# Page 1 of 8

1	Q.	Provide a description of Hydro's preventive maintenance plan as it relates to the
2		inspection of boiler tubes including but not limited to:
3		i. the schedule for the testing of the various boiler tubes (broken down by
4		specific areas) at the Holyrood Thermal Generating Plant;
5		ii. the last recorded preventive maintenance testing of the boiler tubes for Unit
6		1 and Unit 2; and
7		iii. the results of the last recorded preventive maintenance testing or of any
8		other testing that occurred.
9		
10		
11	A.	Boiler Tube Description
12		Holyrood boiler tubing can be classified as tubes containing feedwater
13		(economizer), tubes containing steam (superheat and reheat) and waterwall tubes.
14		Feedwater tubing is located in the boiler just before the exhaust gas leaves the
15		boiler and preheats the water to be turned into steam. The superheat and the
16		reheat tubing are located in the upper parts of the boiler and is where the steam
17		temperature is increased for use in the steam turbine. Waterwall tubing is part of
18		the boiler walls and is where the water is boiled to generate steam.
19		
20		Boiler Tube Maintenance Strategy
21		Hydro's strategy for maintaining Holyrood is to do so in a safe, economically
22		responsible and practical manner. Hydro utilizes operating experience and analysis
23		of inspection and maintenance data to determine the actions required to continue
24		the primary and standby generation required as per the Labrador and Maritime Link
25		In-Feeds integration plans.

Page 2 of 8

1	Specifically, Hydro's strategy for tube maintenance is founded on the Inspection
2	and Test Plan developed in 2010 in conjunction with boiler maintenance contractor
3	Alstom, the condition assessments conducted by expert personnel, including
4	engineering consulting firm AMEC, advice and guidance from Hydro's expert boiler
5	maintenance contractors and Hydro's operational and maintenance knowledge.
6	
7	The AMEC condition assessment followed Electric Power Research Institute (EPRI)
8	Level 1 and Level 2 assessment standards. A Level 1 EPRI assessment consists of
9	experienced design and operating/maintenance specialists conducting condition
10	assessments based on historical data, interviews of operational and maintenance
11	personnel and visual inspections. No detailed testing or inspections are conducted.
12	A level 2 assessment consists of focused inspections and, typically, nondestructive
13	tests usually on areas of significant concern identified from Level 1 to detect issues.
14	
15	In the 2010 Level 1 assessment, AMEC advised, with regards to boiler tubes, that
16	reliable service is achievable to 2020 with ongoing inspections and refurbishments.
17	In the Level 2 assessment, conducted in 2012-2013, with respect to boiler tubes,
18	AMEC recommended additional inspections and that wall thinning of the boiler
19	tubing be managed through boiler maintenance.
20	
21	In 2010, Alstom, the original contractor and OEM, reported that there was
22	corrosion in Unit 1 lower reheat sections and recommended continued monitoring
23	of the tubes and budgeting for tubing replacements. Consequently, Hydro acquired
24	replacement tubing and materials to be used for replacement of possible future
25	failed tubing.

# Page 3 of 8

1	Babcock & Wilcox, Hydro's present boiler maintenance contractor, published a
2	Plant Service Bulletin "Tube Thickness Evaluation Repair or Replacement
3	Guideline". Please see PUB-NLH-001 Attachment 1. It states:
4	
5	Purpose
6	This bulletin was written to assist customers in evaluating existing boiler
7	tube wall thicknesses and defining when repair or replacement is
8	recommended.
9	
10	Background
11	Experience has shown that many tubes do not necessarily fail when
12	operating at thickness below the minimum wall calculated, according to
13	the ASME Code. However, operation in this manner encroaches on the ASME
14	Code design margin. A tube that is below minimum wall thickness may or
15	may not be tolerant of temperature, thermal cycling, mechanical loading
16	and other stresses.
17	
18	Cognizant of this, some operators have elected to take a practical
19	approach, based on actual operating experience, to determine when to
20	repair or replace thinned tubes. A practical minimum wall thickness
21	criterion can be established through a record-keeping process, to track the
22	wall thickness of various boiler tubes over time and to relate tube failure
23	history of those tubes to tube thickness. This is an effective method for
24	locating troubled areas before they lead to forced outages. With this
25	method, the decision to take action for thinned tubes is based on a
26	percentage of the original wall thickness (t) of the tubes. (Emphasis added)

# Page 4 of 8

1	Additic	onally, in PSB-26, B&W advise that the decision to repair or replace tubing
2	that is	under the original specified minimum wall thickness should consider the
3	history	of previous failures of similar tubes, wastage rate (rate of thinning of the
4	tube w	all), susceptibility to temperature fluctuations, thermal cycling, mechanical
5	loading	g, scheduling outages of sufficient length to replace tubes, and risk of injury
6	to pers	connel from primary failure or subsequent reactions.
7		
8	Consid	ering the above advice from AMEC and the boiler contractors, for the water
9	wall, su	uperheater and feedwater tubing, Hydro has adopted a maintenance strategy
10	which	involves ongoing monitoring of the tubing and proactively conducting tubing
11	replace	ements where practicable. As well as the AMEC and the boiler contractors'
12	advice,	, the following additional items were considered by Hydro in adopting its
13	mainte	enance strategy for reheat tubing:
14		
15	•	Continuation and enhancement of tubing inspections and testing to monitor
16		the tubing's overall state;
17	•	At the time of obtaining the advice from AMEC and the boiler contractors,
18		Unit 1 and Unit 2 had not experienced a reheat tubing failure;
19	•	There is a short remaining operational life for the boilers;
20	•	There is no safety risk from a reheat tubing failure as the uncontrolled
21		release of energy will be contained within the boiler;
22	•	If a failure occurred, the boiler could be removed from service in a
23		controlled, safe manner;
24	•	Replacement of failed reheat tubing would involve a smaller amount of
25		tubing compared to replacement of all reheat tubing;
26	•	Replacement tubing and materials were acquired; and

# Page 5 of 8

1	<ul> <li>Replacement of failed tubes would be accomplished within a reasonable</li> </ul>
2	timeframe.
3	
4	Boiler Maintenance Plan
5	Hydro executes its boiler tubing maintenance plan annually. Completion of this
6	maintenance plan is part of Hydro's winter readiness preparations.
7	
8	The preventative activities for all tubing are:
9	<ul> <li>Washing and cleaning of boiler tubes, if required;</li> </ul>
10	Visual inspection of all accessible areas;
11	<ul> <li>Nondestructive ultrasonic thickness testing of accessible tubing;</li> </ul>
12	Correction of observed failures observed during on-going inspection and
13	testing;
14	• Execution of maintenance activities established from analysis of the
15	previous year inspection and testing;
16	• Prior to returning the unit to service, a hydrostatic pressure test of the
17	tubing (except for the reheat tubing, as it cannot be isolated from the
18	turbine) is done at approximate operating service pressure. If any leaks are
19	found they are repaired and the test is repeated; and
20	<ul> <li>Inspection and testing data is reviewed and next year's annual maintenance</li> </ul>
21	plan is prepared.
22	
23	Due to the large amount of reheat tubing (approximately 3900 feet) and the
24	difficulty to access all the reheat tubing, the preventative maintenance ultrasonic

# Page 6 of 8

1	testing is undertaken in a sampling of reheat tubing locations that is more
2	susceptible to thinning .
3	Also, once every three years, on a rotating schedule for Unit 1, 2 and 3, samples of
4	the waterwall tubing are removed and inspected by a lab to assess the physical
5	condition of the tubes and to determine the quantity of internal deposits on the
6	tube surface. If a deposit is excessive and not removed, it may cause a tube failure
7	which could result in a unit trip.
8	
9	Hydro has an inventory of various tubing and materials to allow for limited tube
10	replacement in the boilers. In 2012, to mitigate the duration of replacing failed
11	lower reheat tubing, Hydro increased its inventory of tubing and materials so as to
12	be able to replace the entire bottom row in Unit 1 or Unit 2, should the need arise.
13	
14	Preventive Maintenance Testing and Results
15	The most recent preventive maintenance testing for Unit 1 and 2 tubing occurred as
16	detailed below:
17	Ultrasonic Thickness and Hydrostatic Pressure (Hydrostatic Pressure testing
18	cannot be completed on reheat tubing as it cannot be isolated from the
19	turbine)
20	1. Unit 1: September 2015
21	2. Unit 2: July 2015
22	Waterwall Tube Assessments
23	1. Unit 1: 2013
24	2. Unit 2: 2014
25	

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The results of the most recent preventative maintenance testing are in Attachments
 1 thru 6.

3

6

4 The area in which the 2016 tubing failure occurred is the lower reheat section of 5 the boiler, "8th Floor, Overhead" and it is location is shown in the diagram below.





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1	A	verage Thickn	ess
2	8th Floor, O	verhead, "Lov	ver Reheater"
3		Inches	% Original
4	Unit 1, 2015	0.116	78.4%
5	Unit 1, 2014	0.126	85.1%
6	Unit 2, 2015	0.118	79.7%
7	Unit 2, 2014	0.134	90.5%

8 The 2014 results show that the reheat tubing in the area of the failures had an 9 average thickness of 85% or more as compared to the original thickness. This 10 thickness was after 45 and 46 years of operation for Units 1 and 2 respectively. The 11 2015 thicknesses show increased tube thinning in Unit 1 and 2.

12

13 In 2016, the reheaters in Unit 1 and Unit 2 incurred their first tube failure in their 14 operational history. In response, Hydro evaluated tube inspection and maintenance 15 data, as well as the electrical system load forecast, and then executed a tube 16 replacement work plan. During that work, failed tubes were replaced, as well as additional replacements of other tubing found through inspections to have 17 thicknesses similar to the failed tubes. As an additional response, due to the 18 average thickness being below 85%, the point at which Babcock & Wilcox PSB-26 19 20 recommends replacement, and for which Hydro now has experienced failures, 21 Hydro is planning replacement of the lower reheat tubing in 2016 and as such will 22 submit, to the Board, a supplemental application for lower heat tube replacement 23 in Unit 1 and 2. As part of the work this year, additional tubing thickness 24 assessment will be undertaken to allow Hydro to determine if a further derating of 25 Unit 1 and 2 is required.

