



NORTHERN MATERIALS
ENGINEERING LTD.

June 17, 2011

Ref. No: R-013-10-3

Kam MacGregor
Production Foreman
NuVista Energy Ltd.
Box 63
Thorsby, Alberta
T0C 2P0

**Re: Assessment of December 2010 Ultrasonic Inspection Survey;
Sunchild**

The following report is an evaluation of the ultrasonic thickness survey (UTS) performed by Red Flame NDT at select locations at Sunchild in December 2010. All flagged UTS locations were assessed with respect to total metal loss and remaining wall thickness. Where the remaining wall thickness was less than the nominal thickness, calculations were performed to estimate the minimum required design thickness.

Crack inspections were performed on the blowcase at 10-07-43-10 W5M and on the low temperature blowcase at 11-29-43-11 W5M. No indications of cracking were detected.

Section 1 contains a summary of the evaluations of flagged test points. Detailed calculations are contained in Section 2. For flagged vessels with insufficient data, manufacturer's data sheets were obtained from ABSA, and are attached in Section 3. Section 4 contains remedial actions issued based on the UT survey.

Items of Note:

A#0400151; LSD 10-07-43-10 W5M; Line Heater; Nozzle; Point 10005

According to the manufacturer's data report for the line heater, the thicknesses on the nozzles are all 3 inches schedule 160. The minimum and average thickness measure on point 10005 is far below 3" sch 160 piping specifications. It is recommended that UT be conducted in one year to monitor for corrosion as well as verify the thickness measurements.

A#2710512; LSD 10-18-43-10 W5M; 3 Phase Separator; Gas Outlet Elbow (Nozzle); Point 2735

The gas outlet nozzle thickness according to the manufacture's data report is 0.8125 inch. The minimum and average thickness measurement for point 2735 is low in comparison. It recommended that UT be conducted in one year to monitor for corrosion. The follow up UT will also confirm if point 2735 is piping or nozzle.

RESULTS THROUGH INNOVATION

As provided for in the ABSA document AB-506, examination grades for vessels have been evaluated and inspection intervals have been extended as permitted. See the attached Pressure Vessel Inspection Status Report to view the revised inspection dates. Please contact John Dombroski (780-469-1164 or john@normat.ca) if you have any questions or comments regarding this work.

Sincerely,
Northern Materials Engineering



John Dombroski, API 510, ISPVI
Corrosion Consultant – NuVista Energy Ltd.

