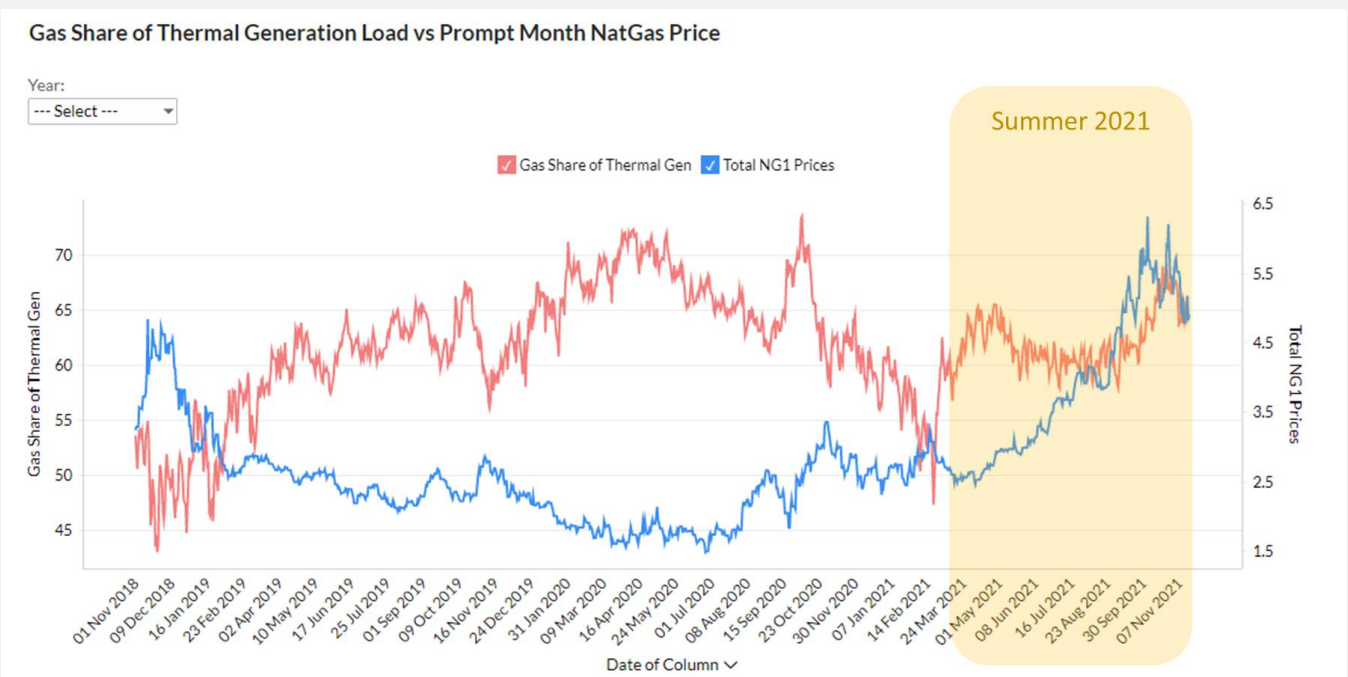


Last week we showed the immense impact of the summer's weak renewable performance on natgas power burns, and this we continue on the same theme. This week we look at how the changing landscape in the coal markets has impacted power burns.

Coal to gas switching has been one of the largest flexible features of the gas market, i.e. natural gas prices adjusting to change a region's power stack to either bring on more gas generation or turn it off. Other than storage activity, this is the only key lever used to keep the gas markets balanced (almost instantaneously).

This relationship is now broken. The following chart shows the coal-to-gas switching dynamic we observed over the past few years and you can see it falling apart this past summer.

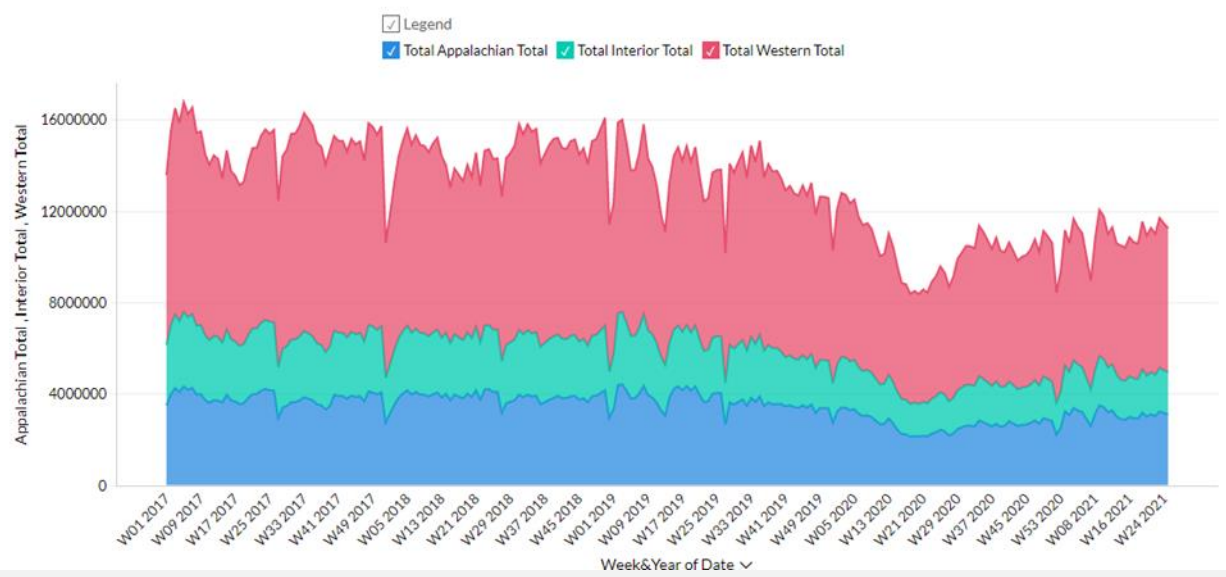


[Click here to see the interactive chart](#)

Why did the power market not respond in the same way this summer? Here are the few reasons we have been pointing to:

- 1) Coal retirements – over 13 GWs retired since April 2020 and therefore coal gen is just not there in some instances
- 2) Lower coal production and stocks - mines have been reducing production for years, and COVID shutdowns just accelerate some of these closures. Now with returning demand, the mines can not respond as fast.

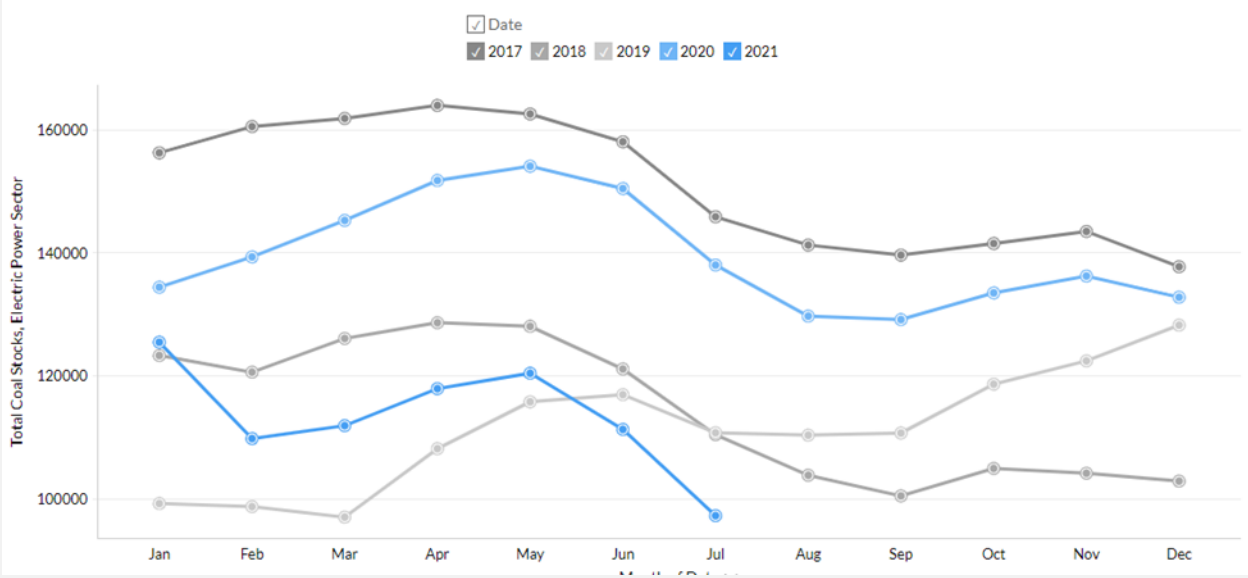
Weekly Coal Production by Region (short-tons)