# Tube Thickness Evaluation Repair or Replacement Guideline

#### Purpose

This bulletin was written to assist customers in evaluating existing boiler tube wall thicknesses and defining when repair or replacement is recommended.

### Background

Experience has shown that many tubes do not necessarily fail when operating at thicknesses below the minimum wall calculated, according to the ASME Code. However, operation in this manner encroaches on the ASME Code design margin. A tube that is below minimum wall thickness may or may not be tolerant of temperature excursions, thermal cycling, mechanical loading and other stresses.

Cognizant of this, some operators have elected to take a practical approach, based on actual operating experience, to determine when to repair or replace thinned tubes. A practical minimum wall thickness criterion can be established through a record-keeping process, to track the wall thickness of various boiler tubes over time and to relate tube failure history of those tubes to tube thicknesses. This is an effective method for locating troubled areas before they lead to forced outages. With this method, the decision to take action for thinned tubes is based on a percentage of the original wall thickness (t) of the tubes.

Since high-temperature (steam-cooled) tubes usually fail by creep-rupture, and water-cooled tubes usually operate below the creep-rupture regime, a different set of evaluation criteria is required for each of these two types of tubes. Furnace tubes of once-through boilers operate at high temperatures and therefore are classified as steam-cooled tubes when evaluating tube thickness. A guideline for determining what course of action to take is shown in Table I.

Many factors were used and taken into consideration for establishing the usable thickness guideline. One of these factors is the need to avoid material yielding as the tube thins in service.

The decision to repair or replace tubing that is under the original specified minimum wall thickness

Guideline		
Location Thio Sp	Actual Tube Wall ckness Relative to Percent becified Wall Thickness, t	Course of Action
1. Furnace Support Tubes and Economizer Stringer Support Tubes	Tubes equal to or greater than 85% t	Monitor thickness
	Tubes less than 85% t	Restore tube wall thickness or replace tube*
2. Economizer, Furnace Wall and other Water-Cooled Tubes	Tubes equal to or greater than 70% t	Monitor thickness
	Tubes less than 70% t	Restore tube wall thickness or replace tube*
3. Superheater, Reheater and Other Steam- Cooled Tubes	Tubes equal to or greater than 85% t	Monitor thickness
2	Tubes less than 85% t	Restore tube wall thickness or replace tube*
*It is difficult to restore the wall t weld burn through and distortion. boilers operating below 1000 psi ASME minimum wall thickness.	hickness for tubes below .090 in On Kraft Recovery boilers, Refu g the tubes should be replaced	nch due to possible ise boilers, and when below the

should be evaluated by the operating company and discussed with the local jurisdiction and/or insurance carrier. This evaluation should consider the following:

- 1. History of previous failures of similar tubes
- 2. Wastage rate
- 3. Susceptibility to temperature excursion
- 4. Thermal cycling
- 5. Mechanical loading
- 6. Scheduling of outages of sufficient length to replace tubes
- 7. Risk of injury to personnel from primary failure or subsequent reactions

#### Recommendations

Customers should develop a program for their individual boilers using this as a guide to collect the specific information needed for reliable maintenance planning.

When replacing short tube segments, it is recommended that replacement tubing be the same OD, thickness and material specification as the original. When replacing large sections, an engineering review should be made to determine the advisability of upgrading to the latest design criteria or to apply other design changes that may eliminate existing problems. Arbitrarily increasing the tube wall thickness or alloy grade is not recommended, as it may lead to additional problems. All boiler tubes may be replaced without weld restriction providing a qualified welding procedure is employed, together with a welding filler metal that is appropriate for the alloy content, tensile strength and service temperature of the tubing.

ALL REPAIRS MUST BE ACCEPTABLE TO THE GOVERNING CODE JURISDICTION AND/OR INSURANCE CARRIER.

#### Support

If you elect to follow the above guidelines, Babcock & Wilcox can assist in developing the specific information needed for an individual unit. Contact Babcock & Wilcox Field Service Engineering if you have any questions or need assistance.

#### For more information...

# In the U.S., call 1-800-BABCOCK (222-2625) or fax (216) 860-1886 (Barberton, Ohio). Outside the U.S., call (519) 621-2130 or fax (519) 621-2142 (Cambridge, Ontario, Canada). In Mexico, call (5) 208-1906 or fax (5) 533-5550. Or contact your nearest B&W sales or service office worldwide.

Akron, (Wadsworth), Ohio Ankara, Turkey Atlanta, Georgia Beijing, P.R.O. China Birmingham, Alabama Boston (Westborough), Massachusetts Cambridge, Ontario, Canada Charlotte, North Carolina Cherry Hill, New Jersey Chicago (Lisle), Illinois

#### Cincinnati, Ohio Dallas, Texas Denver (Lakewood), Colorado Edmonton , Alberta, Canada Halifax (Dartmouth), Nova Scotia, Canada Houston, Texas Jakarta, Indonesia Kansas City, Missouri Los Angeles (Los Alamitos), California Melville, Saskatchewan, Canada

Mexico City, Mexico Montreal, Quebec, Canada New York, New York Portland, Oregon (Vancouver, WA) Pune, India Saint John, New Brunswick, Canada St. Petersburg, Florida San Francisco (Vacaville), California Vancouver (Richmond), British Columbia, Canada

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PUB-NLH-001, Attachment 2



### Page 1 of 2, 2016 Standby Fuel Deferral Application BABCOCK & WILCOX INTERNATIONAL DIVISION HYDROSTATIC/PRESSURE TEST REPORT

Prod. Code.	Order	Part Name		a ha na shi ku shi ku shi ku she ku ku she ku she ka ku shekara ka shekara ka shekara ka shekara ka shekara ka		Unit No	
	or doi	Linit #1 Roi	ilor Holyroo	d Con Station Bower	Poilor	4	
			lier Holyroo	Gen. Station - Power	Doller	1	
Customer				Location			
NL Hydro				NL Hydro, Holyrood			
Procedure			Rev.	Addendum			Rev.
245003			0	DCS Print Pressure T	rend		
Dwg. No.				Design Pressure			
				15,203KPa			
Test Pressure Rec	ı'd.		Exam Pres.	Req'd.	Hold Time	As Required	
12,000kPa			12,000kPa		15 min req	d	
Gauge No.	Unit:	DCS	Range:		Cal. Date		
	Pump:		Range:		Cal. Date		
Test Medium	č.			Temperature of Compo	onent:	DCS	
Water				Temperature of Mediu	m:	20 deg C	
	Test Press	sure		E	xamination	Pressure	
Drum:		12,000 kPa	PSIG/kPa			12,000 kPa	PSIG/kPa
Tube Side:		12,000 kPa	PSIG/kPa			12,000 kPa	PSIG/kPa
Shell Side:			PSIG/kPa				PSIG/kPa
Test							

#### Test Results:

The Unit was hydrostatically brought up to approximately 12,000kPa and the internal pressure was held for roughly 30 min. While the Unit pressure was rising B&W Representatives Kris Jacobs and Shaun Lingley, performed internal visual inspections on all accessible elevations, as well as inspections where external work was performed during the 2015 Maintenance Outage, no leaks were detected. The unit was then depressurized and returned to NL Hydro operations.

SIGNATURES	REPRESENTING	INSPECTION STATUS	DATE
Evaluator: Kris Jacobs	BABCOCK & WILCOX	oK	2015/Nov/04
A.I.:			
Customer: Evan libert And the	NL Hydro	OK	2015/Nov/04
Other: Shaun Lingley	BABCOCK & WILCOX	OK	2015/Nov/04

Page 1



Page 2

Date:10/1/2015 PUB-NLH-001, Attachment 3 Page 1 of 2, 2016 Standby Fuel Deferral Application



