Schlumberger

FracCAT Treatment Report

Well : MIP UNIT5H
Field : UNDESIGNAT
Formation : Marcellus

Well Location : Westover
County : Monongalia
State : West Virginia
Country : United States

Prepared for
Client : NORTHEAST NATURAL ENERGY LLC
Client Rep : Mr. Max Oliver
Proposal No : 1
Date Prepared : 10-29-2015

Prepared by
Name : Robert Boner
Division : Schlumberger
Phone :
Service Point : Weston
Fax Number :

Comments : Stage 3

Disclaimer Notice

This information is presented in good faith, but no warranty is given by and Schlumberger assumes no liability for advice or recommendations made concerning results to be obtained from the use of any product or service. The results given are estimates based on calculations produced by a computer model including various assumptions on the well, reservoir and treatment. The results depend on input data provided by the Operator and estimates as to unknown data and can be no more accurate than the model, the assumptions and such input data. The information presented is Schlumberger's best estimate of the actual results that may be achieved and should be used for comparison purposes rather than absolute values. The quality of input data, and hence results, may be improved through the use of certain tests and procedures which Schlumberger can assist in selecting.

The Operator has superior knowledge of the well, the reservoir, the field and conditions affecting them. If the Operator is aware of any conditions whereby a neighboring well or wells might be affected by the treatment proposed herein it is the Operator's responsibility to notify the owner or owners of the well or wells accordingly.

Prices quoted are estimates only and are good for 30 days from the date of issue. Actual charges may vary depending upon time, equipment, and material ultimately required to perform these services.

Freedom from infringement of patents of Schlumberger or others is not to be inferred.

Schlumberger

Client: NORTHEAST NATURAL ENERGY LLC
Well: MIP UNIT5H
Formation: Marcellus
District: Weston
Country: United States
Loadcase: Stage 3

Section 1: Stage 3, Propped Frac: Designed Pump Sched. - Ramp

Designed Pump Schedule Ramp									
Step #	Step Name	Slurry Volume (bbl)	Pump Rate (bbl/min)	Pump Time (min)	Fluid Name	Fluid Volume (gal)	Prop Name	Prop Conc (PPA)	Prop Mass (lb)
1	Rate	20.0	30.0	0.7	Slickwater	840		0.0	0
2	Acid 7.5% HC	36.0	15.0	2.4	HCl 07.5	1519		0.0	0
3	Water	60.0	15.0	4.0	HCl 07.5	2520		0.0	0
4	Acid 7.5% HC	36.0	15.0	2.4	HCl 07.5	1519		0.0	0
5	PAD	595.0	80.0	7.4	Slickwater	24990		0.0	0
6	0.25 PPA	192.6	80.0	2.4	Slickwater	8000	100 Mesh Sand	0.2	2000
7	0.5 PPA	243.5	80.0	3.0	Slickwater	10000	100 Mesh Sand	0.5	5000
8	0.75 PPA	262.6	80.0	3.3	Slickwater	10667	100 Mesh Sand	0.7	8000
9	1.00 PPA	373.4	80.0	4.7	Slickwater	15000	100 Mesh Sand	1.0	15000
10	2.00 PPA	649.0	80.0	8.1	Slickwater	24990	100 Mesh Sand	2.0	49980
11	1.00 PPA	622.0	80.0	7.8	Slickwater	24990	100 Mesh Sand	1.0	24990
12	2.00 PPA	649.0	80.0	8.1	Slickwater	24990	100 Mesh Sand	2.0	49980
13	2.50 PPA	662.5	80.0	8.3	Slickwater	24990	100 Mesh Sand	2.5	62475
14	3.0 PPA	540.8	80.0	6.8	Slickwater	19992	100 Mesh Sand	3.0	59976
15	1.50 PPA	508.7	80.0	6.4	Slickwater	20000	40/70 White	1.5	30000
16	.50 PPA	730.6	80.0	9.1	Slickwater	30000	40/70 White	0.5	15000
17	2.00 PPA	779.4	80.0	9.7	Slickwater	30000	40/70 White	2.0	60000
18	2.5 PPA	848.7	80.0	10.6	Slickwater	32000	40/70 White	2.5	80000
19	3.0 PPA	811.9	80.0	10.1	Slickwater	30000	40/70 White	3.0	90000
20	Flush	306.4	80.0	3.8	Slickwater	12871		0.0	0

