Substations

Q. Reference: "2025 Capital Budget Application," Newfoundland Power Inc., June 28, 2024, Supporting Materials, Substations: 2.2, p. 2 and p. 4.

According to industry experience, the expected life of a power transformer is between 30 and 50 years, with a sharp decline for in-service power transformers past 70 years of age. The load profile in Newfoundland and Labrador is favourable for transformer life expectancy, as the highest loads are experienced in the winter when ambient temperatures are the lowest. [p. 2]

and;

PUL-T2 is a 39-year-old, 15/20/25 MVA, 66-12.5 kV power transformer manufactured by Ferranti Packard. [p. 4]

a) Please explain the deterioration of PUL-T2 at 39 years when "the load profile in Newfoundland and Labrador is favourable for transformer life expectancy?"
b) Please provide the results of the electrical testing, the internal inspection report, and the Dissolved Gas Analysis test results for each year from 2021 to 2023 for PUL-T2.
c) This project is being proposed as a two-year project. In its report, Newfoundland Power states that lead times on Power Transformers have increased from an average of 34 weeks in 2019 to an average of 117 weeks in 2024. Given these extended lead times, does Newfoundland Power feel the proposed two-year schedule will be attainable?

A. a) There are multiple factors that contribute to the deterioration of a power transformer beyond its load profile. As indicated in *CEATI's Enhancing End-of-Life Assessment of Power Transformers* report:[1]

> *The main degradation, decomposition, or damaging events to transformer systems are:*
> - *Applied mechanical forces: Mechanical forces due to transportation, vibrations, electromagnetism (natural, system short circuits, or inrush currents), or unintentional physical movement by personnel (e.g., during internal inspection or by altering settings or processes, such as increasing oil flow).*
> - *Thermal ageing and chemical reactions: Pyrolysis, oxidation, hydrolysis, byproduct reactions, and so on are accelerated by increased temperatures and oxygen, water, and impurity concentrations*
> - *Voltage stresses*
> - *Contamination*

[1] Refer to *CEATI Report No. T213700-30140 Enhancing End-of-Life Assessment of Power Transformers* published in October 2023.

> *The type of transformer failures can be broadly classified as electrical, mechanical, or thermal. It is important to note that failures may start with one type of failure, but progress to include two or three of the broad classes. Typical causes of transformer failures are:*
> - *Internal: Insulation deterioration, loss of winding clamping, overheating, moisture, solid contamination in the insulating oil, PD, design and manufacturing defects, winding resonance*
> - *External: Lightning strikes, system switching operations, system overload, system faults (short circuits)*

Any of the factors listed above could have contributed to the deterioration of the PUL-T2 power transformer.

See *Appendix A Section 1.2 PUL-T2 Power Transformer* of *NP 2025 Capital Budget Application Report 2.2 Substation Power Transformer Replacements* for a history of the PUL-T2 transformer. This transformer was initially installed in Chamberlains Substation where it was heavily loaded, and was then moved multiple times until it was installed in PUL Substation in 2019. The heavy loading on this transformer, as well as the multiple moves, could have also contributed to the deterioration of the transformer.

b) See Attachment A for the PUL-T2 maintenance report from 2022 which includes the electrical testing and internal inspection results. See Attachment B for the dissolved gas analysis test results from 2021 to 2023.

c) The proposed two-year schedule is expected to be obtainable based on experience with recent power transformer purchases and quotations.[2]

[2] The 117-week average lead time is based on an average of lead times that have been received from all bidders through the Company's competitive bidding process. The recent successful bids have had a better lead time than the average, which is anticipated to be around 90 weeks.

ATTACHMENT A:

PUL-T2 2022 Maintenance Report

Maintenance Standard Report Form
TRANSFORMER

OWNER	Substation Asset Group	DATE	2022,09,19	ASSET ID	200331
SITE	St. Johns	AMBIENT TEMP.	15 °C	HUMIDITY	%
SUBSTATION	PUL: Pulpit Rock Substation	WORK ORDER NO	Substation Maintenance		
EQUIPMENT	200331 - Power Transformer (PUL-T2)		**Open Classifications Folder**		

Maintenance I ☐ Maintenance 3 ☐ Maintenance 4 ☑ Maintenance 5 ☐ | Internal Inspection? | On-Load Tapchanger? | Fall Arrest Bracket?

Style of Pressure Relief System: *Explosion Vent* ☐ *Pressure Relief Device* ☑ | *Yes* ☑ *No* ☐ | *Yes* ☑ *No* ☐ | *Yes* ☐ *No* ☑

MANUFACTURER: Ferranti-Packard SERIAL #: 46311 TYPE: ONAN/ONAF MODEL#: RATED VOLT.: 66000

Check each item with a √ for OK, X to indicate a problem, NA for not applicable, or ND for not done. Once work is completed, the Maintenance Lead Hand and the Maintenance Supervisor must sign and forward to Planner for processing and filing.

Refer to Maintenance Standard MSP004A for additional procedure step information.

Procedure Step	Task	Status or Results	Done By
	SECTION 1 – Maintenance IV Inspection and Checks		
1.1	Company ID number generated and applied OR verified.	√	BM/TH
1.2	Nameplate information recorded and updated from all components with a nameplate. (Main Tank, bushings, Tap changer, etc.) (Record this info. On MSF001)	√	
1.3	Perform visual inspection	√	
1.4	If present, remove any bushing wrap.	NA	
1.5	If not installed and height of XFMR > 10 feet, install fall arrest bracket.	x	
1.6	Ensure cooling fans operate correctly. Ensure drain plugs or adhesive is removed from fan motors.	√	
1.7	Ensure an appropriate PCB label is installed on the unit. Record PCB level on MSF009.	√	
1.8	Obtain Oil Sample with a syringe and bottle for gas analysis.	√	
1.9	Perform dew point test if moisture is suspected to have entered the tank. **°C:**	0	
1.10	Test and record dielectric value of the insulating oil. **kV:**	0	
1.11	Inspect bushings for oil leakage and oil level.	√	
1.12	Ensure control cabinet is clean and dry. Verify proper operation of cabinet heater.	√	
1.13	Check radiators for: **Paint Condition:**	√	
	No Oil Leaks:	√	
	Correct position of all valves	√	
	SECTION 2 – Instrumentation and Protection Devices - Inspection		
2.1	Inspect Oil Level as indicated by the gauge on the conservator tank. Gauge Condition:	PASS	BM/TH
	Oil Level Reading:		
2.2	Inspect Oil Temperature Gauge Gauge Condition:	PASS	
	Oil Temperature:		
	Oil Temperature Alarm Setting:		
	Oil Temperature Trip Setting:		
2.3	Inspect Winding Temperature Gauge Gauge Condition:	PASS	
	Oil Temperature:		
	Oil Temperature Alarm Setting:		
	Oil Temperature Trip Setting:		
2.4	Inspect Fan Temperature Gauge Gauge Condition:	PASS	
	Stage 1 Activation Temperature:		
	Stage 2 Activation Temperature:		
2.5	Check operation of the gas detector relay. Refer to MST007.	FAIL	
2.6	Inspect Cab Tire, connections and weatherproofing on all instrumentation and protection wiring.	PASS	
2.7	Perform a Transformer Protection Devices Inspection as per maintenance standard MST017.	NOT COMPLETE	
2.8a	Inspect Pressure Relief Device for physical damage. Condition:	PASS	BM/TH
2.9a	Inspect Pressure Relief Device and spool for oil leaks. Condition:	PASS	
2.10a	Is a spill pan present? (Yes/No)	PASS	
	If Present - Inspect operation of heat tracing:	PASS	
	If present - inspect operation of valve. (Does not bind, operates smooth):	PASS	
	If Present - Ensure pan is drained and clear of debris:	PASS	

Maintenance Standard Report Form
TRANSFORMER

PAGE _____

SECTION 3 – Service and Maintenance			
3.1.1	Paint Transformer if de-energized. Completed?	NOT COMPLETE	BM/TH
3.1.2	Clean bushings and lighting arrestors. Porcelain should free of atmospheric pollution.	PASS	
3.1.3	Install / Replace humidity absorbent packets in the gas detector relay.	NOT COMPLETE	
3.1.4	Inspect condition of silica gel. Replacement required?	PASS	
	If replacement required - Silica Gel Replaced?		
3.1.5	Ensure off-load tap changer can be operated smoothly. Lubricate locking pins in handle. Operate tap changer throughout its entire range.	NOT APPLICABLE	

SECTION 3 – Internal Inspection

Transformer Internal Inspection: Duration and Weather conditions

Weather Conditions: Cloudy **Temperature:** 18 **Celsius** **Duration tank was open:** 6 **Hours** 0 **Minutes**

Inspection Procedure:	Pass	Fail	N/A
Inside of tank free of loose or damaged parts.	◉	○	○
Inside of tank free of tools or debris.	◉	○	○
Explosion Vent Lower Diaphragm intact.	○	○	◉
Main Tank Oil Level gauge checked.	◉	○	○
Bushing leads in good condition.	◉	○	○
CT leads good and connections tight.	◉	○	○
Tapchanger leads good and connections tight.	◉	○	○
All fasteners (nuts, bolts) in correct place and tight.	◉	○	○
Core laminations and supports in place.	◉	○	○
Off-load tap changer in good condition.	○	○	◉
Terminal Board structure good.	◉	○	○
No signs of carbon or tracking.	○	◉	○
Any and all shipping braces removed.	◉	○	○
CTs, PTs and Auxiliary Transformers properly mounted.	◉	○	○
Coils and insulation in good condition.	◉	○	○
No signs of moisture present.	◉	○	○
No signs of structural failure in tank, such as cracks in wall or welding.	○	◉	○
No signs of physical damage on tank wall.	◉	○	○
All lines checked for proper connections and tightness.	◉	○	○

SECTION 3 – Service and Maintenance - Other Maintenance or Repairs

Was any other Maintenance or repairs completed? Yes ☐ No ☑

SECTION 5 – Diagnostic Testing (Maintenance III, IV and Acceptance)

5.1	Megger Test *Attach data using "Transformer - Meggering" form*	√	BM/TH
5.2	Megger Test (Control Wiring) *Attach data using "Transformer - Control Wiring Meggering" form*	NA	
5.3	Ratio Test *Attach data using "Transformer - Offload / Onload Tapchanger Ratio Test" form*	√	BM/TH
5.4	Power Factor Test *Attach data using "Transformer - Power Factoring" form*	√	BM/TH

Maintenance Standard Report Form
TRANSFORMER

PAGE

SECTION 4 - Tapchanger Inspection

Seperate Diverter Tank? ☑ Yes ☐ No

Counts: Initial Counter Reading: 0 Final Counter Reading: 0

Oil Dielectric Testing: Tapchanger Compartment: 0 kV Diverter: 0 kV **PCB Level:** 0 PPM

Oil Level Reading: Tapchanger Compartment: 0 Diverter: 0

Motor Testing: Motor Megger Test: 0 MΩ Motor Current: 0 Amps

Please make the appropiate selection:	Yes:	No:
Operated Manually:	◉	○
Operated Electrically:	◉	○
Evidence of Oil Leakage Outside:	○	◉
Evidence of Oil Leakage Between Tanks:	○	◉
Evidence of Moisture in Compartment(s):	○	◉
Oil Filtered:	○	◉
Oil Replaced:	○	◉
Compartment(s) flushed with Clean Oil	○	◉
Gears, Shafts, Bearings, etc. Lubricated	○	◉
All Control Features Operational	○	◉
Tap Position Indicator Operational	◉	○
Drag Hand Reset Operational	◉	○
Limit Switches Operational:	◉	○
All Nuts and Bolts Tight	◉	○
All Pins Properly in Position	◉	○
Pressure Relief Device installed on Tapchanger	◉	○
If so, Operation Indicator and/or Alarm Switch Required Resetting?	◉	○
Control Cabinet Clean and Dry	◉	○
Oil Sample Obtained	○	◉

