



## **Noble Energy, Inc.**

**Weld Co., CO**

**NENW Sec 31-T3N-R67W**

**Varra P31-74HN**

**Hz**

**Survey: Survey #1**

## **Standard Survey Report**

**26 October, 2011**



**PHOENIX**  
**TECHNOLOGY SERVICES**

Company:	Noble Energy, Inc.	Local Co-ordinate Reference:	Well Varra P31-74HN
Project:	Weld Co., CO	TVD Reference:	Varra P31-74HN KBE @ 4829.0ft (Original Well Elev)
Site:	NENW Sec 31-T3N-R67W	MD Reference:	Varra P31-74HN KBE @ 4829.0ft (Original Well Elev)
Well:	Varra P31-74HN	North Reference:	Grid
Wellbore:	Hz	Survey Calculation Method:	Minimum Curvature
Design:	Hz	Database:	Local

Project	Weld Co., CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site		NENW Sec 31-T3N-R67W			
Site Position:		Northing:		Latitude:	
From:	Lat/Long	Easting:		Longitude:	
Position Uncertainty:	0.0 ft	Slot Radius:		Grid Convergence:	1.00

Well	Varra P31-74HN					
Well Position	+N/-S	0.0 ft	Northing:	1,312,364.81 ft	Latitude:	40.189450
	+E/-W	0.0 ft	Easting:	3,158,265.05 ft	Longitude:	-104.933500
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,805.0 ft

Wellbore	Hz				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010-14	2011/08/17	8.91	66.85	52,984

Design	Hz				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.0	0.0	0.0	168.92	

Survey Program		Date	2011/10/26	
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
727.0	11,600.0	Survey #1 (Hz)	MWD	

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	Subsea Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
0.0	0.00	0.00	0.0	-4,829.0	0.0	0.0	0.0	0.00	0.00	0.00
727.0	1.00	350.00	727.0	-4,102.0	6.2	-1.1	-6.3	0.14	0.14	0.00
779.0	1.01	262.82	779.0	-4,050.0	6.6	-1.6	-6.8	2.67	0.02	-167.65
901.0	1.10	266.00	900.9	-3,928.1	6.4	-3.9	-7.0	0.09	0.07	2.61
1,182.0	1.00	242.80	1,181.9	-3,647.1	5.1	-8.7	-6.7	0.15	-0.04	-8.26
1,466.0	1.00	275.30	1,465.8	-3,363.1	4.2	-13.4	-6.7	0.20	0.00	11.44
1,497.0	1.10	265.10	1,496.8	-3,332.2	4.2	-14.0	-6.8	0.68	0.32	-32.90
1,529.0	0.40	219.20	1,528.8	-3,300.2	4.1	-14.4	-6.8	2.72	-2.19	-143.44
1,560.0	0.80	130.10	1,559.8	-3,269.2	3.9	-14.3	-6.5	2.87	1.29	-287.42



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Wellbore:	Hz	Survey Calculation Method:	Minimum Curvature
Design:	Hz	Database:	Local