# BAN babcock & wilcox power generation group canada HYDROSTATIC/PRESSURE TEST REPORT

Prod. Code.					the second s		
1	Order	Part Name				Unit No.	
		Unit #2 Bo	iler Holyroo	d Gen. Station - Power	Boiler	2	
Customer				Location			
NL Hydro - Nalco	r			NL Hydro, Holyrood, I	NL		
Procedure			Rev.	Addendum			Rev.
245003			0	DCS Print Pressure T	rend		
Dwg. No.				Design Pressure 15,203KPa			
Test Pressure Rec	q'd.		Exam Pres.	Req'd.	Hold Time	As Required	
12,000kPa			12,000kPa		20 min req'	d	
Gauge No.	Unit:	DCS	Range:		Cal. Date		
	Pump:		Range:		Cal. Date		
Test Medium				Temperature of Compo	onent:	DCS	
Water				Temperature of Mediur	m:	20 deg C	
	Test Press	ure		E	xamination I	Pressure	
Drum:		12,000kPa	PSIG/kPa			12,000kPa	PSIG/kPa
Drum: Tube Side:		12,000kPa 12,000kPa	PSIG/kPa PSIG/kPa			12,000kPa 12,000kPa	PSIG/kPa PSIG/kPa
Drum: Tube Side: Shell Side:		12,000kPa 12,000kPa	PSIG/kPa PSIG/kPa PSIG/kPa			12,000kPa 12,000kPa	PSIG/kPa PSIG/kPa PSIG/kPa
Drum: Tube Side: Shell Side: Test Results: The Unit was hyd While the Unit pre- inspections on all NL Hydro operatio	rostatically b essure was ri accessible o ons.	12,000kPa 12,000kPa prought up to sing B&W F elevations, r	PSIG/kPa PSIG/kPa PSIG/kPa o approxima Representati no leaks we	ately 12,000kPa and the ives Kris Jacobs and S re detected. The unit w	e internal pr Shaun Lingle vas then dep	12,000kPa 12,000kPa ressure was held by performed inte pressurized and r	PSIG/kPa PSIG/kPa PSIG/kPa for 20 min. ernal visual returned to
Drum: Tube Side: Shell Side: Test Results: The Unit was hyd While the Unit pre inspections on all NL Hydro operatio	rostatically b essure was ri accessible o ons.	12,000kPa 12,000kPa brought up ta sing B&W F elevations, r	PSIG/kPa PSIG/kPa PSIG/kPa o approxima Representati no leaks wei	ately 12,000kPa and the ives Kris Jacobs and S re detected. The unit w REPRESENT	e internal pr Shaun Lingle vas then dep	12,000kPa 12,000kPa ressure was held by performed inte pressurized and r	PSIG/kPa PSIG/kPa PSIG/kPa for 20 min. ernal visual returned to
Drum: Tube Side: Shell Side: Test Results: The Unit was hyd While the Unit pre- inspections on all NL Hydro operations Evaluator:	rostatically b essure was ri accessible o ons. SIGNATUR Kristofer Ja	12,000kPa 12,000kPa brought up to sing B&W F elevations, r	PSIG/kPa PSIG/kPa PSIG/kPa o approxima Representationo leaks were	ately 12,000kPa and the ives Kris Jacobs and S re detected. The unit w REPRESENT	e internal pr Shaun Lingle vas then dep ING	12,000kPa 12,000kPa essure was held by performed inte pressurized and r INSPECTION STATUS O.K.	PSIG/kPa PSIG/kPa PSIG/kPa for 20 min. ernal visual returned to DATE 2015/Sept/30
Drum: Tube Side: Shell Side: Test Results: The Unit was hyd While the Unit pre- inspections on all NL Hydro operations Evaluator: A.I.:	rostatically bessure was rid accessible ons. SIGNATUR Kristofer Ja	12,000kPa 12,000kPa prought up to sing B&W F elevations, r	PSIG/kPa PSIG/kPa PSIG/kPa o approxima Representati to leaks we	ately 12,000kPa and the ives Kris Jacobs and S re detected. The unit w REPRESENT	e internal pr bhaun Lingle vas then dep ING _COX	12,000kPa 12,000kPa essure was held by performed inte pressurized and r INSPECTION STATUS O.K.	PSIG/kPa PSIG/kPa PSIG/kPa for 20 min. ernal visual returned to DATE 2015/Sept/30
Drum: Tube Side: Shell Side: Test Results: The Unit was hyd While the Unit pre- inspections on all NL Hydro operations Evaluator: A.I.: Dustomer:	rostatically bessure was ridaccessible opns.	12,000kPa 12,000kPa prought up to sing B&W F elevations, r ES cobs	PSIG/kPa PSIG/kPa PSIG/kPa o approxima Representati no leaks we	ately 12,000kPa and the ives Kris Jacobs and S re detected. The unit w REPRESENT BABCOCK & WIL	e internal pr Shaun Lingle vas then dep	12,000kPa 12,000kPa essure was held by performed inte pressurized and r INSPECTION STATUS O.K.	PSIG/kPa PSIG/kPa PSIG/kPa for 20 min. ernal visual returned to DATE 2015/Sept/30

N





GE Power & Water Water & Process Technologies

Metallurgy Services 9669 Grogan's Mill Road The Woodlands, Texas 77380 281-367-6201 281-363-7794 Fax

#### METALLURGICAL DWD REPORT

Representative:	David Gosse	Plant:	NL Hydro
		Location:	Holyrood, Newfoundland and Labrador,
			Canada
		Unit:	1
		Report No.:	2013-0187-1
		Report Date:	July 3, 2013
		Sample Date:	May 24, 2013

#### **BACKGROUND**

A tube section from the waterwall (Tube 34, west wall, continuing south to north, 53 ft elevation) at the subject account was submitted for internal deposit-weight density (DWD) determination and internal deposit analysis. The service time was not indicated.

#### **RESULTS**

Figure 1 shows the tube sample, as received. Visual inspection revealed no evidence of imminent failure from overheating or fireside corrosion. There was no significant or excessive build-up of deposits noted on the external surface. The internal surface of the tube was covered with light-gray and brown deposits (Figures 2 and 3).

Glass bead blasting per NACE TM0199-99 was used to determine the DWD value. A test section was cut from a representative area of the tube and split longitudinally. Both sides were processed. The wind side of the tube was marked and is designated as Side I in this report. Before cleaning the internal surface, the approximate deposit thickness was measured using a point micrometer. Results of the process are presented in Table 1.

	DWD	Internal Surface Deposit Thickness		Wall Th	Internal Pit Depth	
DWD Section	(g/ft <sup>2</sup> )	min. (in.)	max. (in.)	min. (in.)	max. (in.)	max. (in.)
Side I	5.4	< 0.001	0.001	0.216	0.234	0.010
Side II	5.2	< 0.001	0.001	0.220	0.234	0.009

# TABLE 1.DWD RESULTS AND WALL THICKNESS DATA FROM<br/>TEST SECTION

After cleaning, the condition of the internal surface was evaluated (Figures 4 and 5). Corrosion pits were observed on both sides. The wall thickness and pit data are also listed in Table 1.

Scanning Electron Microscopy Energy Dispersive X-Ray Analysis (SEM-EDXA) was used to determine the inorganic elemental composition of the internal surface deposit. The results are listed in Table 2.

> Michael Adeosun Metallurgical Engineer



Element	Side I Deposit (wt %)
Iron	94.9
Manganese	1.3
Sodium	0.9
Aluminum	0.8
Sulfur	0.7
Silicon	0.7
Potassium	0.6
Calcium	0.2

Data is normalized with carbon and oxygen excluded.

# TABLE 2.SEMI-QUANTITATIVE ELEMENTAL SEM-EDXA OF THE<br/>INTERNAL SURFACE DEPOSIT

# PUB-NLH-001, Attachment 4 Page 4 of 5, 2016 Standby Fuel Deferral Application Page 4 of 5

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Figure 1. Photograph of the tube section, as received.





Figure 2. Photograph of internal surface of DWD test section, Side I.

Figure 3. Photograph of internal surface of DWD test section, Side II.

NL Hydro 2013-0187-1

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Figure 4. Photograph of internal surface of DWD test section, Side I, after mechanical cleaning.



Figure 5. Photograph of internal surface of DWD test section, Side II, after mechanical cleaning.



GE Power & Water Water & Process Technologies

Metallurgy Services 9669 Grogan's Mill Road The Woodlands, Texas 77380 281-367-6201 281-363-7794 Fax

#### METALLURGICAL DWD REPORT

Representative:David GossePlant:NL HydroLocation:Holyrood, Newfoundland and Labrador,<br/>CanadaUnit:2Report No.:2014-0296Report Date:September 24, 2014

#### **BACKGROUND**

A tube section from the waterwall (Tube 92, east wall, cold side, ~ 52 ft elevation) at the subject account was submitted for internal deposit-weight density (DWD) determination and internal deposit analysis. The service time was not indicated.

#### **RESULTS**

Figure 1 shows the tube sample, as received. Visual inspection revealed no evidence of imminent failure from overheating or fireside corrosion. There was no significant or excessive build-up of deposits noted on the external surface. The internal surface of the tube was covered with light-gray and brown deposits (Figures 2 and 3).

Glass bead blasting per NACE TM0199-99 was used to determine the DWD value. A test section was cut from a representative area of the tube and split longitudinally. Both sides were processed. The cold side of the tube was marked and is designated as Side II in this report. Before cleaning the internal surface, the approximate deposit thickness was measured using a point micrometer. Results of the process are presented in Table 1.

	DWD	Internal Surface Deposit Thickness		Wall Th	Internal Pit Depth	
DWD Section	(g/ft²)	min. (in.)	max. (in.)	min. (in.)	max. (in.)	max. (in.)
Side I	6.2	< 0.001	0.002	0.212	0.217	0.001
Side II	7.3	0.001	0.003	0.210	0.217	0.004

# TABLE 1.DWD RESULTS AND WALL THICKNESS DATA FROM<br/>TEST SECTION

After cleaning, the condition of the internal surface was evaluated (Figures 4 and 5). Shallow corrosion pits were observed on both sides. The wall thickness and pit data are also listed in Table 1.

Scanning Electron Microscopy Energy Dispersive X-Ray Analysis (SEM-EDXA) was used to determine the inorganic elemental composition of the internal surface deposit. The results are listed in Table 2.

> Michael Adeosun Metallurgical Engineer



TABLE 2.SEMI-QUANTITATIVE ELEMENTAL SEM-EDXA OF THE<br/>INTERNAL SURFACE DEPOSIT

# PUB-NLH-001, Attachment 5 Page 4 of 5, 2016 Standby Fuel Deferral Application $^{Page\ 4 \ of\ 5}$

### GE Power & Water Water & Process Technologies

Figure 1. Photograph of the tube section, as received.

Figure 2. Photograph of internal surface of DWD test section, Side I.

Figure 3. Photograph of internal surface of DWD test section, Side II.





NL Hydro 2014-0296

# GE Power & Water Water & Process Technologies

Figure 4. Photograph of internal surface of DWD test section, Side I, after mechanical cleaning.



Figure 5. Photograph of internal surface of DWD test section, Side II, after mechanical cleaning.

