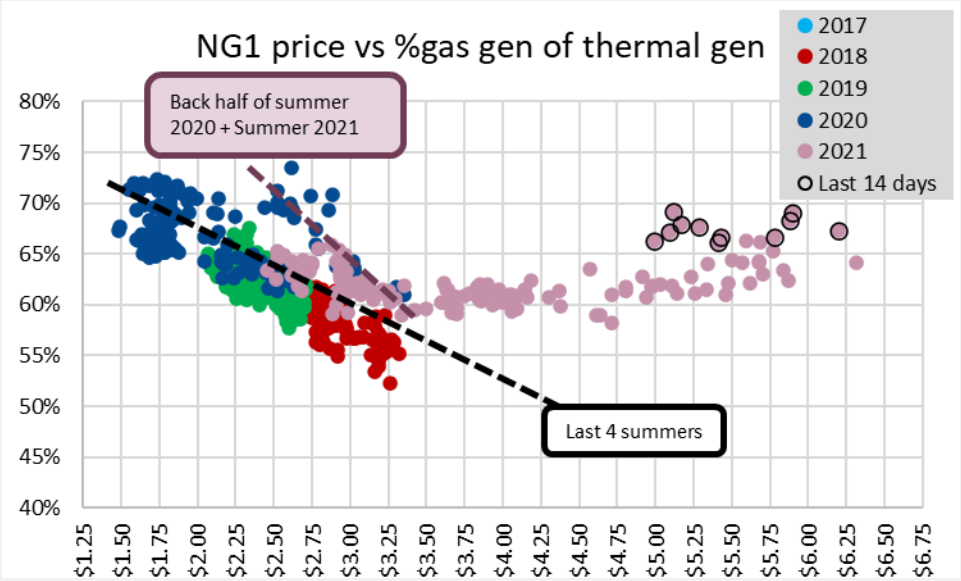
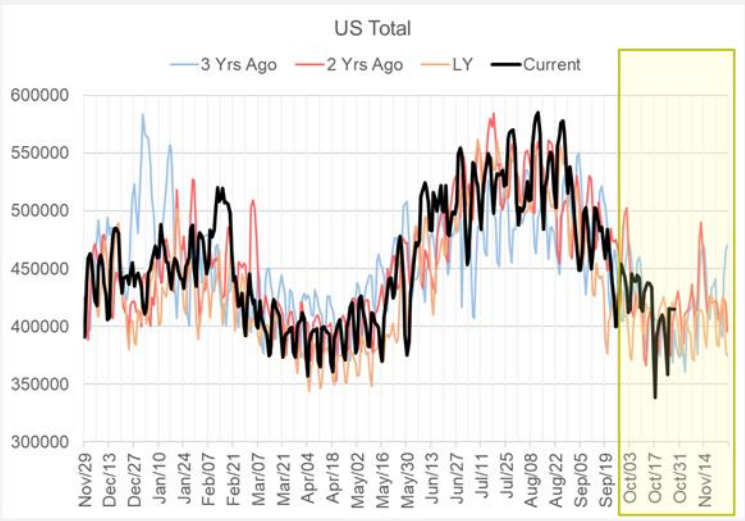
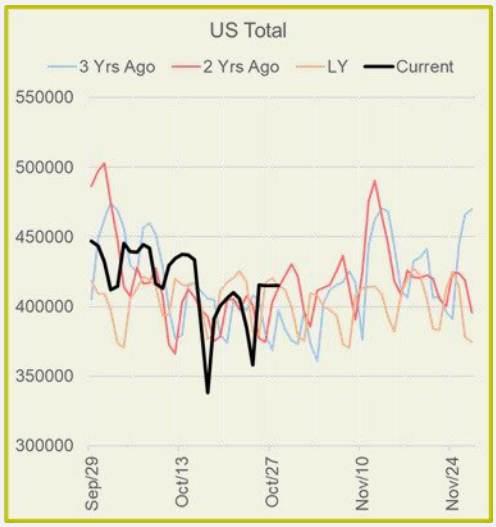
This week we look at natural gas generation's role in the overall power stack. The traditional role of coal and gas switching in the power stack to manage gas consumption and inventory levels through price signals has broken down this past summer. Here is a recent view of natural gas generation's share of the total thermal mix. All summer we have remained above 60% despite natural gas prices moving substantially higher. Most recently, we see gas generation stronger and we think that is with nuke maintenance/refueling taking place.



Natural generation levels are more of an issue for balances during the summer months when power loads pick up for A/C and less of a concern during the winter. That being said, we do see power consumption rise in the winter slightly with shorter days and some electric space heating requirements. Below is a seasonality chart of total US power loads throughout the year. In the shoulder months, the average daily load can drop to 350GWh, while in the summer we can rise above 575 GWh.



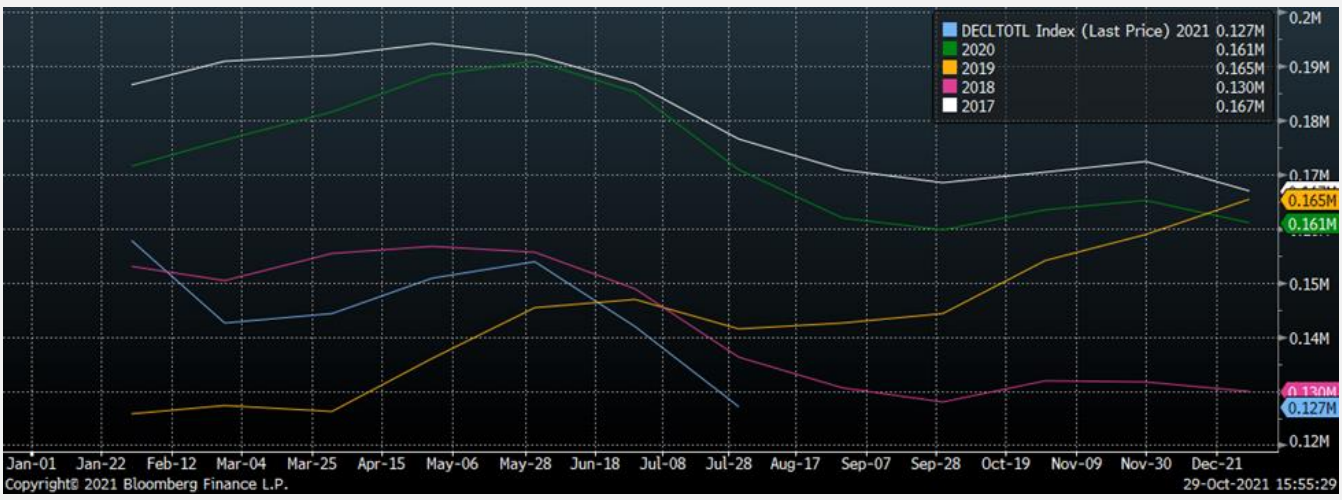


In the winter, at higher natural gas prices we see coal generation lower in the daily power stack; and hence it takes on more of a dominant role. This year could be a lot different after seeing coal generation lag during the summer months:

