This week we give an update on Freeport LNG expectations and also analyze how LNG liquefaction operations with changes in ambient conditions.

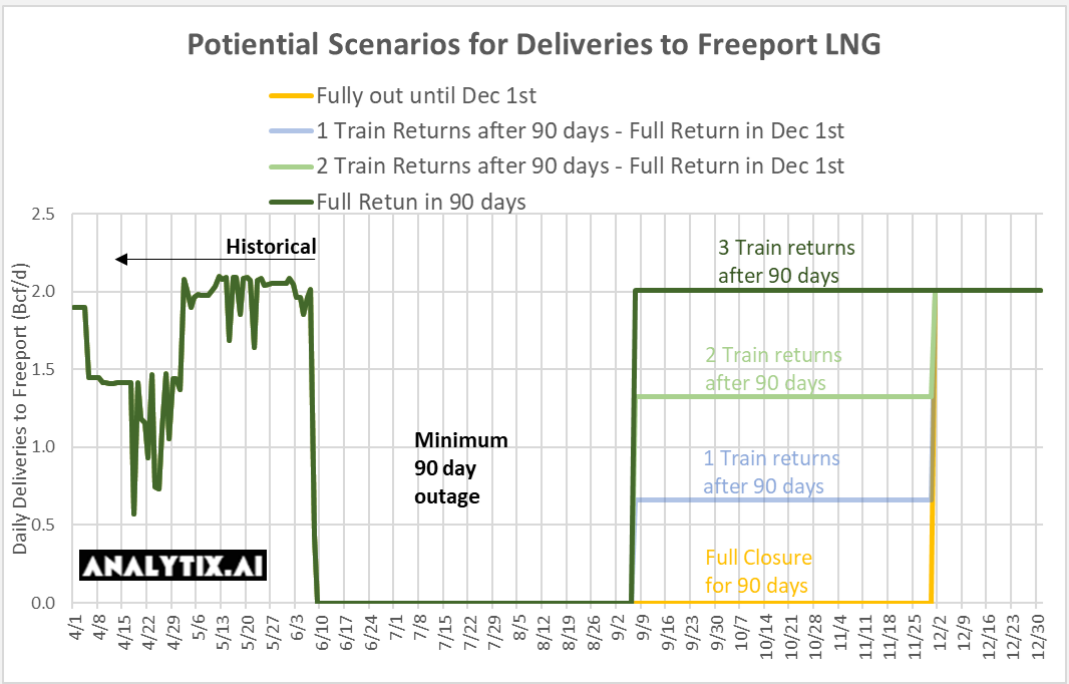
Due to damage from last week's fire, Freeport LNG says its Gulf Coast LNG liquefaction plant will not resume full operations until the end of 2022. The corporation estimates that partial operations could resume in about 90 days.