Check:	Pass	*Fail*	N/A
Insulating Barriers	○	○	◉
Arc Chutes	○	○	◉
Contacts	◉	○	○
Gears	◉	○	○
Cams	◉	○	○
Chain Drive (Where Applicable)	○	○	◉
Mechanical Stops	◉	○	○
Brake Operation	○	○	◉
Operations Counter	◉	○	○
Gaskets	◉	○	○
Relief Vent and/or Breater	◉	○	○
Oil Filter (if applicable)	○	○	◉
Contactors	◉	○	○
Relay Contacts	◉	○	○
Auxiliary Switches	○	◉	○
Cabinet Heaters and Thermostat	◉	○	○
Cabinet Light and Receptacle	◉	○	○
Wiring Connections Tight	◉	○	○

COMMENTS:

- unit un-tanked and inspected for internal damage / signs of fault
- signs of carbon present in oil, dark / discoloured oil. small particles of carbon found on level surfaces
- unit pressurised with dry air while oil was removed
- gas detector and bleed line replaced
- Top Center Hatch was leaking once refilled,
- cleaned up hatch, cut and replaced new cork gasket, new hardware torqued to 45Flb
- repaied leaking piping for GDR
- preformed assoicated testing with x-former, ratio, winding resistance, power factor
- pictures of internal inspection attached

DEFICIENCIES:

- Tap changer "raise" function not working from local control, broken switch
- oil leaking into hollow void of transformer designed for structure (bench) appears to be a small crack in weld, allowing oil to migrate into empty void, (attached is a picture of us trying to drain this oil)

Pul T2 200331

OST, Measure R Ground B "H"

V: 10.02 kv
I: 23.18 mA
W: .6361 w
PF: 0.27%
C: 6140.7 pf

"X"

V: 10.06 kv
I: 23.27 mA
W: 6738 W
PF: 0.29 %
C: 6139.8 pf

Gst Gurard R+B "H"

V: 10.07 kv
I: 11.77 mA
W: .4944 w
PF: 0.42%
C: 3100.8 pf

"X"

V: 10.09 kv
I: 30.61 mA
W: 1.661 w
PF: 0.54 %
C: 8047.4 pf

GST Ground R&B "H"

V: 10.05 kv
I: 35.01 mA
W: 1.129 w
PF: 0.32 %
C: 9241.9 pf

"X"

V: 10.02 kv
I: 53.58 mA
W: 2.551 w
PF: 0.48 %
C: 14181 pf

PUT02
200331
JH, BM

Tap	H1-H0	H2-H0	H3-H0
T-1	.392 Ω	.392 Ω	.391 Ω
2	.395	.387	.389
3	.387	.382	.386
4	.385	.380	.384
5	.383	.377	.382
6	.378	.375	.379
7	.376	.374	.376
8	.375	.374	.375
9	.372	.377	.372
10	.368	.372	.368
11	.366	.372	.367
12	.364	.370	.365
13	.362	.371	.363
14	.361	.368	.360
15	.367	.365	.359
16	.368	.363	.357
17	.360	.355	.352
18	.356	.354	.355

X1-X0	X2-X0	X3-X0
7.5 mΩ	7.8 mΩ	7.7 mΩ

Winding Resistance

NEWFOUNDLAND POWER
A FORTIS COMPANY

MSF009
Form No. 353

Revised: 2022-09-22

Maintenance Standard Report Form
POWER TRANSFORMERS

Check if Okay:

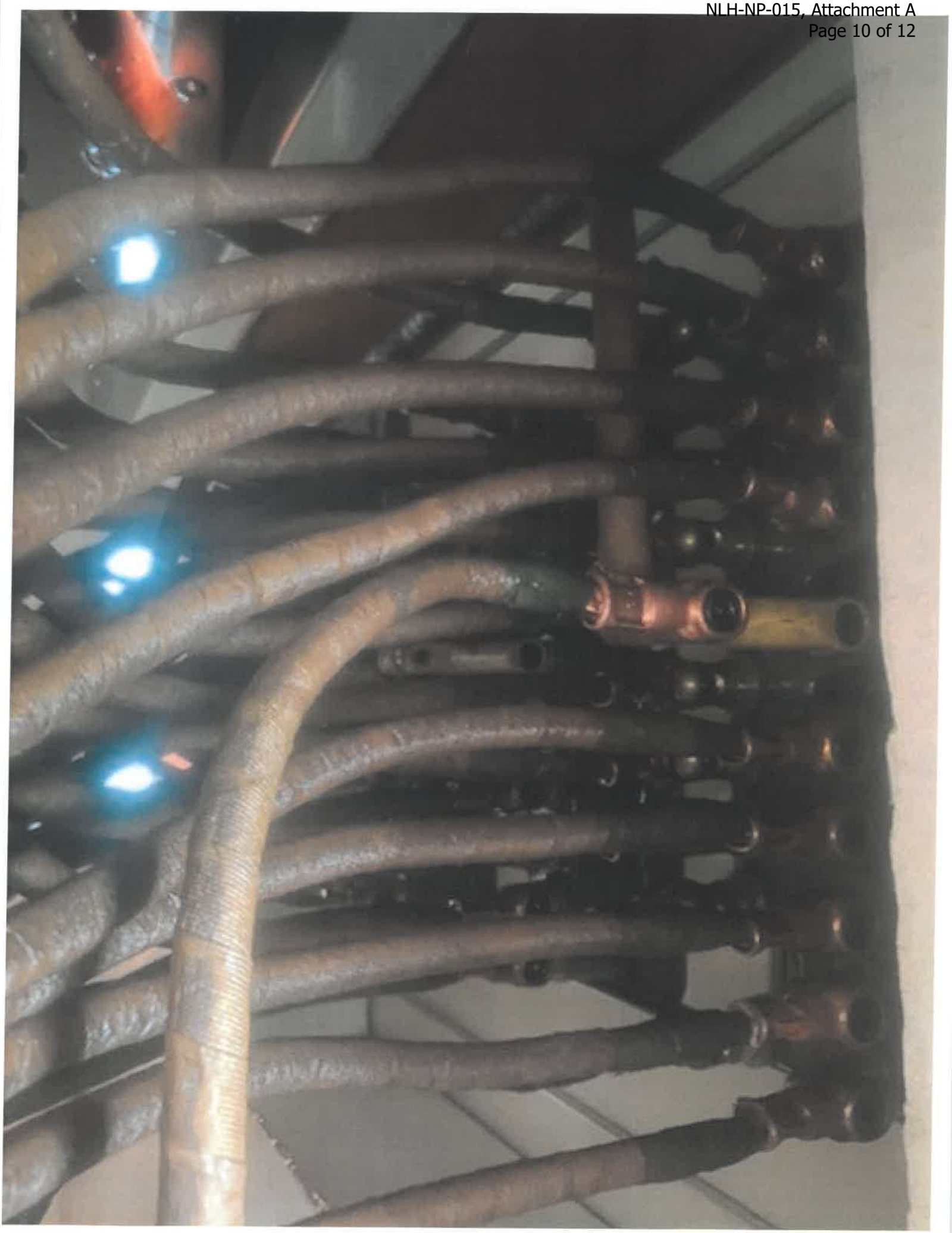
Physical Condition	_____	Line Connections	_____	Cabinet Heaters	_____
Paint	_____	Alarms Operational	_____	Breather	_____
Bushings	_____	Gaskets	_____	Silica Gel	_____
Lightning Arresters	_____	Control Wiring Terminal Connections	_____	Fans	_____
Bushing Oil Level	_____	Control Cabinet	_____	Foundation	_____

Ratio Test:

Tap Position	H1 Phase H1 - ___ ___ - ___	H2 Phase H2 - ___ ___ - ___	H3 Phase H3 - ___ ___ - ___	Tap Position	H1 Phase H1 - ___ ___ - ___	H2 Phase H2 - ___ ___ - ___	H3 Phase H3 - ___ ___ - ___
1	5.57	5.57	5.57	18	5.06	5.06	5.06
2	5.54	5.54	5.54	19	5.03	5.03	5.03
3	5.51	5.51	5.51	20	5.00	5.00	5.00
4	5.48	5.48	5.48	21	4.97	4.97	4.97
5	5.45	5.45	5.45	22	4.94	4.94	4.94
6	5.42	5.42	5.42	23	4.91	4.91	4.91
7	5.39	5.39	5.39	24	4.87	4.87	4.87
8	5.36	5.36	5.36	25	4.85	4.85	4.85
9	5.33	5.33	5.33	26	4.81	4.81	4.81
10	5.30	5.30	5.30	27	4.78	4.78	4.78
11	5.27	5.27	5.27	28	4.75	4.75	4.75
12	5.24	5.24	5.24	29	4.72	4.72	4.72
13	5.21	5.21	5.21	30	4.69	4.69	4.69
14	5.18	5.18	5.18	31	4.66	4.66	4.66
15	5.15	5.15	5.15	32	4.63	4.63	4.63
16	5.12	5.12	5.12	33	4.60	4.60	4.60
17	5.09	5.09	5.09				

Remarks:

Type of Maintenance _____ **Date** _____ **Inspected By** _____



ATTACHMENT B:

PUL-T2 2021 to 2023 Dissolved Gas Analysis

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Tapchanger Activity Signature Analysis TASA ™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311-LTC
Ventilation : Conservator
Compartment : Common

Date : 3/16/2021
Report Number : 5073165
Purchase Order Number:
Manufacturer : ASEA
Model : UZERN200/300

		Sample Date :	3/8/2021	3/19/2020	2/28/2019	9/29/2017	9/20/2016
		Laboratory No. :	5073165	5069802	5065827	5060354	5056599
		Container No. :	47388	44953	40421	35579	34155
		Temperature :	18	50	0.5	35	0
H2	Hydrogen	(ppm) :	8025	3889	299	254	153
CH4	Methane	(ppm) :	27	135	10	19	10
C2H6	Ethane	(ppm) :	8	5	0	1	2
C2H4	Ethylene	(ppm) :	240	121	5	26	10
C2H2	Acetylene	(ppm) :	2736	1574	79	233	11
CO	Carbon monoxide	(ppm) :	212	179	26	91	218
CO2	Carbon dioxide	(ppm) :	1115	975	218	1548	2139
N2	Nitrogen	(ppm) :	89626	95591	86490	81239	83281
O2	Oxygen	(ppm) :	19768	19287	25018	35142	35933
		Total (ppm) :	121757	121756	112145	118553	121757
		TDCG (ppm) :	11248	5903	419	624	404
		SHL (%) :	3.99	4.01	4.07	4.28	5.34
		ETCG (% in blanket) :	12.48	6.22	0.54	0.53	0.41
Particles		5 to 15 um :	965405	3543850	746750	10700	3950
Particles		15 to 25 um :	10270	63150	23000	1450	300
Particles		25 to 50 um :	850	4500	3450	750	0
Particles		50 to 100 um :	38	100	400	250	0
Particles		> 100 um :	4	0	0	0	0
D1533	Moisture	(ppm) :	14	12	11	10	10
D1816	Dielectric BV	(kV) :	29	31	33	32	25
D974	Acid Number	(mg KOH/g) :	0.04	0.04	0.04	0.007	0.007
D971	Interfacial Tension	(dynes/cm) :	29.0	28.4	29.3	39.2	40.3
D1500	Color Number	:	<2.0	<2.0	<2.0	<1.0	<1.0

Tapchanger Activity Signature Analysis Diagnostic Evaluation

TASA Assessment :	2 ID: 200331 Sampler: Brent Green Counter: 6355	1 ID: 200331 Sampler: Tim Horlick Counter: 58833	1 ID: 200331 Sampler: Brent Green Counter: 5446	1 ID: 200331 Sampler: Allan Bartlett Counter: 52095	1 ID: 200331 Sampler: Glenn Knott Counter: 51528

Sampling Interval : Recommend retest within 150 days (5 months) for trending.
Operating Procedure : Monitor for increased arcing. Evaluate for worn or damaged components.
Comments : A slightly abnormal dissipation of energy is noted. This is an early indication of fault or wear activity.
Partial discharge is indicated.
Abnormal arcing is indicated.
Follow guidelines for oils with high flammable gas content.