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	Subsea Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
1,592.0	2.60	107.60	1,591.8	-3,237.2	3.5	-13.4	-6.0	5.89	5.63	-70.31
1,624.0	4.00	103.00	1,623.8	-3,205.2	3.0	-11.6	-5.2	4.45	4.38	-14.38
1,655.0	4.70	102.60	1,654.7	-3,174.3	2.5	-9.3	-4.3	2.26	2.26	-1.29
1,686.0	5.40	101.10	1,685.6	-3,143.4	2.0	-6.7	-3.2	2.30	2.26	-4.84
1,718.0	6.00	99.30	1,717.4	-3,111.6	1.4	-3.5	-2.1	1.96	1.88	-5.63
1,749.0	6.50	99.50	1,748.2	-3,080.8	0.8	-0.2	-0.9	1.61	1.61	0.65
1,781.0	7.20	95.70	1,780.0	-3,049.0	0.4	3.6	0.3	2.60	2.19	-11.88
1,812.0	7.80	89.50	1,810.7	-3,018.3	0.2	7.6	1.3	3.25	1.94	-20.00
1,844.0	9.00	89.80	1,842.4	-2,986.6	0.2	12.3	2.2	3.75	3.75	0.94
1,938.0	9.40	89.50	1,935.2	-2,893.8	0.3	27.3	5.0	0.43	0.43	-0.32
2,033.0	8.30	78.80	2,029.0	-2,800.0	1.7	41.8	6.4	2.08	-1.16	-11.26
2,128.0	8.00	77.50	2,123.1	-2,705.9	4.5	55.0	6.2	0.37	-0.32	-1.37
2,225.0	8.10	80.40	2,219.1	-2,609.9	7.1	68.3	6.2	0.43	0.10	2.99
2,257.0	7.70	80.50	2,250.8	-2,578.2	7.8	72.7	6.3	1.25	-1.25	0.31
2,289.0	8.00	79.70	2,282.5	-2,546.5	8.5	77.0	6.4	1.00	0.94	-2.50
2,320.0	8.90	80.10	2,313.2	-2,515.8	9.3	81.4	6.5	2.91	2.90	1.29
2,384.0	10.00	85.10	2,376.3	-2,452.7	10.7	91.9	7.2	2.14	1.72	7.81
2,415.0	9.60	84.80	2,406.9	-2,422.1	11.1	97.1	7.7	1.30	-1.29	-0.97
2,510.0	9.80	85.90	2,500.5	-2,328.5	12.4	113.1	9.5	0.29	0.21	1.16
2,606.0	9.80	83.40	2,595.1	-2,233.9	13.9	129.3	11.2	0.44	0.00	-2.60
2,701.0	9.10	81.10	2,688.8	-2,140.2	16.0	144.8	12.1	0.84	-0.74	-2.42
2,796.0	9.20	77.50	2,782.6	-2,046.4	18.8	159.6	12.2	0.61	0.11	-3.79
2,891.0	8.70	76.80	2,876.5	-1,952.5	22.1	174.0	11.7	0.54	-0.53	-0.74
2,986.0	7.80	84.00	2,970.5	-1,858.5	24.4	187.4	12.0	1.44	-0.95	7.58
3,081.0	8.00	90.00	3,064.6	-1,764.4	25.1	200.5	13.9	0.89	0.21	6.32
3,176.0	9.20	93.70	3,158.5	-1,670.5	24.6	214.7	17.1	1.39	1.26	3.89
3,271.0	8.30	94.50	3,252.4	-1,576.6	23.6	229.1	20.9	0.96	-0.95	0.84
3,365.0	7.60	91.30	3,345.5	-1,483.5	22.9	242.0	24.0	0.88	-0.74	-3.40
3,460.0	7.00	85.20	3,439.7	-1,389.3	23.3	254.1	26.0	1.03	-0.63	-6.42
3,555.0	6.60	89.90	3,534.1	-1,294.9	23.8	265.3	27.7	0.72	-0.42	4.95
3,650.0	6.70	98.00	3,628.4	-1,200.6	23.0	276.3	30.5	0.99	0.11	8.53
3,745.0	10.10	91.00	3,722.4	-1,106.6	22.1	290.1	34.1	3.73	3.58	-7.37
3,840.0	10.50	89.30	3,815.9	-1,013.1	22.0	307.1	37.4	0.53	0.42	-1.79
3,935.0	10.50	84.80	3,909.3	-919.7	22.9	324.4	39.8	0.86	0.00	-4.74
4,030.0	9.20	71.10	4,002.9	-826.1	26.2	340.2	39.7	2.81	-1.37	-14.42
4,125.0	8.00	64.00	4,096.8	-732.2	31.5	353.3	36.9	1.68	-1.26	-7.47
4,220.0	9.70	68.40	4,190.7	-638.3	37.4	366.7	33.8	1.92	1.79	4.63
4,315.0	9.50	65.90	4,284.4	-544.6	43.5	381.3	30.5	0.49	-0.21	-2.63
4,410.0	9.50	62.50	4,378.0	-451.0	50.4	395.4	26.6	0.59	0.00	-3.58
4,505.0	9.90	64.20	4,471.7	-357.3	57.5	409.7	22.3	0.52	0.42	1.79
4,600.0	10.30	63.10	4,565.2	-263.8	64.9	424.6	17.9	0.47	0.42	-1.16