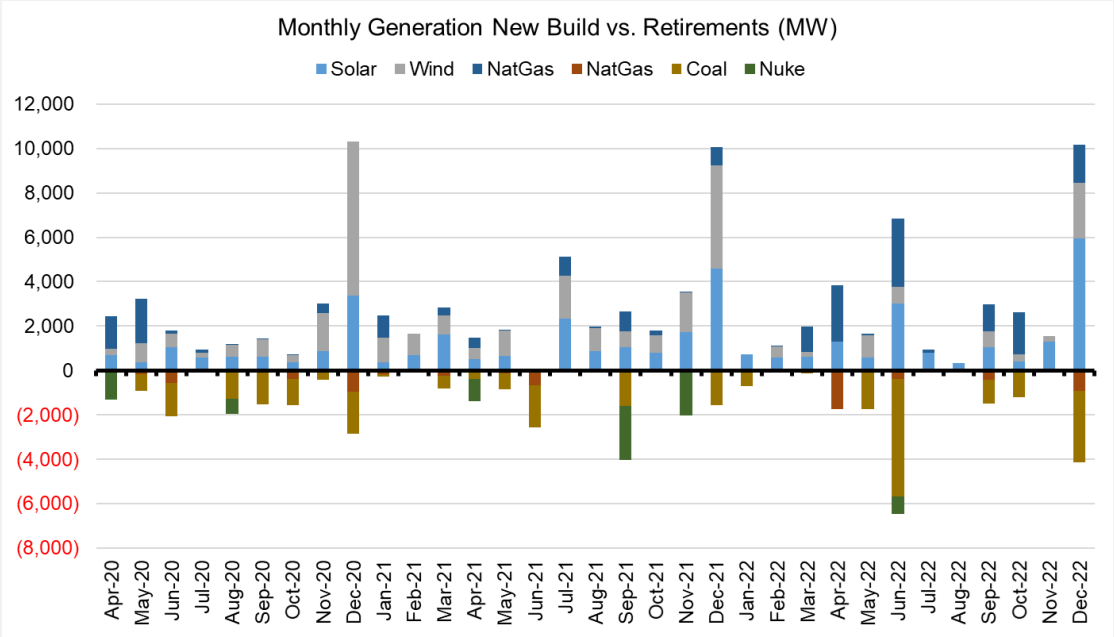
1) Coal inventory levels are the lowest level in decades with coal production much lower (some mines temporarily shut-in last year due to COVID) and strong exports due to global demand.

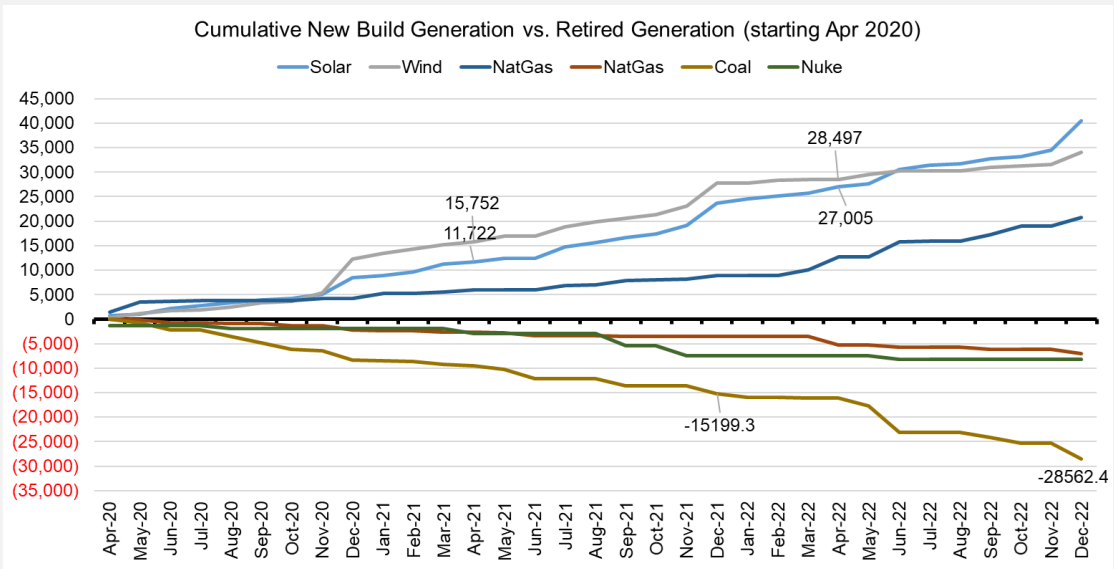
US Weekly Coal Production

US Coal Stockpiles Seasonality Chart



2) Retired coal plants are being replaced by natural gas and renewables generation. Since April 2020, there has been over 15GW of coal capacity retired.





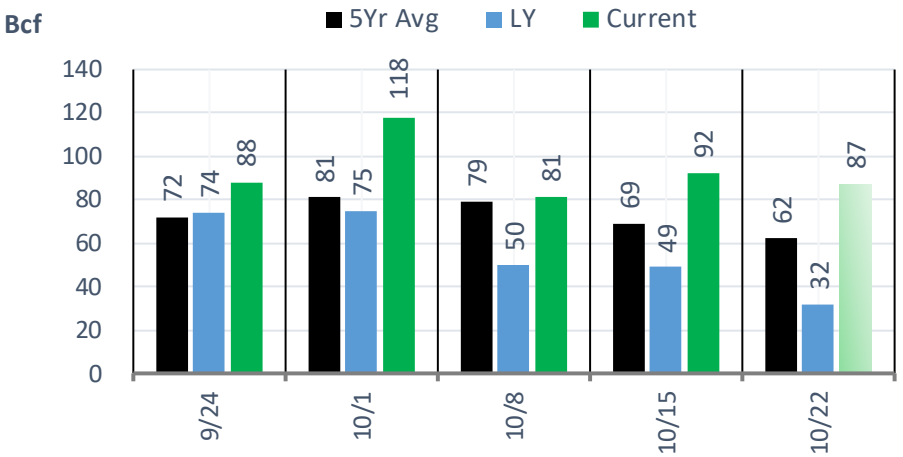
We should note that the capacity factor of wind is ~35-40% and solar is ~20-25%; hence natural gas generation is heavily relied on as coal retires

3) with the increase in wind generation (as seen above), natural gas generation can instantaneously react to real-time variations in wind output.