#### PUB-NLH-001, Attachment 6 Page 1 of 15, 2016 Standby Fuel Deferral Application

newfoundland labrador	UNIT #1 - BOILER					
a nalcor energy company		WATERWA	ALL TUBES			
NDE SHEET: No 1-1, Rev. 2	Inspector's Name:					
MAINTENANCE FILE NUMBER 102-05-1-17	Ins	Inspector's Signature;				
USE ADDITIONAL SHEETS IF NECESSARY	D	ate of Inspection:				
Area of Boiler and General						
Examination to be Performed	TUBE #	U.T. READING (in.)	COMMENTS			
Waterwall Upper Rear Junction			7 15 8 5 5 5 1 5 2 5 5 5			
Header (SH-4), 11th Floor 1.)						
on First Tube Bend Tubes						
Numbered East to West						
		1				
* NO ACCESS						
		а.				
	1					
	20					
-21-216-21249216	30					
	40					
Waterwall Tube (Knee Region) Wall	50 60					
1.) Ultrasonic Inspection Tubes	70					
Numbered from West Wall	80					
	90 100					
* NO ACCESS	110					
	120					
	127		*			

new/oundiand labrador		UNIT #	1 - BOILER				
a nalcor energy company		BOILER T	UBES BURNE	RS			
NDE SHEET No 1-11.4, Rev. 2	Inspector's Name: SID RANSOME						
NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17	Inspector's Signature:						
USE ADDITIONAL SHEETS IF NECESSARY	Date	Date of Inspection: SEPT. 17,2015					
Area of Boiler and General	Water Wall		CORNER	NUMBER			
Examination to be Performed	Tube Locations	A (SW) - U.T. (in.)	B (NW) - U.T. (in.)	C (NE) - U.T. (in.)	D (SE) - U.T. (in.)		
	Top Left Corner	.211	.267	.265	.236		
	Top Right Corner	.247	.241	.234	.213		
	1st Burner 4th Left	.241	,232	.236	. 232		
	1st Burner 8th Left	. 231	. 238	.234	.228		
	1st Burner 4th Right	.239	. 256	.235	.225		
	1st Burner 8th Right	.230	1226	-230	.231		
We have Well Take Well Thiskness of Duran	2nd Burner 4th Left	.242	. 235	.242	.227		
Elevations (SK-693-11) 1.) Ultrasonic Inspection on Tubes - PREPARED DRAWING SHOWING	2nd Burner 8th Left	.233	.244	.244	. 220		
LOCATIONS OF ULTRASONIC THICKNESS MEASUREMENTS	2nd Burner 4th Right	.234	.233	.235	.222		
	2nd Burner 8th Right	.241	.240	.241	. 233		
	3rd Burner 4th Left	,245	.238	.237	.226		
	3rd Burner 8th Left	,228	.240	.247	,235		
	3rd Burner 4th Right	,234	.235	.235	.225		
	3rd Burner 8 Right	,251	.236	.248	.241		
	Bottom Center Left	.227	.233	.232	.246		
	Bottom Center Right	.227	,222	.228	.206		
CORROSION PITTING DEPTH MEASUREMENTS ALSO REQUIRED DURING THIS INSPECTION 1.) Visually					5/A		
record. 3.) Reference gauged areas in relation to burner							

#### PUB-NLH-001, Attachment 6 Page 3 of 15, 2016 Standby Fuel Deferral Application

Nydro	UNIT #1 - BOILER						
a nalcor energy company	ECONOMIZER TUBES						
NDE SHEET: No 1-12.2, Rev. 2		Inspector's Name: SID RANSOME Inspector's Signature: Date of Inspection: AU(2, 20, 2015					
NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1	-17						
USE ADDITIONAL SHEETS IF NECESSA	RY						
Area of Boiler and Gonera			/				
Description of Non-Destruct	ve	BEND	AT SUPPO	RT PLATE			
Examination to be Perform	ed ELEMENT #	SOUTH - UT (in.)	NORTH - UT (in.)	SOUTH - UT (in.)			
	7		9				
	8						
	13						
Thicknesses. Location: 5th Flo	16						
Overhead. 1.) Ultrasonic Inspec	tion 24						
South Bends and Straight Tube	es. 32	-					
support plates. Both North a	nd 40						
inspected. South side of North	and 43						
North side of South. See draw	ing 48						
for details. Tubes are number from East to West.	56						
	64						
*	72						
NO ACCESS	80						

c.		AT SUPPORT PLATES		
	ELEMENT #	SOUTH OF NORTH - UT (in.)	NORTH OF SOUTH - UT (in.)	SOUTH - UT (in.)
	8	.211	.212	$\land$ /
Economizer Tubes Wall	16	. 222	.209	$\setminus$ /
Thicknesses. Location: 8th Floor,	24	. 216	.210	$\setminus$ /
Inspection on Economizer Tubes	32	.217	,207	$\setminus$
Assemblies. Straight tubes at	40	,202	- 233	$\vee$
South support plates to be	48	1223	- 237	$\wedge$
inspected. South side of North and	56	,225	.230	
for details. Tubes are numbered	64	,231	,224	
from East to West.	72	,236	.220	
	80	NIA	.221	

newfoundland labrador		UNIT #1 - BO	ILER					
a naicor energy company	BOILER FLOOR TUBES							
NDE SHEET: No 1-13, Rev. 2	Inspector's Name: SID RANSOME							
MAINTENANCE FILE NUMBER 102-05-1-17	Inspector's	Signature:	51	Mh .				
USE ADDITIONAL SHEETS IF NECESSARY	Date of ir	nspection:	OCT. 6	,2015				
Area of Boiler and General								
Description of Non-Destructive	NORTH	SLOPE	SOUTH	SLOPE				
Examination to be Performed	TUBE #	U.T. READING (in.)	TUBE #	U.T. READING (in.)				
	10	. 237	10	.180				
	20	.235	20	. 174				
	30	.244	30	.188				
	40	.247	40	.186				
Boiler Floor Tubes, Location: Main Boiler Door, 1.) Ultrasonic thickness	50	. 222	50	= 195				
readings on boiler floor tubes 6 feet down from the floor fillet	60	.234	60	.189				
weld. 2.) Thickness readings on every 10th tube for both the north	70	.227	70	.183				
and south slopes. Tubes are numbered from East to West.	80	,225	80	.199				
	90	. 231	90	.267				
	100	. 217	100	.179				
	110	,248	110	,264				
	120	.229	120	. 180				

hudro	UNIT #1 - BOILER							
a nalcor energy company		PRIMARY SUPERHEATER						
NDE SHEET No 1-25.1 (pg. 1), Rev. 2	Inspecto	r's Name:	SID RANSOME					
NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17 USE ADDITIONAL SHEETS IF NECESSARY				1 11				
		Inspector's	s Signature:					
		Date of Ir	nspection:	AUG. 20, 2015				
Area of Boiler and General				1				
Description of Non-Destructive	e	1ft. FROM SOUTH	DIRECTLY UNDER					
Examination to be Performed	TUBE	DRAWING - U.T. READING (in.)	SOOTBLOWER - U.T. READING (in.)	COMMENTS				
	1	0.112	0,234					
	5	0.215	0.217					
	10	0.216	0.227					
	15	0.220	0.221					
	20	0.219	0.222					
	25	0.218	0.218					
	30	0.225	0.226					
Primary Superheater Tubes	35	0.210	0,233					
Upper Section Back Pass,	40	0.220	0.230					
10th Floor Below Feet 1.)	45	0.208	0,229					
U.T. Inspection on the uppe	<u>50</u>	0.216	0.236					
tube section - SEE DRAWING	\$5	0.211	0.224	те.				
FOR DETAILS	60	0.215	0.230	, B <u>.</u>				
	65	0.221	0.221					
	70	0.213	0.215					
	75	0.210	0.218					
	80	0.207	0.233					
	85	0:213	0.240					
	40	0.208	0.220					
	93	0.214	0.215					

#### PUB-NLH-001, Attachment 6 Page 6 of 15, 2016 Standby Fuel Deferral Application

	UNIT #1 - BOILER						
a nalcor energy company		PRIMARY SUPERHEATER					
NDE SHEET No 1-25.1 (pg. 2), Rev NON-DESTRUCTIVE EXAMINATIO MAINTENANCE FILE NUMBER 102-05	. 2 N -1-17	Inspector's Name:	SID RANSOME				
USE ADDITIONAL SHEETS IF NECESS	ARY	Date of Inspection:	AUG. 20,2015				
Area of Boiler and Gener	al						
Description of Non-Destruc Examination to be Perform	ned TUBE	DIRECTLY ABOVE SOOTBLOWER - U.T. READING (in.)	COMMENTS				
		0.210					
	5	0.226					
	15	0 200					
	20	0.196					
	25	0.194					
	30	0.193	5				
Primary Superheater Tul	bes 35	0.190					
Lower Section Back Pass,	9th 40	0.208					
Floor Above Head 1.) U.	т. <u>45</u>	0.196					
tube section - SFF DRAW		0.200					
FOR DETAILS	100	0-141					
	105	0.191					
	70	0.188					
	75	0.206					
	80	0.200					
	85	0.197					
	90	0.199					
	93	0.195					