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Wellbore:	Hz	Survey Calculation Method:	Minimum Curvature
Design:	Hz	Database:	Local

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	Subsea Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
4,695.0	9.10	62.40	4,658.9	-170.1	72.2	438.8	13.4	1.27	-1.26	-0.74
4,790.0	8.00	59.50	4,752.8	-76.2	79.1	451.2	9.1	1.24	-1.16	-3.05
4,885.0	6.20	60.80	4,847.1	18.1	84.9	461.4	5.3	1.90	-1.89	1.37
4,980.0	4.70	57.30	4,941.6	112.6	89.5	469.1	2.3	1.62	-1.58	-3.68
5,075.0	3.60	48.20	5,036.4	207.4	93.6	474.6	-0.7	1.35	-1.16	-9.58
5,170.0	2.90	43.40	5,131.2	302.2	97.4	478.5	-3.6	0.79	-0.74	-5.05
5,265.0	2.40	36.10	5,226.1	397.1	100.7	481.3	-6.4	0.63	-0.53	-7.68
5,360.0	1.30	22.30	5,321.1	492.1	103.3	482.9	-8.6	1.24	-1.16	-14.53
5,455.0	1.30	34.90	5,416.1	587.1	105.2	483.9	-10.3	0.30	0.00	13.26
5,549.0	0.60	46.80	5,510.0	681.0	106.4	484.9	-11.3	0.77	-0.74	12.66
5,644.0	1.00	321.30	5,605.0	776.0	107.4	484.7	-12.3	1.18	0.42	-90.00
5,739.0	0.60	134.00	5,700.0	871.0	107.7	484.6	-12.6	1.68	-0.42	181.79
5,834.0	0.01	84.00	5,795.0	966.0	107.4	485.0	-12.2	0.62	-0.62	-52.63
5,929.0	0.60	219.80	5,890.0	1,061.0	107.0	484.6	-11.9	0.64	0.62	142.95
6,024.0	0.50	230.70	5,985.0	1,156.0	106.3	484.0	-11.4	0.15	-0.11	11.47
6,119.0	0.50	279.50	6,080.0	1,251.0	106.1	483.3	-11.3	0.43	0.00	51.37
6,214.0	0.70	232.10	6,175.0	1,346.0	105.9	482.4	-11.2	0.54	0.21	-49.89
6,309.0	0.60	298.90	6,270.0	1,441.0	105.7	481.5	-11.2	0.76	-0.11	70.32
6,340.0	0.50	309.00	6,301.0	1,472.0	105.9	481.3	-11.5	0.45	-0.32	32.58
6,408.0	0.70	117.60	6,369.0	1,540.0	105.9	481.4	-11.4	1.76	0.29	247.94
6,439.0	0.80	127.30	6,400.0	1,571.0	105.7	481.7	-11.1	0.52	0.32	31.29
6,471.0	2.10	164.10	6,432.0	1,603.0	105.0	482.1	-10.4	4.80	4.06	115.00
6,503.0	4.90	176.10	6,463.9	1,634.9	103.1	482.3	-8.4	9.00	8.75	37.50
6,534.0	7.60	179.30	6,494.7	1,665.7	99.7	482.5	-5.1	8.78	8.71	10.32
6,566.0	10.30	179.40	6,526.4	1,697.4	94.7	482.5	-0.2	8.44	8.44	0.31
6,598.0	12.30	178.60	6,557.7	1,728.7	88.4	482.6	6.0	6.27	6.25	-2.50
6,629.0	13.50	179.90	6,588.0	1,759.0	81.5	482.7	12.8	3.98	3.87	4.19
6,661.0	14.00	180.00	6,619.0	1,790.0	73.9	482.7	20.2	1.56	1.56	0.31
6,693.0	16.40	178.90	6,649.9	1,820.9	65.5	482.8	28.5	7.55	7.50	-3.44
6,724.0	19.30	177.60	6,679.4	1,850.4	56.0	483.1	37.9	9.44	9.35	-4.19
6,756.0	21.50	181.00	6,709.4	1,880.4	44.9	483.2	48.8	7.81	6.88	10.63
6,787.0	23.90	183.20	6,738.0	1,909.0	32.9	482.8	60.5	8.21	7.74	7.10
6,819.0	27.00	183.50	6,766.9	1,937.9	19.2	482.0	73.8	9.70	9.69	0.94
6,851.0	28.50	184.90	6,795.2	1,966.2	4.3	480.9	88.1	5.11	4.69	4.38
6,882.0	27.50	181.80	6,822.6	1,993.6	-10.2	480.0	102.2	5.70	-3.23	-10.00
6,914.0	27.60	175.90	6,851.0	2,022.0	-25.0	480.3	116.8	8.53	0.31	-18.44
6,946.0	28.30	173.10	6,879.2	2,050.2	-39.9	481.7	131.7	4.65	2.19	-8.75
6,977.0	30.60	173.00	6,906.2	2,077.2	-55.0	483.6	146.9	7.42	7.42	-0.32
7,009.0	34.30	172.30	6,933.2	2,104.2	-72.0	485.8	164.0	11.62	11.56	-2.19
7,041.0	37.60	172.20	6,959.1	2,130.1	-90.7	488.3	182.8	10.31	10.31	-0.31
7,135.0	47.50	172.90	7,028.3	2,199.3	-153.6	496.5	246.2	10.54	10.53	0.74
7,167.0	53.70	173.30	7,048.6	2,219.6	-178.1	499.5	270.8	19.40	19.38	1.25