cc: Ryan Paulgaard

NuVista Energy Ltd
Pressure Vessel Inspection Status Report

Sunchild

LSD	A Number	Description	Sour?	Status	Old ABSA ExamGrade	New ABSA ExamGrade	External Inspection			Internal Inspection			Crack Inspection			UT Survey		
							Last Insp	Int	Next Insp	Last Insp	Int	Next Insp	Last Insp	Int	Next Insp	Last Insp	Int	Next Insp
01-21-43-10 W5M	419612	Line Heater Reheat	No No	In Service	1	2	Mar 07	5y	Mar 12							Dec 10	5y	Dec 15
	549788	3 Phase Separator	No	In Service	1	2	Mar 07	5y	Mar 12							Dec 10	5y	Dec 15
	SN-1006-2997	Fuel Gas Scrubber	No	In Service	1	2	Mar 07	5y	Mar 12							Dec 10	5y	Dec 15
03-23-42-10 W5M	2710529	3 Phase Separator	Yes	In Service		1	Jul 09	5y	Jul 14							Dec 10	4y	Dec 14
	2710550	Glycol Flash Drum	Yes	Out of Ser	2		Dec 07									Dec 10		
	2711458	Line Heater Reheat	Yes No	In Service		1	Jul 09	5y	Jul 14							Dec 10	4y	Dec 14
	SN-LGS-4615	Primary Fuel Gas Scrub	Yes	In Service		1	Jul 09	5y	Jul 14							Dec 10	4y	Dec 14
	SN-LM-2548	Fuel Gas Scrubber	Yes	In Service	1	2	Jul 09	5y	Jul 14							Dec 10	4y	Dec 14
	SN-LM-2646	Glycol Filter	Yes	Out of Ser	1		Dec 07									Dec 10		
04-07-44-10 W5M	503784	3 Phase Separator	No	In Service	1	2	Apr 10	5y	Apr 15							Dec 10	5y	Dec 15
	SN-1491	Fuel Gas Scrubber	No	In Service	1	2	Apr 10	5y	Apr 15							Dec 10	5y	Dec 15
06-25-42-10 W5M	06-25-42-10	Inlet Piping Inlet Piping	Yes	In Service												Dec 10	4y	Dec 14
	2710536	3 Phase Separator	Yes	In Service	0	1	Jul 09	5y	Jul 14							Dec 10	4y	Dec 14
	2711465	Line Heater	Yes	Out of Ser	1		Dec 07									Jul 07		
	SN-LGS-4616	Primary Fuel Gas Scrub	Yes	In Service		1	Jul 09	5y	Jul 14							Dec 10	4y	Dec 14
	SN-LM-2549	Secondary Fuel Gas Sc	Yes	In Service		1	Jul 09	5y	Jul 14							Dec 10	4y	Dec 14
07-12-44-11 W5M	464344	Glycol Contactor	No	In Service		1	Feb 08	5y	Feb 13							Dec 10	5y	Dec 15
	496358	3 Phase Separator	No	In Service		1	Feb 08	5y	Feb 13							Dec 10	5y	Dec 15
	SN-2K.3980F-1	Glycol Filter	No	In Service	1	2	Feb 08	5y	Feb 13							Dec 10	5y	Dec 15
	SN-6286-435	Fuel Gas Scrubber	No	In Service	1	2	Feb 08	5y	Feb 13							Dec 10	5y	Dec 15
08-31-43-10 W5M	08-31-43-10	Riser Riser	No	In Service												Dec 10	5y	Dec 15
	512240	3 Phase Separator	No	In Service		1	Apr 10	5y	Apr 15							Dec 10	5y	Dec 15
	94584	Glycol Contactor Tower	No	In Service		1	Apr 10	5y	Apr 15							Dec 10	5y	Dec 15
	SN-1756	Fuel Gas Scrubber	No	In Service	1	2	Apr 10	5y	Apr 15							Dec 10	5y	Dec 15
	SN-LGS 4798	Fuel Gas Scrubber	No	In Service	1	2	Apr 10	5y	Apr 15							Dec 10	5y	Dec 15
	SN-LM-2817	Glycol Filter	No	Out of Ser	1		Feb 05									Dec 10		
09-36-43-11 W5M	512296	Separator	No	In Service	1	2	Apr 07	5y	Apr 12							Dec 10	5y	Dec 15
	SN-1014.1051	Fuel Gas Scrubber	No	In Service	1	2	Apr 07	5y	Apr 12							Dec 10	5y	Dec 15
10-07-43-10 W5M	400124	#2-3 Phase Separator	No	In Service	0	2	Jul 09	5y	Jul 14							Dec 10	5y	Dec 15