#### PUB-NLH-001, Attachment 6 Page 7 of 15, 2016 Standby Fuel Deferral Application

newfoundiand laterador	UNIT #1 - BOILER						
a nalcor energy company	1	PRIMARY SUPERHEATER					
NDE SHEET No 1-25.2 (pg. 1), Rev. 2			Inspector	's Name:	SID RANSOME		
NON-DESTRUCTIVE EXAMINA MAINTENANCE FILE NUMBER 102	TION 2-05-1-17	1	Inspector's	Signature:	15ph		
USE ADDITIONAL SHEETS IF NEC	ESSARY	1	Date of In	spection:	AUG. 20, 2015		
Area of Boiler and Ger	neral						
Description of Non-Destr Examination to be Perfo	ructive ormed	TUBE	1ft. FROM SOUTH HANGER TUBE - SEE DRAWING - U.T. READING (in.)	DIRECTLY UNDER SOOTBLOWER - U.T. READING (in.)	COMMENTS		
		1	0,190	0.206			
		5	0.210	0.208			
		10	0.198	0.207			
		15	0.187	0.200	1		
		20	0:193	0.198			
		25	0.200	0.204			
		30	0.201	0.199			
		35	0,198	0.207			
Primary Superheater Tubes Section Back Pass, 9th Floor	Upper Below	40	0.194	0.199			
Feet 1.) U.T. Inspection on th	he lower	45	0,202	0.206			
tube section, directly belo	by the	50	0.205	0.203			
tube - SEE DRAWING FOR D	ETAILS	55	0.196	0.194			
		60	0.208	0.208			
		65	0.202	0.202			
		70	0.197	0.200			
		75	0.208	0.205			
		80	0.194	0.199			
		85	0.199	0.201			
		90	0.203	0.204			
		95	0,207	0.210			

newfoundland labrador	UNIT #1 - BOILER						
a nalcor energy company	PRIMARY SUPERHEATER						
NDE SHEET No 1-25.2 (pg. 2), Rev. 1	1	Inspector's Name:	SID RANSO	ave			
NON-DESTRUCTIVE EXAMINATION							
MAINTENANCE FILE NUMBER 102-05-1-17		Inspector's Signature:					
K		Date of Inspection:	AUG. 20	2015			
Area of Boiler and General Description of Non-			/				
Destructive Examination to be Performed	TUBE	(A) U.T. READING (in.)	(B) BENDS - U.T. READING (in.)	COMMENTS			
		0,180	0.160				
	.5	0.173	0.158				
	10	0.176	0.168				
	15	0.180	0.167				
	20	0.181	0.163				
	25	0.178	0:164				
	30	0-177	0.161				
Diana Caralanta Talan	35	0,181	0,159				
Horizontal Spaced Lower	40	0.178	0.157				
Assembely, east to west 8th Floor	45	0.173	0.153				
1.) U.T. Inspection on the tubes	50	0.179	0,1.58				
Superheater inlet header (SH-2) -	55	0.182	0.163				
SEE DRAWING FOR DETAILS	60	A 181	0.166				
	65	0,176	B.1.59				
	70	0.179	0.162				
	75	0,177	0.1.57				
	80	0.182	0161				
	95	01100	0.167				
	Q A	0.180	0 160				
Economizer	93	0.179	0.158				



LOOKING EAST

#### PUB-NLH-001, Attachment 6 Page 9 of 15, 2016 Standby Fuel Deferral Application

newfoundland labrador	UNIT #1 - BOILER SUPERHEAT PLATEN						
a nalcor energy company							
NDE SHEET: No 1-26.2, Rev. 2 (pg. 1)	Inspector's Name:	SID RAN	SOME				
NON-DESTRUCTIVE EXAMINATION			2				
MAINTENANCE FILE NUMBER 102-05-1-17	Inspector's Signature:	/ //	$\sim$				
USE ADDITIONAL SHEETS IF NECESSARY	Date of Inspection:	SEPT. 23, 8	2015				
Area of Boiler and General							
Description of Non-Destructive		U.T.	(in.)				
Examination to be Performed	PLATEN # EAST TO WEST	EAST TUBE #1	WEST TUBE #2				
	7	0.206	0.215				
Location: 7th Floor. Above Head. 1.) Bend	7	0.212	0.221				
(South) 2.) Front hanger (South) 3.) Rear	7	0,213	0.237				
Hanger (North) 4.) Center of Element (Align with Overspray) 5.) 6" from north water wall 6.	7	0,226	0:228				
12" from north water wall.	7	0.222	0,231				
المتعقب المتحدية والأكام يتكا	7	0,219	0,230				
		0-1011	0.000				
	8	0:213	O. JOH				
Location: 7th Floor, Above Head, 1.) Bend	8	0.124	0.118				
(South) 2.) Front hanger (South) 3.) Rear	8	0,223	0.230				
Hanger (North) 4.) Center of Element (Align	8	1. 218	0,225				
12" from north water wall.	8	0,7127	0,210				
	8	0,221	0,217				
		0.900	0.011				
	24	0.215	0.217				
Location: 7th Floor, Above Head, 1.) Bend	24	0,221	0:220				
(South) 2.) Front hanger (South) 3.) Rear	24	0.217	0,204				
Hanger (North) 4.) Center of Element (Align with Overspray) 5.) 6" from porth water wall 6.)	24	0.218	0.211				
12" from north water wall.	24	0.215	0,214				
	24	0,222	0,217				
	25	0.208	0.210				
Location: 7th Floor. Above Head. 1.) Bend	25	0,224	0,215				
(South) 2.) Front hanger (South) 3.) Rear	25	0.229	0.225				
with Overspray) 5.) 6" from north water wall 6.)	25	6.220	0.222				
12" from north water wall.	25	0.232	0.226				
	25	0,228	0,224				

 $\bigcirc$ 

newfoundland labrador hudro	UNIT #1 - BOILER							
a nalcor energy company		SUPERHEAT PLATEN						
NDE SHEET: No 1-26.2, Rev.	2 (pg. 2)	Inspector's Name:	SID RAI	usome				
NON-DESTRUCTIVE EXAMIN MAINTENANCE FILE NUMBER 10	IATION 02-05-1-17	Inspector's Signature:						
USE ADDITIONAL SHEETS IF N	ECESSARY	Date of Inspection:	Date of Inspection: SEPT. 23, 2015					
Area of Boiler and Ge	eneral		/					
Description of Non-Des Examination to be Per	tructive formed	PLATEN # EAST TO WEST	TUBE #1	TUBE #2				
		7	. 258	. 259				
Location: 7th Floor. Under feet. 1. 2.) Front hanger (South) 3.) Rear	Bend (North) Hanger 4.)	7	.279	. 280				
Center of Element 5.) 6" from nort 6.) 12" from north water	th water wall wall.	7	1376	. 275				
		7	.294	. 288				
	and and a starting							
		8	. 235	- 265				
Location: 7th Floor. Under feet. 1. 2.) Front hanger (South) 3.) Rear	) Bend (North) Hanger 4.)	8	. 287	.287				
Center of Element 5.) 6" from nor 6.) 12" from north water v	th water wall wall.	8	· 289	.276				
		8	. 259	1246				
		24	, 275	1040				
Location: 7th Floor. Under feet. 1. 2.) Front hanger (South) 3.) Rear	) Bend (North) Hanger 4.)	24	172	. 279				
Center of Element 5.) 6" from nort 6.) 12" from north water y	th water wall wall.	24	.288	,281				
0.) 12 Honribith water water		24	1 280	- 286				
			* 4 / )	1911				
	estant Balliet German	25	.248	,239				
Location: 7th Floor. Under feet. 1.	) Bend (North)	25	.267	.269				
2.) Front hanger (South) 3.) Rear	Hanger 4.)	25	. 271	,268				
Center of Element 5.) 6" from north 6.) 12" from north water wa	th water wall wall.	25	, 270	. 277				
	-	25	1 251	1247				
		25	. 203	1050				

newfoundland labrador hudro	UNIT #1 - BOILER					
a nalcor energy company	SUPERHEAT PLATEN					
NDE SHEET: No 1-26.2, Rev. 2 (pg. 3)	Inspector's Name:	SID RA	nsome			
NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17	Inspector's Signature:	101				
USE ADDITIONAL SHEETS IF NECESSARY	Date of Inspection:	SEPT. 23	,2015			
Area of Boiler and General						
Description of Non-Destructive Examination to be Performed	PLATEN # EAST TO WEST	TUBE #1	(In.) TUBE #2			
	7	.197	.198			
Location: 8th Floor Under Feet 1 ) Bend (North)	7	.221	.219			
2.) Front hanger (South) 3.) Rear Hanger 4.)	7	, 224	,208			
Center of Element (North) 5.) 6" from north water wall 6.) 12" from north water wall.	7	.225	: 226			
	7	. 220	. 214			
	7	. 991	,219			
		0.42	2011			
	0	110	: 204			
Location: 8th Floor.Under Feet 1.) Bend (North)	8	126	220			
Center of Element (North) 5.) 6" from north	8	110	173			
water wall 6.) 12" from north water wall.	8	, 124	, 117			
	8	, 226	, 222			
	24	.204	.210			
Location: 8th Floor, Under Feet 1.) Bend (North)	24	1219	. 223			
2.) Front hanger (South) 3.) Rear Hanger 4.)	24	. 222	,225			
Center of Element (North) 5.) 6" from north water wall 6.) 12" from north water wall.	24	. 214	,216			
	24		1219			
	24	. 219	1216			
	25	204	100			
	25	127	222			
Location: 8th Floor.Under Feet 1.) Bend (North)	25	1221	1225			
Center of Element (North) 5.) 6" from north	25	1216	,217			
water wall 6.) 12" from north water wall.	25	, 223	205			
	25	,221	,216			

#### PUB-NLH-001, Attachment 6 Page 12 of 15, 2016 Standby Fuel Deferral Application

RANSOME

2015

23,



UNIT #1 - BOILER REHEATER ASSEMBLIES

Inspector's Name: SID

7 Inspect

NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17 <u>USE ADDITIONAL SHEETS IF NECESSARY</u>