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7,199.0	58.20	173.30	7,066.5	2,237.5	-204.5	502.6	297.2	14.06	14.06	0.00
7,230.0	61.10	173.00	7,082.2	2,253.2	-231.0	505.8	323.9	9.39	9.35	-0.97
7,262.0	63.90	174.00	7,096.9	2,267.9	-259.2	509.0	352.2	9.18	8.75	3.13
7,293.0	67.60	174.60	7,109.7	2,280.7	-287.3	511.8	380.3	12.07	11.94	1.94
7,325.0	71.10	174.90	7,121.0	2,292.0	-317.2	514.5	410.1	10.97	10.94	0.94
7,356.0	73.70	175.50	7,130.3	2,301.3	-346.6	517.0	439.5	8.59	8.39	1.94
7,388.0	75.50	175.50	7,138.8	2,309.8	-377.4	519.4	470.1	5.63	5.63	0.00
7,419.0	76.50	176.10	7,146.3	2,317.3	-407.4	521.6	500.0	3.73	3.23	1.94
7,451.0	79.50	175.70	7,153.0	2,324.0	-438.6	523.9	531.1	9.45	9.38	-1.25
7,483.0	82.20	176.50	7,158.1	2,329.1	-470.1	526.0	562.4	8.79	8.44	2.50
7,506.0	83.80	176.60	7,160.9	2,331.9	-492.9	527.4	585.0	6.97	6.96	0.43
7,609.0	87.80	178.20	7,168.4	2,339.4	-595.5	532.0	686.6	4.18	3.88	1.55
7,641.0	87.80	178.30	7,169.6	2,340.6	-627.4	533.0	718.2	0.31	0.00	0.31
7,672.0	88.10	176.20	7,170.7	2,341.7	-658.4	534.5	748.8	6.84	0.97	-6.77
7,704.0	90.10	176.10	7,171.3	2,342.3	-690.3	536.6	780.6	6.26	6.25	-0.31
7,736.0	92.30	175.50	7,170.6	2,341.6	-722.2	539.0	812.3	7.13	6.88	-1.88
7,831.0	91.80	174.00	7,167.2	2,338.2	-816.7	547.7	906.8	1.66	-0.53	-1.58
7,926.0	91.60	176.20	7,164.4	2,335.4	-911.3	555.8	1,001.2	2.32	-0.21	2.32
8,021.0	90.40	173.40	7,162.7	2,333.7	-1,005.9	564.4	1,095.6	3.21	-1.26	-2.95
8,116.0	93.10	172.70	7,159.8	2,330.8	-1,100.2	575.9	1,190.3	2.94	2.84	-0.74
8,211.0	92.70	171.20	7,155.0	2,326.0	-1,194.1	589.2	1,285.1	1.63	-0.42	-1.58