Approved by: RWarmenhove

Rico Warmenhove
Lab Manager

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment™

Date : 03-22-2021

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311
Manufacturer : FPL
Date Mfgd : 1985
Size (kVA) : 25000
Rating kV: 66

Report Number : 5073164
Fluid volume : 14443
Fluid type : Mineral Oil
Preservation : Conservator
Cooling : ONAN/ONAF/ONAF
Core & coil wt. : 22589
Impedance :

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

		Sample Date :	3/8/2021	3/19/2020	2/28/2019	2/3/2019	6/14/2018
		Laboratory No. :	5073164	5069800	5065826	5065670	5063173
		Container No. :	47368	44922	40414	38487	38699
		Temperature :	33	40	30	-6	26
H2	Hydrogen	(ppm) :	16	10	2	0	14
CH4	Methane	(ppm) :	3	5	1	1	7
C2H6	Ethane	(ppm) :	1	0	0	0	3
C2H4	Ethylene	(ppm) :	20	6	0	0	5
C2H2	Acetylene	(ppm) :	14	5	0	0	1
CO	Carbon monoxide	(ppm) :	423	314	43	23	520
CO2	Carbon dioxide	(ppm) :	2025	1509	385	153	2640
N2	Nitrogen	(ppm) :	98897	79459	37624	32806	98030
O2	Oxygen	(ppm) :	22759	21223	10007	8671	4518
		Total (ppm) :	124158	102531	48062	41654	105738
		TDCG (ppm) :	477	340	46	24	550
		SHL (%) :	10.41	10.72	10.25	12.28	11.00
		ETCG (% in blanket) :	0.30	0.27	0.08	0.05	0.40
Particles		5 to 15 um :	25053	87800	240350	127200	115400
Particles		15 to 25 um :	1620	13300	56650	17000	10400
Particles		25 to 50 um :	651	2050	14150	3750	3350
Particles		50 to 100 um :	81	50	700	200	550
Particles		> 100 um :	11	0	0	0	100
D1533	Moisture	(ppm) :	9	6	4	5	4
D1816	Dielectric BV	(kV) :	36	30	32	35	31
D974	Acid Number	(mg KOH/g) :	0.06	0.06	0.05	0.06	0.05
D971	Interfacial Tension	(dynes/cm) :	26.2	25.9	26.0	25.2	25.3
D1500	Color Number	:	<2.5	<2.5	<2.0	<2.0	<2.0
D924	Power Factor	:	0.026	0.124	0.156	0.077	0.128
D2668	Oxidation Inhibitor	(%) :	<0.010	<0.010	<0.010	<0.010	<0.010
5 HMF	5 hydroxymethyl-2-furaldehyde	(ppm) :	<0.010	<0.010		<0.010	<0.010
2 FAL	2 furaldehyde	(ppm) :	<0.010	<0.010		<0.010	0.011
2 ACF	2 acetylfuran	(ppm) :	<0.010	<0.010		<0.010	<0.010
5 MEF	5 methyl-2-furaldehyde	(ppm) :	<0.010	<0.010		<0.010	<0.010
2 FOL	2 furfurol	(ppm) :	<0.010	<0.010		<0.010	<0.010
	Estimated DP	:	>1000	>1000		>1000	994

Transformer Condition Assessment Diagnostic Evaluation

TCA Assessment :	3 ID: 200331 Sampler: Brent Green	1 ID: 200331 Sampler: Tim Horlick	1 ID: 200331 Sampler: Brent Green	1 ID: 200331 Sampler: N/A	1 ID: 200331 Sampler: Allan Bartlett

Sampling Interval : Retest in three months.
Operating Procedure : Continue normal operation. Paper mechanical condition is normal.
Comments : Arcing is indicated.

Field Comments : Fluid condition is within acceptable in-service parameters.

Approved by: RWarmenhove

Rico Warmenhove
Lab Manager

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311
Manufacturer : FPL
Date Mfgd : 1985
Size (kVA) : 25000
Rating kV: 66

Date : 05-03-2021
Report Number : 5073412
Fluid volume : 14443
Fluid type : Mineral Oil
Preservation : Conservator
Cooling : ONAN/ONAF/ONAF
Core & coil wt. : 22589
Impedance :

		Sample Date :	4/14/2021	3/8/2021	3/19/2020	2/28/2019	2/3/2019
		Laboratory No. :	5073412	5073164	5069800	5065826	5065670
		Container No. :	44874	47368	44922	40414	38487
		Temperature :	28	33	40	30	-6
H2	Hydrogen	(ppm) :	3	16	10	2	0
CH4	Methane	(ppm) :	1	3	5	1	1
C2H6	Ethane	(ppm) :	0	1	0	0	0
C2H4	Ethylene	(ppm) :	15	20	6	0	0
C2H2	Acetylene	(ppm) :	12	14	5	0	0
CO	Carbon monoxide	(ppm) :	319	423	314	43	23
CO2	Carbon dioxide	(ppm) :	1442	2025	1509	385	153
N2	Nitrogen	(ppm) :	64528	98897	79459	37624	32806
O2	Oxygen	(ppm) :	16276	22759	21223	10007	8671
		Total (ppm) :	82596	124158	102531	48062	41654
		TDCG (ppm) :	350	477	340	46	24
		SHL (%) :	11.64	10.41	10.72	10.25	12.28
		ETCG (% in blanket) :	0.32	0.30	0.27	0.08	0.05
Particles		5 to 15 um :	9621	25053	87800	240350	127200
Particles		15 to 25 um :	406	1620	13300	56650	17000
Particles		25 to 50 um :	136	651	2050	14150	3750
Particles		50 to 100 um :	13	81	50	700	200
Particles		> 100 um :	0	11	0	0	0
D1533	Moisture	(ppm) :	6	9	6	4	5
D1816	Dielectric BV	(kV) :	32	36	30	32	35
D974	Acid Number	(mg KOH/g) :	0.05	0.06	0.06	0.05	0.06
D971	Interfacial Tension	(dynes/cm) :	26.6	26.2	25.9	26.0	25.2
D1500	Color Number	:	<2.5	<2.5	<2.5	<2.0	<2.0
D924	Power Factor	:	0.132	0.026	0.124	0.156	0.077
D2668	Oxidation Inhibitor	(%) :	<0.010	<0.010	<0.010	<0.010	<0.010
5 HMF	5 hydroxymethyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010		<0.010
2 FAL	2 furaldehyde	(ppm) :	<0.010	<0.010	<0.010		<0.010
2 ACF	2 acetylfuran	(ppm) :	<0.010	<0.010	<0.010		<0.010
5 MEF	5 methyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010		<0.010
2 FOL	2 furfurol	(ppm) :	<0.010	<0.010	<0.010		<0.010
	Estimated DP	:	>1000	>1000	>1000		>1000

Transformer Condition Assessment Diagnostic Evaluation

TCA Assessment :	2 ID: 200331 Sampler: David Warren	3 ID: 200331 Sampler: Brent Green	1 ID: 200331 Sampler: Tim Horlick	1 ID: 200331 Sampler: Brent Green	1 ID: 200331 Sampler: N/A

Sampling Interval : Retest in six months.
Operating Procedure : Continue normal operation. Paper mechanical condition is normal.
Comments : Arcing is indicated.

Field Comments : Fluid condition is within acceptable in-service parameters.

Approved by: RWarmenhove
Rico Warmenhove
Lab Manager

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Tapchanger Activity Signature Analysis TASA™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311-LTC
Ventilation :
Compartment : Common

Date : 9/15/2021
Report Number : 5075045
Purchase Order Number:
Manufacturer : ASEA
Model :

		Sample Date :	8/25/2021	3/8/2021	3/19/2020	2/28/2019	9/29/2017
		Laboratory No. :	5075045	5073165	5069802	5065827	5060354
		Container No. :	49277	47388	44953	40421	35579
		Temperature :	40	18	50	0.5	35
H2	Hydrogen	(ppm) :	7238	8025	3889	299	254
CH4	Methane	(ppm) :	319	27	135	10	19
C2H6	Ethane	(ppm) :	10	8	5	0	1
C2H4	Ethylene	(ppm) :	301	240	121	5	26
C2H2	Acetylene	(ppm) :	3421	2736	1574	79	233
CO	Carbon monoxide	(ppm) :	324	212	179	26	91
CO2	Carbon dioxide	(ppm) :	1553	1115	975	218	1548
N2	Nitrogen	(ppm) :	88367	89626	95591	86490	81239
O2	Oxygen	(ppm) :	13056	19768	19287	25018	35142
		Total (ppm) :	114589	121757	121756	112145	118553
		TDCG (ppm) :	11613	11248	5903	419	624
		SHL (%) :	4.00	3.99	4.01	4.07	4.28
		ETCG (% in blanket) :	12.10	12.48	6.22	0.54	0.53
Particles		5 to 15 um :	97278	965405	3543850	746750	10700
Particles		15 to 25 um :	263	10270	63150	23000	1450
Particles		25 to 50 um :	65	850	4500	3450	750
Particles		50 to 100 um :	5	38	100	400	250
Particles		> 100 um :	0	4	0	0	0
D1533	Moisture	(ppm) :	15	14	12	11	10
D1816	Dielectric BV	(kV) :	35	29	31	33	32
D974	Acid Number	(mg KOH/g) :	0.03	0.04	0.04	0.04	0.007
D971	Interfacial Tension	(dynes/cm) :	30.6	29.0	28.4	29.3	39.2
D1500	Color Number	:	<2.0	<2.0	<2.0	<2.0	<1.0

Tapchanger Activity Signature Analysis Diagnostic Evaluation

TASA Assessment :	2 ID: 200331 Sampler: Brent Green Counter: 23	2 ID: 200331 Sampler: Brent Green Counter: 6355	1 ID: 200331 Sampler: Tim Horlick Counter: 58833	1 ID: 200331 Sampler: Brent Green Counter: 5446	1 ID: 200331 Sampler: Allan Bartlett Counter: 52095

Sampling Interval : Recommend retest within 150 days (5 months) for trending.
Operating Procedure : Monitor for increased arcing. Evaluate for worn or damaged components.
Comments : A slightly abnormal dissipation of energy is noted. This is an early indication of fault or wear activity.
Partial discharge is indicated.
Abnormal arcing is indicated.
Follow guidelines for oils with high flammable gas content.

Approved by: RWarmenhove

Rico Warmenhove
Lab Manager

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Tapchanger Activity Signature Analysis TASA™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311-LTC
Ventilation : Conservator
Compartment : Common

Date : 2/1/2022
Report Number : 5076545
Purchase Order Number:
Manufacturer : ASEA
Model : UZERN200/300

		Sample Date :	1/17/2022	8/25/2021	3/8/2021	3/19/2020	2/28/2019
		Laboratory No. :	5076545	5075045	5073165	5069802	5065827
		Container No. :	47734	49277	47388	44953	40421
		Temperature :	3	40	18	50	0.5
H2	Hydrogen	(ppm) :	8078	7238	8025	3889	299
CH4	Methane	(ppm) :	316	319	27	135	10
C2H6	Ethane	(ppm) :	22	10	8	5	0
C2H4	Ethylene	(ppm) :	335	301	240	121	5
C2H2	Acetylene	(ppm) :	3778	3421	2736	1574	79
CO	Carbon monoxide	(ppm) :	299	324	212	179	26
CO2	Carbon dioxide	(ppm) :	1705	1553	1115	975	218
N2	Nitrogen	(ppm) :	88384	88367	89626	95591	86490
O2	Oxygen	(ppm) :	18839	13056	19768	19287	25018
		Total (ppm) :	121756	114589	121757	121756	112145
		TDCG (ppm) :	12828	11613	11248	5903	419
		SHL (%) :	3.99	4.00	3.99	4.01	4.07
		ETCG (% in blanket) :	12.91	12.10	12.48	6.22	0.54
Particles		5 to 15 um :	94797	97278	965405	3543850	746750
Particles		15 to 25 um :	403	263	10270	63150	23000
Particles		25 to 50 um :	48	65	850	4500	3450
Particles		50 to 100 um :	3	5	38	100	400
Particles		> 100 um :	0	0	4	0	0
D1533	Moisture	(ppm) :	9	15	14	12	11
D1816	Dielectric BV	(kV) :	36	35	29	31	33
D974	Acid Number	(mg KOH/g) :	0.03	0.03	0.04	0.04	0.04
D971	Interfacial Tension	(dynes/cm) :	30.9	30.6	29.0	28.4	29.3
D1500	Color Number	:	<2.0	<2.0	<2.0	<2.0	<2.0

Tapchanger Activity Signature Analysis Diagnostic Evaluation

TASA Assessment :	2 ID: 200331 Sampler: Brent Green Counter:6639	2 ID: 200331 Sampler: Brent Green Counter: 23	2 ID: 200331 Sampler: Brent Green Counter: 6355	1 ID: 200331 Sampler: Tim Horlick Counter: 58833	1 ID: 200331 Sampler: Brent Green Counter: 5446

Sampling Interval : Recommend retest within 150 days (5 months) for trending.
Operating Procedure : Monitor for increased arcing. Evaluate for worn or damaged components.
Comments : A slightly abnormal dissipation of energy is noted. This is an early indication of fault or wear activity.
Partial discharge is indicated.
Abnormal arcing is indicated.
Follow guidelines for oils with high flammable gas content.