Designed Ramp Totals			
Slurry (bbl)	Pump Time (min)	Clean Fluid (gal)	Proppant (lb)
8928.2	119.2	349864	552401

Section 2: Stage 3, Propped Frac: As Measured Pump Schedule

As Measured Pump Schedule										
Step #	Step Name	Slurry Volume (bbl)	Slurry Rate (bbl/min)	Pump Time (min)	Fluid Name	Fluid Volume (gal)	Proppant Name	Max Prop Conc (PPA)	Prop Conc (PPA)	Prop Mass (lb)
1	Rate	5.3	15.0	0.4	Slickwater	221		0.0	0.0	0
2	Acid 7.5% HC	46.9	15.0	3.1	HCl 07.5	1969		0.0	0.0	0
3	Water	60.0	14.8	4.0	HCl 07.5	2520		0.0	0.0	0
4	Acid 7.5% HC	55.8	14.9	3.7	HCl 07.5	2344		0.0	0.0	0
5	PAD	595.0	76.3	15.8	Slickwater	24946		0.0	0.0	0
6	0.25 PPA	192.6	78.2	2.5	Slickwater	8003	100 Mesh Sand	0.3	0.2	1928

Schlumberger

Client: NORTHEAST NATURAL ENERGY LLC
Well: MIP UNIT5H
Formation: Marcellus
District: Weston
Country: United States
Loadcase: Stage 3

As Measured Pump Schedule

Step #	Step Name	Slurry Volume (bbl)	Slurry Rate (bbl/min)	Pump Time (min)	Fluid Name	Fluid Volume (gal)	Proppant Name	Max Prop Conc (PPA)	Prop Conc (PPA)	Prop Mass (lb)
7	0.5 PPA	243.5	79.0	3.1	Slickwater	10002	100 Mesh Sand	0.5	0.4	4910
8	0.75 PPA	262.6	80.2	3.3	Slickwater	10671	100 Mesh Sand	0.7	0.3	7887
9	1.00 PPA	609.6	81.9	7.4	Slickwater	24493	100 Mesh Sand	1.0	0.0	24377
10	2.00 PPA	960.4	84.5	11.4	Slickwater	36989	100 Mesh Sand	2.0	0.0	73693
11	1.00 PPA	329.7	84.9	3.9	Slickwater	13235	100 Mesh Sand	2.0	0.0	13572
12	2.00 PPA	250.5	84.9	3.0	Slickwater	9659	100 Mesh Sand	2.0	0.0	18969
13	1.50 PPA	1610.5	84.6	19.1	Slickwater	63306	40/70 White	2.0	0.0	95224
14	.50 PPA	213.5	78.5	2.7	Slickwater	8804	40/70 White	1.5	0.0	3774
15	Flush	509.8	69.5	7.6	Slickwater	21461		0.0	0.0	0

Stage Pressures & Rates

Step #	Step Name	Average Slurry Rate (bbl/min)	Maximum Slurry Rate (bbl/min)	Average Treating Pressure (psi)	Maximum Treating Pressure (psi)	Minimum Treating Pressure (psi)
1	Rate	15.0	15.0	6925	6934	6910
2	Acid 7.5% HC	15.0	15.8	6821	6910	6752
3	Water	14.8	14.9	6634	6807	6521
4	Acid 7.5% HC	14.9	15.5	6493	6525	6429
5	PAD	76.3	78.1	8630	8835	6388
6	0.25 PPA	78.2	78.3	8597	8608	8582
7	0.5 PPA	79.0	80.3	8634	8701	8575
8	0.75 PPA	80.2	80.3	8647	8698	8622
9	1.00 PPA	81.9	82.7	8686	8732	8616
10	2.00 PPA	84.5	85.0	8857	9018	8692
11	1.00 PPA	84.9	85.0	8970	9024	8884
12	2.00 PPA	84.9	85.0	8804	8922	8656
13	1.50 PPA	84.6	85.1	8868	9095	8648
14	.50 PPA	78.5	81.4	9017	9125	8889
15	Flush	69.5	72.5	8930	9119	5159