[Click here to see the interactive chart](#)

SEASONALITY CHART - Coal Monthly Stock Level (thousands short-tons)

Source: EIA



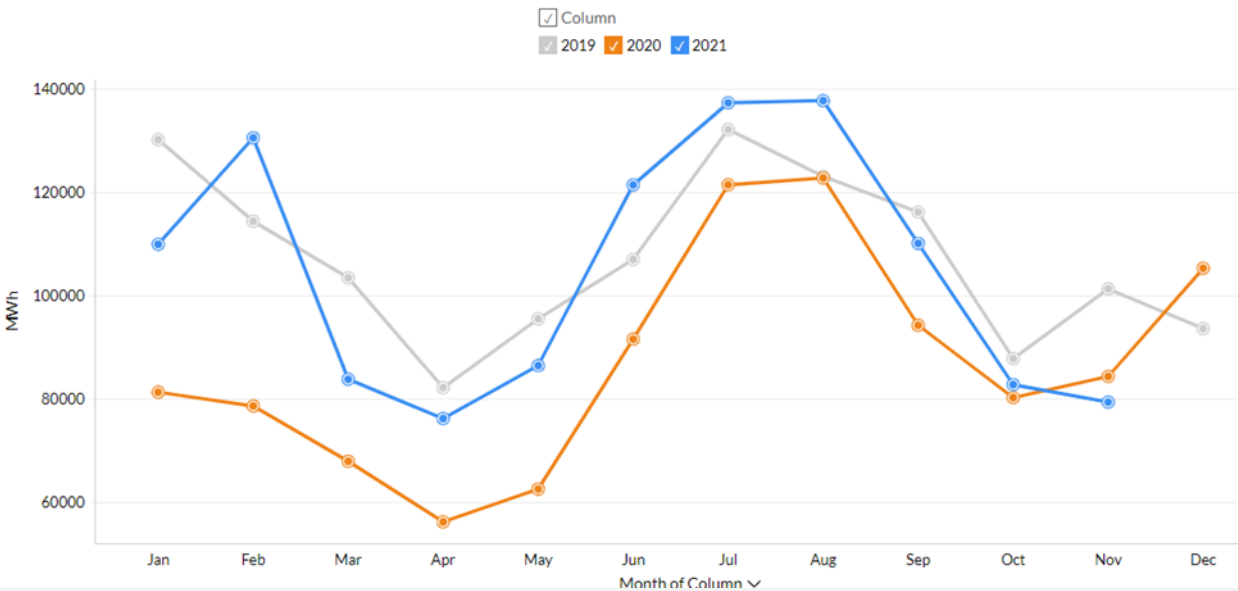
[Click here to see the interactive chart](#)

- 3) Increased coal exports – strong international prices are drawing away excess US coal. Exports make up ~15% of the total supply.
- 4) Renewables growth – gas gen has quick ramp times to moderate the wild variability of wind.

With all those facts we still saw coal generation increase. The surge in post-COVID electricity demand and lower year-on-year renewables output needed the coal generators to participate. Summer-on-summer we see that total power demand was up by 4%, but coal generation was higher by 19% and natural gas generation was up by 29%.

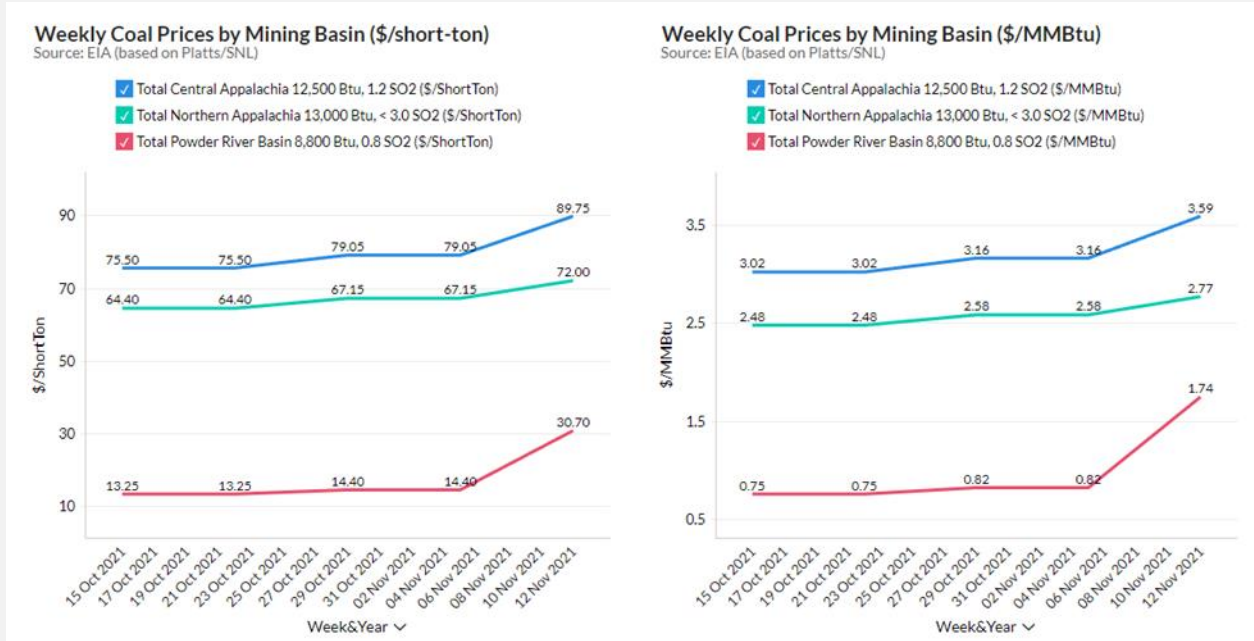
Average Daily Coal Generation - SEASONALITY CHART

Source: EIA



[Click here to see the interactive chart](#)

With the start of winter season, coal generation has dropped off significantly this month. Many utilities burned through their stockpiles over the summer and it's difficult to buy more. Most coal is contracted on a long-term basis with very little changing hands in the spot market; hence price can move quite quickly if utilities are out trying to purchase it. The following chart shows a big step up in coal prices in the last few weeks as buyers try to procure extra supplies.