Approved by: RWarmenhove

Rico Warmenhove
Lab Manager

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment ™

Date : 06-06-2022

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311
Manufacturer : FPL
Date Mfgd : 1985
Size (kVA) : 25000
Rating kV: 66

Report Number : 5077103
Fluid volume : 600
Fluid type : Mineral Oil
Preservation : Conservator
Cooling : ONAN/ONAF/ONAF
Core & coil wt. : 22589
Impedance :

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

			Sample Date :	5/26/2022	4/14/2021	3/8/2021	3/19/2020	2/28/2019
			Laboratory No. :	5077103	5073412	5073164	5069800	5065826
			Container No. :	51296	44874	47368	44922	40414
			Temperature :	32	28	33	40	30
H2	Hydrogen	(ppm) :		10	3	16	10	2
CH4	Methane	(ppm) :		2	1	3	5	1
C2H6	Ethane	(ppm) :		1	0	1	0	0
C2H4	Ethylene	(ppm) :		23	15	20	6	0
C2H2	Acetylene	(ppm) :		27	12	14	5	0
CO	Carbon monoxide	(ppm) :		340	319	423	314	43
CO2	Carbon dioxide	(ppm) :		1796	1442	2025	1509	385
N2	Nitrogen	(ppm) :		79991	64528	98897	79459	37624
O2	Oxygen	(ppm) :		23546	16276	22759	21223	10007
			Total (ppm) :	105736	82596	124158	102531	48062
			TDCG (ppm) :	403	350	477	340	46
			SHL (%) :	10.54	11.64	10.41	10.72	10.25
			ETCG (% in blanket) :	0.29	0.32	0.30	0.27	0.08
Particles			5 to 15 um :	1580	9621	25053	87800	240350
Particles			15 to 25 um :	60	406	1620	13300	56650
Particles			25 to 50 um :	15	136	651	2050	14150
Particles			50 to 100 um :	2	13	81	50	700
Particles			> 100 um :	0	0	11	0	0
D1533	Moisture	(ppm) :		9	6	9	6	4
D1816	Dielectric BV	(kV) :		36	32	36	30	32
D974	Acid Number	(mg KOH/g) :		0.05	0.05	0.06	0.06	0.05
D971	Interfacial Tension	(dynes/cm) :		25.4	26.6	26.2	25.9	26.0
D1500	Color Number	:		2.0	<2.5	<2.5	<2.5	<2.0
D924	Power Factor	:		0.127	0.132	0.026	0.124	0.156
D2668	Oxidation Inhibitor	(%) :		<0.010	<0.010	<0.010	<0.010	<0.010
5 HMF	5 hydroxymethyl-2-furaldehyde	(ppm) :		<0.010	<0.010	<0.010	<0.010	
2 FAL	2 furaldehyde	(ppm) :		<0.010	<0.010	<0.010	<0.010	
2 ACF	2 acetylfuran	(ppm) :		<0.010	<0.010	<0.010	<0.010	
5 MEF	5 methyl-2-furaldehyde	(ppm) :		<0.010	<0.010	<0.010	<0.010	
2 FOL	2 furfurol	(ppm) :		<0.010	<0.010	<0.010	<0.010	
	Estimated DP	:		>1000	>1000	>1000	>1000	

Transformer Condition Assessment Diagnostic Evaluation

TCA Assessment :	Potential 4 ID: 200331 Sampler: Tim Horlick	2 ID: 200331 Sampler: David Warren	3 ID: 200331 Sampler: Brent Green	1 ID: 200331 Sampler: Tim Horlick	1 ID: 200331 Sampler: Brent Green

Sampling Interval : Retest immediately to confirm condition.
Operating Procedure : Plan to remove from service for additional testing, investigation, and analysis.
Comments : Arcing and heating at higher temperatures are indicated. Paper condition is normal.

Field Comments : Fluid condition is within acceptable in-service parameters.

Approved by: RWarmenhove

Rico Warmenhove
Lab Manager

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location :	Pulpit Rock	Date :	06-21-2022
Bank & Phase :	PUL-T2	Report Number :	5077235
Serial Number :	46311	Fluid volume :	600
Manufacturer :	FPL	Fluid type :	Mineral Oil
Date Mfgd :	1985	Preservation :	Conservator
Size (kVA) :	25000	Cooling :	ONAN/ONAF/ONAF
Rating kV :	66	Core & coil wt. :	22589
		Impedance :	

		Sample Date :	6/7/2022	5/26/2022	4/14/2021	3/8/2021	3/19/2020
		Laboratory No. :	5077235	5077103	5073412	5073164	5069800
		Container No. :	48297	51296	44874	47368	44922
		Temperature :	25	32	28	33	40
H2	Hydrogen	(ppm) :	11	10	3	16	10
CH4	Methane	(ppm) :	3	2	1	3	5
C2H6	Ethane	(ppm) :	0	1	0	1	0
C2H4	Ethylene	(ppm) :	30	23	15	20	6
C2H2	Acetylene	(ppm) :	30	27	12	14	5
CO	Carbon monoxide	(ppm) :	276	340	319	423	314
CO2	Carbon dioxide	(ppm) :	1653	1796	1442	2025	1509
N2	Nitrogen	(ppm) :	84176	79991	64528	98897	79459
O2	Oxygen	(ppm) :	35445	23546	16276	22759	21223
		Total (ppm) :	121624	105736	82596	124158	102531
		TDCG (ppm) :	350	403	350	477	340
		SHL (%) :	10.00	10.54	11.64	10.41	10.72
		ETCG (% in blanket) :	0.22	0.29	0.32	0.30	0.27
Particles		5 to 15 um :	492	1580	9621	25053	87800
Particles		15 to 25 um :	166	60	406	1620	13300
Particles		25 to 50 um :	78	15	136	651	2050
Particles		50 to 100 um :	8	2	13	81	50
Particles		> 100 um :	0	0	0	11	0
D1533	Moisture	(ppm) :	10	9	6	9	6
D1816	Dielectric BV	(kV) :	28	36	32	36	30
D974	Acid Number	(mg KOH/g) :	0.05	0.05	0.05	0.06	0.06
D971	Interfacial Tension	(dynes/cm) :	26.4	25.4	26.6	26.2	25.9
D1500	Color Number	:	2.0	2.0	<2.5	<2.5	<2.5
D924	Power Factor	:	0.128	0.127	0.132	0.026	0.124
D2668	Oxidation Inhibitor	(%) :	<0.010	<0.010	<0.010	<0.010	<0.010
5 HMF	5 hydroxymethyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FAL	2 furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 ACF	2 acetylfuran	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
5 MEF	5 methyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FOL	2 furfurol	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
	Estimated DP	:	>1000	>1000	>1000	>1000	>1000

Transformer Condition Assessment Diagnostic Evaluation

TCA Assessment :	4 ID: 200331 Sampler: David Warren	Potential 4 ID: 200331 Sampler: Tim Horlick	2 ID: 200331 Sampler: David Warren	3 ID: 200331 Sampler: Brent Green	1 ID: 200331 Sampler: Tim Horlick

Sampling Interval : Retest in 14 days

Operating Procedure : Plan to remove from service for additional testing, investigation and analysis.

Comments : Heating at higher temperatures and arcing are indicated. Cellulose may be involved. Paper condition is normal.

Field Comments : Fluid condition is within acceptable in-service parameters.

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Transformer Condition Assessment ™

		Date :	06-21-2022
	Location : Pulpit Rock	Report Number :	5077235
	Bank & Phase : PUL-T2	Fluid volume :	600
Glenn Samms	Serial Number : 46311	Fluid type :	Mineral Oil
Newfoundland Power	Manufacturer : FPL	Preservation :	Conservator
P.O. Box 8910	Date Mfgd : 1985	Cooling :	ONAN/ONAF/ONAF
55 Kenmount Road	Size (kVA) : 25000	Core & coil wt. :	22589
St. John's, NF A1B 3P6	Rating kV : 66	Impedance :	

Approved by: R Warmenhove

Rico Warmenhove
Lab Manager

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Tapchanger Activity Signature Analysis TASA™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311-LTC
Ventilation : Conservator
Compartment : Common

Date : 6/23/2022
Report Number : 5077241
Purchase Order Number:
Manufacturer : ASEA
Model : UZERN200/300

		Sample Date :	6/8/2022	1/17/2022	8/25/2021	3/8/2021	3/19/2020
		Laboratory No. :	5077241	5076545	5075045	5073165	5069802
		Container No. :	45361	47734	49277	47388	44953
		Temperature :	6	3	40	18	50
H2	Hydrogen	(ppm) :	7954	8078	7238	8025	3889
CH4	Methane	(ppm) :	305	316	319	27	135
C2H6	Ethane	(ppm) :	15	22	10	8	5
C2H4	Ethylene	(ppm) :	367	335	301	240	121
C2H2	Acetylene	(ppm) :	3746	3778	3421	2736	1574
CO	Carbon monoxide	(ppm) :	293	299	324	212	179
CO2	Carbon dioxide	(ppm) :	1638	1705	1553	1115	975
N2	Nitrogen	(ppm) :	86778	88384	88367	89626	95591
O2	Oxygen	(ppm) :	20659	18839	13056	19768	19287
		Total (ppm) :	121755	121756	114589	121757	121756
		TDCG (ppm) :	12680	12828	11613	11248	5903
		SHL (%) :	3.99	3.99	4.00	3.99	4.01
		ETCG (% in blanket) :	12.81	12.91	12.10	12.48	6.22
Particles		5 to 15 um :	68107	94797	97278	965405	3543850
Particles		15 to 25 um :	111	403	263	10270	63150
Particles		25 to 50 um :	9	48	65	850	4500
Particles		50 to 100 um :	0	3	5	38	100
Particles		> 100 um :	0	0	0	4	0
D1533	Moisture	(ppm) :	15	9	15	14	12
D1816	Dielectric BV	(kV) :	38	36	35	29	31
D974	Acid Number	(mg KOH/g) :	0.03	0.03	0.03	0.04	0.04
D971	Interfacial Tension	(dynes/cm) :	28.4	30.9	30.6	29.0	28.4
D1500	Color Number	:	<2.0	<2.0	<2.0	<2.0	<2.0

Tapchanger Activity Signature Analysis Diagnostic Evaluation

TASA Assessment :	2 ID: 200331 Sampler: David Warren Counter: 67363	2 ID: 200331 Sampler: Brent Green Counter:6639	2 ID: 200331 Sampler: Brent Green Counter: 23	2 ID: 200331 Sampler: Brent Green Counter: 6355	1 ID: 200331 Sampler: Tim Horlick Counter: 58833

Sampling Interval : Recommend retest within 150 days (5 months) for trending.

Operating Procedure : Monitor for increased arcing. Evaluate for worn or damaged components.

Comments : A slightly abnormal dissipation of energy is noted. This is an early indication of fault or wear activity.
Partial discharge is indicated.
Abnormal arcing is indicated.
Follow guidelines for oils with high flammable gas content.