As Measured Totals

Slurry (bbl)	Pump Time (min)	Clean Fluid (gal)	Proppant (lb)
5945.7	90.9	238624	265640

Schlumberger

Client: NORTHEAST NATURAL ENERGY LLC
Well: MIP UNIT5H
Formation: Marcellus
District: Weston
Country: United States
Loadcase: Stage 3

Average Treating Pressure:	8827 psi
Maximum Treating Pressure:	9125 psi
Minimum Treating Pressure:	5159 psi
Average Injection Rate:	81.8 bbl/min
Maximum Injection Rate:	85.1 bbl/min
Average Horsepower:	17687.5 hhp
Maximum Horsepower:	18903.9 hhp
Maximum Prop Concentration:	2.0 PPA
Openn Psi	4316psi
Breakdown	6906psi
Breakdown Rate	14.8bbl/min
Breakdown Vol.	275bbl
ISIP	5885psi
FG	1.22
5min	5405psi
10min	5227psi
15min	5120psi

Section 3: Stage 3, Propped Frac: Material Balance

Material Balance	
Material Name	**Quantity Pumped**
Slickwater	185592gal
HCl 07.5	3038 gal
100 Mesh Sand	142340 lb
40/70 White	123300 lb
A264	3gal
B317, Scale	25gal
B385	100gal
J609, Water Friction-Reducing Agent	270gal
J218, Breaker	3lbs
J580	896lbs
L058, Iron C	15lbs
WF120	46200gal

Section 4: Stage 3, Propped Frac: Job Messages

Message Log							
#	**Time**	**Message**	**Treating Pressure** (psi)	**Annulus Pressure** (psi)	**Total Slurry** (bbl)	**Slurry Rate** (bbl/min)	**Prop. Conc.** (PPA)
1		Reset Executed Steps	0	0	0.0	0.0	0.0
2		Reset Executed Steps	0	0	0.0	0.0	0.0
3	15:00:18	Remark	2916	9	0.0	0.0	0.0
4	15:03:42	Remark	9497	9	0.0	0.2	0.0
5	15:13:14	Start Rate Automatically	6932	7	0.0	15.0	0.0
6	15:13:14	Start Propped Frac Automatically	6932	7	0.0	15.0	0.0
7	15:13:14	Start Stage 3 Automatically	6932	7	0.0	15.0	0.0
8	15:13:14	Started Pumping	6932	7	0.0	15.0	0.0
9	15:13:35	Start Acid 7.5% HC Manually	6907	7	5.3	15.1	0.0
10	15:15:49	Activated Extend Stage	6821	7	38.8	15.0	0.0
11	15:16:42	Deactivated Extend Stage	6795	7	52.1	14.6	0.0