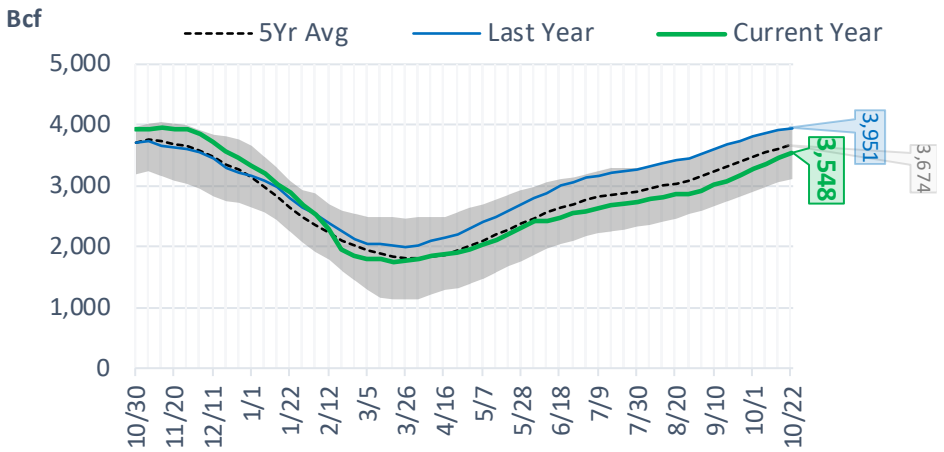
Market Report

EIA Storage Report

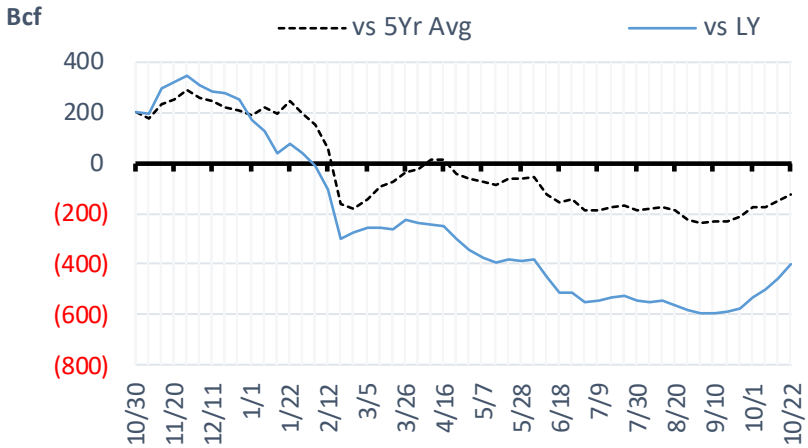
Total Lower 48 YoY Weekly Change



Total Lower 48 Storage Levels



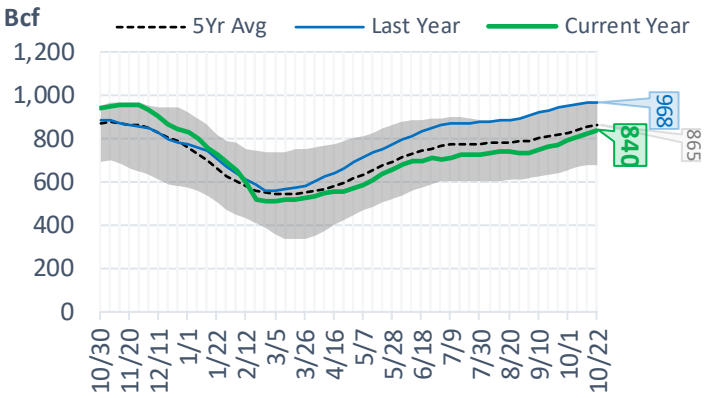
Total Lower 48 LY Surplus/Deficit



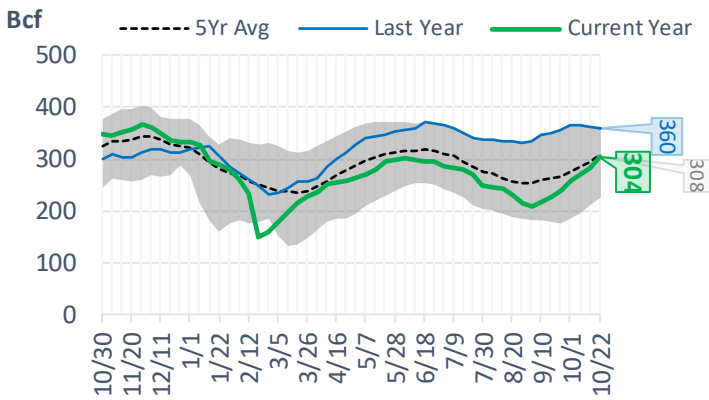
Natural Gas Storage Stats - Last 5 Weeks

Week Ending	Current 22-Oct	Week - 1 15-Oct	Week - 2 8-Oct	Week - 3 1-Oct	Week - 4 24-Sep	Week - 5 17-Sep
Total Lower 48 Storage Level	**3548**	3461	3369	3288	3170	3082
Weekly Change	**+87**	+92	+81	+118	+88	+76
vs LY	**-403**	-458	-501	-532	-575	-589
vs 5Yr Avg	**-126**	-151	-174	-176	-213	-229
S. Central Salt Storage Level	**304**	283	269	259	239	228
Weekly Change	**+21**	+14	+10	+20	+11	+11
vs LY	**-56**	-78	-97	-106	-118	-121
vs 5Yr Avg	**-4**	-10	-14	-15	-27	-35
S. Central NonSalt Storage Level	**840**	825	810	795	774	762
Weekly Change	**+15**	+15	+15	+21	+12	+14
vs LY	**-128**	-143	-149	-159	-169	-171
vs 5Yr Avg	**-25**	-30	-33	-35	-45	-50
Midwest Storage Level	**1052**	1027	997	971	934	904
Weekly Change	**+25**	+30	+26	+37	+30	+28
vs LY	**-64**	-75	-81	-87	-96	-101
vs 5Yr Avg	**-18**	-20	-23	-19	-24	-24
East Storage Level	**885**	862	834	810	779	751
Weekly Change	**+23**	+28	+24	+31	+28	+19
vs LY	**-53**	-59	-72	-80	-90	-96
vs 5Yr Avg	**-21**	-30	-42	-45	-52	-56
Mountain Storage Level	**212**	211	210	206	201	196
Weekly Change	**+1**	+1	+4	+5	+5	+3
vs LY	**-33**	-33	-30	-29	-29	-28
vs 5Yr Avg	**-9**	-8	-7	-9	-10	-10
Pacific Storage Level	**255**	253	251	248	243	240
Weekly Change	**+2**	+2	+3	+5	+3	0
vs LY	**-68**	-70	-69	-70	-72	-72
vs 5Yr Avg	**-50**	-52	-52	-53	-55	-54