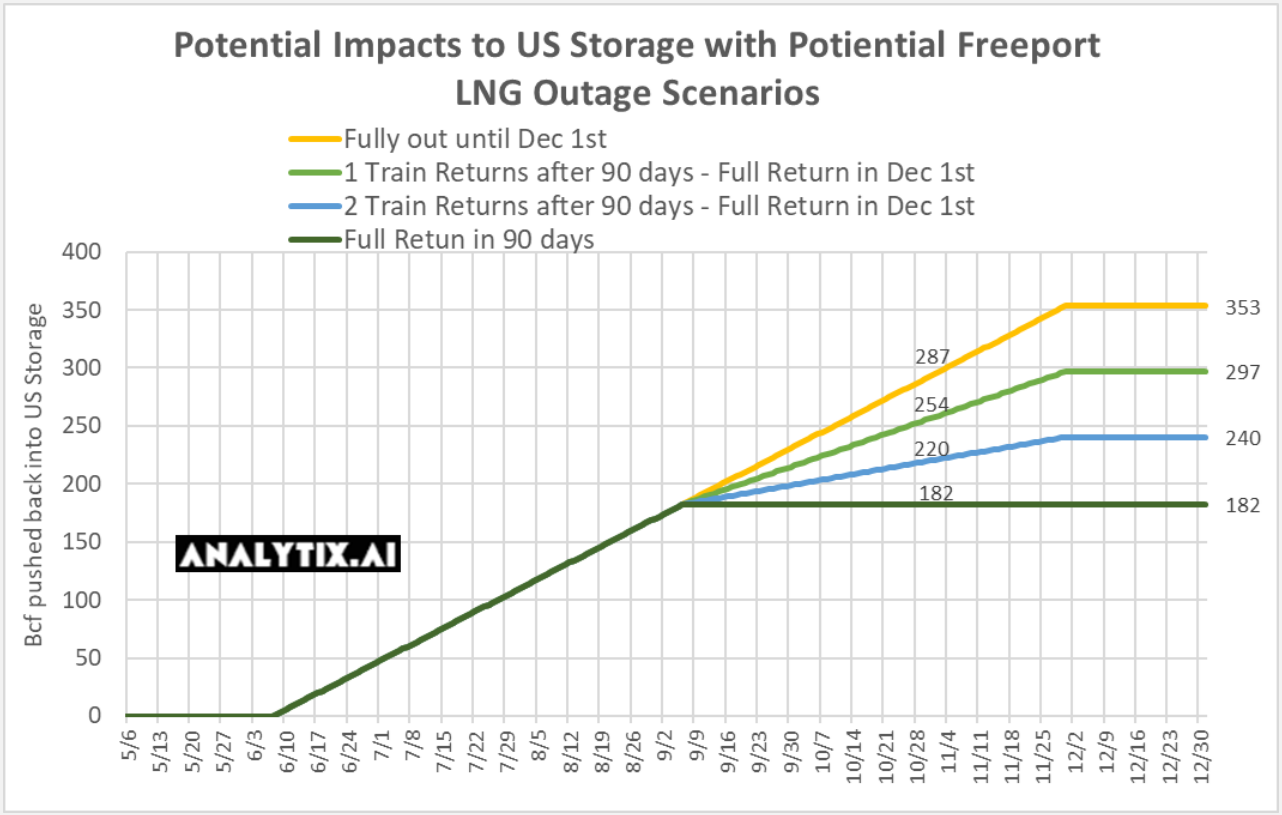
The news was revealed in the company's most recent fire update, which contained some preliminary results from its investigation into the incident. The incident happened in pipe racks that support the transfer of LNG from the facility's storage tank area to the terminal's dock facilities. The preliminary findings suggest that the event was caused by the overpressure and rupture of a segment of an LNG transfer line, resulting in the rapid flashing of LNG and the discharge and igniting of a natural gas vapor cloud.

According to the US Department of Energy, the Freeport LNG facility loaded 21 cargoes in March, carrying an estimated 64 billion cubic feet of gas to destinations in Europe, South Korea, and China, up from 15 cargoes in February and 19 in January.

The new timeline projections are longer than originally estimated, adding to the global LNG market's already constrained supply as a result of Russia's invasion of Ukraine. That being said, US storage levels are now expected to reach more comfortable levels by end of this summer. The storage deficit should be reduced by 182 to 287 Bcf by the end of Oct.

Here is our latest projection of the impact of the Freeport outage.