8,306.0	93.10	171.10	7,150.2	2,321.2	-1,287.9	603.8	1,379.9	0.43	0.42	-0.11
8,401.0	90.90	169.70	7,146.9	2,317.9	-1,381.5	619.6	1,474.8	2.74	-2.32	-1.47
8,495.0	89.80	169.30	7,146.3	2,317.3	-1,473.9	636.7	1,568.8	1.25	-1.17	-0.43
8,590.0	88.40	169.70	7,147.8	2,318.8	-1,567.3	654.0	1,663.8	1.53	-1.47	0.42
8,686.0	89.10	169.20	7,149.9	2,320.9	-1,661.6	671.6	1,759.7	0.90	0.73	-0.52
8,780.0	90.20	170.20	7,150.5	2,321.5	-1,754.1	688.4	1,853.7	1.58	1.17	1.06
8,875.0	88.70	171.10	7,151.4	2,322.4	-1,847.9	703.9	1,948.7	1.84	-1.58	0.95
8,971.0	89.10	172.50	7,153.2	2,324.2	-1,942.9	717.5	2,044.5	1.52	0.42	1.46
9,066.0	89.80	172.90	7,154.1	2,325.1	-2,037.1	729.6	2,139.3	0.85	0.74	0.42
9,160.0	91.00	174.90	7,153.5	2,324.5	-2,130.5	739.6	2,233.0	2.48	1.28	2.13
9,255.0	90.50	174.80	7,152.2	2,323.2	-2,225.1	748.1	2,327.4	0.54	-0.53	-0.11
9,350.0	89.70	176.20	7,152.1	2,323.1	-2,319.8	755.6	2,421.8	1.70	-0.84	1.47
9,445.0	89.10	175.60	7,153.1	2,324.1	-2,414.6	762.4	2,516.1	0.89	-0.63	-0.63
9,540.0	88.60	176.40	7,155.0	2,326.0	-2,509.3	769.0	2,610.4	0.99	-0.53	0.84
9,635.0	90.80	177.30	7,155.5	2,326.5	-2,604.2	774.2	2,704.4	2.50	2.32	0.95
9,730.0	90.80	176.80	7,154.1	2,325.1	-2,699.1	779.1	2,798.5	0.53	0.00	-0.53
9,825.0	90.40	176.20	7,153.1	2,324.1	-2,793.9	784.9	2,892.6	0.76	-0.42	-0.63
9,920.0	90.50	176.50	7,152.4	2,323.4	-2,888.7	791.0	2,986.8	0.33	0.11	0.32
10,015.0	90.10	176.00	7,151.9	2,322.9	-2,983.5	797.2	3,081.1	0.67	-0.42	-0.53
10,109.0	89.80	175.60	7,152.0	2,323.0	-3,077.2	804.0	3,174.4	0.53	-0.32	-0.43
10,205.0	90.80	176.10	7,151.5	2,322.5	-3,173.0	811.0	3,269.7	1.16	1.04	0.52