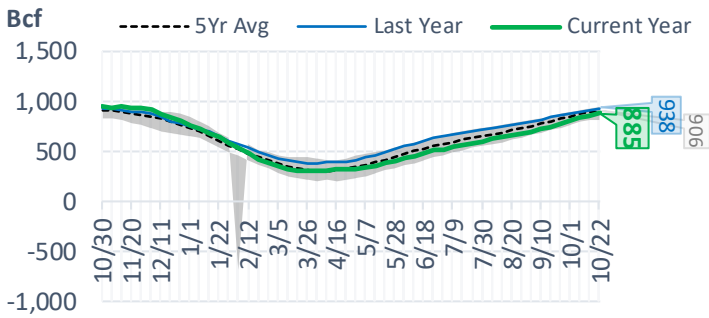
NonSalt Storage Levels



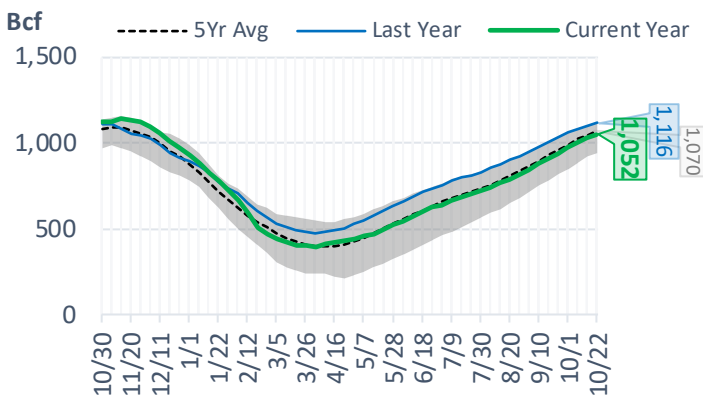
Salt Storage Levels



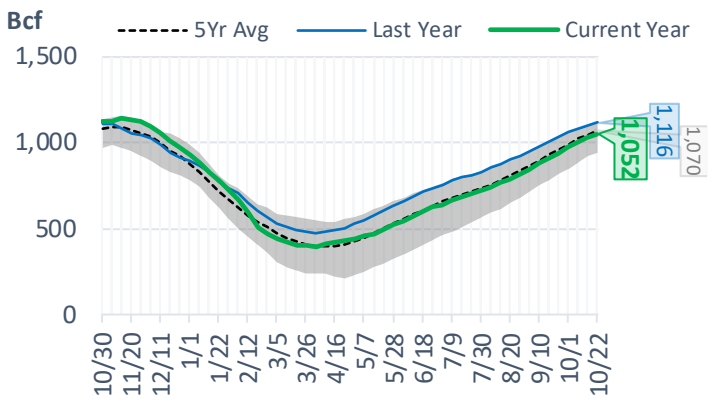
East Storage Levels



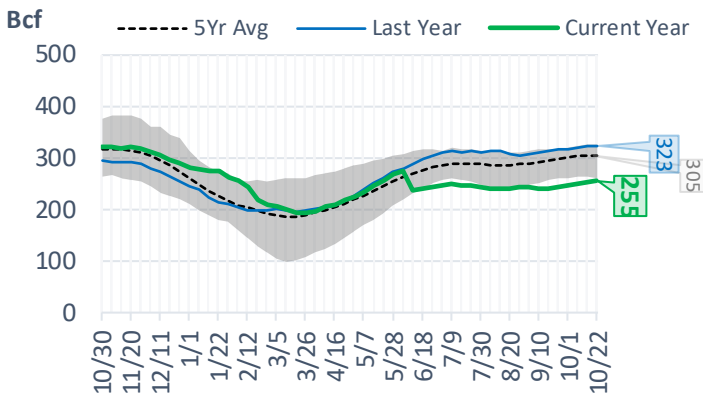
Midwest Storage Levels



Midwest Storage Levels



Pacific Storage Levels



EIA Storage Week Balances

	24-Sep	1-Oct	8-Oct	15-Oct	22-Oct	29-Oct	WoW	vs. 4W
Lower 48 Dry Production	**93.0**	**93.3**	**92.9**	**92.6**	**92.4**	**93.5**	**1.1**	**0.7**
Canadian Imports	**5.2**	**5.7**	**5.3**	**4.9**	**5.6**	**5.6**	**0.0**	**0.2**
L48 Power	33.3	30.3	32.9	31.7	29.0	28.9	-0.1	-2.0
L48 Residential & Commercial	8.1	8.4	8.2	9.5	13.9	17.6	3.7	7.6
L48 Industrial	20.6	20.1	21.9	19.5	18.7	19.2	0.6	-0.8
L48 Lease and Plant Fuel	5.1	5.1	5.1	5.0	5.0	5.1	0.1	0.0
L48 Pipeline Distribution	2.3	2.1	2.2	2.2	2.3	2.5	0.2	0.3
L48 Regional Gas Consumption	**69.2**	**66.0**	**70.2**	**68.0**	**68.9**	**73.3**	**4.4**	**5.0**
Net LNG Exports	**9.9**	**10.3**	**9.9**	**10.7**	**10.8**	**10.8**	**0.0**	**0.4**
Total Mexican Exports	**6.8**	**6.7**	**6.5**	**6.6**	**6.6**	**6.9**	**0.3**	**0.3**
Implied Daily Storage Activity	**12.2**	**16.0**	**11.6**	**12.2**	**11.7**	**8.0**	**-3.7**	
EIA Reported Daily Storage Activity	**12.6**	**16.9**	**11.6**	**13.1**	**12.4**			
Daily Model Error	**-0.4**	**-0.9**	**0.0**	**-0.9**	**-0.7**			

Monthly Balances

	2Yr Ago Oct-19	LY Oct-20	Jun-21	Jul-21	Aug-21	Sep-21	MTD Oct-21	MoM	vs. LY
Lower 48 Dry Production	**95.1**	**88.3**	**93.3**	**93.3**	**92.5**	**92.3**	**92.9**	**0.6**	**4.6**
Canadian Imports	**4.6**	**4.3**	**4.9**	**5.2**	**5.1**	**5.1**	**5.3**	**0.2**	**1.1**
L48 Power	30.3	30.8	35.9	39.4	40.2	33.1	30.5	-2.6	-0.3
L48 Residential & Commercial	15.3	15.3	8.8	8.1	7.7	7.6	12.5	4.8	-2.8
L48 Industrial	23.5	22.6	20.5	20.9	20.4	20.2	19.8	-0.4	-2.8
L48 Lease and Plant Fuel	5.1	4.8	5.0	5.1	5.0	5.0	5.1	0.0	0.2
L48 Pipeline Distribution	2.4	2.5	2.4	2.5	2.5	2.2	2.3	0.1	-0.2
L48 Regional Gas Consumption	**76.6**	**75.9**	**72.7**	**76.0**	**75.8**	**68.2**	**70.2**	**1.9**	**-5.7**
Net LNG Exports	**6.7**	**8.0**	**10.2**	**10.8**	**10.5**	**10.3**	**10.6**	**0.2**	**2.6**
Total Mexican Exports	**5.4**	**6.0**	**7.4**	**7.1**	**6.9**	**6.7**	**6.7**	**-0.1**	**0.7**
Implied Daily Storage Activity	**11.1**	**2.7**	**7.8**	**4.6**	**4.5**	**12.2**	**10.8**		
EIA Reported Daily Storage Activity									
Daily Model Error									