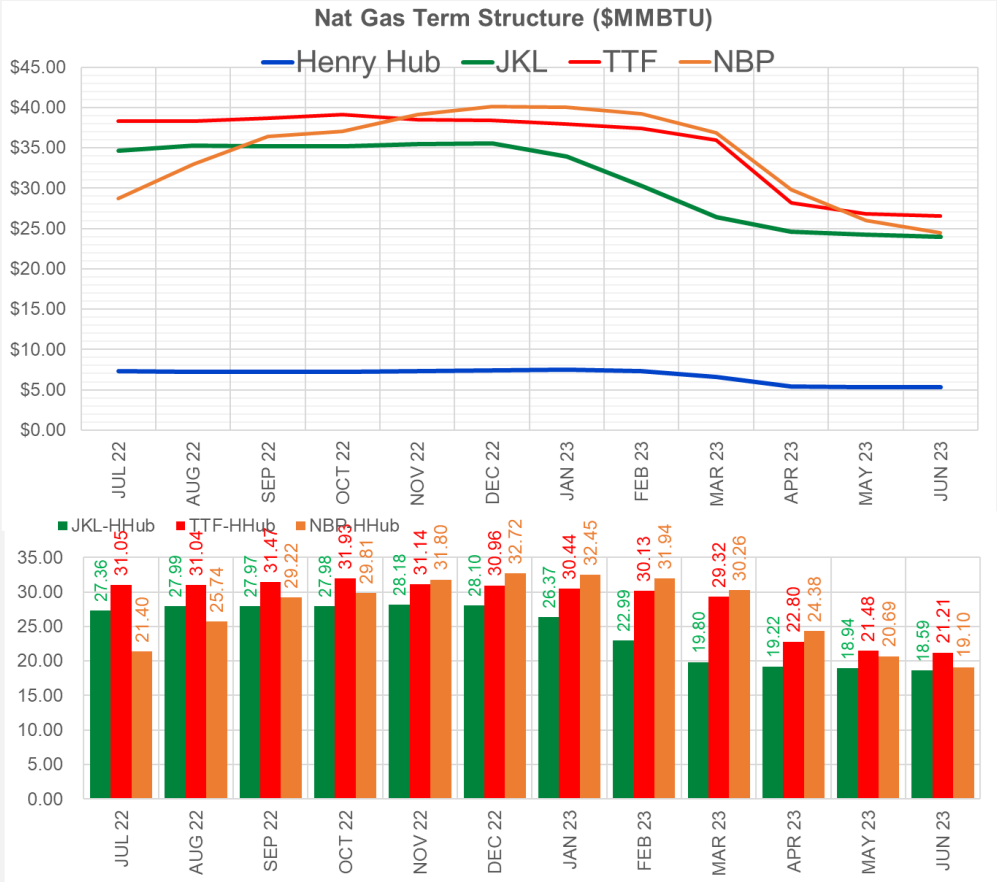




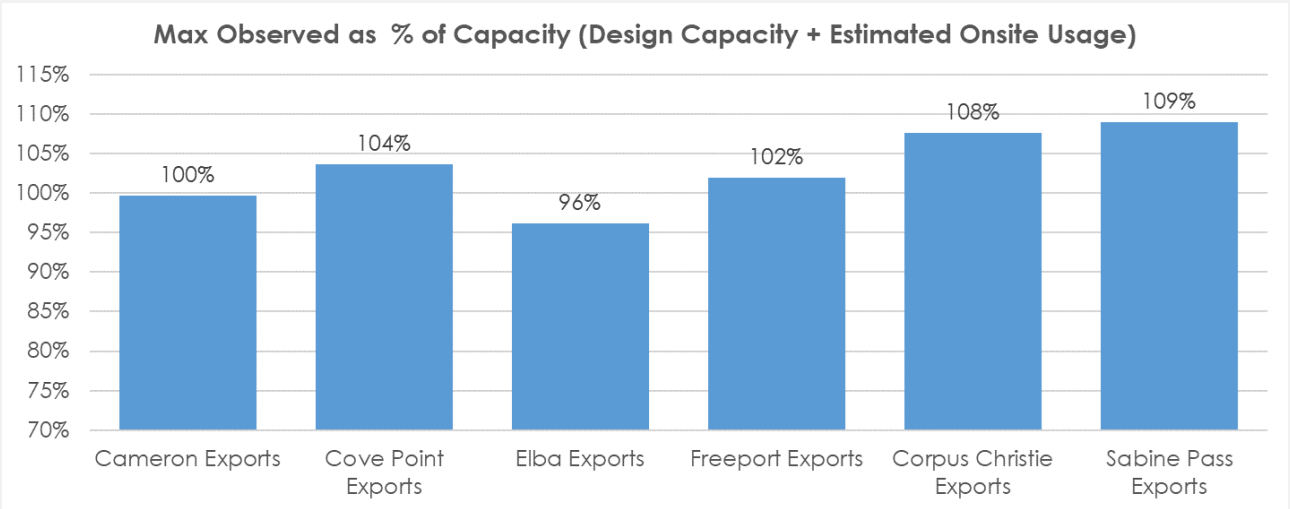
Now, on to the next point, we wanted to discuss, which will reinforce reduced US LNG flows in the coming months. In most years, LNG shipments drop throughout the summer months due to lower demand, but this year, Europe is scooping every molecule it can to meet its winter storage needs. With the reduced flows on Nord Stream 1, this has become even more important.

The arbs between the gulf coast and TTF/NBP/JKM blew out further this past week. At the moment, Europe is the preferred destination which is helping get natural gas storage levels to respectable levels.

Market Report



With the LNG flowing well in the money, we would expect US LNG facilities to move as much product as possible this summer. LNG facilities can operate above their design capacity, and this has been demonstrated from the daily flow data that we capture. The Cheniere facilities have been observed to operate 8-9% above the design capacity.