NDE SHEET No U1-27.1, page 1 of 4

Inspector's Signature: Date of Inspection: SEPT,

Area of Boiler and General	ELEMENT #			,		
Examination to be Performed	(EAST TO WEST)	U.T. SOUTH (in.)	U.T. SOUTH HANGER (in.)	U.T. CENTRE OF ELEMENT (in.)	U.T. NORTH HANGER (in.)	U.T. NORTH BEND (in.)
	1	.128	.139	.141	.146	.138
	3	.114	.124	.125	.131	.140
	6	.095	-086	.078	.128	.102
*	9	.103	.107	.092	.107	.109
	12	.103	.113	.104	.124	.118
	15	0111	.113	.101	.130	.122
	18	.112	.090	-088	.118	.123
Pobostor Horizontally Spaced	21	.094	.109	.096	.125	.120
Assemblies Location: 8th Floor	24	.108	.115	.116	.125	.125
(Over Head) Bottom section of reheater 1.) Ultrasonic Inspection	27	.122	.110	.124	,139	.128
of 20 assemblies 2.) Each of the 20 elements have 5 locations for	30	.133	e131	.114	.140	.141
inspection (bottom section only) - See attached drawing for details	33	. 121	.120	.136	,145	.133
the attached draming for details	36	.119	.118	. 131	.141	.139
	39	.123	.119	.120	.138	.147
	42	.114	.115	.111	.143	. 137
	45	.118	.109	.117	,145	.136
	48	,092	,093	.117	.136	.124
	51	.115	.111	.097	.138	,124
	54	.120	.104	,093	.117	.112
	57	, 106	.099	.085	.109	.108

#### PUB-NLH-001, Attachment 6 Page 13 of 15, 2016 Standby Fuel Deferral Application

newfoundland labrador hudro	UNIT #1 - BOILER						
a nalcor energy company		REHEATER ASSEMBLIES					
NDE SHEET No U1-27.1, page 2 of 4	Insp	spector's Name: SID RANSOME					
MAINTENANCE FILE NUMBER 102-05-1-17	Inspe	ector's Signature:					
USE AUDITIONAL SHEETS IF NECESSART	Date	te of Inspection: SEPT. 18,2015					
Area of Boiler and General Description of Non-Destructive Examination to be Performed	ELEMENT # (EAST TO WEST)	U.T. SOUTH (in.) U.T. NORTH (in.) COMMENTS					
	1	. 238 . 166					
	3	. 237 . 181					
	6	. 226 . 178					
4	9	. 238 . 172					
	12	. 238 . 178					
	15	- 242 - 169					
	18	.250 .170					
Reheater Horizontally Spaced Assemblies Location: 9th Floor	21	. 233 . 167					
(Under Feet) Middle section of	24	.226 .176					
of 20 assemblies 2.) Inspection on	27	. 231 . 175					
one for the south and one for the	30	- 227 - 182					
north (approx. 2 feet from the bends) - See attached drawing for	33	, 240 , 177					
details	36	. 225 . 176					
	39	. 232 , 190					
	42	. 242 . 180					
	45	- 236 - 184					
	48	. 248 . 179					
	51	- 226 - 178					
	54	. 239 . 183					
	57	1.235 .171					

#### PUB-NLH-001, Attachment 6 Page 14 of 15, 2016 Standby Fuel Deferral Application

newfoundland labrador	UNIT #1 - BOILER					
a nalcor energy company	REHEATER ASSEMBLIES					
NDE SHEET No U1-27.1, page 3 of 4 NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17	Inspe	Inspector's Name: SID RANSOME				
USE ADDITIONAL SHEETS IF NECESSARY	Date of Inspection: SEPT. 18, 2015					
Area of Boiler and General Description of Non-Destructive Examination to be Performed	ELEMENT # (EAST TO WEST)	U.T CENTER OF ELEMENT (in.)	COMMENTS			
	1	» 190				
	3	. 201				
	6	. 188				
	9	. 167				
	12	.174				
	15	. 188				
	18	. 187				
Reheater Horizontally Spaced	21	.179				
Assemblies Location: 9th Floor	24	.195				
reheater 1.) Ultrasonic Inspection	27	. 182				
on over head requires centre	30	.179				
U.T. reading only - See attached drawing for details	33	. 184				
AN PROPERTY N	36	. 189				
	39	. 179				
	42	.178				
	45	. 186				
	48	.178				
	51	.118				
	54	.176				
	57	. / 89				

#### PUB-NLH-001, Attachment 6 Page 15 of 15, 2016 Standby Fuel Deferral Application

Newfoundland labrador UNIT #1 - BOILER						
a nalcor energy company	REHEATER ASSEMBLIES					
NDE SHEET No U1-27.1, page 4 of 4	Insp	Dector's Name: SID	RANSOME			
NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17	Inspe	Inspector's Signature:				
USE ADDITIONAL SHEETS IF NECESSARY	Date	of Inspection: SEP	T. 18,2015			
Area of Boiler and General	ELEMENT #		,			
Examination to be Performed	(EAST TO WEST)	U.T CENTER OF ELEMENT (in.)	COMMENTS			
	1	.149				
	3	.147				
	6	.154				
	9	.157				
	12	. 155				
	15	.153				
	18	.151				
Reheater Horizontally Spaced	21	.146				
(Under Feet) Middle section of	24	.151				
of 20 assemblies 2.) Each of the	27	e 151				
20 elements require centre inspection only (inspection under	30	. 158				
feet only) - See attached drawing	33	.167				
Tor details	36	.154				
	39	.148				
	42	.153				
	45	.157				
	48	.151				
	51	0143 IPP				
	54	0/58				
	57	.152				

newfoundiand labrador	UNIT #2 - BOILER				
a nalcor energy company	WATERWALL TUBES				
NDE SHEET: No 2-1, Rev. 2	l	nspector's Name:	S. RANSOME		
MON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17	Ins	pector's Signature:	10 h		
USE ADDITIONAL SHEETS IF NECESSARY	D	ate of Inspection:	July 9th, 2015		
Area of Boiler and General Description of Non-Destructive			1 1		
	TUBE #	U.T. READING (in.)	COMMENTS		
		/			
		5/			
Waterwall Upper Rear Junction		5.5			
Ultrasonic Inspection Performed		(/			
on First Tube Bend Tubes		*			
Numbered East to West					
		<u> </u>			
250.0000000000					
		/	- A		
	_				
	1	0.233			
	10	0.231			
	30	0.001			
	40	A 245			
Waterwall Tube (Knee Region) Wall	50	0.226			
Thickness, Boiler (Top of Scaffold)	60	0.228			
1.) Ultrasonic Inspection Tubes	70	0.231			
Numbered from west wall	80	0.225			
	90	0.233			
1	100	0,034			
	120	13 232			
×	127	0.221	n		





ECONOMIZER TUBES

UNIT #2 - BOILER

NDE	SHEET: No 2-12.2, Rev. 2
NON-E	DESTRUCTIVE EXAMINATION
MAINTENA	NCE FILE NUMBER 102-05-1-17
USE ADDI	TIONAL SHEETS IF NECESSARY

ECONOMIZE	RTUBES
Inspector's Name:	5. RANSOME
Inspector's Signature:	& MC
Date of Inspection:	July 8th 2015

Area of Boiler and General				
Description of New Destruction		BEND	AT SUPPO	RT PLATE
Examination to be Performed	ELEMENT #	SOUTH - UT (in.)	NORTH - UT (in.)	SOUTH - UT (in.)
	7	0.198	224	211
	8	0.192	217	215
	13	0.225	198	210
Economizer Tubes Wall Thicknesses. Location: 5th Floor, Overhead. 1.) Ultrasonic Inspection	16	0.209	206	205
	24	0.205	219	209
on Economizer Tube Assemblies. South Bends and Straight Tubes at	32	0.190	273	214
support plates. Both North and	40	. 195	222	207
South support plates to be inspected. South side of North and	43	. 197	219	218
North side of South. See drawing	48	. 192	199	211
for details. Tubes are numbered from East to West.	56	197	215	213
	64	191	229	222
	72	193	207	231
	80	191	198	227

		AT SUPPO	RT PLATES	
	ELEMENT #	SOUTH OF NORTH - UT (in.)	NORTH OF SOUTH - UT (in.)	SOUTH - UT (in.)
	8	0.235	0.233	0.230
Economizer Tubes Wall	16	0.223	0.218	0.217
Thicknesses. Location: 8th Floor,	24	0.233	0.223	0.226
Inspection on Economizer Tubes	32	0,220	0.216	0.218
Assemblies. Straight tubes at	40	0.231	0.213	0.219
South support plates to be	48	0.218	0.229	0.226
inspected. South side of North and North side of South. See drawing for details. Tubes are numbered	56	0.231	0.224	0.222
	64	0.225	0.235	0,216
from East to West.	72	0.230	0.222	0.219
the shall be a straight of	80	12,233	P. 215	0.210



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NDE SHEET No 2-25.1 (pg. 1), Rev. 2

NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17

USE ADDITIONAL SHEETS IF NECESSARY

UNIT #2 - BOILER PRIMARY SUPERHEATER Inspector's Name: Inspector's Signature: Date of Inspection: July 7, 2015

Area of Boiler and General				
Description of Non-Destructive Examination to be Performed	TUBE	1ft. FROM SOUTH HANGER TUBE - SEE DRAWING - U.T. READING (in.)	DIRECTLY UNDER SOOTBLOWER - U.T. READING (in.)	COMMENTS
	1	201	249	
	5	217	218	
	10	196	219	
	15	218	220	
	20	218	229	
	25	188	227	
	30	209	233	5
Primary Superheater Tubes	35	203	220	
Upper Section Back Pass,	40	215	237	
10th Floor Below Feet 1.)	45	208	219	
U.T. Inspection on the upper	50	218	231	
tube section - SEE DRAWING	55	222	233	
FOR DETAILS	60	221	222	
	65	210	234	
	70	213	231	
	75	210	233	
	80	210	227	
	85	199	235	
	90	217	232	
	95	211	228	

newfoundland labrador	UNIT #2 - BOILER							
a nalcor energy company	PRIMARY SUPERHEATER							
NDE SHEET No 2-25.1 (pg.	2), Rev. 2		Inspector's Name:	GLAND MELNOY				
NON-DESTRUCTIVE EXAN MAINTENANCE FILE NUMBER	INATION 102-05-1-17		Inspector's Signature:	ZL				
USE ADDITIONAL SHEETS IF	NECESSARY		Date of Inspection:	July 7 2015				
Area of Boiler and	General							
Examination to be Pe	erformed	TUBE	DIRECTLY ABOVE SOOTBLOWER - U.T. READING (in.)	COMMENTS				
		1	216					
		5	221					
		10	222					
		15	209					
		20	210					
		25	226					
		30	121					
Primary Superheate	er Tubes	35	199					
Lower Section Back	Pass, 9th	40	265					
Inspection on the	upper	50	196					
tube section - SEE I	DRAWING	55	7,9	· · · · · · · · · · · · · · · · · · ·				
FOR DETAIL	S	60	198	· · · · · · · · · · · · · · · · · · ·				
a contractor contractor contractor		65	227					
		70	215					
		75	221					
		80	223					
		85	225					
		90	215					
		95	198					