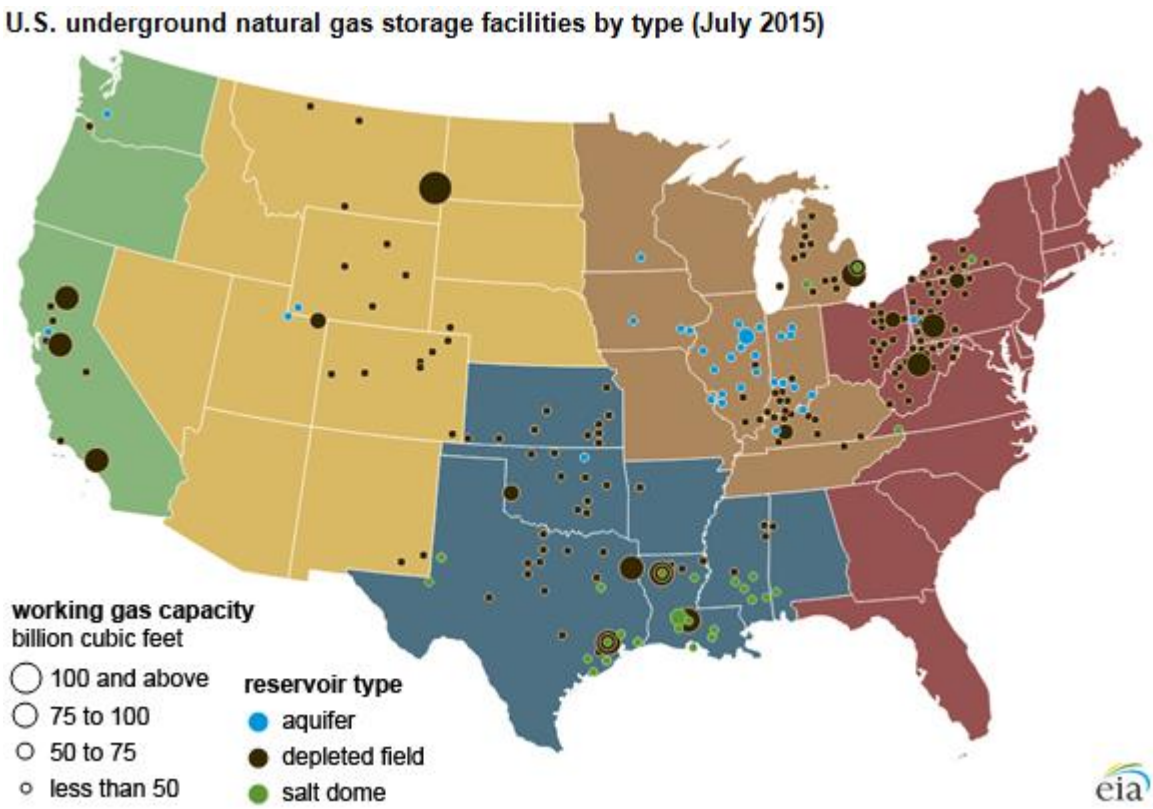
Source: Bloomberg, analytix.ai

Regional S/D Models Storage Projection

Week Ending 29-Oct

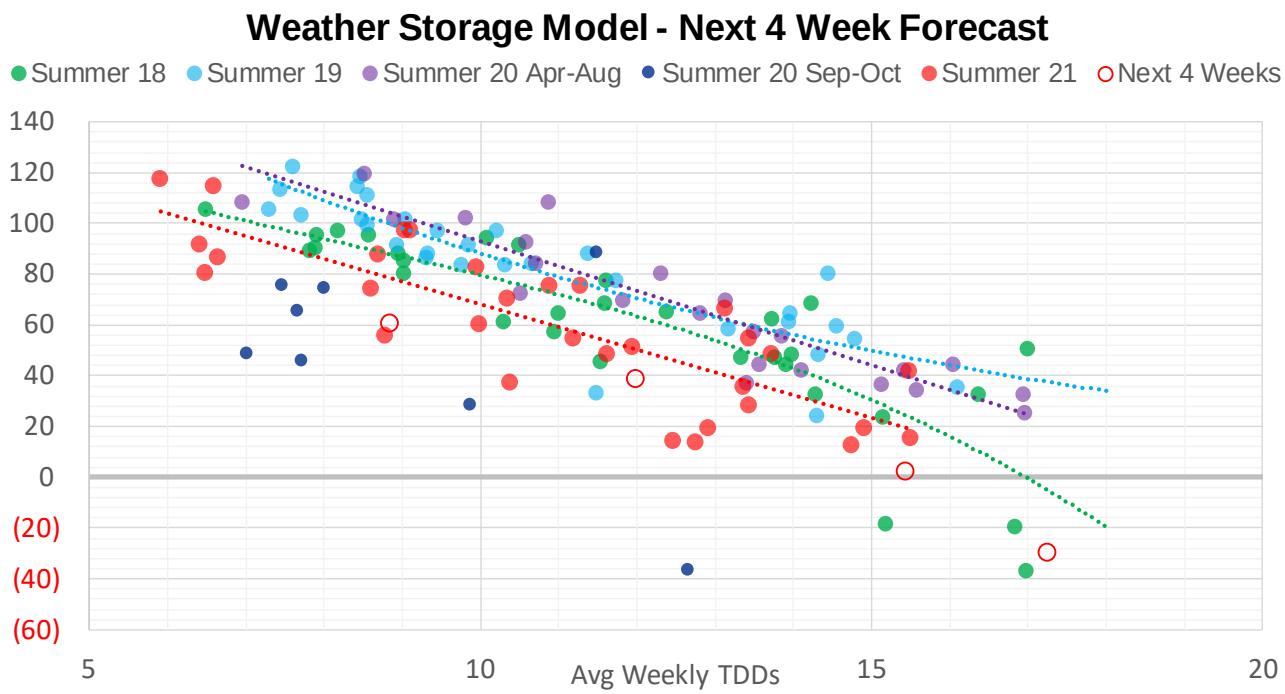
	Daily Raw Storage	Daily Adjustment Factor	Daily Average Storage Activity (Adjusted) *	Weekly Adjusted Storage Activity
L48	7.8	0.9	8.7	61
East	1.5	0.2	1.8	12
Midwest	1.3	0.0	1.3	9
Mountain	3.6	-3.1	0.5	3
South Central	0.7	4.4	5.1	35
Pacific	0.6	-0.5	0.1	1