By our calculation, the design capacity + estimated onsite usage of the current facilities is 14.1 Bcf/d while the observed non-coincidental peak is 14.8 Bcf/d. The peak daily level we have seen is 13.75 Bcf on Mar 19th.

US LNG Deliveries (MMcf/d)

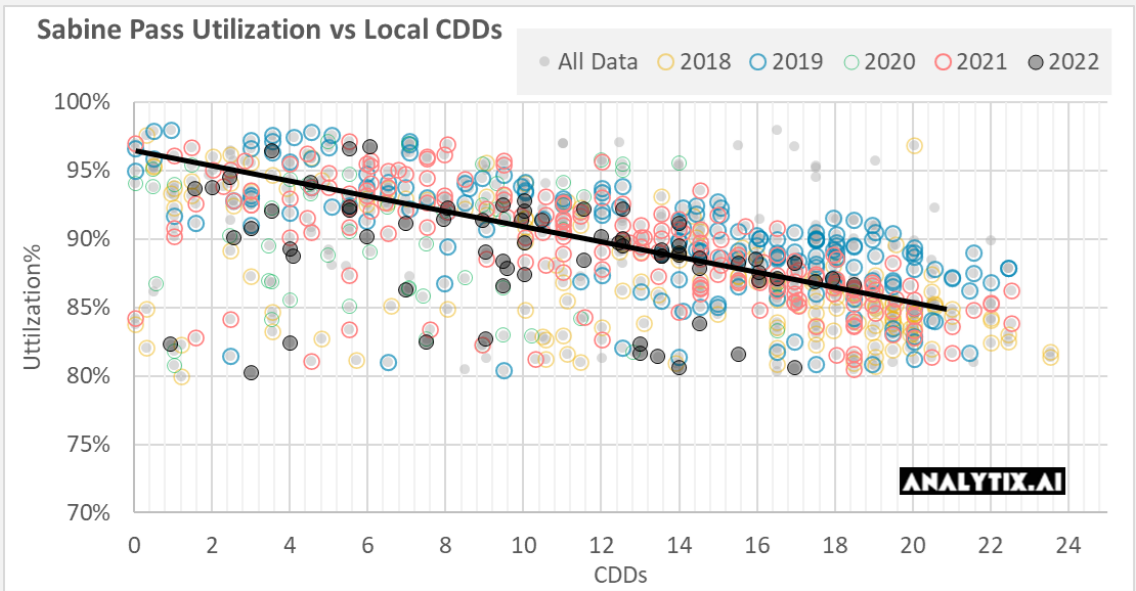
	Cameron	Cove Point	Elba	Freeport	Calcasieu Pass	Corpus Christie	Sabine Pass	US LNG Fleet
Last 30day Average	1818	829	327	2012	1105	2167	4403	12659
Design Capacity	2120	760	360	2120	1050	2100	4248	12758
Design Capacity + Est. Onsite Usage	2332	851	403	2184	1176	2352	4758	14056
Non-coincidental Peak	2325	883	388	2226	1316	2531	5184	14852

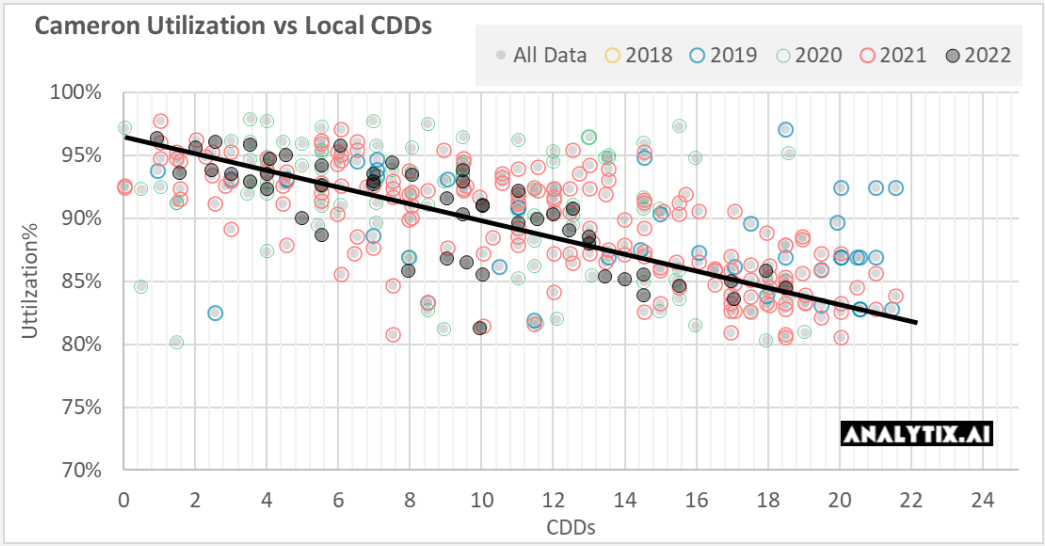
So what's stopping LNG flows from at max observed levels this summer, other than the obvious forced majeure situation?