Schlumberger

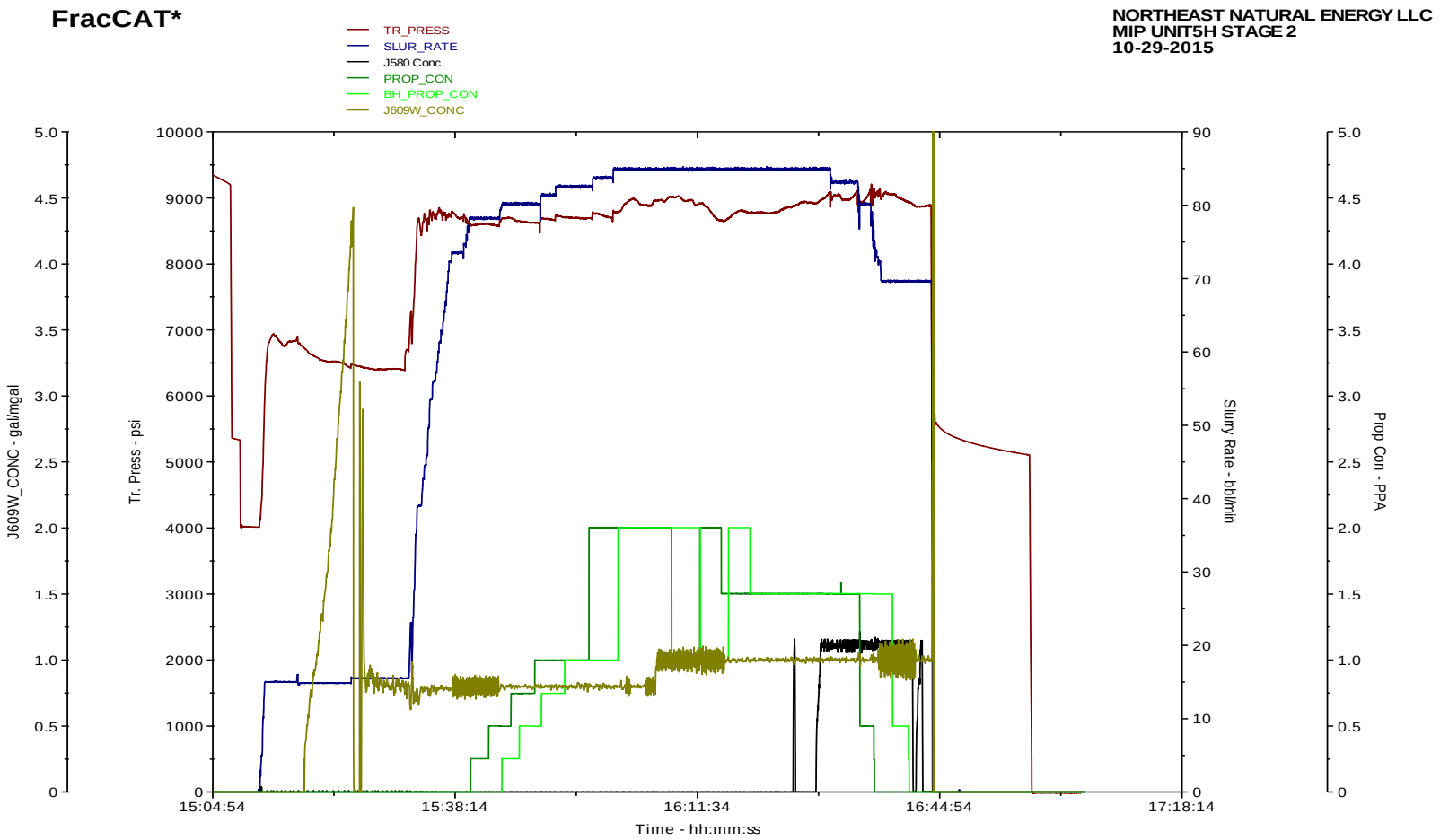
Client: NORTHEAST NATURAL ENERGY LLC
Well: MIP UNIT5H
Formation: Marcellus
District: Weston
Country: United States
Loadcase: Stage 3