*Adjustment Factor is calcuated based on historical regional deltas



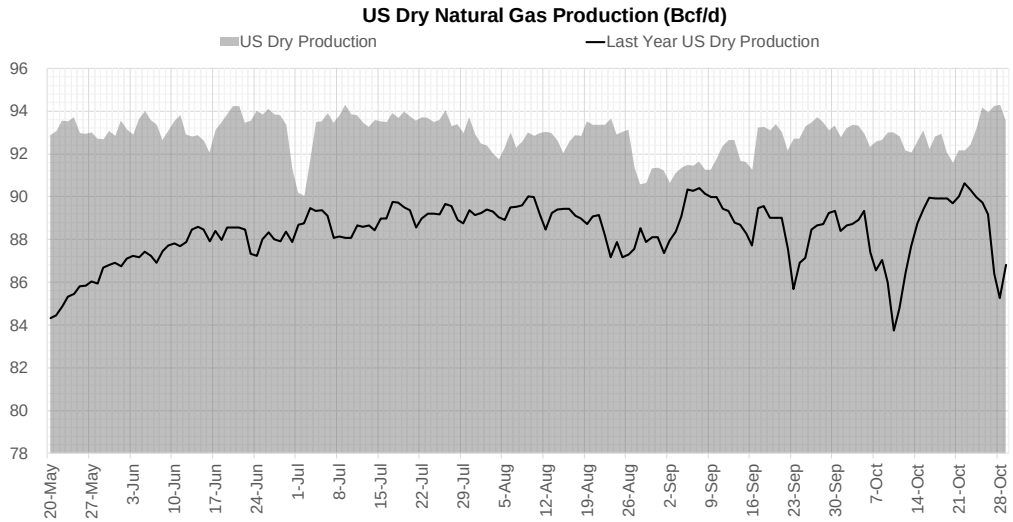
Weather Model Storage Projection

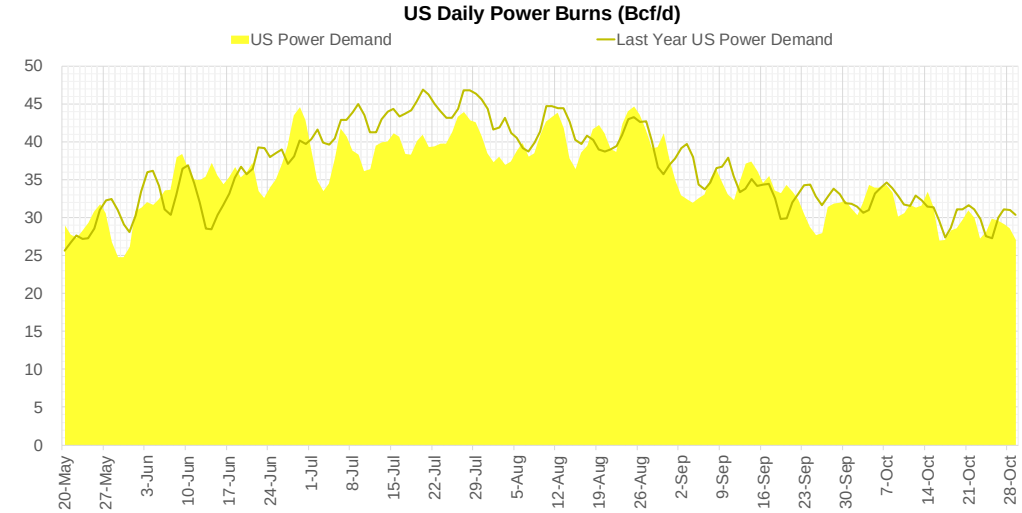
Next report and beyond		
Week Ending	Temp	Week Storage Projection
05-Nov	12.0	39
12-Nov	15.4	2
19-Nov	17.3	-30

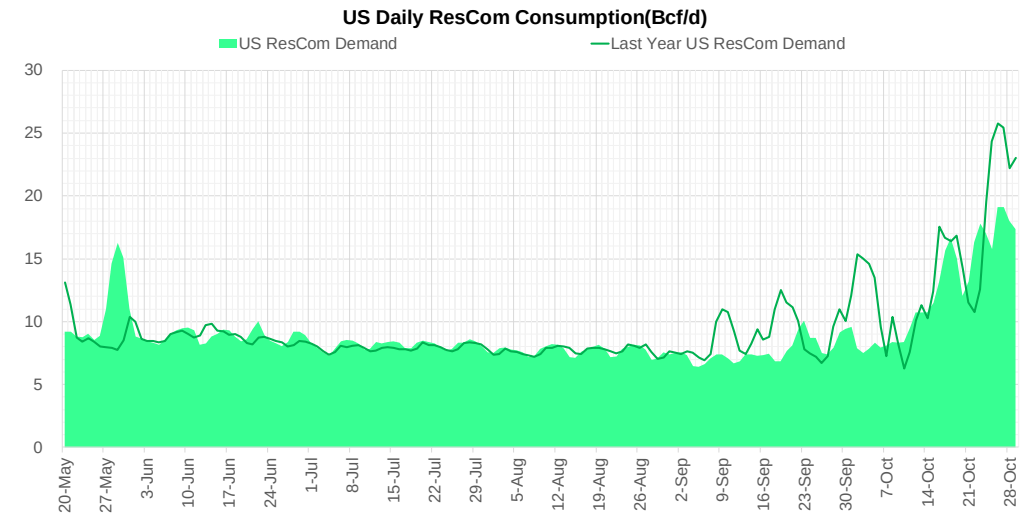


Note: this is not our official end of season forecast. This chart signifies where storage levels end with 10-year normal weather and current market tightness relative to last year