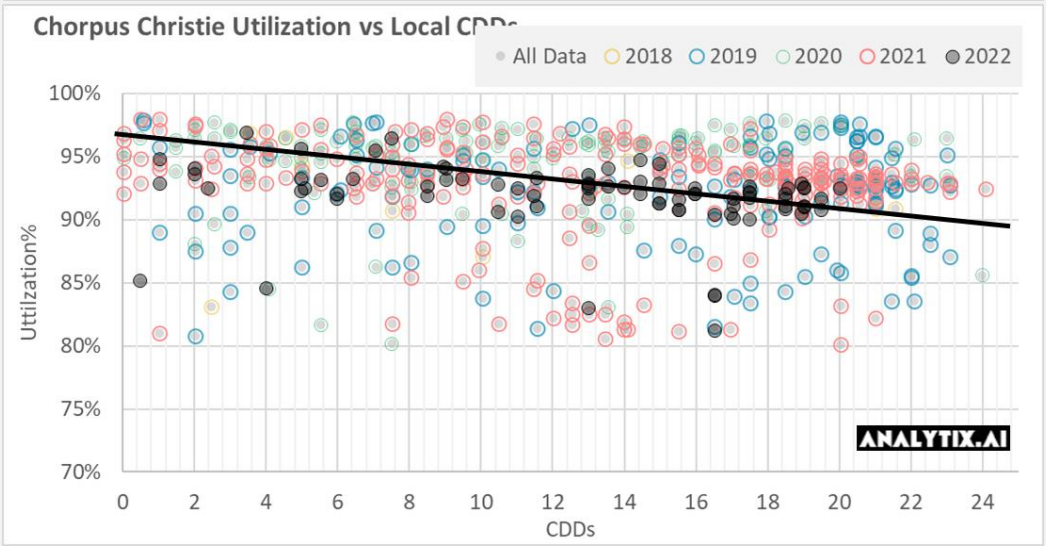
Here are the main reasons we came up with:

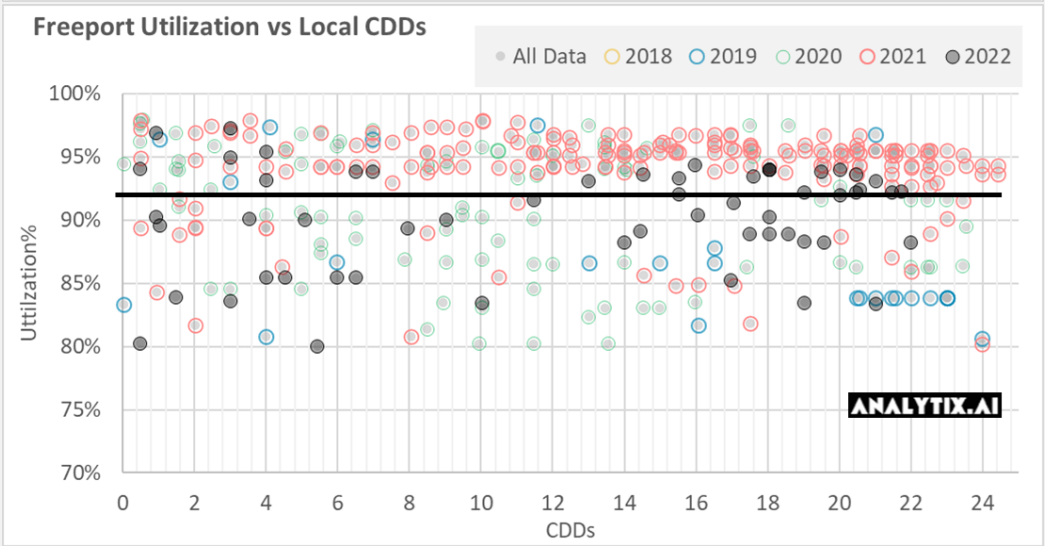
1. Plant and Feedgas Pipe Maintenance: typically each LNG train needs maintenance annually that lasts 1-3 weeks.
2. Above-ground storage of liquified gas is full: each facility requires some onsite storage to buffer the pace of liquefaction to tanker arrival.
3. Economic opportunity to sell gas back into the US market: LNG facilities can divert their gas to the market if cash prices are strong.
4. Extreme Weather Events: Heavy rain to hurricanes have an impact on facility operation.
5. Hot ambient temperatures slow operations.