#### PUB-NLH-001, Attachment 7 Page 6 of 16, 2016 Standby Fuel Deferral Application



NDE SHEET No 2-25.2 (pg. 1), Rev. 2

NON-DESTRUCTIVE EXAMINATION

MAINTENANCE FILE NUMBER 102-05-1-17

USE ADDITIONAL SHEETS IF NECESSARY

UNIT #2 - BOILER PRIMARY SUPERHEATER Inspector's Name: Inspector's Signature: Date of Inspection: UNIY 7, 2015

Area of Boiler and General				
Description of Non-Destructive Examination to be Performed	TUBE	1ft. FROM SOUTH HANGER TUBE - SEE DRAWING - U.T. READING (in.)	DIRECTLY UNDER SOOTBLOWER - U.T. READING (in.)	COMMENTS
	1	194	222	
	5	199	225	
	10	196	215	
	15	199	205	
	20	211	204	
	25	202	192	
	30	206	197	
	35	194	199	
Primary Superheater Tubes Upper Section Back Pass, 9th Floor Below Feet 1.) U.T. Inspection on the lower tube section, directly below the	40	207	203	
	45	215	227	
	50	192	207	
tube - SEE DRAWING FOR DETAILS	55	199	213	
	60	213	204	
	65	216	198	
	70	210	193	
	75	213	196	
	80	226	195	
	85	229	222	
	90	213	206	
	95	217	211	

1 hudro	UNIT #2 - BOILER						
a nakor energy company	PRIMARY SUPERHEATER						
NDE SHEET No 2-25.2 (pg. 2), Rev. 1		Inspector's Name:	S.RAPSO	ME			
NON-DESTRUCTIVE EXAMINATION				/			
USE ADDITIONAL SHEETS IF NECESSARY		Inspector's Signature:	1 - 10 th				
		Date of Inspection:	JULY 8,	2015			
Area of Boiler and General Description of Non-							
Destructive Examination to be Performed	TUBE	(A) U.T. READING (in.)	(B) BENDS - U.T. READING (in.)	COMMENTS			
	/	0.181	0.160				
	.5	0.185	0.162				
	10	0.184	0.164				
	15	0.187	0:160				
	20	0.190	0,159				
	25	0.192	0.168				
	30	0.188	0.155				
Drimons Superheater Tuber	35	0:191	0,158				
Horizontal Spaced Lower	40	0.192	0.163				
Assembely, east to west 8th Floor	45	0.187	0:160				
1.) U.T. Inspection on the tubes 5ft, above the Primary	50	0.185	0.168				
Superheater inlet header (SH-2) -	55	0.189	0.163				
SEE DRAWING FOR DETAILS	100	0.191	0:167				
	65	0.182	0.160				
	70	0.191	0.168				
	75	0:192	0,165				
	80	0.194	0:161				
	85	0.183	0.165				
	90	0.191	0.162				
Economizer	93	0.193	0.159				



LOOKING EAST

### PUB-NLH-001, Attachment 7 Page 8 of 16, 2016 Standby Fuel Deferral Application

newfoundland labradar	UNIT #2 - BOILER						
a nalcor energy company	SUPER	SUPERHEAT PLATEN					
NDE SHEET: No 2-26.2, Rev. 2 (pg. 1)	Inspector's Name:	S. RANSO	ome				
NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17	Inspector's Signature:	10.	A				
USE ADDITIONAL SHEETS IF NECESSARY							
	Date of Inspection:						
Area of Boiler and General	,	U.T.	(in.)				
Examination to be Performed	PLATEN # EAST TO WEST	EAST TUBE #1	WEST TUBE #2				
	<b>B</b> 7	210	206				
Location: 7th Floor. Above Head. 1.) Bend	F 14 7	227	218				
Hanger (North) 4.) Center of Element (Align	RH 7	221	229				
with Overspray) 5.) 6" from north water wall 6.)		202	200				
12 Holl Holdi Water watt.	674.7	707	212				
		227	217				
	8	201	193				
Location: 7th Floor. Above Head. 1.) Bend	Fit 8	212	205				
(South) 2.) Front hanger (South) 3.) Rear	RH B	233	216				
with Overspray) 5.) 6" from north water wall 6.)	C 8	.210	218				
12" from north water wall.	6 8	220	226				
	(2" 8	217	215				
		.717					
	24	1247	. 210				
(South) 2.) Front hanger (South) 3.) Rear	P 11 24	220	229				
Hanger (North) 4.) Center of Element (Align	C 24	12.6	, 724				
12" from north water wall.	( <sup>14</sup> 24	· 2-24	.218				
	1 2 24	. 220	. 233				
	R 25	.225	1200				
Location: 7th Floor. Above Head. 1.) Bend	FH 25	.223	: 209				
(South) 2.) Front hanger (South) 3.) Rear Hanger (North) 4.) Center of Element (Align	R 16 25	. 230	. 226				
with Overspray) 5.) 6" from north water wall 6.	C 25	.213	• 217				
12" from north water wall.	25	,203	. 233				
	l 2 <sup>**</sup> 25	a 218	. 217				

and the f

newfoundland labrador	UNIT #2 - BOILER						
a nalcor energy company		SUPERHEAT PLATEN					
NDE SHEET: No 2-26.2, Rev.	2 (pg. 2)	Inspector's Name:	SID R	ANSOME			
NON-DESTRUCTIVE EXAMI MAINTENANCE FILE NUMBER 1	NATION 02-05-1-17	Inspector's Signature:	Je,	A			
USE ADDITIONAL SHEETS IF N	ECESSARY	Date of Inspection:	July	23 2014			
Area of Boiler and G	eneral						
Examination to be Per	formed	PLATEN # EAST TO WEST	TUBE #1	TUBE #2			
		7	,233	. 220			
Location: 7th Floor, Under feet, 1	) Bend (North)	7	.258	. 287			
2.) Front hanger (South) 3.) Real	r Hanger 4.)	7	.257	1260			
Center of Element 5.) 6" from nor 6.) 12" from porth water	th water wall	, 7	.285	1281			
u, 12 hom horth water	wall.	7	1240	.255			
		7	1246	. 258			
		8	.249	,231			
Location: 7th Floor, Under feet, 1.	) Bend (North)	8	,276	.284			
2.) Front hanger (South) 3.) Rea	r Hanger 4.)	8	,249	. 244			
Center of Element 5.) 6" from nor 6.) 12" from porth water	th water wall	8	.273	. 259			
0.712 Hom Hordi water	Wall.	8	1252	1250			
		8	.261	. 248			
		24	1255	1245			
Location: 7th Floor. Under feet. 1.	) Bend (North)	24	.281	1273			
2.) Front hanger (South) 3.) Rea	r Hanger 4.)	24	.269	. 253			
6.) 12" from north water	wall.	24	. 285	, 277			
		24	,283	1278			
		24	, 280	·277			
		25	. 235	141			
Location: 7th Floor. Under feet. 1.	) Bend (North)	25	. 290	.286			
2.) Front hanger (South) 3.) Rea	r Hanger 4.)	25	. 480	1282			
6.) 12" from north water	wall.	25	1270	: 486			
		25		• 459			
a ta she ka ka she a sa ƙasar ta sa ƙwallon ƙasar ƙ		25	· 4++	0 L T L			

#### PUB-NLH-001, Attachment 7 Page 10 of 16, 2016 Standby Fuel Deferral Application

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**UNIT #2 - BOILER** SUPERHEAT PLATEN a nalcor energy company S. RAPSOME NDE SHEET: No 2-26.2, Rev. 2 (pg. 2) Inspector's Name: NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17 Inspector's Signature: USE ADDITIONAL SHEETS IF NECESSARY Date of Inspection: Area of Boiler and General U.T. (in.) **Description of Non-Destructive** PLATEN # EAST TO Examination to be Performed TUBE #1 TUBE #2 WEST 0.270 7 0.268 0.239 7 0.227 Tube #1 EAST, Tube #2 WEST - Overhead from scaffold 1.) First bend off header (south) 2.) 0.251 0.248 7 Second bend off header (south) 3.) Rear hanger 0.243 0.238 7 bend (north) 4.) Center of element 5.) 6" from north water wall 6.) 12" from north water wall 7 0.256 0.261 7 0.261 0.248 0.271 8 0.266 0.228 8 1.219 Tube #1 EAST, Tube #2 WEST - Overhead from scaffold 1.) First bend off header (south) 2.) 8 0.251 0.244 Second bend off header (south) 3.) Rear hanger 8 0.249 0.260 bend (north) 4.) Center of element 5.) 6" from north water wall 6.) 12" from north water wall 8 254 66 0. 0. 8 0.252 6.25 238 0.234 24 B. 24 0.260 0.271 Tube #1 EAST, Tube #2 WEST - Overhead from scaffold 1.) First bend off header (south) 2.) 24 0.23 0.240 Second bend off header (south) 3.) Rear hanger 7 0.254 24 0.2 bend (north) 4.) Center of element 5.) 6" from north water wall 6.) 12" from north water wall 0.262 24 0.25 24 O. 254 0. 259 249 246 25 0.260 25 Tube #1 EAST, Tube #2 WEST - Overhead from 0-262 scaffold 1.) First bend off header (south) 2.) 0.240 25 251 O. Second bend off header (south) 3.) Rear hanger 0.259 25 0. 268 bend (north) 4.) Center of element 5.) 6" from