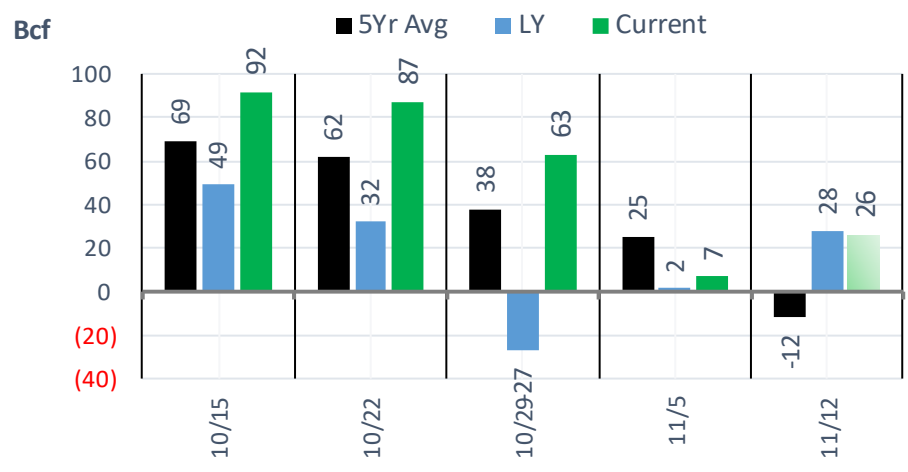
[Click here to see the interactive chart](#)

The consensus is that the lower coal gen this month is a result of holding back on supplies for the peak winter months. This month so far coal generation is lower by 9% year-on-year. As a result, natural gas burns have been extremely strong or 12% higher than last year despite prices being 175% higher (prompt month averaging \$5.19 vs. \$2.96).

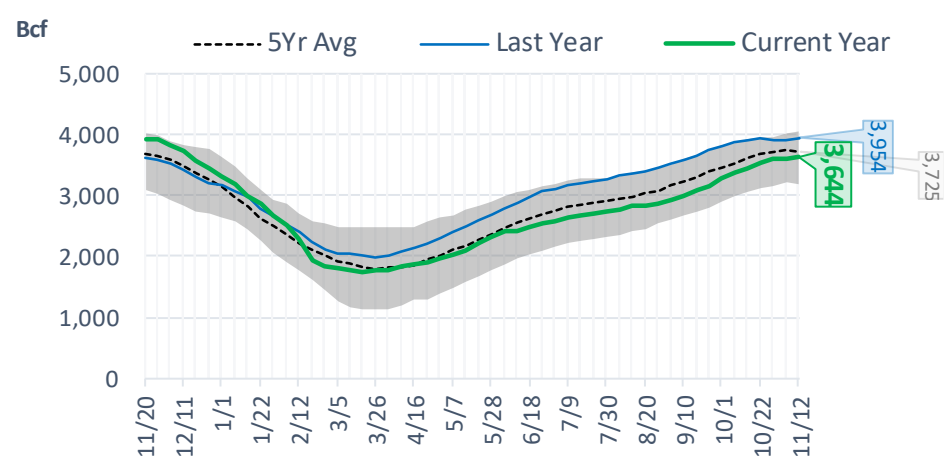
We will keep a close eye on power burns this winter as the combination of renewable, higher coal prices, and weather will likely result in volatile behavior.

## EIA Storage Report

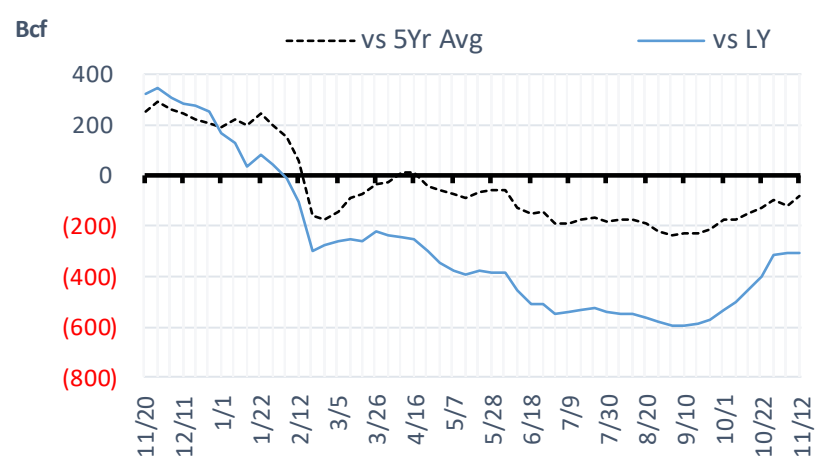
### Total Lower 48 YoY Weekly Change



### Total Lower 48 Storage Levels



### Total Lower 48 LY Surplus/Deficit

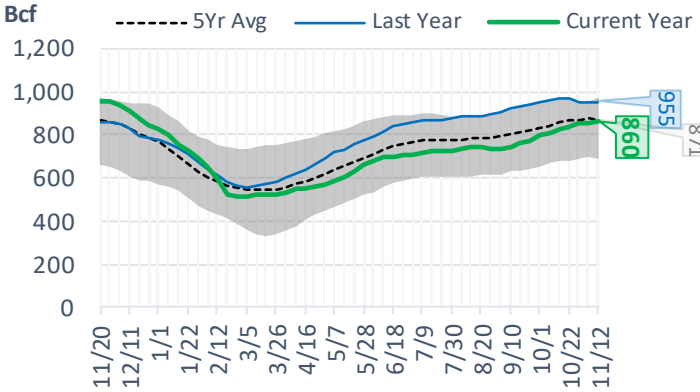


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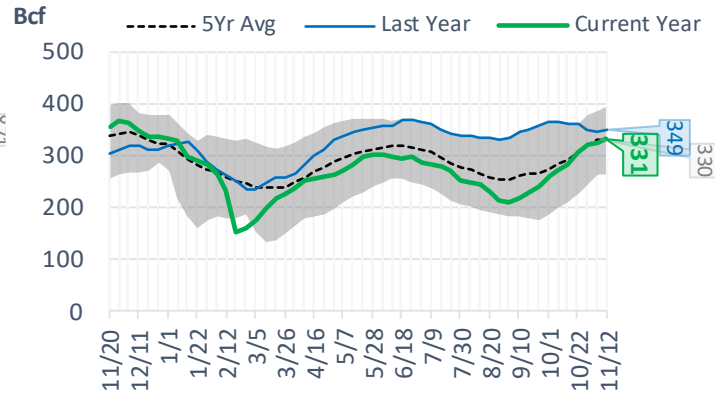
## Natural Gas Storage Stats - Last 5 Weeks

