3. Generator Thrust Bearing Temperature Trip (38BT-1). ( )	
4. Governor Accumulator Tank Low Air Pressure Trip (63GT). ( )	
5. Governor Accumulator Tank Low Oil Level Trip (71GL). ( )	

PM Checksheet No.:	**59115 - Generator - Unit No. 3 - BDE**	**Sheet: 5 of 6**
Type of Inspection:	**PM6**	**Rev. No.: 12**
Department:	**Protection & Control**	**Rev. Date: 15-05-14**
		Index No.: 371 Binder No.: 41

Tested By: Brandon Sewer **Date:** Sept 25, 2018

Instrument Checked: KV Meter

Standard Source	Calculated	Recorded	Final Adjustment
0 volts	0 kv	0 kv	✓
50 volts	6 kv	6.2 kv	✓
100 volts	12 kv	12.1 kv	✓
150 volts	18 kv	18 kv	✓

Meter Type: Type AB-18 **Scale:** 0 – 150 volts **Manufacturer:** General Electric

Comments: _____

PM Checksheet No.:	**59115 - Generator - Unit No. 3 - BDE**	**Sheet: 6 of 6**
Type of Inspection:	**PM6**	**Rev. No.: 12**
Department:	**Protection & Control**	**Rev. Date: 15-05-14**
		Index No.: 371 Binder No.: 41

Protection & Control Devices - Generator #1

Device No.	Device Function	Recommended Setting	Actual Setting
62	Creep detector time delay relay	3 Minutes	179.6 seconds
62X	Shutoff valve closing time delay auxiliary relay	10 Seconds	9.2 seconds