Message Log

#	Time	Message	Treating Pressure (psi)	Annulus Pressure (psi)	Total Slurry (bbl)	Slurry Rate (bbl/min)	Prop. Conc. (PPA)
12	15:16:42	Start Water Manually	6795	7	52.1	14.6	0.0
13	15:20:45	Start Acid 7.5% HC Automatically	6520	7	112.2	14.8	0.0
14	15:20:50	Activated Extend Stage	6523	7	113.4	14.8	0.0
15	15:24:29	Deactivated Extend Stage	6464	9	167.9	15.5	0.0
16	15:24:29	Start PAD Manually	6464	9	167.9	15.5	0.0
17	15:33:40	Stage at Perfs: Rate	8467	5	336.8	39.4	0.0
18	15:33:48	Stage at Perfs: Acid 7.5% HC	8629	5	342.3	41.9	0.0
19	15:34:49	Stage at Perfs: Water	8793	7	389.5	53.4	0.0
20	15:35:53	Stage at Perfs: Acid 7.5% HC	8800	6	449.1	59.2	0.0
21	15:36:47	Stage at Perfs: PAD	8727	6	505.2	65.4	0.0
22	15:40:19	Start 0.25 PPA Automatically	8590	8	763.5	78.2	0.0
23	15:40:19	Started Pumping Prop	8590	8	763.5	78.2	0.0
24	15:42:47	Start 0.5 PPA Automatically	8600	9	956.4	78.1	0.3
25	15:44:37	Stage at Perfs: 0.25 PPA	8669	8	1100.1	79.7	0.5
26	15:45:52	Start 0.75 PPA Automatically	8693	9	1200.3	80.4	0.5
27	15:47:02	Stage at Perfs: 0.5 PPA	8653	10	1293.8	80.1	0.7
28	15:49:08	Start 1.00 PPA Automatically	8628	9	1462.2	80.2	0.7
29	15:49:20	Activated Extend Stage	8624	10	1478.3	80.3	1.0
30	15:50:04	Stage at Perfs: 0.75 PPA	8693	9	1537.1	81.3	1.0
31	15:53:16	Stage at Perfs: 1.00 PPA	8711	9	1798.9	82.6	1.0
32	15:56:34	Deactivated Extend Stage	8695	8	2071.3	82.6	1.0
33	15:56:34	Start 2.00 PPA Manually	8695	8	2071.3	82.6	1.0
34	15:56:39	Activated Extend Stage	8690	7	2078.1	82.6	1.0
35	16:00:36	Stage at Perfs: 2.00 PPA	8782	6	2409.0	84.9	2.0
36	16:07:56	Deactivated Extend Stage	9008	8	3031.7	84.9	2.0
37	16:07:56	Start 1.00 PPA Manually	9008	8	3031.7	84.9	2.0
38	16:11:00	Activated Extend Stage	8943	9	3292.1	84.9	1.0
39	16:11:49	Deactivated Extend Stage	8910	8	3361.4	84.9	1.0
40	16:11:49	Start 2.00 PPA Manually	8910	8	3361.4	84.9	1.0
41	16:11:54	Stage at Perfs: 1.00 PPA	8922	9	3368.5	85.1	1.0
42	16:11:54	Activated Extend Stage	8922	9	3368.5	85.1	1.0
43	16:14:46	Deactivated Extend Stage	8653	9	3612.0	84.7	2.0
44	16:14:46	Start 1.50 PPA Manually	8653	9	3612.0	84.7	2.0
45	16:15:47	Stage at Perfs: 2.00 PPA	8686	9	3698.3	84.9	1.5
46	16:17:09	Activated Extend Stage	8800	9	3814.4	85.2	1.5
47	16:18:44	Stage At Perfs	8777	9	3948.8	84.9	1.5
48	16:31:31	Remark	8966	8	5031.5	83.3	1.5
49	16:31:37	Marker #1 At Surface	8975	7	5039.8	83.2	1.5
50	16:33:49	Deactivated Extend Stage	8760	7	5222.5	81.4	1.5
51	16:33:49	Start .50 PPA Manually	8760	7	5222.5	81.4	1.5
52	16:33:56	Activated Extend Stage	8934	9	5231.8	80.1	0.5
53	16:35:45	Marker #1 At Perfs	9088	8	5376.9	77.1	0.5
54	16:36:33	Deactivated Extend Stage	9089	8	5436.0	72.4	0.0
55	16:36:33	Start Flush Manually	9089	8	5436.0	72.4	0.0
56	16:38:19	Stage At Perfs	9054	9	5559.6	69.7	0.0
57	16:41:23	Stage At Perfs	8888	8	5773.2	69.7	0.0

Client: NORTHEAST NATURAL ENERGY LLC
Well: MIP UNIT5H
Formation: Marcellus
District: Weston
Country: United States
Loadcase: Stage 3