Week Ending	Current 12-Nov	Week - 1 5-Nov	Week - 2 29-Oct	Week - 3 22-Oct	Week - 4 15-Oct	Week - 5 8-Oct
<b>Total Lower 48 Storage Level</b>	<b>3644</b>	3618	3611	3548	3461	3369
<b>Weekly Change</b>	<b>+26</b>	+7	+63	+87	+92	+81
<b>vs LY</b>	<b>-310</b>	-308	-313	-403	-458	-501
<b>vs 5Yr Avg</b>	<b>-81</b>	-119	-101	-126	-151	-174
<b>S. Central Salt Storage Level</b>	<b>331</b>	324	320	304	283	269
<b>Weekly Change</b>	<b>+7</b>	+4	+16	+21	+14	+10
<b>vs LY</b>	<b>-18</b>	-21	-30	-56	-78	-97
<b>vs 5Yr Avg</b>	<b>+1</b>	-4	+1	-4	-10	-14
<b>S. Central NonSalt Storage Level</b>	<b>860</b>	850	852	840	825	810
<b>Weekly Change</b>	<b>+10</b>	-2	+12	+15	+15	+15
<b>vs LY</b>	<b>-95</b>	-98	-96	-128	-143	-149
<b>vs 5Yr Avg</b>	<b>-11</b>	-23	-17	-25	-30	-33
<b>Midwest Storage Level</b>	<b>1079</b>	1075	1071	1052	1027	997
<b>Weekly Change</b>	<b>+4</b>	+4	+19	+25	+30	+26
<b>vs LY</b>	<b>-58</b>	-51	-48	-64	-75	-81
<b>vs 5Yr Avg</b>	<b>-12</b>	-21	-15	-18	-20	-23
<b>East Storage Level</b>	<b>900</b>	897	899	885	862	834
<b>Weekly Change</b>	<b>+3</b>	-2	+14	+23	+28	+24
<b>vs LY</b>	<b>-51</b>	-46	-47	-53	-59	-72
<b>vs 5Yr Avg</b>	<b>-8</b>	-18	-14	-21	-30	-42
<b>Mountain Storage Level</b>	<b>212</b>	213	213	212	211	210
<b>Weekly Change</b>	<b>-1</b>	0	+1	+1	+1	+4
<b>vs LY</b>	<b>-29</b>	-30	-28	-33	-33	-30
<b>vs 5Yr Avg</b>	<b>-8</b>	-9	-8	-9	-8	-7
<b>Pacific Storage Level</b>	<b>261</b>	258	256	255	253	251
<b>Weekly Change</b>	<b>+3</b>	+2	+1	+2	+2	+3
<b>vs LY</b>	<b>-58</b>	-64	-64	-68	-70	-69
<b>vs 5Yr Avg</b>	<b>-42</b>	-46	-48	-50	-52	-52

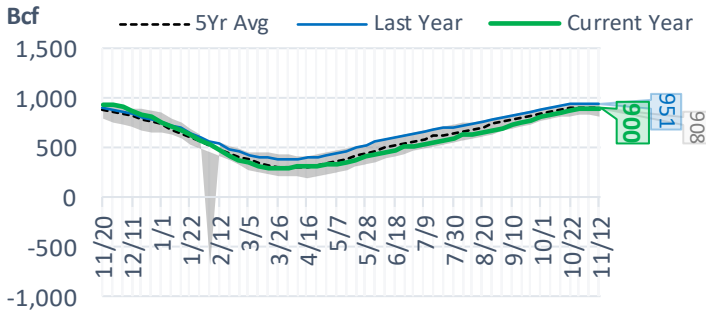
## NonSalt Storage Levels



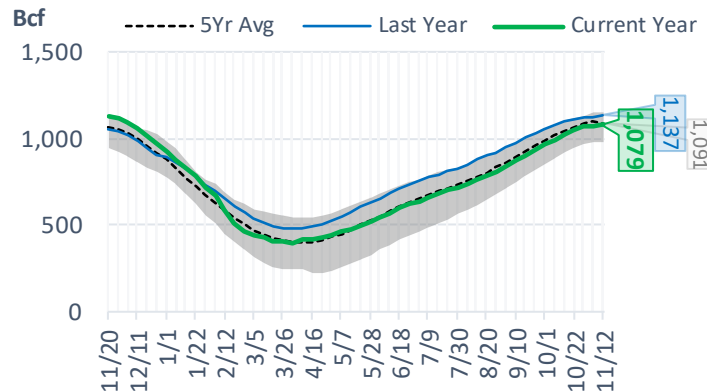
## Salt Storage Levels



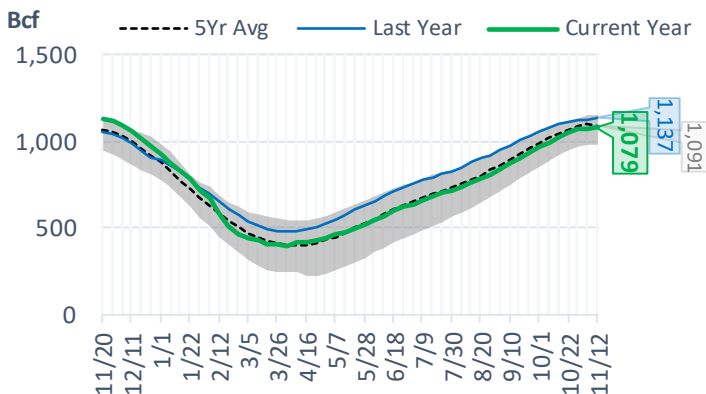
## East Storage Levels



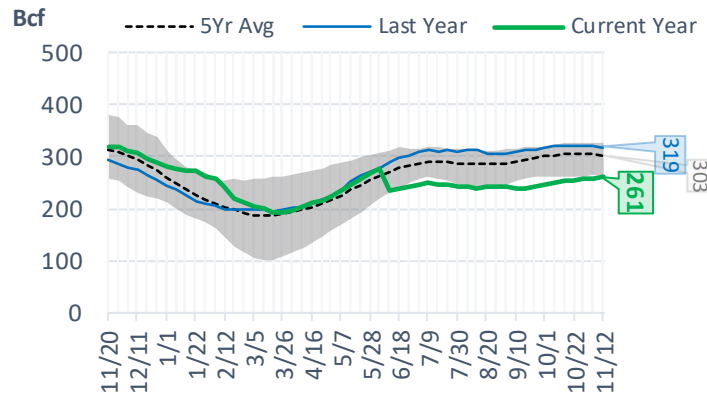
## Midwest Storage Levels



## Midwest Storage Levels



## Pacific Storage Levels



## EIA Storage Week Balances

	15-Oct	22-Oct	29-Oct	5-Nov	12-Nov	19-Nov	WoW	vs. 4W
<b>Lower 48 Dry Production</b>	94.7	94.6	95.7	96.4	97.2	96.4	▼-0.8	▲ 0.4
<b>Canadian Imports</b>	5.0	5.6	5.6	5.5	5.1	4.9	▼-0.2	▼-0.6
L48 Power	31.7	29.0	29.0	29.5	27.3	27.2	▼-0.2	▼-1.5
L48 Residential & Commercial	9.5	13.9	17.7	24.1	23.4	27.7	▲ 4.3	▲ 7.9
L48 Industrial	21.5	20.5	21.0	22.8	23.0	24.8	▲ 1.8	▲ 3.0
L48 Lease and Plant Fuel	5.2	5.1	5.2	5.2	5.3	5.2	▼0.0	▲ 0.0
L48 Pipeline Distribution	2.2	2.3	2.5	2.9	2.7	2.9	▲ 0.2	▲ 0.3
<b>L48 Regional Gas Consumption</b>	70.1	70.8	75.4	84.5	81.7	87.9	▲ 6.1	▲ 9.8
<b>Net LNG Exports</b>	10.7	10.8	10.8	10.9	11.2	11.1	▼-0.1	▲ 0.2
<b>Total Mexican Exports</b>	6.6	6.6	6.9	6.1	6.2	6.0	▼-0.1	▼-0.4
<b>Implied Daily Storage Activity</b>	12.2	12.0	8.2	0.4	3.2	-3.7	-6.9	
<b>EIA Reported Daily Storage Activity</b>	13.1	12.4	9.0	1.0	3.7			
<b>Daily Model Error</b>	-0.9	-0.5	-0.8	-0.6	-0.5			