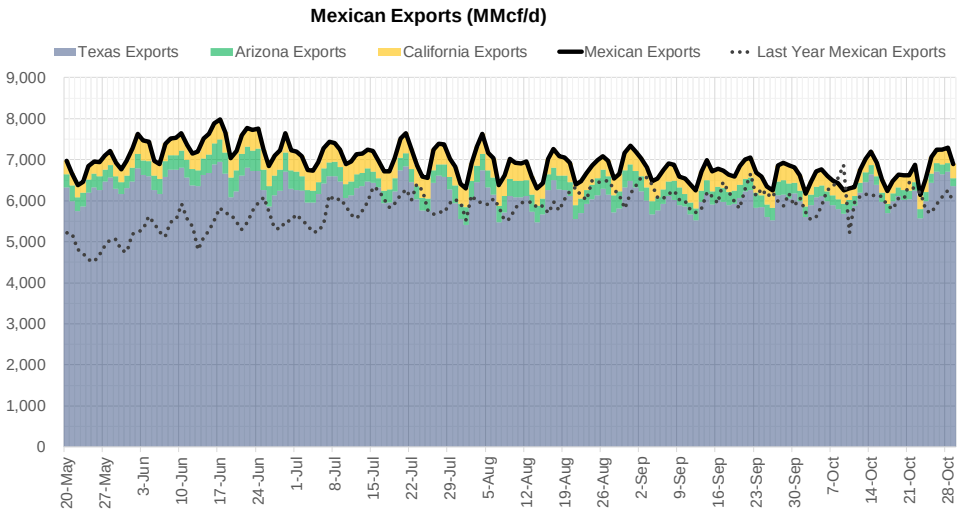
Supply – Demand Trends

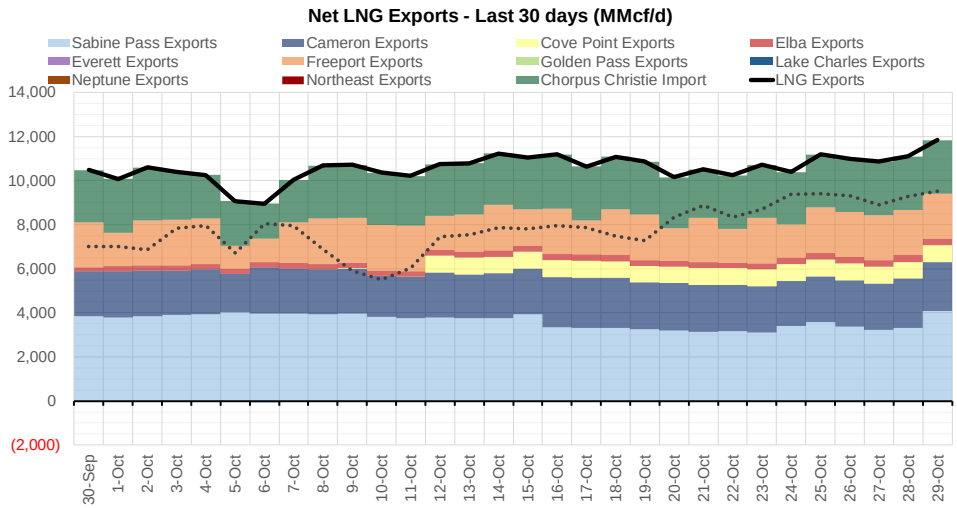






Source: Bloomberg





Source: Bloomberg

Nat Gas Options Volume and Open Interest

CME, ICE and Nasdaq Combined

CONTRACT MONTH	CONTRACT YEAR	PUT/CALL	STRIKE	CUMULATIVE VOL
12	2021	P	5.00	7970
12	2021	P	4.00	4127
12	2021	P	5.50	4037
12	2021	P	4.90	4019
12	2021	C	6.00	3535
12	2021	P	5.40	3293
12	2021	C	6.50	2941
1	2022	C	7.00	2466
1	2022	P	4.00	2351
12	2021	C	7.00	2307
1	2022	P	3.50	2088
12	2021	P	4.25	2075
1	2022	C	10.00	1964
12	2021	C	10.00	1862
3	2022	C	9.00	1845
1	2022	C	12.00	1843
12	2021	P	5.25	1727
1	2022	C	8.00	1716
1	2022	C	6.00	1606
3	2022	C	8.00	1603
1	2022	C	9.00	1586
3	2022	C	12.00	1551
12	2021	P	4.75	1308
2	2022	C	8.00	1271
12	2021	P	4.50	1200
1	2022	P	4.25	1126
2	2022	P	5.00	1050
2	2022	C	6.00	1030
1	2022	P	4.50	1011
4	2022	C	4.25	1000
5	2022	C	4.00	1000
5	2022	P	2.50	1000
3	2022	C	6.00	980
3	2022	P	4.50	845
2	2022	P	4.30	800
3	2022	P	3.50	708
12	2021	C	12.00	660
12	2021	P	5.20	615
12	2021	C	15.00	600
4	2022	P	2.75	600
12	2021	C	6.25	587
1	2022	C	15.00	548
1	2022	C	6.10	532
4	2022	P	3.50	530
3	2022	C	5.00	529
12	2021	C	8.50	505
3	2022	P	4.00	500
6	2022	P	2.50	500
3	2022	C	15.00	472

CONTRACT MONTH	CONTRACT YEAR	PUT/CALL	STRIKE	CUMULATIVE OI
12	2021	P	2.75	54603
12	2021	P	3.00	42228
12	2021	P	4.00	41987
12	2021	P	2.50	39421
12	2021	P	3.50	35665
3	2022	C	10.00	30121
3	2022	C	8.00	24767
1	2022	P	3.00	23595
1	2022	P	2.75	22906
12	2021	C	4.00	22527
12	2021	P	5.00	22263
3	2022	C	5.00	22074
1	2022	C	6.00	20595
12	2021	C	6.00	20590
4	2022	C	3.00	19710
1	2022	P	3.50	19063
3	2022	P	2.50	18386
1	2022	C	5.00	18059
3	2022	P	3.50	17974
1	2022	P	4.00	17722
12	2021	C	8.00	17571
3	2022	P	4.00	17407
2	2022	C	5.00	16834
12	2021	P	2.00	16834
12	2021	P	4.50	16768
12	2021	C	7.00	16358
3	2022	P	3.00	15633
3	2022	C	4.00	15631
4	2022	P	2.50	15489
2	2022	P	3.50	15376
12	2022	C	5.00	15232
1	2022	C	4.00	14393
2	2022	P	4.00	14362
4	2022	C	5.00	14299
3	2022	C	7.00	13775
5	2022	C	3.00	13733
1	2022	C	7.00	13727
3	2022	C	9.00	13641
2	2022	C	6.00	13508
6	2022	C	3.00	13438
3	2022	P	5.00	13368
12	2022	C	4.50	13367
12	2022	C	5.25	13263
1	2022	C	10.00	13237
7	2022	C	3.00	13230
8	2022	C	3.00	13226
9	2022	C	3.00	13225
3	2022	C	3.00	13177
10	2022	C	3.00	13114
2	2022	C	4	13019