NuVista Energy Ltd
Pressure Vessel Inspection Status Report

Sunchild

LSD	A Number	Description	Sour?	Status	Old ABSA ExamGrade	New ABSA ExamGrade	External Inspection			Internal Inspection			Crack Inspection			UT Survey			
							Last Insp	Int	Next Insp	Last Insp	Int	Next Insp	Last Insp	Int	Next Insp	Last Insp	Int	Next Insp	
10-07-43-10 W5M	400151	Line Heater	No	In Service		1	Jul 09	5y	Jul 14							Dec 10	1y	Dec 11	
	403393	#1-3 Phase Separator	Yes	In Service		1	Jul 09	5y	Jul 14							Dec 10	4y	Dec 14	
	530734	Inlet Suction Scrubber	Yes	In Service	1	2	Jul 09	5y	Jul 14							Dec 10	4y	Dec 14	
	530735	Discharge Scrubber	Yes	In Service	0	1	Jul 09	5y	Jul 14							Dec 10	4y	Dec 14	
	530736	Lube Oil Separator	Yes	In Service		1	Jul 09	5y	Jul 14							Dec 10	4y	Dec 14	
	543272	Blowcase	Yes	In Service	1	2	Jul 09	5y	Jul 14				Dec 10	4y	Dec 14	Dec 10	4y	Dec 14	
	SN-57410A.2	Natural Gas Cooler	Yes	In Service		1	Jul 09	5y	Jul 14							Dec 10	4y	Dec 14	
	SN-C662A.FP79	#1-Fuel Gas Scrubber	Yes	In Service		1	Jul 09	5y	Jul 14							Dec 10	4y	Dec 14	
	SN-C926B.FP967	#2-Fuel Gas Scrubber	No	In Service		1	Jul 09	5y	Jul 14							Dec 10	5y	Dec 15	
	SN-C933A.FP962	Line Heater Fuel Gas S	No	Out of Ser												Dec 10			
10-18-43-10 W5M	SN-H060CN02605 001	Glycol/Oil Exchanger	Yes	In Service		1		5y							Dec 10	4y	Dec 14		
	2698977	Glycol Flash Drum	Yes	Out of Ser	2		Feb 07								Apr 06				
	2710512	3 Phase Separator	Yes	In Service		1	Jul 09	5y	Jul 14						Dec 10	1y	Dec 11		
	2780786	Inlet Separator	Yes	In Service		1	Jul 09	5y	Jul 14	Jan 93	4y	Jan 97			Dec 10	4y	Dec 14		
	408177	3 Phase Separator	Yes	In Service	1	2	Jul 09	5y	Jul 14						Dec 10	4y	Dec 14		
	530737	Suction Scrubber	Yes	In Service	1	2	Jul 09	5y	Jul 14						Dec 10	4y	Dec 14		
	530738	Discharge Scrubber	Yes	In Service	1	2	Jul 09	5y	Jul 14						Dec 10	4y	Dec 14		
	530739	Lube Oil Separator	Yes	In Service		1	Jul 09	5y	Jul 14						Dec 10	4y	Dec 14		
	SN-57410B.2	NG Discharge Cooler	Yes	In Service		1	Jul 09	5y	Jul 14						Dec 10	4y	Dec 14		
	SN-C461AFP630	Fuel Gas Scrubber	Yes	In Service	1	2	Jul 09	5y	Jul 14						Dec 10	4y	Dec 14		
11-14-42-10 W5M	SN-LGS-4617	Fuel Gas Scrubber	Yes	In Service		1	Jul 09	5y	Jul 14						Dec 10	4y	Dec 14		
	SN-LM-2541	Fuel Gas Filter	Yes	In Service	1	2	Jul 09	5y	Jul 14						Dec 10	4y	Dec 14		
	SN-LM-2644	Gylcol Filter	Yes	Out of Ser	1														
	403500	3 Phase Separator	Yes	In Service		1	Jul 09	5y	Jul 14						Dec 10	4y	Dec 14		
	SN-C701A.FP806	Fuel Gas Scrubber	No	In Service	1	2	Jul 09	5y	Jul 14						Dec 10	5y	Dec 15		
	11-29-43-11 W5M	560371	Low Temp Blowcase	No	In Service	1	2	Mar 07	5y	Mar 12				Dec 10	4y	Dec 14	Dec 10	4y	Dec 14
		563135	Condensate Conditioner	No	In Service	1	2	Mar 07	5y	Mar 12						Dec 10	5y	Dec 15	

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Pressure Vessel Inspection Status Report

Sunchild

LSD	A Number	Description	Sour?	Status	Old ABSA	New ABSA	External Inspection			Internal Inspection			Crack Inspection			UT Survey		
					ExamGrade	ExamGrade	Last Insp	Int	Next Insp	Last Insp	Int	Next Insp	Last Insp	Int	Next Insp	Last Insp	Int	Next Insp
11-29-43-11 W5M	SN-S-13326	Blowcase Fuel Gas Scr	No	In Service	0	1	Mar 07	5y	Mar 12							Dec 10	4y	Dec 14