## Monthly Balances

	2Yr Ago Nov-19	LY Nov-20	Jul-21	Aug-21	Sep-21	Oct-21	MTD Nov-21	MoM	vs. LY
<b>Lower 48 Dry Production</b>	96.2	91.1	93.6	94.2	94.4	95.1	96.6	▲ 1.5	▲ 5.5
<b>Canadian Imports</b>	4.5	4.6	5.2	5.1	5.1	5.4	5.1	▼-0.3	▲ 0.5
L48 Power	27.5	25.7	39.4	40.1	33.1	30.3	28.1	▼-2.2	▲ 2.4
L48 Residential & Commercial	32.8	24.4	8.1	7.8	7.7	12.9	26.5	▲13.6	▲ 2.1
L48 Industrial	24.9	22.4	21.2	21.9	22.1	21.7	23.9	▲ 2.2	▲ 1.4
L48 Lease and Plant Fuel	5.2	5.0	5.1	5.1	5.2	5.2	5.3	▲ 0.1	▲ 0.3
L48 Pipeline Distribution	3.0	2.7	2.5	2.6	2.2	2.3	2.9	▲ 0.6	▲ 0.2
<b>L48 Regional Gas Consumption</b>	93.5	80.2	76.3	77.5	70.3	72.4	86.7	▲14.3	▲ 6.5
<b>Net LNG Exports</b>	7.2	10.1	10.8	10.5	10.3	10.6	11.1	▲ 0.5	▲ 1.0
<b>Total Mexican Exports</b>	5.2	6.1	7.1	6.9	6.7	6.6	6.1	▼-0.6	▼ 0.0
<b>Implied Daily Storage Activity</b>	-5.1	-0.7	4.6	4.6	12.2	10.9	-2.2		
<b>EIA Reported Daily Storage Activity</b>									
<b>Daily Model Error</b>									

Source: Bloomberg, analytix.ai



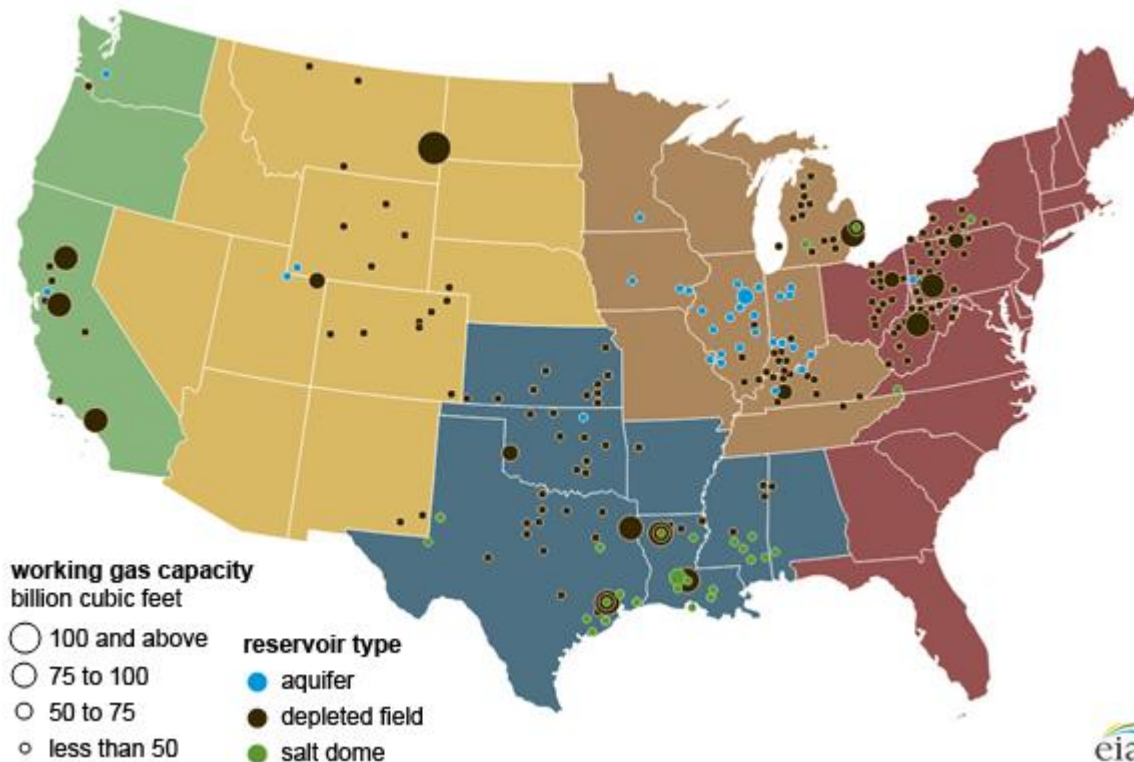
## Regional S/D Models Storage Projection

Week Ending 19-Nov

	Daily Raw Storage	Daily Adjustment Factor	Daily Average Storage Activity (Adjusted) *	Weekly Adjusted Storage Activity
L48	-4.0	0.8	-3.2	-22
East	-1.5	0.4	-1.1	-8
Midwest	-2.4	0.9	-1.5	-10
Mountain	3.0	-3.4	-0.4	-3
South Central	-3.3	3.0	-0.2	-2
Pacific	0.2	-0.1	0.1	0

\*Adjustment Factor is calculated based on historical regional deltas

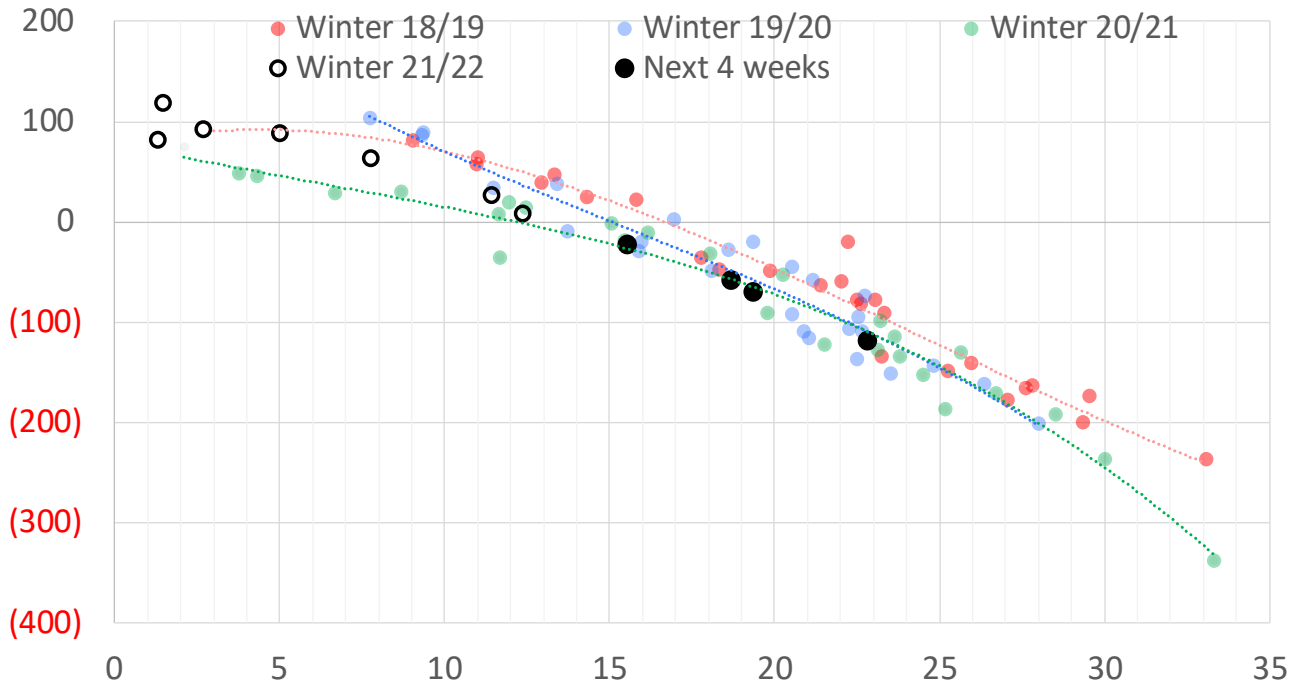
U.S. underground natural gas storage facilities by type (July 2015)