Section 5: Stage 3: NNE 5H Stage 3 Post Job Plot



© Schlumberger 1994-2015

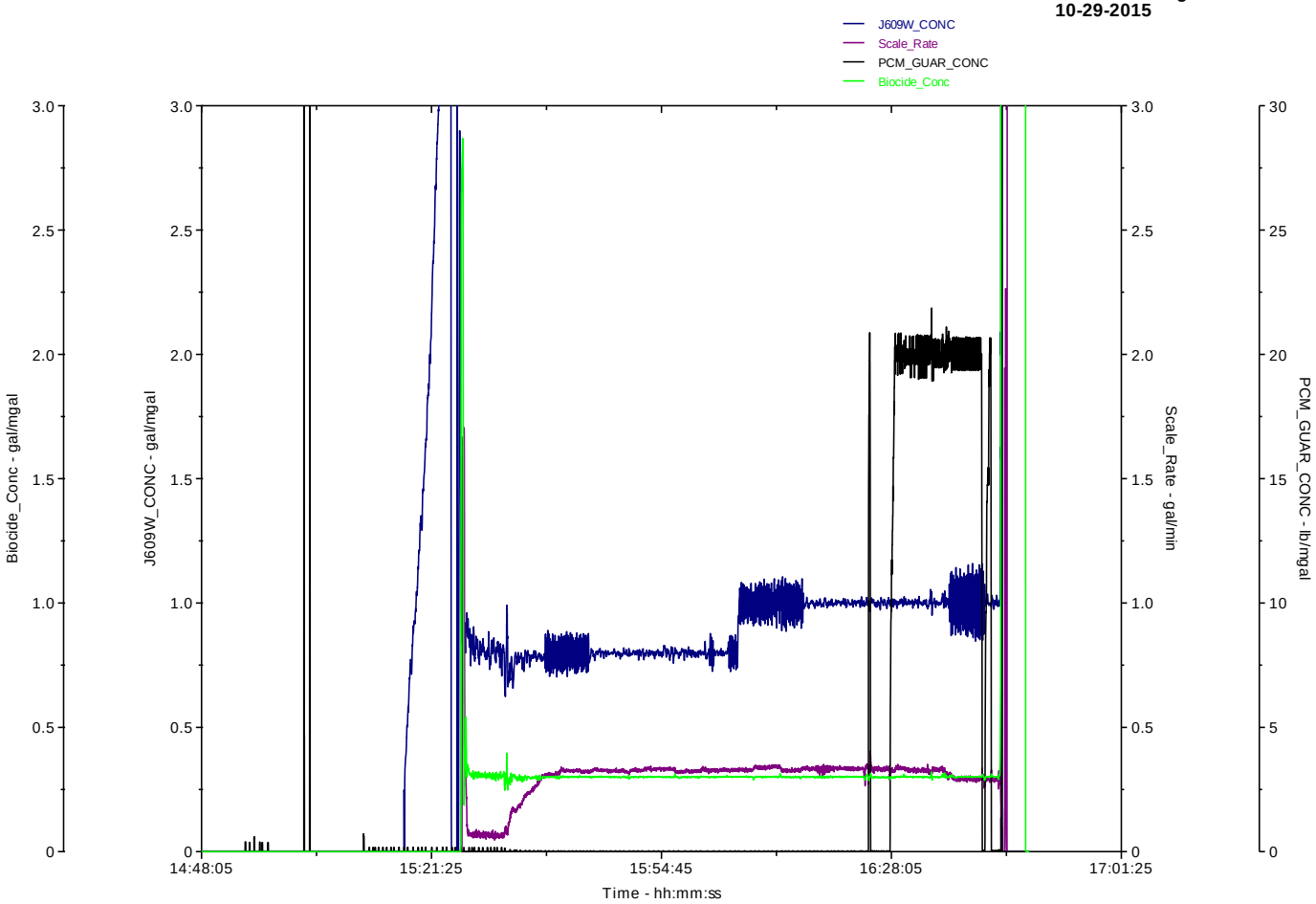
Schlumberger

Client: NORTHEAST NATURAL ENERGY LLC
Well: MIP UNIT5H
Formation: Marcellus
District: Weston
Country: United States
Loadcase: Stage 3

Section 6: Job: Additive Plot

FracCAT*

NORTHEAST NATURAL ENERGY LLC
MIP UNIT5H Stg3
10-29-2015



© Schlumberger 1994-2015

Schlumberger