Chief Inspector: John Dombroski for Mike Reimer

Comments:

Signature: 

Section 1

Flagged UTS Test Point Assessment Summary

The intent of this assessment was to evaluate all flagged thickness readings contained within the attached ultrasonic thickness survey report. This assessment should not be taken as a detailed engineering evaluation, but rather as a preliminary overview of the flagged thickness readings to determine if further actions or assessments are warranted. The following calculations were based on information available at the time of this assessment. Where materials could not be confirmed, the most conservative allowable stress value was used to calculate the minimum design thickness. Thickness calculations were based on internal design pressures and did not consider other potential stresses that may have been considered during the original design.

NuVista Energy Ltd.

Sunchild Flagged UTS Test Point Assessment Summary

June 14, 2011							AB
<u>Test Pt. & Location</u>	<u>Description</u>	<u>MAWP (PSI)</u>	<u>Original Design Required Thickness (in.)</u>	<u>Minimum Measured Thickness (in.)</u>	<u>Calculated Required Thickness (in.)</u>	<u>Comments</u>	<u>Remedial Action Required</u>
01-21-43-10 W5M							
1630	3" Sch XS Gas Outlet Elbow; 3 Phase Separator; A549788	1440	0.263	0.257	0.147	There is between 0.006 in (0.1 mm) and 0.081 in (2.0 mm) of possible metal loss. The measured thickness of 0.257 in (6.5 mm) remains greater than the calculated required thickness of 0.147 in (3.7 mm). The piping is OK for continued service.	
1725	2" Sch 160 Elbow; Line Heater; A419612	3000	0.301	0.299	0.178	There is between 0.002 in (0.1 mm) and 0.088 in (2.2 mm) of possible metal loss. The remaining thickness is above the calculated required pipe thickness. Okay for continued service.	
03-23-42-10 W5M							
11925	2" Sch 160 Reheat Outlet Elbow; Line Heater ; A2711458	1440	0.300	0.297	0.086	Between 0.003 in (0.1 mm) and 0.089 in (2.3 mm) of possible metal loss. The minimum thickness measured remains greater than the calculated required pipe thickness. OK for continued service.	
11940	2" Sch 160 Inlet Elbow from Well; Line Heater ; A2711458	3375	0.300	0.272	0.200	Between 0.028 in (0.7 mm) and 0.114 in (2.9 mm) of possible metal loss. The minimum thickness measured remains greater than the calculated required pipe thickness. OK for continued service.	
12000	Top Head; 3 Phase Separator; A2710529	1440	0.865	0.932	53.6% of corrosion allowance remaining	The material thickness remains within 53.6% of the corrosion allowance. The vessel is OK for continued service.	
12030	Bottom Head; 3 Phase Separator; A2710529	1440	0.865	0.961	76.8% of corrosion allowance remaining	The material thickness remains within 76.8% of the corrosion allowance. The vessel is OK for continued service.	
12055	2" Sch XS Gas Outlet Elbow; 3 Phase Separator; A2710529	1440	0.191	0.190	0.086	Up to 0.055 in (1.4 mm) of possible metal loss has occurred. The measured thickness is greater than the calculated required thickness. This piping is OK for continued service.	