## Weather Model Storage Projection

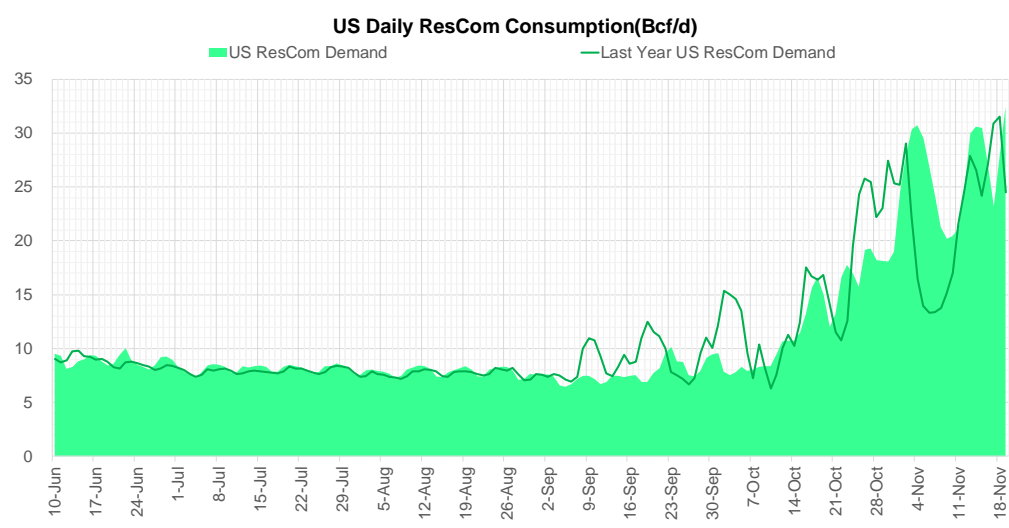
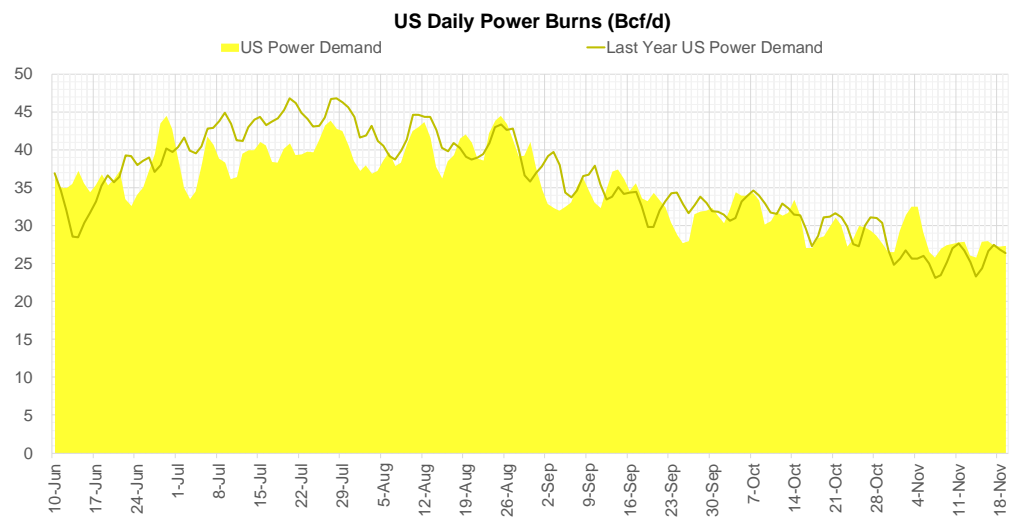
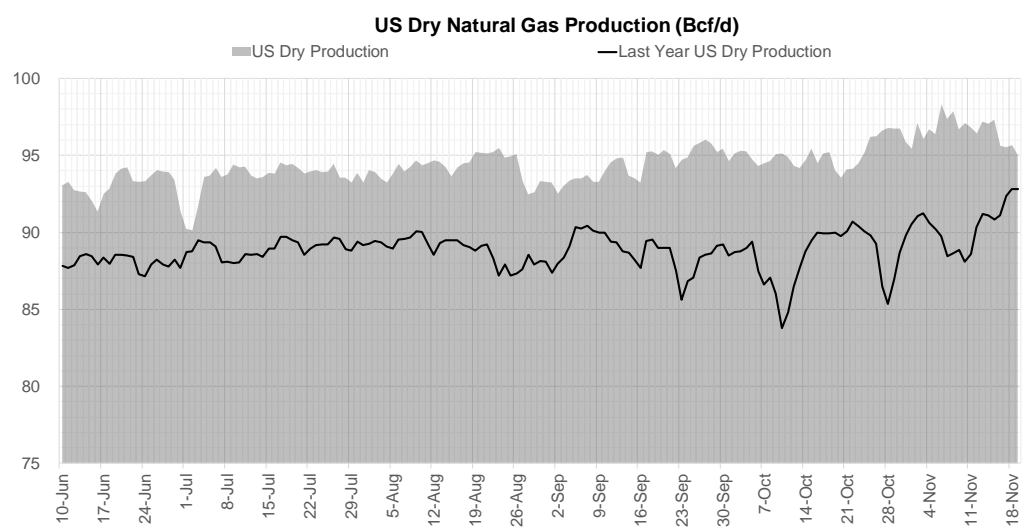
Next report and beyond		
Week Ending	GWDDs	Week Storage Projection
19-Nov	15.5	-22
26-Nov	19	-57
03-Dec	19	-69
10-Dec	23	-119