25

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north water wall 6.) 12" from north water wall





### PUB-NLH-001, Attachment 7 Page 11 of 16, 2016 Standby Fuel Deferral Application

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newfoundland labrador		UNIT #2 - BOILER				
a nalcor energy company			SUPERHEAT PLATEN			
NDE SHEET: No 2-26.2, Rev.	2 (pg. 3)	Inspec	tor's Name:	S. RANSON	ne	
NON-DESTRUCTIVE EXAMIN MAINTENANCE FILE NUMBER 1	ATION 02-05-1-17	Inspecto	r's Signature:	$\sim$	- 10-	
USE ADDITIONAL SHEETS IF N	ECESSARY	Date of	Inspection:	23-7-20	15	
Area of Boiler and Ge	eneral			II T	(in )	
Examination to be Per	formed	PLATEN #	EAST TO WEST	TUBE #1	TUBE #2	
			7	.201	208	
Location: 8th Floor Under Feet 1	Bend (North)		7	.217	213	
2.) Front hanger (South) 3.) Rear	Hanger 4.)		7	. 220	.220	
Center of Element (North) 5.) 6' water wall 6.) 12" from porth y	' from north		7	- 210	206	
	rater matt.		7	1220	1216	
			7	.221	.216	
	a er a sandar Annan a sandar				2.1	
			8	•211	.197	
Location: 8th Floor.Under Feet 1.) Bend (North)			8	. 224	# 220	
2.) Front hanger (South) 3.) Rear Center of Element (North) 5.) 6	2.) Front hanger (South) 3.) Rear Hanger 4.) Center of Element (North) 5.) 6" from north		0	219	710	
water wall 6.) 12" from north v	vater wall.		8	218	210	
			8	+ 221	. 218	
		1	24	. 207	1206	
Location: 8th Floor Under Feet 1	Bend (North)	2	24	,216	. 212	
2.) Front hanger (South) 3.) Rear	Hanger 4.)	3	24	· 224	·222	
Center of Element (North) 5.) 6'	' from north	4	24	-215	·200	
water wat 0.) 12 mon north v	water wat 0.) 12 from horth water wat.		24	.224	1225	
	TRAFT OF TOOL	6	24	, 220	,222	
	and the state				2 - 2	
		1	25	205	. 40 4	
Location: 8th Floor.Under Feet 1.)	Bend (North)	A	25	7/2	217	
2.) Front hanger (South) 3.) Rear Center of Element (North) 5.) 6	from north	2	25	1271	211	
water wall 6.) 12" from north v	vater wall.	4	25	- 219	,212	
		1	25	.224	. 2.11	
and a second sec		100				

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KANSOME



REHEATER ASSEMBLIES

Inspector's Name:

**UNIT #2 - BOILER** 

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NDE SHEET No U2-27.1, page 1 of 4 NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17 USE ADDITIONAL SHEETS IF NECESSARY

Inspector's Signature: 2015 72 Date of Inspection: Area of Boiler and General ELEMENT # **Description of Non-Destructive** (EAST TO U.T. CENTRE OF U.T. NORTH U.T. SOUTH U.T. NORTH Examination to be Performed WEST) U.T. SOUTH (in.) HANGER (in.) ELEMENT (in.) HANGER (in.) BEND (in.) .142 1 .152 108 .136 .131 3 . 119 .097 .099 .110 .116 .103 6 ,101 ,124 .101 .102 9 .128 .096 :121 ,123 .110 12 1991 -108 -119 .103 .115 120 15 ,103 .106 .113 :097 18 1097 .116 .114 0110 21 120 122 ,122 ,121 24 .133 110 .112 . 111 27 .136 131 1122 .129 30 .133 .137 .131 1121 33 . 138 137 .125 . 150

.115 .109 Reheater Horizontally Spaced Assemblies Location: 8th Floor 1124 (Over Head) Bottom section of .120 reheater 1.) Ultrasonic Inspection of 20 assemblies 2.) Each of the .132 20 elements have 5 locations for inspection (bottom section only) -.132 See attached drawing for details 36 .123 . 109 137 .117 .141 39 1125 .139 . 106 -101 134 42 .111 ,092 .095 .136 .128 45 .098 .095 103 .152 . 149 ,102 .136 ,090 48 .092 .137 .098 51 ,099 -138 .094 .122 54 . 111 .093 . 106 120 -129 57 . 108 -111 1124 .112 0122



REHEATER ASSEMBLIES

UNIT #2 - BOILER

NDE SHEET No U2-27.1, page 2 of 4	Inspector's Name: S. RANSOME				
NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17	Inspe	ector's Signature:			
USE ADDITIONAL SHEETS IF NECESSARY	Date	te of Inspection: July 14th, 2015			
Area of Boiler and General					
Description of Non-Destructive	ELEMENT # (EAST TO				
Examination to be Performed	WEST)	U.T. SOUTH (in.) U.T. NORTH (in.) COMMENTS			
	1	0.237 0.176			
	3	0. 234 0. 178			
	6	0.235 0.179			
	9	0.233 0.183			
	12	0.237 0.182			
	15	0.225 0.173			
	18	0.230 0.180			
Reheater Horizontally Spaced	21	0.2420.181			
(Under Feet) Middle section of	24	0.231 0.179			
of 20 assemblies 2.) Inspection on	27	0.338 0.182			
under feet requires two readings,	30	0.233 0.176			
north (approx. 2 feet from the	33	0.230 0.177			
details	36	0.2320.175			
	39	0.229 0.178			
	42	0.235 0.183			
	45	0.342 0.176			
	48	0,2330.184			
	51	0. 244 0.179			
	54	0.2410.176			
	57	0.230 0.178			



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Nhudro	UNIT #2 - BOILER					
a nalcor energy company		REHEATER ASSI	EMBLIES			
NDE SHEET No U2-27.1, page 3 of 4	Insj	pector's Name: 5, 8	ANSOM E			
NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17	Inspe	ctor's Signature:	h			
USE ADDITIONAL SHEETS IF NECESSARY	Date	e of Inspection: July	14, 2015			
Area of Boiler and General	FLEMENT #		1			
Description of Non-Destructive Examination to be Performed	(EAST TO WEST)	U.T CENTER OF ELEMENT (in.)	COMMENTS			
	1	0.175				
	3	0.177				
	6	0.173				
	9	0.173				
	12	0.179	1			
	15	0.169				
	18	0.178				
Reheater Horizontally Spaced	21	0.185				
Assemblies Location: 9th Floor	24	0.179				
reheater 1.) Ultrasonic Inspection	27	0.170				
of 20 assemblies 2.) Inspection on over head requires centre	30	0.181	1.00 M			
U.T. reading only - See attached	33	0.182				
diaming for details	36	0.174				
	39	0.176				
	42	0.180				
	45	0.183				
	48	0.182				
	51	0.179				
	54	0.177				
	57	0.171				

newfoundland labrador
hudro
a nalcor energy company

UNIT #2 - BOILER	
REHEATER ASSEMBLI	ES

S. RANSOME

NDE SHEET No U2-27.1, page 4 of 4 NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17 USE ADDITIONAL SHEETS IF NECESSARY

Inspector's Signature:

Inspector's Name:

Date of Inspection: July 14th, 2015

Area of Boiler and General Description of Non-Destructive Examination to be Performed	ELEMENT # (EAST TO WEST)	U.T CENTER OF ELEMENT (in.)	COMMENTS
	1	0.149	
	3	0.156	
	6	0.151	
	9	0.154	
	12	0.154	
	15	0.152	
	18	0.148	
Reheater Horizontally Spaced	21	0.150	
Assemblies Location: 10th Floor (Under Feet) Middle section of	24	0.153	1
reheater 1.) Ultrasonic Inspection	27	0.155	
20 elements require centre	30	0.152	
feet only) - See attached drawing	33	0.146	
for details	36	0.151	
	39	0.149	
	42	0-152	
	45	0-150	
	48	0.148	
	51	0.151	
	54	0.150	
	57	0-148	

#### PUB-NLH-001, Attachment 7 Page 16 of 16, 2016 Standby Fuel Deferral Application

newfoundiand labradar	UNIT #2 - BOILER			
a nalcor energy company	BOILER FLOOR TUBES			
NDE SHEET: No 2-13, Rev. 2	Inspector's Name:		S.RANSOME	
NON-DESTRUCTIVE EXAMINATION MAINTENANCE FILE NUMBER 102-05-1-17 USE ADDITIONAL SHEETS IF NECESSARY	Inspector's Signature:		CAC	
	Date of Inspection:		AUG là	1 <sup>T4</sup> 2015
Area of Boiler and General				
Description of Non-Destructive	NORTH SLOPE		SOUTH SLOPE	
Examination to be Performed	TUBE #	U.T. READING (in.)	TUBE #	U.T. READING (in.)
	10	0,233	10	0.194
	20	0.239	20	0.177
	30	0.244	30	0.189
Boiler Floor Tubes, Location: Main Boiler Door, 1.) Ultrasonic thickness readings on boiler floor tubes 6 feet down from the floor fillet weld. 2.) Thickness readings on every 10th tube for both the north and south slopes. Tubes are numbered from East to West.	40	0.248	40	0.196
	50	6.252	50	0.189
	60	0.256	60	0.186
	70	0.249	70	0.194
	80	0.225	80	0.188
	90	0.229	90	0.189
	100	Ó. 233	100	0.199
	110	0.239	110	0.199
	120	0.245	120	0.197