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03-23-42-10 W5M							
12100	Filter Mid Shell; Glycol Filter; SN-LM-2646	150	0.219	0.191	0.075	There is between 0.028 in (0.7 mm) and 0.090 in (2.3 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. This vessel is ok for continued service should it be put back into service.	
12200	Mid. Shell; Primary Fuel Gas Filter; SN-LGS-4615	150	0.219	0.204	0.075	There is between 0.015 in (0.4 mm) and 0.077 in (2.0 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. This vessel is OK for continued service.	
12400	Top Head; Glycol Flash Drum; A2710550	150	0.317	0.432	92.0% of corrosion allowance remaining	There is 92.0% of the corrosion allowance remaining. This vessel is OK for continued service should this vessel be put back into service.	
06-25-42-10 W5M							
11100	2" Sch 160 Tee; Well Head Piping;	1440	0.300	0.480	0.086	The minimum measured thickness was less than 10% of the average thickness measured. Okay for continued service.	
11105	2" Sch 160 First Elbow Down Stream of Well; Riser;	1440	0.300	0.282	0.086	There is between 0.018 in (0.5 mm) and 0.104 in (2.6 mm) of possible metal loss. The measured thickness remains above the calculated required thickness. This piping is ok for continued service.	
11110	2" Sch 160 Second Elbow Down Stream of Well; Riser;	1440	0.300	0.276	0.086	There is between 0.024 in (0.6 mm) and 0.110 in (2.8 mm) of possible metal loss. The measured thickness remains above the calculated required thickness. This piping is OK for continued service.	
11115	2" Sch 160 Third Elbow Down Stream of Well; Riser;	1440	0.300	0.268	0.086	There is between 0.032 in (0.8 mm) and 0.118 in (3.0 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. This piping is OK for continued service.	

NuVista Energy Ltd.

Sunchild Flagged UTS Test Point Assessment Summary

June 14, 2011							AB
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06-25-42-10 W5M							
11200	Top Head; 3 Phase Separator; A2710536	1440	0.848	0.896	38.4% of corrosion allowance remaining	There is 38.4% of the corrosion allowance remaining. Okay for continued service.	
11210	Upper Shell Above the Roof Line; 3 Phase Separator; A2710536	1440	0.777	0.976	0.716	There is possible metal loss from the original thickness. The remaining material is within the mill tolerance. Okay for continued service.	
11225	Lower Shell by Bottom Sight Glass; 3 Phase Separator; A2710536	1440	0.777	0.978	0.715	There is possible metal loss from the original thickness. The remaining material is within the mill tolerance. Okay for continued service.	
11230	Bottom Head; 3 Phase Separator; A2710536	1440	0.828	0.902	59.2% of corrosion allowance remaining	There is 59.2% of the corrosion allowance remaining. Okay for continued service.	
11235	2" Sch XS Gas Outlet Elbow; 3 Phase Separator; A2710536	1440	0.191	0.172	0.086	There is between 0.019 in (0.5 mm) and 0.073 in (1.9 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. This piping is OK for continued use.	
11245	2" Sch 160 Gas Inlet Elbow; 3 Phase Separator; A2710536	1440	0.300	0.296	0.086	There is between 0.004 in (0.1 mm) and 0.090 in (2.3 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. This piping is OK for continued service.	
11300	Mid. Shell; Fuel Gas Scrubber; SN-LM-2549	150	0.245	0.206	0.063	There is between 0.039 in (1.0 mm) and 0.109 in (2.8 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. OK for continued service.	
11305	Bottom Head; Fuel Gas Scrubber; SN-LM-2549	150	0.245	0.208	0.063	Based on the calculated required thickness there is enough thickness for continued service.	
11400	Mid. Shell; Primary Fuel Gas Scrubber; SN-LGS-4616	150	0.219	0.196	0.075	There is between 0.023 in (0.6 mm) and 0.085 in (2.2 mm) of possible metal loss. The measured thickness of remains greater than the calculated required thickness. This vessel is ok for continued service.	