## Weather Storage Model - Next 4 Week Forecast



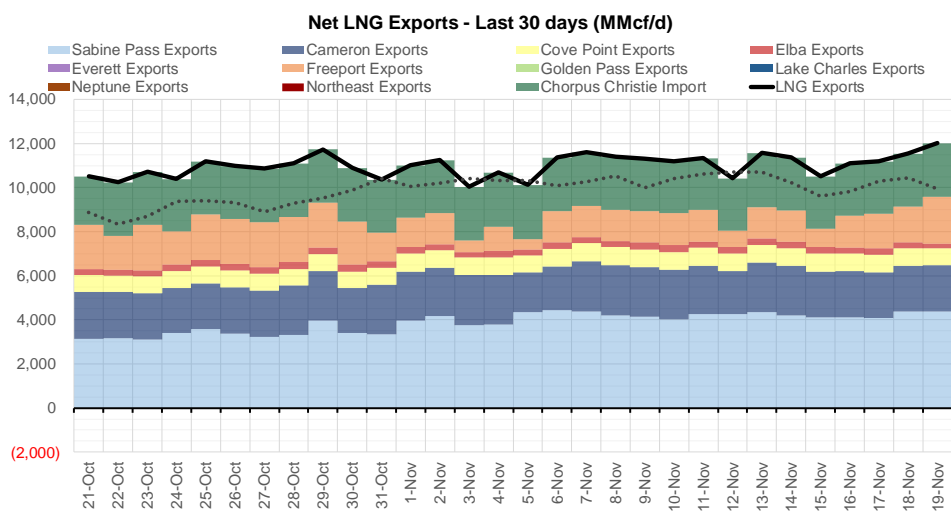
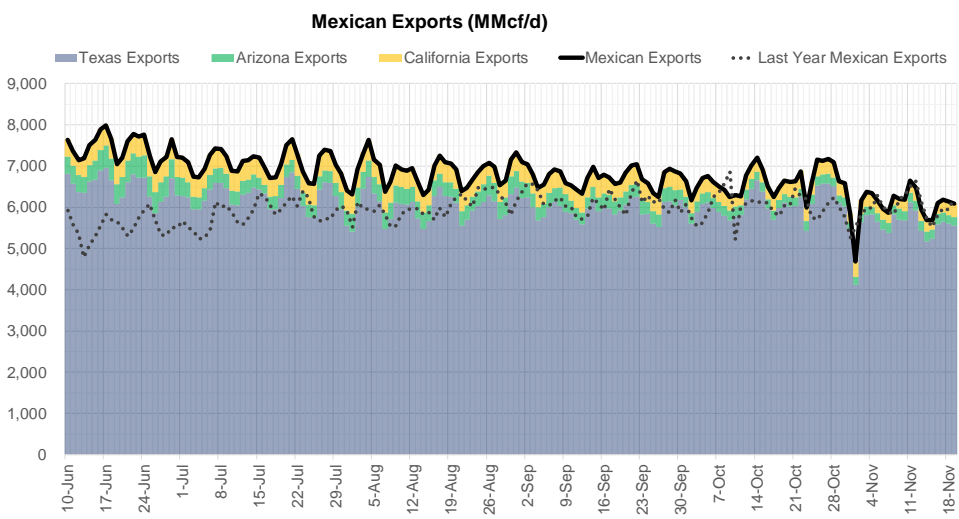
Note: this is not our official end of season forecast. This chart signifies where storage levels end with 10-year normal weather and current market tightness relative to last year

## Supply – Demand Trends



Source: Bloomberg

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Source: Bloomberg

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## Nat Gas Options Volume and Open Interest CME, ICE and Nasdaq Combined

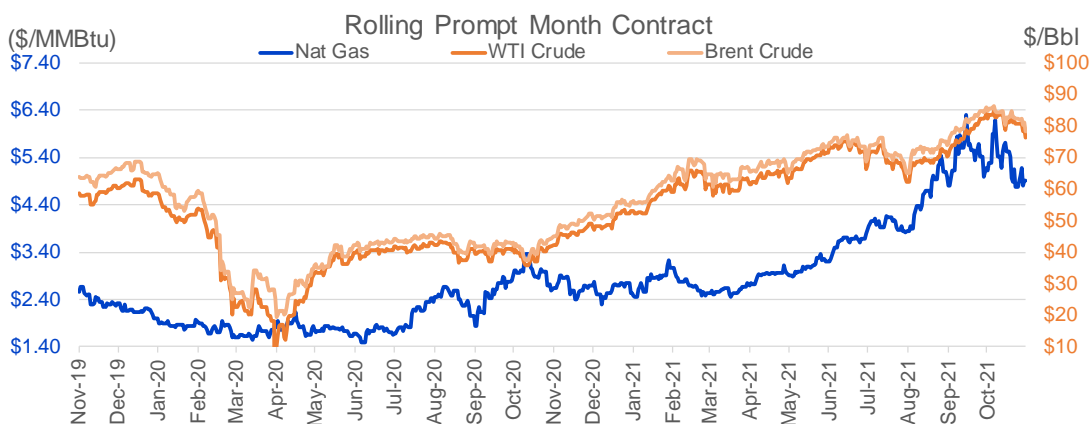
CONTRACT MONTH	CONTRACT YEAR	PUT/CALL	STRIKE	CUMULATIVE VOL	CONTRACT MONTH	CONTRACT YEAR	PUT/CALL	STRIKE	CUMULATIVE OI
12	2021	P	4.50	6265	12	2021	P	2.75	54612
12	2021	C	5.40	3358	12	2021	P	4.00	42522
3	2022	C	9.00	3200	12	2021	P	3.00	40234
12	2021	C	5.55	3070	12	2021	P	2.50	39420
12	2021	C	6.00	3006	3	2022	C	10.00	34396
4	2022	C	5.00	2277	12	2021	P	3.50	33464
12	2021	C	7.00	2127	12	2021	C	6.00	25608
12	2021	P	4.75	2114	3	2022	C	8.00	25194
12	2021	C	5.50	2087	12	2021	P	5.00	24882
9	2022	C	5.00	2075	12	2021	P	4.25	24460
10	2022	C	5.00	2075	1	2022	C	6.00	23651
5	2022	C	5.00	2050	12	2021	C	7.00	23322
6	2022	C	5.00	2050	1	2022	P	2.75	23233
7	2022	C	5.00	2050	3	2022	C	5.00	22598
8	2022	C	5.00	2050	1	2022	P	3.00	22560
12	2021	P	4.25	2039	12	2021	C	4.00	22526
12	2021	C	6.50	1645	12	2021	C	8.00	20765
1	2022	P	4.00	1575	3	2022	P	3.00	20698
10	2022	C	7.00	1500	4	2022	C	3.00	19710
12	2021	C	5.00	1403	3	2022	P	2.50	18839
1	2022	P	4.50	1366	12	2021	P	4.50	18836
1	2022	C	10.00	1336	3	2022	P	3.50	18730
1	2022	C	12.00	1292	1	2022	C	5.00	18452
4	2022	P	3.00	1250	3	2022	P	4.00	17761
4	2023	P	2.75	1050	2	2022	C	5.00	17693
12	2021	C	5.80	1048	1	2022	P	3.50	17439
3	2022	C	8.00	1045	3	2022	C	6.00	17416
12	2021	C	5.90	1008	1	2022	C	7.00	17343
12	2021	C	13.00	1000	4	2022	C	5.00	16947
4	2022	C	4.00	951	12	2021	P	2.00	16834
1	2022	C	8.00	943	12	2021	C	5.00	16144
6	2022	C	4.00	875	12	2022	C	5.00	16047
12	2021	P	4.40	865	3	2022	C	4.00	15506
1	2022	P	5.00	859	12	2021	C	5.50	15314
5	2022	C	4.00	825	4	2022	P	2.50	15264
1	2022	C	5.10	811	2	2022	P	3.50	15226
12	2021	P	4.00	776	1	2022	P	4.00	15118
7	2022	C	4.00	775	1	2022	C	4.00	14369
8	2022	C	4.00	775	2	2022	C	6.00	14006
9	2022	C	4.00	775	3	2022	P	5.00	13982
10	2022	C	4.00	775	1	2022	C	10.00	13953
6	2022	P	3.00	763	1	2022	C	8.00	13898
7	2022	P	3.00	763	5	2022	C	3.00	13733
8	2022	P	3.00	763	3	2022	C	7.00	13563
9	2022	P	3.00	763	12	2021	C	15.00	13491
10	2022	P	3.00	763	6	2022	C	3.00	13438
1	2022	P	4.45	751	6	2022	C	5.00	13282
5	2022	P	3.00	750	12	2022	C	4.50	13267
12	2021	P	4.90	690	12	2022	C	5.25	13263
					7	2022	C	3	13230