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Tapchanger Activity Signature Analysis TASA™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location :	Pulpit Rock	Date :	6/23/2022
Bank & Phase :	PUL-T2	Report Number :	5077241
Serial Number :	46311-LTC	Purchase Order Number:	
Ventilation :	Conservator	Manufacturer :	ASEA
Compartment :	Common	Model :	UZERN200/300

Approved by: R Warmenhove

Rico Warmenhove
Lab Manager

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment ™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311
Manufacturer : FPL
Date Mfgd : 1985
Size (kVA) : 25000
Rating kV : 66

Date : 06-28-2022
Report Number : 5077408
Fluid volume : 600
Fluid type : Mineral Oil
Preservation : Conservator
Cooling : ONAN/ONAF/ONAF
Core & coil wt. : 22589
Impedance :

		Sample Date :	6/20/2022	6/7/2022	5/26/2022	4/14/2021	3/8/2021
		Laboratory No. :	5077408	5077235	5077103	5073412	5073164
		Container No. :	45373	48297	51296	44874	47368
		Temperature :	32	25	32	28	33
H2	Hydrogen	(ppm) :	10	11	10	3	16
CH4	Methane	(ppm) :	5	3	2	1	3
C2H6	Ethane	(ppm) :	1	0	1	0	1
C2H4	Ethylene	(ppm) :	34	30	23	15	20
C2H2	Acetylene	(ppm) :	36	30	27	12	14
CO	Carbon monoxide	(ppm) :	272	276	340	319	423
CO2	Carbon dioxide	(ppm) :	2072	1653	1796	1442	2025
N2	Nitrogen	(ppm) :	79466	84176	79991	64528	98897
O2	Oxygen	(ppm) :	22037	35445	23546	16276	22759
		Total (ppm) :	103933	121624	105736	82596	124158
		TDCG (ppm) :	358	350	403	350	477
		SHL (%) :	9.99	10.00	10.54	11.64	10.41
		ETCG (% in blanket) :	0.24	0.22	0.29	0.32	0.30
Particles		5 to 15 um :	449	492	1580	9621	25053
Particles		15 to 25 um :	165	166	60	406	1620
Particles		25 to 50 um :	48	78	15	136	651
Particles		50 to 100 um :	3	8	2	13	81
Particles		> 100 um :	0	0	0	0	11
D1533	Moisture	(ppm) :	10	10	9	6	9
D1816	Dielectric BV	(kV) :	35	28	36	32	36
D974	Acid Number	(mg KOH/g) :	0.05	0.05	0.05	0.05	0.06
D971	Interfacial Tension	(dynes/cm) :	24.9	26.4	25.4	26.6	26.2
D1500	Color Number	:	<2.5	2.0	2.0	<2.5	<2.5
D924	Power Factor	:	0.123	0.128	0.127	0.132	0.026
D2668	Oxidation Inhibitor	(%) :	<0.01	<0.010	<0.010	<0.010	<0.010
5 HMF	5 hydroxymethyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FAL	2 furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 ACF	2 acetylfuran	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
5 MEF	5 methyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FOL	2 furfurol	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
	Estimated DP	:	>1000	>1000	>1000	>1000	>1000

Transformer Condition Assessment Diagnostic Evaluation

TCA Assessment :	4 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: David Warren	Potential 4 ID: 200331 Sampler: Tim Horlick	2 ID: 200331 Sampler: David Warren	3 ID: 200331 Sampler: Brent Green

Sampling Interval : Retest in 14 days

Operating Procedure : Plan to remove from service for additional testing, investigation and analysis.

Comments : Heating at higher temperatures and arcing are indicated.

Field Comments : Fluid condition is within acceptable in-service parameters.

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Transformer Condition Assessment ™

		Date :	06-28-2022
	Location : Pulpit Rock	Report Number :	5077408
	Bank & Phase : PUL-T2	Fluid volume :	600
Glenn Samms	Serial Number : 46311	Fluid type :	Mineral Oil
Newfoundland Power	Manufacturer : FPL	Preservation :	Conservator
P.O. Box 8910	Date Mfgd : 1985	Cooling :	ONAN/ONAF/ONAF
55 Kenmount Road	Size (kVA) : 25000	Core & coil wt. :	22589
St. John's, NF A1B 3P6	Rating kV : 66	Impedance :	

Approved by: R Warmenhove

Rico Warmenhove
Lab Manager

TJ | H2b
ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311
Manufacturer : FPL
Date Mfgd : 1985
Size (kVA) : 25000
Rating kV : 66

Date : 08-16-2022
Report Number : 5078286
Fluid volume : 600
Fluid type : Mineral Oil
Preservation : Conservator
Cooling : ONAN/ONAF/ONAF
Core & coil wt. : 22589
Impedance :

		Sample Date :	7/19/2022	6/20/2022	6/7/2022	5/26/2022	4/14/2021
		Laboratory No. :	5078286	5077408	5077235	5077103	5073412
		Container No. :	51292	45373	48297	51296	44874
		Temperature :	39	32	25	32	28
H2	Hydrogen	(ppm) :	19	10	11	10	3
CH4	Methane	(ppm) :	21	5	3	2	1
C2H6	Ethane	(ppm) :	12	1	0	1	0
C2H4	Ethylene	(ppm) :	38	34	30	23	15
C2H2	Acetylene	(ppm) :	46	36	30	27	12
CO	Carbon monoxide	(ppm) :	610	272	276	340	319
CO2	Carbon dioxide	(ppm) :	2750	2072	1653	1796	1442
N2	Nitrogen	(ppm) :	84367	79466	84176	79991	64528
O2	Oxygen	(ppm) :	3708	22037	35445	23546	16276
		Total (ppm) :	91571	103933	121624	105736	82596
		TDCG (ppm) :	746	358	350	403	350
		SHL (%) :	10.39	9.99	10.00	10.54	11.64
		ETCG (% in blanket) :	0.56	0.24	0.22	0.29	0.32
Particles		5 to 15 um :	1684	449	492	1580	9621
Particles		15 to 25 um :	115	165	166	60	406
Particles		25 to 50 um :	52	48	78	15	136
Particles		50 to 100 um :	0	3	8	2	13
Particles		> 100 um :	0	0	0	0	0
D1533	Moisture	(ppm) :	15	10	10	9	6
D1816	Dielectric BV	(kV) :	23	35	28	36	32
D974	Acid Number	(mg KOH/g) :	0.05	0.05	0.05	0.05	0.05
D971	Interfacial Tension	(dynes/cm) :	23.0	24.9	26.4	25.4	26.6
D1500	Color Number	:	2.0	<2.5	2.0	2.0	<2.5
D924	Power Factor	:	0.128	0.123	0.128	0.127	0.132
D2668	Oxidation Inhibitor	(%) :	<0.010	<0.01	<0.010	<0.010	<0.010
5 HMF	5 hydroxymethyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FAL	2 furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 ACF	2 acetylfuran	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
5 MEF	5 methyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FOL	2 furfurol	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
	Estimated DP	:	>1000	>1000	>1000	>1000	>1000

Transformer Condition Assessment Diagnostic Evaluation

TCA Assessment :	4 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: David Warren	Potential 4 ID: 200331 Sampler: Tim Horlick	2 ID: 200331 Sampler: David Warren

Sampling Interval : Retest in 14 days

Operating Procedure : Plan to remove from service for additional testing, investigation and analysis.

Comments : Heating at higher temperatures and arcing are indicated. Paper condition is normal.

Field Comments : Fluid condition is within acceptable in-service parameters.

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Transformer Condition Assessment ™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location :	Pulpit Rock
Bank & Phase :	PUL-T2
Serial Number :	46311
Manufacturer :	FPL
Date Mfgd :	1985
Size (kVA) :	25000
Rating kV :	66

Date :	08-16-2022
Report Number :	5078286
Fluid volume :	600
Fluid type :	Mineral Oil
Preservation :	Conservator
Cooling :	ONAN/ONAF/ONAF
Core & coil wt. :	22589
Impedance :	

Approved by: RWarmenhove

Rico Warmenhove
Lab Manager

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311
Manufacturer : FPL
Date Mfgd : 1985
Size (kVA) : 25000
Rating kV : 66

Date : 09-23-2022
Report Number : 5078595
Fluid volume : 600
Fluid type : Mineral Oil
Preservation : Conservator
Cooling : ONAN/ONAF/ONAF
Core & coil wt. : 22589
Impedance :

		Sample Date :	8/18/2022	7/19/2022	6/20/2022	6/7/2022	5/26/2022
		Laboratory No. :	5078595	5078286	5077408	5077235	5077103
		Container No. :	51288	51292	45373	48297	51296
		Temperature :	35	39	32	25	32
H2	Hydrogen	(ppm) :	34	19	10	11	10
CH4	Methane	(ppm) :	11	21	5	3	2
C2H6	Ethane	(ppm) :	3	12	1	0	1
C2H4	Ethylene	(ppm) :	31	38	34	30	23
C2H2	Acetylene	(ppm) :	39	46	36	30	27
CO	Carbon monoxide	(ppm) :	488	610	272	276	340
CO2	Carbon dioxide	(ppm) :	2121	2750	2072	1653	1796
N2	Nitrogen	(ppm) :	75442	84367	79466	84176	79991
O2	Oxygen	(ppm) :	3841	3708	22037	35445	23546
		Total (ppm) :	82010	91571	103933	121624	105736
		TDCG (ppm) :	606	746	358	350	403
		SHL (%) :	9.27	10.39	9.99	10.00	10.54
		ETCG (% in blanket) :	0.54	0.56	0.24	0.22	0.29
Particles		5 to 15 um :	295	1684	449	492	1580
Particles		15 to 25 um :	17	115	165	166	60
Particles		25 to 50 um :	1	52	48	78	15
Particles		50 to 100 um :	0	0	3	8	2
Particles		> 100 um :	0	0	0	0	0
D1533	Moisture	(ppm) :	16	15	10	10	9
D1816	Dielectric BV	(kV) :	36	23	35	28	36
D974	Acid Number	(mg KOH/g) :	0.04	0.05	0.05	0.05	0.05
D971	Interfacial Tension	(dynes/cm) :	24.8	23.0	24.9	26.4	25.4
D1500	Color Number	:	2.0	2.0	<2.5	2.0	2.0
D924	Power Factor	:	0.121	0.128	0.123	0.128	0.127
D2668	Oxidation Inhibitor	(%) :	<0.010	<0.010	<0.01	<0.010	<0.010
5 HMF	5 hydroxymethyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FAL	2 furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 ACF	2 acetylfuran	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
5 MEF	5 methyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FOL	2 furfurol	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
	Estimated DP	:	>1000	>1000	>1000	>1000	>1000

Transformer Condition Assessment Diagnostic Evaluation

TCA Assessment :	4 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: David Warren	Potential 4 ID: 200331 Sampler: Tim Horlick

Sampling Interval : Retest in 14 days

Operating Procedure : Plan to remove from service for additional testing, investigation and analysis.

Comments : Heating at higher temperatures and arcing are indicated. Paper condition is normal.

Field Comments : Fluid condition is within acceptable in-service parameters.