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Sunchild Flagged UTS Test Point Assessment Summary

June 14, 2011							AB
<u>Test Pt. & Location</u>	<u>Description</u>	<u>MAWP (PSI)</u>	<u>Original Design Required Thickness (in.)</u>	<u>Minimum Measured Thickness (in.)</u>	<u>Calculated Required Thickness (in.)</u>	<u>Comments</u>	<u>Remedial Action Required</u>
07-12-44-11 W5M							
3435	3" Sch XS Gas Inlet Elbow; 3 Phase Separator; A496358	1440	0.263	0.256	0.126	There is between 0.007 in (0.2 mm) and 0.082 in (2.1 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. This piping is OK for continued use.	
08-31-43-10 W5M							
4400	Mid. Shell; Glycol Filter; SN-LM-2817	150	0.240	0.190	0.082	Based on calculated required shell thickness, there is enough remaining shell thickness for continued service should this vessel be put back into service.	
10400	3" Sch XS Elbow; Riser;	1420	0.263	0.213	0.124	There is between 0.050 in (1.3 mm) and 0.125 in (3.2 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. The piping is OK for continued service.	
10725	3" Sch XS Gas Outlet Elbow; 3 Phase Separator; A512240	1440	0.263	0.260	0.126	There is between 0.003 in (0.1 mm) and 0.078 in (2.0 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. The piping is OK for continues service.	
10735	2" Sch 160 Gas Inlet Elbow; 3 Phase Separator; A512240	1440	0.300	0.298	0.126	There is between 0.002 in (0.1 mm) and 0.088 in (2.2 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. The piping is OK for continued service.	
10815	Mid. Shell at Top Sight Glass; Glycol Contactor Tower; A94584	1420	1.520	1.409	1.319	There is between 0.111 in (2.8 mm) and 0.131 in (3.3 mm) of possible metal loss. The measured thickness of remains greater than the calculated required thickness. Okay for continued service.	

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10-07-43-10 W5M							
120	2" Sch 40 Elbow; Natural Gas Cooler; SN-57410A.2	400	0.189	0.182	0.063	There is between 0.007 in (0.2 mm) and 0.061 in (1.5 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. The piping is OK for continued use.	
200	Head; Lube Oil Separator; A530736	400	0.231	0.286	88.2% of corrosion allowance remaining	There is 88.2% of corrosion allowance remaining. Ok for continued service.	
215	2.5" Sch 80 Gas Inlet Elbow (Nozzle); Lube Oil Separator; A530736	400	0.242	0.172	0.063	There is between 0.070 in (1.8 mm) and 0.139 in (3.5 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. Ok for continued service.	
220	2.5" Sch 80 Gas Outlet Elbow (Nozzle); Lube Oil Separator; A530736	400	0.242	0.168	0.063	There is between 0.074 in (1.9 mm) and 0.143 in (3.6 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. Ok for continued service.	
730	3" Sch XS Gas Outlet Elbow; 3 Phase Separator; A403393	1440	0.263	0.260	0.126	There is between 0.003 in (0.1 mm) and 0.078 in (2.0 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. Ok for continued use.	
745	3" Sch XS Gas Inlet Elbow; 3 Phase Separator; A403393	1440	0.263	0.261	0.126	Possible metal loss up to 0.077 in (1.9 mm) has occurred. The measured thickness remains greater than the calculated required thickness. Ok for continued use.	
900	2" Sch XS Piping; Glycol/Oil Exchanger; SN-H060CN02605501	400	0.191	0.181	0.063	There is between 0.010 in (0.2 mm) and 0.064 in (1.6 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. The exchanger is OK for continued service.	
910	2" Sch XS Piping; Glycol/Oil Exchanger; SN-H060CN02605501	400	0.191	0.179	0.063	There is between 0.012 in (0.3 mm) and 0.066 in (1.7 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. The exchanger is OK for continued service.	