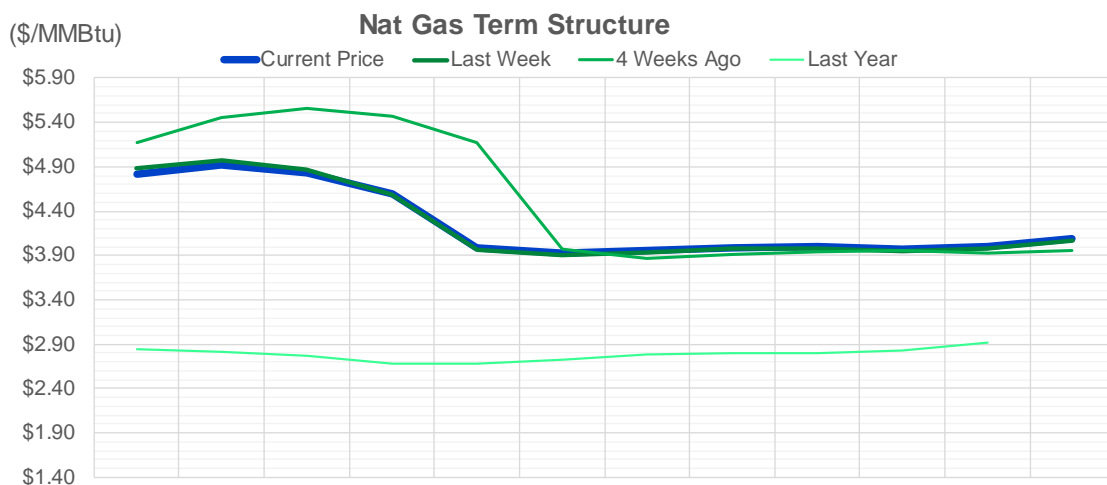
Source: CME, Nasdaq, ICE

## 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	54565	60944	-6379	DEC 21	88313	90163	-1850
JAN 22	263084	262239	845	JAN 22	89939	89258	680
FEB 22	79297	79758	-461	FEB 22	69230	69148	81
MAR 22	162129	158625	3504	MAR 22	80169	80385	-216
APR 22	115688	115300	388	APR 22	75291	75049	242
MAY 22	139433	139720	-287	MAY 22	72799	72466	333
JUN 22	45013	45040	-27	JUN 22	54944	54675	269
JUL 22	43171	42963	208	JUL 22	56923	56607	316
AUG 22	31856	31615	241	AUG 22	55194	54898	296
SEP 22	37257	36880	377	SEP 22	56087	55793	294
OCT 22	88731	88185	546	OCT 22	62442	62254	187
NOV 22	35537	35539	-2	NOV 22	47720	47709	11
DEC 22	27311	27361	-50	DEC 22	50466	50419	47
JAN 23	32312	31729	583	JAN 23	40542	40206	337
FEB 23	11241	11290	-49	FEB 23	33444	33516	-73
MAR 23	24565	23896	669	MAR 23	37176	37113	63
APR 23	16948	16542	406	APR 23	38157	38148	9
MAY 23	10047	10124	-77	MAY 23	35317	35484	-167
JUN 23	9055	8774	281	JUN 23	31602	31727	-124
JUL 23	6198	6311	-113	JUL 23	31468	31589	-121
AUG 23	5118	5034	84	AUG 23	32499	32658	-159
SEP 23	6402	6397	5	SEP 23	30715	30869	-154
OCT 23	10625	10497	128	OCT 23	34780	34525	255
NOV 23	5287	5121	166	NOV 23	33760	34055	-295
DEC 23	8339	8288	51	DEC 23	31276	31580	-304
JAN 24	4900	4974	-74	JAN 24	20389	19690	699
FEB 24	1449	1449	0	FEB 24	15303	15170	134
MAR 24	8641	8636	5	MAR 24	20398	20047	351
APR 24	4868	5367	-499	APR 24	14475	14430	45
MAY 24	1981	1982	-1	MAY 24	15120	14972	149

Source: CME, ICE






	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22
<b>Current Price</b>	<b>\$4.816</b>	<b>\$4.914</b>	<b>\$4.824</b>	<b>\$4.593</b>	<b>\$3.986</b>	<b>\$3.923</b>	<b>\$3.951</b>	<b>\$3.993</b>	<b>\$3.998</b>	<b>\$3.978</b>	<b>\$4.007</b>	<b>\$4.090</b>
Last Week	\$4.880	\$4.974	\$4.861	\$4.590	\$3.967	\$3.900	\$3.930	\$3.973	\$3.977	\$3.956	\$3.984	\$4.061
vs. Last Week	-\$0.064	-\$0.060	-\$0.037	\$0.003	\$0.019	\$0.023	\$0.021	\$0.020	\$0.021	\$0.022	\$0.023	\$0.029
4 Weeks Ago	\$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. 4 Weeks Ago	-\$0.354	-\$0.533	-\$0.738	-\$0.876	-\$1.185	-\$0.055	\$0.084	\$0.088	\$0.052	\$0.028	\$0.076	\$0.127
Last Year	\$2.712	\$2.838	\$2.818	\$2.767	\$2.680	\$2.684	\$2.728	\$2.784	\$2.805	\$2.794	\$2.828	\$2.912
vs. Last Year	\$2.104	\$2.076	\$2.006	\$1.826	\$1.306	\$1.239	\$1.223	\$1.209	\$1.193	\$1.184	\$1.179	\$1.178

	Units	Current Price	vs. Last Week	vs. 4 Weeks Ago	vs. Last Year
NatGas Jul21/Oct21	\$/MMBtu	2.224	▲ 0.000	▲ 0.000	▲ 2.169
NatGas Oct21/Nov21	\$/MMBtu	0.361	▲ 0.000	▲ 1.087	▲ 0.283
NatGas Oct21/Jan22	\$/MMBtu	-0.846	▼ -0.250	▼ -0.466	▼ -1.167
NatGas Apr22/Oct22	\$/MMBtu	0.017	▲ 0.021	▲ 0.023	▼ -0.050
WTI Crude	\$/Bbl	79.01	▼ -2.580	▼ -3.490	▲ 37.270
Brent Crude	\$/Bbl	81.24	▼ -1.630	▼ -3.370	▲ 37.040
Fuel Oil, NY Harbour 1%	\$/Bbl	97.18	▲ 0.000	▲ 0.000	▲ 0.000
Heating Oil	cents/Gallon	238.40	▼ -6.310	▼ -16.510	▲ 111.330
Propane, Mt. Bel	cents/Gallon	1.26	▼ -0.096	▼ -0.198	▲ 0.723
Ethane, Mt. Bel	cents/Gallon	0.40	▼ -0.010	▼ -0.029	▲ 0.184
Coal, PRB	\$/MTon	12.30	▲ 0.000	▲ 0.000	▲ 0.000
Coal, PRB	\$/MMBtu	0.70			

Source: CME, Bloomberg

## Baker Hughes Rig Counts

Rotary Rig Count						Baker Hughes 
11/19/2021						
U.S. Breakout Information	This Week	+/-	Last Week	+/-	Year Ago	
Oil	461	7	454	230	231	
Gas	102	0	102	26	76	
Miscellaneous	0	0	0	-3	3	
Directional	35	0	35	15	20	
Horizontal	506	7	499	234	272	
Vertical	22	0	22	4	18	
Canada Breakout	This Week	+/-	Last Week	+/-	Year Ago	
Oil	102	1	101	60	42	
Gas	65	-2	67	6	59	
Major Basin Variances	This Week	+/-	Last Week	+/-	Year Ago	
Arkoma Woodford	3	0	3	3	0	
Barnett	1	0	1	1	0	
Cana Woodford	24	0	24	15	9	
DJ-Niobrara	11	-1	12	8	3	
Eagle Ford	42	1	41	22	20	
Granite Wash	3	0	3	3	0	
Haynesville	47	1	46	7	40	
Marcellus	29	1	28	2	27	
Permian	278	6	272	122	156	
Utica	10	-2	12	6	4	
Williston	24	0	24	13	11	