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Transformer Condition Assessment TM

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location :	Pulpit Rock
Bank & Phase :	PUL-T2
Serial Number :	46311
Manufacturer :	FPL
Date Mfgd :	1985
Size (kVA) :	25000
Rating kV :	66

Date :	09-23-2022
Report Number :	5078595
Fluid volume :	600
Fluid type :	Mineral Oil
Preservation :	Conservator
Cooling :	ONAN/ONAF/ONAF
Core & coil wt. :	22589
Impedance :	

Approved by: RWarmenhove

Rico Warmenhove
Lab Manager

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Tapchanger Activity Signature Analysis TASA ™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311-LTC
Ventilation : Conservator
Compartment : Common

Date : 11-02-2022
Report Number : 5079108
Purchase Order Number:
Manufacturer : ASEA
Model : UZERN200/300

		Sample Date :	9/29/2022	6/8/2022	1/17/2022	8/25/2021	3/8/2021
		Laboratory No. :	5079108	5077241	5076545	5075045	5073165
		Container No. :	52747	45361	47734	49277	47388
		Temperature :	19	6	3	40	18
H2	Hydrogen	(ppm) :	5936	7954	8078	7238	8025
CH4	Methane	(ppm) :	385	305	316	319	27
C2H6	Ethane	(ppm) :	17	15	22	10	8
C2H4	Ethylene	(ppm) :	505	367	335	301	240
C2H2	Acetylene	(ppm) :	2412	3746	3778	3421	2736
CO	Carbon monoxide	(ppm) :	308	293	299	324	212
CO2	Carbon dioxide	(ppm) :	2138	1638	1705	1553	1115
N2	Nitrogen	(ppm) :	70499	86778	88384	88367	89626
O2	Oxygen	(ppm) :	18819	20659	18839	13056	19768
		Total (ppm) :	101019	121755	121756	114589	121757
		TDCG (ppm) :	9563	12680	12828	11613	11248
		SHL (%) :	4.02	3.99	3.99	4.00	3.99
		ETCG (% in blanket) :	11.81	12.81	12.91	12.10	12.48
Particles		5 to 15 um :	707	68107	94797	97278	965405
Particles		15 to 25 um :	37	111	403	263	10270
Particles		25 to 50 um :	45	9	48	65	850
Particles		50 to 100 um :	4	0	3	5	38
Particles		> 100 um :	0	0	0	0	4
D1533	Moisture	(ppm) :	17	15	9	15	14
D1816	Dielectric BV	(kV) :	33	38	36	35	29
D974	Acid Number	(mg KOH/g) :	<0.02	0.03	0.03	0.03	0.04
D971	Interfacial Tension	(dynes/cm) :	24.9	28.4	30.9	30.6	29.0
D1500	Color Number	:	2.0	<2.0	<2.0	<2.0	<2.0

Tapchanger Activity Signature Analysis Diagnostic Evaluation

TASA Assessment :	2 ID: 200331 Sampler: David Warren Counter: 6819	2 ID: 200331 Sampler: David Warren Counter: 67363	2 ID: 200331 Sampler: Brent Green Counter:6639	2 ID: 200331 Sampler: Brent Green Counter: 23	2 ID: 200331 Sampler: Brent Green Counter: 6355

Sampling Interval : Recommend retest within 150 days (5 months) for trending.
Operating Procedure : Monitor for increased arcing. Evaluate for worn or damaged components.
Comments : A slightly abnormal dissipation of energy is noted. This is an early indication of fault or wear activity.
Partial discharge is indicated.
Abnormal arcing is indicated.
Follow guidelines for oils with high flammable gas content.

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Tapchanger Activity Signature Analysis TASA™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location :	Pulpit Rock
Bank & Phase :	PUL-T2
Serial Number :	46311-LTC
Ventilation :	Conservator
Compartment :	Common
Date :	11-02-2022
Report Number :	5079108
Purchase Order Number:	
Manufacturer :	ASEA
Model :	UZERN200/300

Approved by: RWarmenhove

Rico Warmenhove
Lab Manager

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311
Manufacturer : FPL
Date Mfgd : 1985
Size (kVA) : 25000
Rating kV : 66

Date : 12-07-2022
Report Number : 5079438
Fluid volume : 600
Fluid type : Mineral Oil
Preservation : Conservator
Cooling : ONAN/ONAF/ONAF
Core & coil wt. : 22589
Impedance :

			Sample Date :	11/16/2022	8/18/2022	7/19/2022	6/20/2022	6/7/2022
			Laboratory No. :	5079438	5078595	5078286	5077408	5077235
			Container No. :	52714	51288	51292	45373	48297
			Temperature :	45	35	39	32	25
H2	Hydrogen	(ppm) :		8	34	19	10	11
CH4	Methane	(ppm) :		7	11	21	5	3
C2H6	Ethane	(ppm) :		1	3	12	1	0
C2H4	Ethylene	(ppm) :		31	31	38	34	30
C2H2	Acetylene	(ppm) :		28	39	46	36	30
CO	Carbon monoxide	(ppm) :		314	488	610	272	276
CO2	Carbon dioxide	(ppm) :		2256	2121	2750	2072	1653
N2	Nitrogen	(ppm) :		81395	75442	84367	79466	84176
O2	Oxygen	(ppm) :		26048	3841	3708	22037	35445
			Total (ppm) :	110088	82010	91571	103933	121624
			TDCG (ppm) :	389	606	746	358	350
			SHL (%) :	10.55	9.27	10.39	9.99	10.00
			ETCG (% in blanket) :	0.26	0.54	0.56	0.24	0.22
Particles			5 to 15 um :	123	295	1684	449	492
Particles			15 to 25 um :	59	17	115	165	166
Particles			25 to 50 um :	13	1	52	48	78
Particles			50 to 100 um :	0	0	0	3	8
Particles			> 100 um :	0	0	0	0	0
D1533	Moisture	(ppm) :		9	16	15	10	10
D1816	Dielectric BV	(kV) :		37	36	23	35	28
D974	Acid Number	(mg KOH/g) :		0.06	0.04	0.05	0.05	0.05
D971	Interfacial Tension	(dynes/cm) :		23.1	24.8	23.0	24.9	26.4
D1500	Color Number	:		2.5	2.0	2.0	<2.5	2.0
D924	Power Factor	:		0.106	0.121	0.128	0.123	0.128
D2668	Oxidation Inhibitor	(%) :		0.069	<0.010	<0.010	<0.01	<0.010
5 HMF	5 hydroxymethyl-2-furaldehyde	(ppm) :		<0.010	<0.010	<0.010	<0.010	<0.010
2 FAL	2 furaldehyde	(ppm) :		<0.010	<0.010	<0.010	<0.010	<0.010
2 ACF	2 acetylfuran	(ppm) :		<0.010	<0.010	<0.010	<0.010	<0.010
5 MEF	5 methyl-2-furaldehyde	(ppm) :		<0.010	<0.010	<0.010	<0.010	<0.010
2 FOL	2 furfurol	(ppm) :		<0.010	<0.010	<0.010	<0.010	<0.010
	Estimated DP	:		>1000	>1000	>1000	>1000	>1000

Transformer Condition Assessment Diagnostic Evaluation

TCA Assessment :	4 ID: 200331 Sampler: Holly Best	4 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: David Warren

Sampling Interval : Retest in thirty days.

Operating Procedure : Plan to remove from service for additional testing, investigation and analysis.

Comments : Arcing is indicated. Paper condition is normal.

Field Comments : Fluid condition is within acceptable in-service parameters.

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Transformer Condition Assessment TM

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location :	Pulpit Rock
Bank & Phase :	PUL-T2
Serial Number :	46311
Manufacturer :	FPL
Date Mfgd :	1985
Size (kVA) :	25000
Rating kV :	66

Date :	12-07-2022
Report Number :	5079438
Fluid volume :	600
Fluid type :	Mineral Oil
Preservation :	Conservator
Cooling :	ONAN/ONAF/ONAF
Core & coil wt. :	22589
Impedance :	

Approved by: R Warmenhove

Rico Warmenhove
Lab Manager

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311
Manufacturer : FPL
Date Mfgd : 1985
Size (kVA) : 25000
Rating kV : 66

Date : 02-21-2023
Report Number : 5079764
Fluid volume : 600
Fluid type : Mineral Oil
Preservation : Conservator
Cooling : ONAN/ONAF/ONAF
Core & coil wt. : 22589
Impedance :

		Sample Date :	2/8/2023	11/16/2022	8/18/2022	7/19/2022	6/20/2022
		Laboratory No. :	5079764	5079438	5078595	5078286	5077408
		Container No. :	53323	52714	51288	51292	45373
		Temperature :	30	45	35	39	32
H2	Hydrogen	(ppm) :	24	8	34	19	10
CH4	Methane	(ppm) :	9	7	11	21	5
C2H6	Ethane	(ppm) :	2	1	3	12	1
C2H4	Ethylene	(ppm) :	32	31	31	38	34
C2H2	Acetylene	(ppm) :	29	28	39	46	36
CO	Carbon monoxide	(ppm) :	378	314	488	610	272
CO2	Carbon dioxide	(ppm) :	2511	2256	2121	2750	2072
N2	Nitrogen	(ppm) :	85398	81395	75442	84367	79466
O2	Oxygen	(ppm) :	24955	26048	3841	3708	22037
		Total (ppm) :	113338	110088	82010	91571	103933
		TDCG (ppm) :	474	389	606	746	358
		SHL (%) :	9.41	10.55	9.27	10.39	9.99
		ETCG (% in blanket) :	0.32	0.26	0.54	0.56	0.24
Particles		5 to 15 um :	1947	123	295	1684	449
Particles		15 to 25 um :	176	59	17	115	165
Particles		25 to 50 um :	90	13	1	52	48
Particles		50 to 100 um :	12	0	0	0	3
Particles		> 100 um :	0	0	0	0	0
D1533	Moisture	(ppm) :	5	9	16	15	10
D1816	Dielectric BV	(kV) :	33	37	36	23	35
D974	Acid Number	(mg KOH/g) :	0.06	0.06	0.04	0.05	0.05
D971	Interfacial Tension	(dynes/cm) :	35.0	23.1	24.8	23.0	24.9
D1500	Color Number	:	<2.5	2.5	2.0	2.0	<2.5
D924	Power Factor	:	0.126	0.106	0.121	0.128	0.123
D2668	Oxidation Inhibitor	(%) :	<0.010	0.069	<0.010	<0.010	<0.01
5 HMF	5 hydroxymethyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FAL	2 furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 ACF	2 acetylfuran	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
5 MEF	5 methyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FOL	2 furfurol	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
	Estimated DP	:	>1000	>1000	>1000	>1000	>1000

Transformer Condition Assessment Diagnostic Evaluation

TCA Assessment :	3 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: Holly Best	4 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: David Warren

Sampling Interval : Retest in 90 days.

Operating Procedure : Continue normal operation.

Comments : Heating and arcing are indicated. Paper condition is normal.

Field Comments : Fluid condition is within acceptable in-service parameters.

TJ | H2b
ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment TM

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

		Date :	02-21-2023
Location :	Pulpit Rock	Report Number :	5079764
Bank & Phase :	PUL-T2	Fluid volume :	600
Serial Number :	46311	Fluid type :	Mineral Oil
Manufacturer :	FPL	Preservation :	Conservator
Date Mfgd :	1985	Cooling :	ONAN/ONAF/ONAF
Size (kVA) :	25000	Core & coil wt. :	22589
Rating kV :	66	Impedance :	

Approved by: RWarmenhove

Rico Warmenhove
Lab Manager

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Tapchanger Activity Signature Analysis TASA ™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311-LTC
Ventilation : Conservator
Compartment : Common

Date : 4/4/2023
Report Number : 5079890
Purchase Order Number:
Manufacturer : ASEA
Model : UZERN200/300

		Sample Date :	3/20/2023	9/29/2022	6/8/2022	1/17/2022	8/25/2021
		Laboratory No. :	5079890	5079108	5077241	5076545	5075045
		Container No. :	53411	52747	45361	47734	49277
		Temperature :	5	19	6	3	40
H2	Hydrogen	(ppm) :	6878	5936	7954	8078	7238
CH4	Methane	(ppm) :	385	385	305	316	319
C2H6	Ethane	(ppm) :	19	17	15	22	10
C2H4	Ethylene	(ppm) :	557	505	367	335	301
C2H2	Acetylene	(ppm) :	2946	2412	3746	3778	3421
CO	Carbon monoxide	(ppm) :	313	308	293	299	324
CO2	Carbon dioxide	(ppm) :	1834	2138	1638	1705	1553
N2	Nitrogen	(ppm) :	74805	70499	86778	88384	88367
O2	Oxygen	(ppm) :	21156	18819	20659	18839	13056
		Total (ppm) :	108893	101019	121755	121756	114589
		TDCG (ppm) :	11098	9563	12680	12828	11613
		SHL (%) :	4.01	4.02	3.99	3.99	4.00
		ETCG (% in blanket) :	12.65	11.81	12.81	12.91	12.10
Particles		5 to 15 um :	63862	707	68107	94797	97278
Particles		15 to 25 um :	346	37	111	403	263
Particles		25 to 50 um :	65	45	9	48	65
Particles		50 to 100 um :	2	4	0	3	5
Particles		> 100 um :	1	0	0	0	0
D1533	Moisture	(ppm) :	15	17	15	9	15
D1816	Dielectric BV	(kV) :	33	33	38	36	35
D974	Acid Number	(mg KOH/g) :	0.04	<0.02	0.03	0.03	0.03
D971	Interfacial Tension	(dynes/cm) :	26.8	24.9	28.4	30.9	30.6
D1500	Color Number	:	<2.0	2.0	<2.0	<2.0	<2.0

Tapchanger Activity Signature Analysis Diagnostic Evaluation

TASA Assessment :	2 ID: 200331 Sampler: William Crane Counter: 69635	2 ID: 200331 Sampler: David Warren Counter: 6819	2 ID: 200331 Sampler: David Warren Counter: 67363	2 ID: 200331 Sampler: Brent Green Counter:6639	2 ID: 200331 Sampler: Brent Green Counter: 23

Sampling Interval : Recommend retest within 150 days (5 months) for trending.