Company:	Noble Energy, Inc.	Local Co-ordinate Reference:	Well Varra P31-74HN
Project:	Weld Co., CO	TVD Reference:	Varra P31-74HN KBE @ 4829.0ft (Original Well Elev)
Site:	NENW Sec 31-T3N-R67W	MD Reference:	Varra P31-74HN KBE @ 4829.0ft (Original Well Elev)
Well:	Varra P31-74HN	North Reference:	Grid
Wellbore:	Hz	Survey Calculation Method:	Minimum Curvature
Design:	Hz	Database:	Local

#### Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	Subsea Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
10,299.0	92.30	176.10	7,148.9	2,319.9	-3,266.7	817.4	3,362.9	1.60	1.60	0.00
10,394.0	92.40	176.00	7,145.0	2,316.0	-3,361.4	823.9	3,457.1	0.15	0.11	-0.11
10,489.0	91.70	175.80	7,141.6	2,312.6	-3,456.1	830.7	3,551.3	0.77	-0.74	-0.21
10,584.0	90.00	174.70	7,140.2	2,311.2	-3,550.8	838.6	3,645.7	2.13	-1.79	-1.16
10,679.0	90.40	175.50	7,139.9	2,310.9	-3,645.4	846.7	3,740.2	0.94	0.42	0.84
10,774.0	89.10	174.70	7,140.3	2,311.3	-3,740.1	854.8	3,834.6	1.61	-1.37	-0.84
10,869.0	89.20	173.10	7,141.7	2,312.7	-3,834.5	864.9	3,929.2	1.69	0.11	-1.68
10,964.0	90.50	172.80	7,142.0	2,313.0	-3,928.8	876.6	4,024.0	1.40	1.37	-0.32
11,059.0	87.30	171.80	7,143.8	2,314.8	-4,022.9	889.3	4,118.8	3.53	-3.37	-1.05
11,154.0	87.20	171.90	7,148.4	2,319.4	-4,116.8	902.7	4,213.6	0.15	-0.11	0.11
11,249.0	87.00	171.90	7,153.2	2,324.2	-4,210.8	916.1	4,308.3	0.21	-0.21	0.00
11,343.0	86.90	172.60	7,158.2	2,329.2	-4,303.8	928.8	4,402.0	0.75	-0.11	0.74
11,439.0	86.90	172.50	7,163.4	2,334.4	-4,398.8	941.2	4,497.7	0.10	0.00	-0.10
11,533.0	87.30	172.60	7,168.1	2,339.1	-4,491.9	953.4	4,591.4	0.44	0.43	0.11
11,541.0	87.20	171.90	7,168.5	2,339.5	-4,499.8	954.4	4,599.4	8.83	-1.25	-8.75
Projection to Bit										
11,600.0	87.20	171.90	7,171.4	2,342.4	-4,558.2	962.7	4,658.2	0.00	0.00	0.00

#### Survey Annotations

Measured Depth (')	Vertical Depth (')	Local Coordinates		Comment
		+N/-S (')	+E/-W (')	
11,600.0	7,171.4	-4,558.2	962.7	Projection to Bit

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_

WELL DETAILS: Varra P31-74HN

+N/-S		+E/-W		Nothing	Eastings	Northings	Latitude	Longitude	Spot
0.0	0.0	0.0	0.0	1312364.81	3158255.06	40.189	-104.933		

SECTION DETAILS

No plan data is available

ANNOTATIONS

TVD	MD	Annotation
7155.1	7595.0	Casing Pt 688 FHL/2325' FEL
7171.4	11600.0	Projection to BH
7171.4	11600.0	BHL: 589' FSU/1913' FEL

**noble energy**

Project: Weld Co., CO  
Site: NENW Sec 31-T3N-R67W  
Well: Varra P31-74HN  
Wellbore: Hz  
Design: Hz

**PHOENIX**  
TECHNOLOGY SERVICES USA INC.