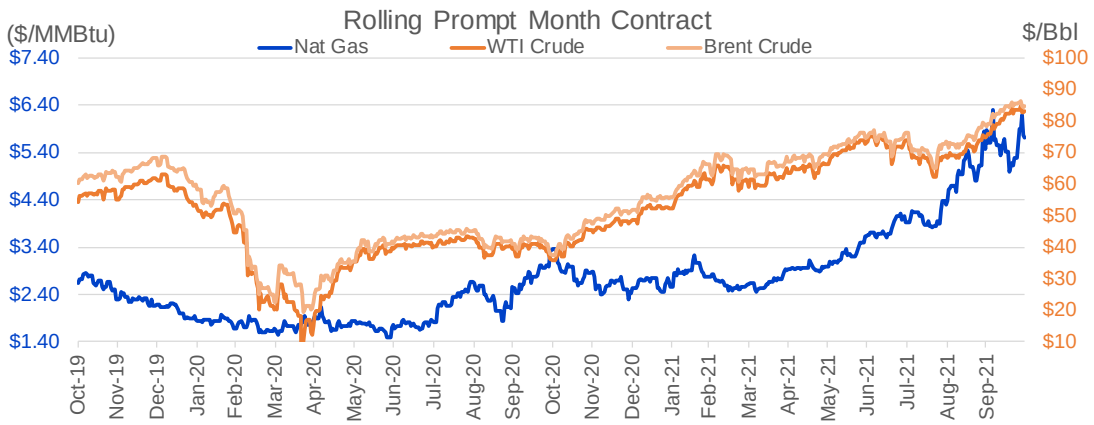
Source: CME, Nasdaq, ICE

Nat Gas Futures Open Interest

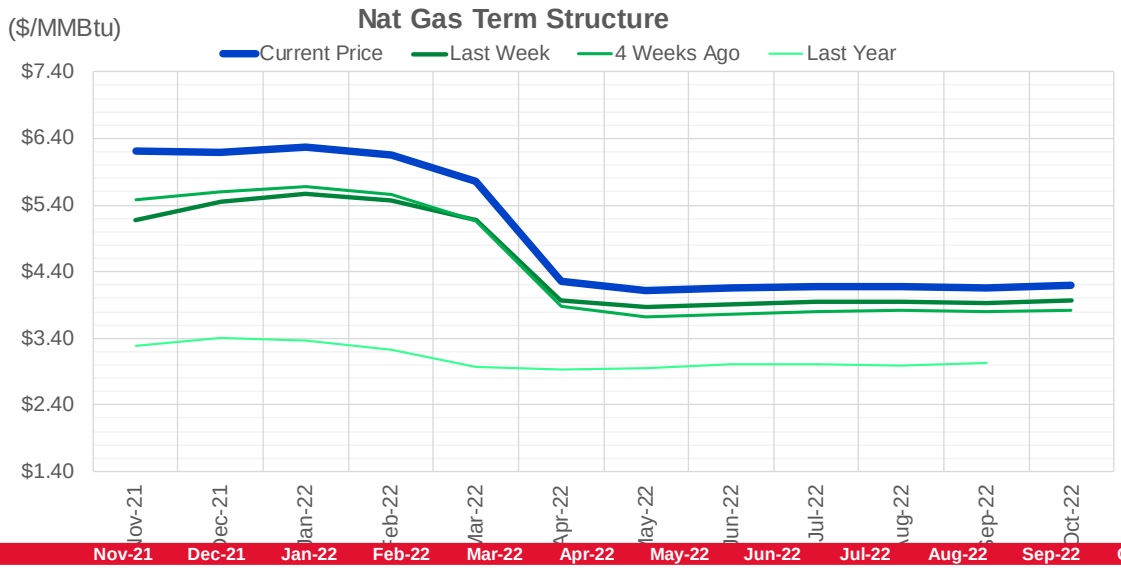
CME, ICE and Nasdaq Combined

CME Henry Hub Futures (10,000 MMBtu)				ICE Henry Hub Futures Contract Equivalent (10,000 MM			
	Current	Prior	Daily Change		Current	Prior	Daily Change
DEC 21	165305	540	164765	DEC 21	92407	82477	9931
JAN 22	213926	167178	46748	JAN 22	91630	91769	-139
FEB 22	75946	218011	-142065	FEB 22	69514	95288	-25775
MAR 22	154948	75323	79625	MAR 22	77641	69596	8045
APR 22	112967	155534	-42567	APR 22	78827	76974	1853
MAY 22	125478	113413	12065	MAY 22	71206	78743	-7537
JUN 22	42090	125377	-83287	JUN 22	55354	71344	-15990
JUL 22	38054	41966	-3912	JUL 22	57605	55545	2060
AUG 22	29402	38622	-9220	AUG 22	56212	57428	-1216
SEP 22	34138	29751	4387	SEP 22	57029	56283	746
OCT 22	85355	34261	51094	OCT 22	62154	57210	4944
NOV 22	34778	84987	-50209	NOV 22	49093	62503	-13410
DEC 22	25755	34745	-8990	DEC 22	52042	48979	3063
JAN 23	30124	25687	4437	JAN 23	39611	52165	-12554
FEB 23	10720	30069	-19349	FEB 23	32550	39743	-7193
MAR 23	18085	10580	7505	MAR 23	34995	32632	2363
APR 23	15608	17969	-2361	APR 23	35405	35096	310
MAY 23	9092	15567	-6475	MAY 23	34529	35382	-853
JUN 23	7114	9006	-1892	JUN 23	30753	34711	-3958
JUL 23	4864	7118	-2254	JUL 23	30966	30923	43
AUG 23	4025	4861	-836	AUG 23	31923	31140	783
SEP 23	5031	4056	975	SEP 23	29924	32097	-2174
OCT 23	6469	5063	1406	OCT 23	33814	30094	3720
NOV 23	3729	6497	-2768	NOV 23	32626	33996	-1370
DEC 23	4319	3598	721	DEC 23	27901	32759	-4859
JAN 24	1880	4318	-2438	JAN 24	18170	28036	-9866
FEB 24	1141	1890	-749	FEB 24	13928	18106	-4179
MAR 24	4667	1169	3498	MAR 24	18697	13868	4829
APR 24	3521	4663	-1142	APR 24	13128	18650	-5523
MAY 24	1824	3531	-1707	MAY 24	13690	13148	542

Source: CME, ICE



Market Report



	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22
Current Price	**$6.202**	**$6.198**	**$6.277**	**$6.151**	**$5.755**	**$4.256**	**$4.119**	**$4.148**	**$4.182**	**$4.184**	**$4.164**	**$4.195**
Last Week	$5.170	$5.447	$5.562	$5.469	$5.171	$3.978	$3.867	$3.905	$3.946	$3.950	$3.931	$3.963
vs. Last Week	$1.032	$0.751	$0.715	$0.682	$0.584	$0.278	$0.252	$0.243	$0.236	$0.234	$0.233	$0.232
4 Weeks Ago	$5.477	$5.595	$5.675	$5.560	$5.166	$3.886	$3.730	$3.764	$3.807	$3.812	$3.793	$3.822
vs. 4 Weeks Ago	$0.725	$0.603	$0.602	$0.591	$0.589	$0.370	$0.389	$0.384	$0.375	$0.372	$0.371	$0.373
Last Year	$2.996	$3.291	$3.411	$3.363	$3.236	$2.970	$2.929	$2.960	$3.000	$3.011	$2.999	$3.034
vs. Last Year	$3.206	$2.907	$2.866	$2.788	$2.519	$1.286	$1.190	$1.188	$1.182	$1.173	$1.165	$1.161

	Units	Current Price	vs. Last Week	vs. 4 Weeks Ago	vs. Last Year
NatGas Jul21/Oct21	$/MMBtu	2.224	0.000	0.000	2.195
NatGas Oct21/Nov21	$/MMBtu	0.361	1.087	0.335	0.301
NatGas Oct21/Jan22	$/MMBtu	0.030	0.410	-0.202	-0.270
NatGas Apr22/Oct22	$/MMBtu	-0.025	-0.019	0.058	-0.051
WTI Crude	$/Bbl	82.81	0.310	7.780	46.640
Brent Crude	$/Bbl	84.32	-0.290	5.800	46.670
Fuel Oil, NY Harbour 1%	$/Bbl	97.18	0.000	0.000	0.000
Heating Oil	cents/Gallon	251.65	-3.260	17.480	142.810
Propane, Mt. Bel	cents/Gallon	1.45	-0.013	0.154	0.924
Ethane, Mt. Bel	cents/Gallon	0.43	0.006	0.045	0.220
Coal, PRB	$/MTon	12.30	0.000	0.000	0.000
Coal, PRB	$/MMBtu	0.70			

Source: CME, Bloomberg

Market Report

Baker Hughes Rig Counts

Rotary Rig Count

10/29/2021

Baker Hughes

U.S. Breakout Information	This Week	+/-	Last Week	+/-	Year Ago
Oil	444	1	443	223	221
Gas	100	1	99	28	72
Miscellaneous	0	0	0	-3	3
Directional	32	0	32	10	22
Horizontal	483	1	482	229	254
Vertical	29	1	28	9	20
Canada Breakout	**This Week**	**+/-**	**Last Week**	**+/-**	**Year Ago**
Oil	98	5	93	58	40
Gas	68	-3	71	22	46
Major Basin Variances	**This Week**	**+/-**	**Last Week**	**+/-**	**Year Ago**
Ardmore Woodford	2	0	2	2	0
Arkoma Woodford	2	0	2	2	0
Cana Woodford	22	0	22	14	8
DJ-Niobrara	12	1	11	9	3
Eagle Ford	40	0	40	23	17
Granite Wash	3	0	3	3	0
Haynesville	46	0	46	9	37
Marcellus	27	0	27	1	26
Mississippian	1	0	1	1	0
Permian	268	0	268	126	142
Utica	10	0	10	4	6
Williston	24	1	23	12	12