Operating Procedure : Monitor for increased arcing. Evaluate for worn or damaged components.

Comments : A slightly abnormal dissipation of energy is noted. This is an early indication of fault or wear activity.
Partial discharge is indicated.
Heating is indicated.
Abnormal arcing is indicated.

Follow guidelines for oils with high flammable gas content.

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Tapchanger Activity Signature Analysis TASA™

Glenn Samms	Location :	Pulpit Rock	Date : 4/4/2023
Newfoundland Power	Bank & Phase :	PUL-T2	Report Number : 5079890
P.O. Box 8910	Serial Number :	46311-LTC	Purchase Order Number:
55 Kenmount Road	Ventilation :	Conservator	Manufacturer : ASEA
St. John's, NF A1B 3P6	Compartment :	Common	Model : UZERN200/300

Approved by:

Michelle Kutzleb, PhD
Director of Operations

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ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311
Manufacturer : FPL
Date Mfgd : 1985
Size (kVA) : 25000
Rating kV : 66

Date : 04-05-2023
Report Number : 5079889
Fluid volume : 600
Fluid type : Mineral Oil
Preservation : Conservator
Cooling : ONAN/ONAF/ONAF
Core & coil wt. : 22589
Impedance :

		Sample Date :	3/20/2023	2/8/2023	11/16/2022	8/18/2022	7/19/2022
		Laboratory No. :	5079889	5079764	5079438	5078595	5078286
		Container No. :	53414	53323	52714	51288	51292
		Temperature :	48	30	45	35	39
H2	Hydrogen	(ppm) :	21	24	8	34	19
CH4	Methane	(ppm) :	9	9	7	11	21
C2H6	Ethane	(ppm) :	2	2	1	3	12
C2H4	Ethylene	(ppm) :	32	32	31	31	38
C2H2	Acetylene	(ppm) :	31	29	28	39	46
CO	Carbon monoxide	(ppm) :	346	378	314	488	610
CO2	Carbon dioxide	(ppm) :	2181	2511	2256	2121	2750
N2	Nitrogen	(ppm) :	79073	85398	81395	75442	84367
O2	Oxygen	(ppm) :	21856	24955	26048	3841	3708
		Total (ppm) :	103551	113338	110088	82010	91571
		TDCG (ppm) :	441	474	389	606	746
		SHL (%) :	9.44	9.41	10.55	9.27	10.39
		ETCG (% in blanket) :	0.32	0.32	0.26	0.54	0.56
Particles		5 to 15 um :	3571	1947	123	295	1684
Particles		15 to 25 um :	257	176	59	17	115
Particles		25 to 50 um :	79	90	13	1	52
Particles		50 to 100 um :	3	12	0	0	0
Particles		> 100 um :	1	0	0	0	0
D1533	Moisture	(ppm) :	14	5	9	16	15
D1816	Dielectric BV	(kV) :	26	33	37	36	23
D974	Acid Number	(mg KOH/g) :	0.05	0.06	0.06	0.04	0.05
D971	Interfacial Tension	(dynes/cm) :	29.7	35.0	23.1	24.8	23.0
D1500	Color Number	:	<2.5	<2.5	2.5	2.0	2.0
D924	Power Factor	:	0.119	0.126	0.106	0.121	0.128
D2668	Oxidation Inhibitor	(%) :	<0.010	<0.010	0.069	<0.010	<0.010
5 HMF	5 hydroxymethyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FAL	2 furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 ACF	2 acetylfuran	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
5 MEF	5 methyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FOL	2 furfurol	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
	Estimated DP	:	>1000	>1000	>1000	>1000	>1000

Transformer Condition Assessment Diagnostic Evaluation

TCA Assessment :	3 ID: 200331 Sampler: William Crane	3 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: Holly Best	4 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: David Warren

Sampling Interval : Retest in three months. Establish trends and confirm condition.

Operating Procedure : Monitor for increased arcing. Evaluate for worn or damaged components.

Comments : Arcing is indicated. Partial discharge is indicated. Paper condition is normal.

Field Comments : Fluid condition is within acceptable in-service parameters.

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Transformer Condition Assessment TM

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location :	Pulpit Rock
Bank & Phase :	PUL-T2
Serial Number :	46311
Manufacturer :	FPL
Date Mfgd :	1985
Size (kVA) :	25000
Rating kV :	66

Date :	04-05-2023
Report Number :	5079889
Fluid volume :	600
Fluid type :	Mineral Oil
Preservation :	Conservator
Cooling :	ONAN/ONAF/ONAF
Core & coil wt. :	22589
Impedance :	

Approved by:

Michelle Kutzleb, PhD
Director of Operations

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment™

Date : 05-26-2023

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311
Manufacturer : FPL
Date Mfgd : 1985
Size (kVA) : 25000
Rating kV : 66

Report Number : 5080048
Fluid volume : 600
Fluid type : Mineral Oil
Preservation : Conservator
Cooling : ONAN/ONAF/ONAF
Core & coil wt. : 22589
Impedance :

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

		Sample Date :	5/8/2023	3/20/2023	2/8/2023	11/16/2022	8/18/2022
		Laboratory No. :	5080048	5079889	5079764	5079438	5078595
		Container No. :	53417	53414	53323	52714	51288
		Temperature :	31	48	30	45	35
H2	Hydrogen	(ppm) :	13	21	24	8	34
CH4	Methane	(ppm) :	6	9	9	7	11
C2H6	Ethane	(ppm) :	1	2	2	1	3
C2H4	Ethylene	(ppm) :	31	32	32	31	31
C2H2	Acetylene	(ppm) :	34	31	29	28	39
CO	Carbon monoxide	(ppm) :	293	346	378	314	488
CO2	Carbon dioxide	(ppm) :	2212	2181	2511	2256	2121
N2	Nitrogen	(ppm) :	79052	79073	85398	81395	75442
O2	Oxygen	(ppm) :	31024	21856	24955	26048	3841
		Total (ppm) :	112666	103551	113338	110088	82010
		TDCG (ppm) :	378	441	474	389	606
		SHL (%) :	9.82	9.44	9.41	10.55	9.27
		ETCG (% in blanket) :	0.25	0.32	0.32	0.26	0.54
Particles		5 to 15 um :	1481	3571	1947	123	295
Particles		15 to 25 um :	51	257	176	59	17
Particles		25 to 50 um :	11	79	90	13	1
Particles		50 to 100 um :	2	3	12	0	0
Particles		> 100 um :	0	1	0	0	0
D1533	Moisture	(ppm) :	9	14	5	9	16
D1816	Dielectric BV	(kV) :	40	26	33	37	36
D974	Acid Number	(mg KOH/g) :	0.06	0.05	0.06	0.06	0.04
D971	Interfacial Tension	(dynes/cm) :	27.1	29.7	35.0	23.1	24.8
D1500	Color Number	:	2.0	<2.5	<2.5	2.5	2.0
D924	Power Factor	:	0.133	0.119	0.126	0.106	0.121
D2668	Oxidation Inhibitor	(%) :	<0.010	<0.010	<0.010	0.069	<0.010
5 HMF	5 hydroxymethyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FAL	2 furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 ACF	2 acetylfuran	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
5 MEF	5 methyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FOL	2 furfurol	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
	Estimated DP	:	>1000	>1000	>1000	>1000	>1000

Transformer Condition Assessment Diagnostic Evaluation

TCA Assessment :	3 ID: 200331 Sampler: David Warren	3 ID: 200331 Sampler: William Crane	3 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: Holly Best	4 ID: 200331 Sampler: David Warren

Sampling Interval : Retest in three months. Establish trends and confirm condition.

Operating Procedure : Monitor for increased arcing. Evaluate for worn or damaged components.

Comments : Arcing is indicated. Partial discharge is indicated. Paper condition is normal.

Field Comments : Fluid condition is within acceptable in-service parameters.

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Transformer Condition Assessment TM

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

		Date :	05-26-2023
Location :	Pulpit Rock	Report Number :	5080048
Bank & Phase :	PUL-T2	Fluid volume :	600
Serial Number :	46311	Fluid type :	Mineral Oil
Manufacturer :	FPL	Preservation :	Conservator
Date Mfgd :	1985	Cooling :	ONAN/ONAF/ONAF
Size (kVA) :	25000	Core & coil wt. :	22589
Rating kV :	66	Impedance :	

Approved by:

Michelle Kutzleb, PhD
Director of Operations

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311
Manufacturer : FPL
Date Mfgd : 1985
Size (kVA) : 25000
Rating kV : 66

Date : 07-31-2023
Report Number : 5080444
Fluid volume : 600
Fluid type : Mineral Oil
Preservation : Conservator
Cooling : ONAN/ONAF/ONAF
Core & coil wt. : 22589
Impedance :

		Sample Date :	7/13/2023	5/8/2023	3/20/2023	2/8/2023	11/16/2022
		Laboratory No. :	5080444	5080048	5079889	5079764	5079438
		Container No. :	4660	53417	53414	53323	52714
		Temperature :	47	31	48	30	45
H2	Hydrogen	(ppm) :	17	13	21	24	8
CH4	Methane	(ppm) :	6	6	9	9	7
C2H6	Ethane	(ppm) :	1	1	2	2	1
C2H4	Ethylene	(ppm) :	34	31	32	32	31
C2H2	Acetylene	(ppm) :	38	34	31	29	28
CO	Carbon monoxide	(ppm) :	335	293	346	378	314
CO2	Carbon dioxide	(ppm) :	1919	2212	2181	2511	2256
N2	Nitrogen	(ppm) :	72869	79052	79073	85398	81395
O2	Oxygen	(ppm) :	27096	31024	21856	24955	26048
		Total (ppm) :	102315	112666	103551	113338	110088
		TDCG (ppm) :	431	378	441	474	389
		SHL (%) :	9.65	9.82	9.44	9.41	10.55
		ETCG (% in blanket) :	0.32	0.25	0.32	0.32	0.26
Particles		5 to 15 um :	1513	1481	3571	1947	123
Particles		15 to 25 um :	47	51	257	176	59
Particles		25 to 50 um :	6	11	79	90	13
Particles		50 to 100 um :	0	2	3	12	0
Particles		> 100 um :	0	0	1	0	0
D1533	Moisture	(ppm) :	8	9	14	5	9
D1816	Dielectric BV	(kV) :	33	40	26	33	37
D974	Acid Number	(mg KOH/g) :	0.06	0.06	0.05	0.06	0.06
D971	Interfacial Tension	(dynes/cm) :	26.2	27.1	29.7	35.0	23.1
D1500	Color Number	:	<2.5	2.0	<2.5	<2.5	2.5
D924	Power Factor	:	0.124	0.133	0.119	0.126	0.106
D2668	Oxidation Inhibitor	(%) :	<0.010	<0.010	<0.010	<0.010	0.069
5 HMF	5 hydroxymethyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FAL	2 furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 ACF	2 acetylfuran	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
5 MEF	5 methyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FOL	2 furfurol	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
	Estimated DP	:	>1000	>1000	>1000	>1000	>1000

Transformer Condition Assessment Diagnostic Evaluation

TCA Assessment :	3 ID: 200331 Sampler: William Crane	3 ID: 200331 Sampler: David Warren	3 ID: 200331 Sampler: William Crane	3 ID: 200331 Sampler: David Warren	4 ID: 200331 Sampler: Holly Best

Sampling Interval : Retest in three months.