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<u>Test Pt. & Location</u>	<u>Description</u>	<u>MAWP (PSI)</u>	<u>Original Design Required Thickness (in.)</u>	<u>Minimum Measured Thickness (in.)</u>	<u>Calculated Required Thickness (in.)</u>	<u>Comments</u>	<u>Remedial Action Required</u>
10-07-43-10 W5M							
1000	Mid. Shell; Line Heater Fuel Gas Scrubber; SN-C933A.FP962	150	0.240	0.233	0.064	Based on the calculated required thickness, there is enough remaining thickness for continued service should this vessel be put back into service.	
1100	Mid. Shell; Fuel Gas Scrubber; SN-C662A.FP79	150	0.219	0.237	0.063	The measured thickness remains within the mill tolerance. The vessel is OK for continued service.	
1300	Mid. Shell; Fuel Gas Scrubber; SN-C926B.FP967	150	0.219	0.236	0.063	The measured thickness remains within the mill tolerance. The vessel is OK for continued use.	
9920	3" Sch 80 Gas Outlet Nozzle; Discharge Scrubber; A530735	400	0.263	0.257	0.063	There is between 0.006 in (0.1 mm) and 0.081 in (2.0 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. Ok for continued service.	
9925	3" Sch 80 Gas Inlet Nozzle; Discharge Scrubber; A530735	400	0.263	0.221	0.063	There is between 0.042 in (1.1 mm) and 0.117 in (3.0 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. Ok for continued service.	
9935	1.5" Sch 160 Drain Nozzle; Discharge Scrubber; A530735	400	0.246	0.189	0.063	There is between 0.057 in (1.4 mm) and 0.127 in (3.2 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. Ok for continued service.	
10005	3" Sch 160 Nozzle; Line Heater; A400151	3134	0.383	0.221	0.366	According to the manufacturer's data report, the nozzles on the line heater are 3" schedule 160 in thickness. The minimum measured thickness is low in comparison. It is recommended that UT be conducted in one year to monitor for corrosion.	Conduct UT in one year.
10060	3" Sch 160 Elbow; Line Heater; A4000151	1440	0.383	0.360	0.126	There is between 0.023 in (0.6 mm) and 0.133 in (3.4 mm) of possible metal loss. The measured thickness remains above the calculated required thickness. Ok for continued service.	

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Sunchild Flagged UTS Test Point Assessment Summary

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<u>Test Pt. & Location</u>	<u>Description</u>	<u>MAWP (PSI)</u>	<u>Original Design Required Thickness (in.)</u>	<u>Minimum Measured Thickness (in.)</u>	<u>Calculated Required Thickness (in.)</u>	<u>Comments</u>	<u>Remedial Action Required</u>
10-18-43-10 W5M							
2030	4" Sch 40 Elbow; Natural Gas Cooler; SN-57410B.2	400	0.207	0.203	0.063	There is between 0.004 in (0.1 mm) and 0.064 in (1.6 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. Ok for continued service.	
2200	Mid. Shell; Fuel Gas Scrubber; SN-LGS-4617	150	0.219	0.205	0.074	Based on calculated required shell thickness, there is enough remaining shell thickness for continued service.	
2530	2" XS Gas Inlet Line Elbow; Discharge Scrubber; A530738	400	0.191	0.186	0.063	There is between 0.005 in (0.1 mm) and 0.059 in (1.5 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. Ok for continued service.	
2615	2.5" Sch 80 Gas Outlet Elbow (Nozzle); 3 Phase Separator; A549788	400	0.242	0.194	0.063	There is between 0.048 in (1.2 mm) and 0.117 in (3.0 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. Ok for continued service.	
2620	2.5" Sch 80 Gas Inlet Elbow (Nozzle); 3 Phase Separator; A549788	400	0.242	0.180	0.063	There is between 0.062 in (1.6 mm) and 0.131 in (3.3 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. Ok for continued service.	
2700	Top Head; 3 Phase Separator; A2710512	1440	0.970	1.089	95.2% of corrosion allowance remaining	There is 95.2% of the corrosion allowance remaining. Ok for continued service.	
2735	3" Sch XXS Gas Outlet Elbow (Nozzle); 3 Phase Separator; A2710512	1440	0.525	0.271	0.144	The manufacturer's data report gives a gas outlet nozzle thickness of 0.8125 inch. However the maximum thickness of commercial 3" piping is 0.600 inch. The minimum measured thickness on the gas outlet elbow (nozzle) is low in comparison to those values. It is recommended that UT be performed in one year to monitor for active corrosion.	Conduct UT in one year.
10300	4" Sch 120 Bend From Pipeline; Riser;	1440	0.383	0.362	0.162	There is between 0.021 in (0.5 mm) and 0.131 in (3.3 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. Ok for continued service.	