Operating Procedure : Monitor for increased arcing. Evaluate for worn or damaged components.

Comments : Arcing and heating at higher temperatures are indicated. Paper condition is normal.

Field Comments : Fluid condition is within acceptable in-service parameters.

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment TM

		Date :	07-31-2023
	Location : Pulpit Rock	Report Number :	5080444
	Bank & Phase : PUL-T2	Fluid volume :	600
Glenn Samms	Serial Number : 46311	Fluid type :	Mineral Oil
Newfoundland Power	Manufacturer : FPL	Preservation :	Conservator
P.O. Box 8910	Date Mfgd : 1985	Cooling :	ONAN/ONAF/ONAF
55 Kenmount Road	Size (kVA) : 25000	Core & coil wt. :	22589
St. John's, NF A1B 3P6	Rating kV : 66	Impedance :	

Approved by:

Michelle Kutzleb, PhD
Director of Operations

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Tapchanger Activity Signature Analysis TASA ™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311-LTC
Ventilation : Conservator
Compartment : Common

Date : 11/7/2023
Report Number : 5081189
Purchase Order Number:
Manufacturer : ASEA
Model : UZERN200/300

		Sample Date :	11/1/2023	3/20/2023	9/29/2022	6/8/2022	1/17/2022
		Laboratory No. :	5081189	5079890	5079108	5077241	5076545
		Container No. :	54473	53411	52747	45361	47734
		Temperature :	11	5	19	6	3
H2	Hydrogen	(ppm) :	6342	6878	5936	7954	8078
CH4	Methane	(ppm) :	379	385	385	305	316
C2H6	Ethane	(ppm) :	16	19	17	15	22
C2H4	Ethylene	(ppm) :	461	557	505	367	335
C2H2	Acetylene	(ppm) :	3644	2946	2412	3746	3778
CO	Carbon monoxide	(ppm) :	314	313	308	293	299
CO2	Carbon dioxide	(ppm) :	2189	1834	2138	1638	1705
N2	Nitrogen	(ppm) :	68673	74805	70499	86778	88384
O2	Oxygen	(ppm) :	22222	21156	18819	20659	18839
		Total (ppm) :	104240	108893	101019	121755	121756
		TDCG (ppm) :	11156	11098	9563	12680	12828
		SHL (%) :	4.00	4.01	4.02	3.99	3.99
		ETCG (% in blanket) :	12.58	12.65	11.81	12.81	12.91
Particles		5 to 15 um :	46989	63862	707	68107	94797
Particles		15 to 25 um :	197	346	37	111	403
Particles		25 to 50 um :	20	65	45	9	48
Particles		50 to 100 um :	0	2	4	0	3
Particles		> 100 um :	0	1	0	0	0
D1533	Moisture	(ppm) :	9	15	17	15	9
D1816	Dielectric BV	(kV) :	43	33	33	38	36
D974	Acid Number	(mg KOH/g) :	0.04	0.04	<0.02	0.03	0.03
D971	Interfacial Tension	(dynes/cm) :	26.8	26.8	24.9	28.4	30.9
D1500	Color Number	:	<2.0	<2.0	2.0	<2.0	<2.0

Tapchanger Activity Signature Analysis Diagnostic Evaluation

TASA Assessment :	2 ID: 200331 Sampler: David Warren Counter: 70339	2 ID: 200331 Sampler: William Crane Counter: 69635	2 ID: 200331 Sampler: David Warren Counter: 6819	2 ID: 200331 Sampler: David Warren Counter: 67363	2 ID: 200331 Sampler: Brent Green Counter:6639

Sampling Interval : Recommend retest within 150 days (5 months) for trending.
Operating Procedure : Monitor for increased arcing. Evaluate for worn or damaged components.
Comments : A slightly abnormal dissipation of energy is noted. This is an early indication of fault or wear activity.
Partial discharge is indicated.
Abnormal arcing is indicated.
Follow guidelines for oils with high flammable gas content.

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Tapchanger Activity Signature Analysis TASA™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location :	Pulpit Rock
Bank & Phase :	PUL-T2
Serial Number :	46311-LTC
Ventilation :	Conservator
Compartment :	Common
Date :	11/7/2023
Report Number :	5081189
Purchase Order Number:	
Manufacturer :	ASEA
Model :	UZERN200/300

Approved by:

Michelle Kutzleb, PhD
Director of Operations

TJ | H2b
ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311
Manufacturer : FPL
Date Mfgd : 1985
Size (kVA) : 25000
Rating kV : 66

Date : 11-15-2023
Report Number : 5081188
Fluid volume : 600
Fluid type : Mineral Oil
Preservation : Conservator
Cooling : ONAN/ONAF/ONAF
Core & coil wt. : 22589
Impedance :

		Sample Date :	11/1/2023	7/13/2023	5/8/2023	3/20/2023	2/8/2023
		Laboratory No. :	5081188	5080444	5080048	5079889	5079764
		Container No. :	54464	4660	53417	53414	53323
		Temperature :	36	47	31	48	30
H2	Hydrogen	(ppm) :	17	17	13	21	24
CH4	Methane	(ppm) :	7	6	6	9	9
C2H6	Ethane	(ppm) :	1	1	1	2	2
C2H4	Ethylene	(ppm) :	34	34	31	32	32
C2H2	Acetylene	(ppm) :	34	38	34	31	29
CO	Carbon monoxide	(ppm) :	405	335	293	346	378
CO2	Carbon dioxide	(ppm) :	2600	1919	2212	2181	2511
N2	Nitrogen	(ppm) :	71485	72869	79052	79073	85398
O2	Oxygen	(ppm) :	21820	27096	31024	21856	24955
		Total (ppm) :	96403	102315	112666	103551	113338
		TDCG (ppm) :	498	431	378	441	474
		SHL (%) :	10.03	9.65	9.82	9.44	9.41
		ETCG (% in blanket) :	0.39	0.32	0.25	0.32	0.32
Particles		5 to 15 um :	4895	1513	1481	3571	1947
Particles		15 to 25 um :	160	47	51	257	176
Particles		25 to 50 um :	31	6	11	79	90
Particles		50 to 100 um :	1	0	2	3	12
Particles		> 100 um :	0	0	0	1	0
D1533	Moisture	(ppm) :	8	8	9	14	5
D1816	Dielectric BV	(kV) :	41	33	40	26	33
D974	Acid Number	(mg KOH/g) :	0.07	0.06	0.06	0.05	0.06
D971	Interfacial Tension	(dynes/cm) :	24.0	26.2	27.1	29.7	35.0
D1500	Color Number	:	2.0	<2.5	2.0	<2.5	<2.5
D924	Power Factor	:	0.100	0.124	0.133	0.119	0.126
D2668	Oxidation Inhibitor	(%) :	<0.010	<0.010	<0.010	<0.010	<0.010
5 HMF	5 hydroxymethyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FAL	2 furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 ACF	2 acetylfuran	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
5 MEF	5 methyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FOL	2 furfurol	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
	Estimated DP	:	>1000	>1000	>1000	>1000	>1000

Transformer Condition Assessment Diagnostic Evaluation

TCA Assessment :	3 ID: 200331 Sampler: David Warren	3 ID: 200331 Sampler: William Crane	3 ID: 200331 Sampler: David Warren	3 ID: 200331 Sampler: William Crane	3 ID: 200331 Sampler: David Warren

Sampling Interval : Retest in three months.

Operating Procedure : Monitor for increased arcing. Evaluate for worn or damaged components.

Comments : Arcing is indicated. Partial discharge is indicated. Paper condition is normal.

Field Comments : Fluid condition is within acceptable in-service parameters.

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment TM

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location :	Pulpit Rock
Bank & Phase :	PUL-T2
Serial Number :	46311
Manufacturer :	FPL
Date Mfgd :	1985
Size (kVA) :	25000
Rating kV :	66

Date :	11-15-2023
Report Number :	5081188
Fluid volume :	600
Fluid type :	Mineral Oil
Preservation :	Conservator
Cooling :	ONAN/ONAF/ONAF
Core & coil wt. :	22589
Impedance :	

Approved by:

Michelle Kutzleb, PhD
Director of Operations

TJ | H2b ANALYTICAL SERVICES INCORPORATED

Transformer Condition Assessment™

Glenn Samms
Newfoundland Power
P.O. Box 8910
55 Kenmount Road
St. John's, NF A1B 3P6

Location : Pulpit Rock
Bank & Phase : PUL-T2
Serial Number : 46311
Manufacturer : FPL
Date Mfgd : 1985
Size (kVA) : 25000
Rating kV : 66

Date : 12-01-2023
Report Number : 5081286
Fluid volume : 600
Fluid type : Mineral Oil
Preservation : Conservator
Cooling : ONAN/ONAF/ONAF
Core & coil wt. : 22589
Impedance :

		Sample Date :	11/15/2023	11/1/2023	7/13/2023	5/8/2023	3/20/2023
		Laboratory No. :	5081286	5081188	5080444	5080048	5079889
		Container No. :	54497	54464	4660	53417	53414
		Temperature :	32	36	47	31	48
H2	Hydrogen	(ppm) :	22	17	17	13	21
CH4	Methane	(ppm) :	8	7	6	6	9
C2H6	Ethane	(ppm) :	2	1	1	1	2
C2H4	Ethylene	(ppm) :	36	34	34	31	32
C2H2	Acetylene	(ppm) :	34	34	38	34	31
CO	Carbon monoxide	(ppm) :	486	405	335	293	346
CO2	Carbon dioxide	(ppm) :	2865	2600	1919	2212	2181
N2	Nitrogen	(ppm) :	71204	71485	72869	79052	79073
O2	Oxygen	(ppm) :	14174	21820	27096	31024	21856
		Total (ppm) :	88831	96403	102315	112666	103551
		TDCG (ppm) :	588	498	431	378	441
		SHL (%) :	9.98	10.03	9.65	9.82	9.44
		ETCG (% in blanket) :	0.50	0.39	0.32	0.25	0.32
Particles		5 to 15 um :	655	4895	1513	1481	3571
Particles		15 to 25 um :	31	160	47	51	257
Particles		25 to 50 um :	9	31	6	11	79
Particles		50 to 100 um :	0	1	0	2	3
Particles		> 100 um :	0	0	0	0	1
D1533	Moisture	(ppm) :	10	8	8	9	14
D1816	Dielectric BV	(kV) :	30	41	33	40	26
D974	Acid Number	(mg KOH/g) :	0.07	0.07	0.06	0.06	0.05
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D2668	Oxidation Inhibitor	(%) :	<0.010	<0.010	<0.010	<0.010	<0.010
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2 ACF	2 acetylfuran	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
5 MEF	5 methyl-2-furaldehyde	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
2 FOL	2 furfurol	(ppm) :	<0.010	<0.010	<0.010	<0.010	<0.010
	Estimated DP	:	>1000	>1000	>1000	>1000	>1000

Transformer Condition Assessment Diagnostic Evaluation

TCA Assessment :	3 ID: 200331 Sampler: David Warren	3 ID: 200331 Sampler: David Warren	3 ID: 200331 Sampler: William Crane	3 ID: 200331 Sampler: David Warren	3 ID: 200331 Sampler: William Crane

Sampling Interval : Retest in three months.

Operating Procedure : Monitor for increased arcing. Evaluate for worn or damaged components.

Comments : Arcing is indicated. Partial discharge is indicated. Paper condition is normal.

Field Comments : Fluid condition is within acceptable in-service parameters.

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Transformer Condition Assessment TM

Glenn Samms
Newfoundland Power
P.O. Box 8910
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Approved by:

Michelle Kutzleb, PhD
Director of Operations