NuVista Energy Ltd.

Sunchild Flagged UTS Test Point Assessment Summary

June 14, 2011							AB
<u>Test Pt. & Location</u>	<u>Description</u>	<u>MAWP (PSI)</u>	<u>Original Design Required Thickness (in.)</u>	<u>Minimum Measured Thickness (in.)</u>	<u>Calculated Required Thickness (in.)</u>	<u>Comments</u>	<u>Remedial Action Required</u>
11-29-43-11 W5M							
3125	2" Sch 160 Outlet Elbow off Shell; Low Temp Blowcase; A560371	1440	0.300	0.292	0.086	There is between 0.008 in (0.2 mm) and 0.094 in (2.4 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. Ok for continued service.	
3200	Mid. Shell; Fuel Gas Scrubber; SN-S13326	150	0.156	0.192	0.063	There is 57.2% of the corrosion allowance remaining. Ok for continued service.	

Section 2

Detailed Assessment Calculations

The intent of this assessment was to evaluate all flagged thickness readings contained within the attached ultrasonic thickness survey report. This assessment should not be taken as a detailed engineering evaluation, but rather as a preliminary overview of the flagged thickness readings to determine if further actions or assessments are warranted. The following calculations were based on information available at the time of this assessment. Where materials could not be confirmed, the most conservative allowable stress value was used to calculate the minimum design thickness. Thickness calculations were based on internal design pressures and did not consider other potential stresses that may have been considered during the original design.

Detailed Assessment Calculations for Flagged Ultrasonic Inspection Test Points

Company: NuVista Energy Ltd.

Facility: Sunchild

UTS performed by Red Flame NDT Services

Survey Completion Date: February 24, 2011

Location: 11-29-43-11 W5M

Test Point #: 3125

Test Point Description: 2" Sch 160 Outlet Elbow off Shell

Associated Vessel(s): Low Temp Blowcase

A Number: A560371

Flag Status Code: A, B

Thickness Data:

Nominal Thickness	0.343 in.	8.7 mm
2" Sch 160 Outlet Elbow off Shell Material	SA-234-WPB (<i>assumed</i>)	
		(12.5% for B31.3 pipe/fittings)
Mill Tolerance	0.043 in.	

Mill Tolerance Check:

Nominal Thickness Minus Mill Tolerance=	0.300 in.	
Nominal Thickness Plus Mill Tolerance=	0.386 in.	Below mill tolerance.
Minimum Thickness Measured:	0.292 in.	Proceed with calculations

Additional Data:

Max. Line Pressure (P)	1440 psi	9929 kPa
Outside Diameter (D)	2.375 in.	60.3 mm
Max. Allowable Stress (S)	20000 psi	
Joint Efficient (E)	1.00	
Maximum Metal Loss Since Previous UTS	0 in.	0.0 mm
Previous UTS Performed	N/A months ago	

Calculations:

Calculated Minimum Required Pipe Thickness (t_{min})	0.086 in.	0.086 $t=PD_o/(2SE)$
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Results:

Thickness Above/Below Lower Mill Tolerance (t) =	-0.008 in.	0.2 mm below
Thickness Above/Below Upper Mill Tolerance (t) =	-0.094 in.	2.4 mm below
Actual Minimum Thickness Measured (t_{act})	0.292 in.	7.4 mm
Calculated Required Pipe Thickness (t_{min})	0.086 in.	2.2 mm
Remaining Pipe Thickness (t)	0.207 in.	5.2 mm
Estimated Remaining Life	N/A yrs.	
Corrosion Rate	N/A in. per year	N/A mm per year

Comments:

There is between 0.008 in (0.2 mm) and 0.094 in (2.4 mm) of possible metal loss. The measured thickness remains greater than the calculated required thickness. Ok for continued service.

Remedial Action Required:

June 14, 2011

AB