Let's focus on that last point today, which is usually not well understood.
Here are some charts showing how the operations at the main Gulf Coast LNG facilities degrade as heat picks up. The charts show a cleaned-up version of daily temps vs. plant utilization (from max observed).









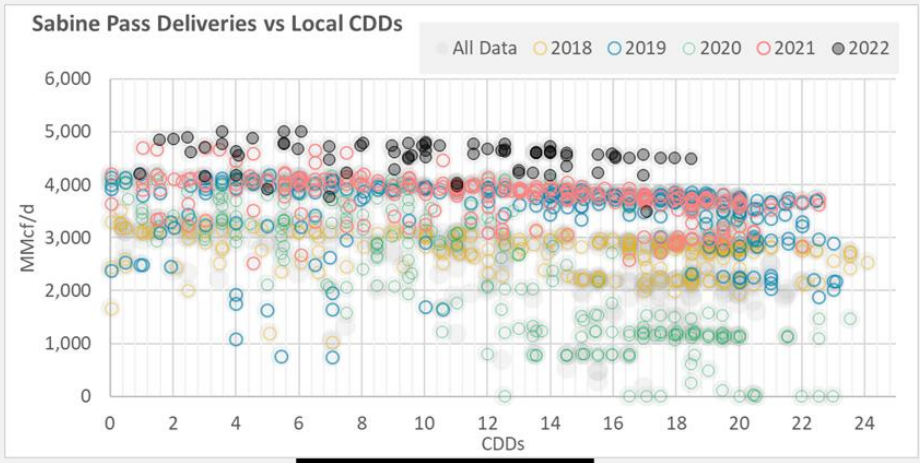
The impacts are quite large, where facility operations can drop by as much as 10% from optimal levels. I found a good explanation of the cause of this here:

Ambient conditions can have a significant impact on the overall operation of an LNG plant — particularly when it comes to liquefaction. Among all environmental factors, air temperature typically has the largest effect due to the fact that as it increases, the efficiency of turbines that drive the liquefaction process will decrease. This results in a corresponding decrease in the available power from the turbine, leading to a drop in overall production.

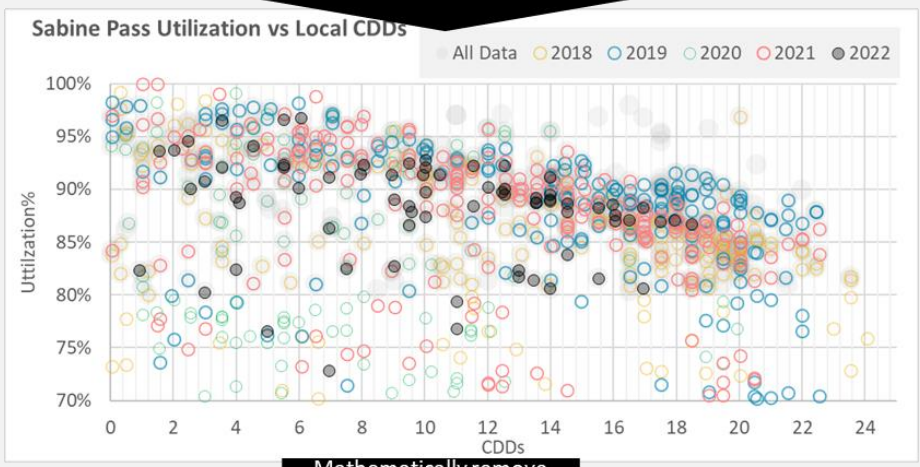
Coincidently, Freeport's operations look unchanged with the weather, and that has to do with the facility being an all-electric drive motor plant. This method of powering up has its pros and cons, as the surrounding power grid operations can stall the plant if damaged, i.e. Hurricanes.

Using the data above, along with known maintenance, we can come up with a good estimate of plant utilization and LNG feedgas levels for the rest of summer.

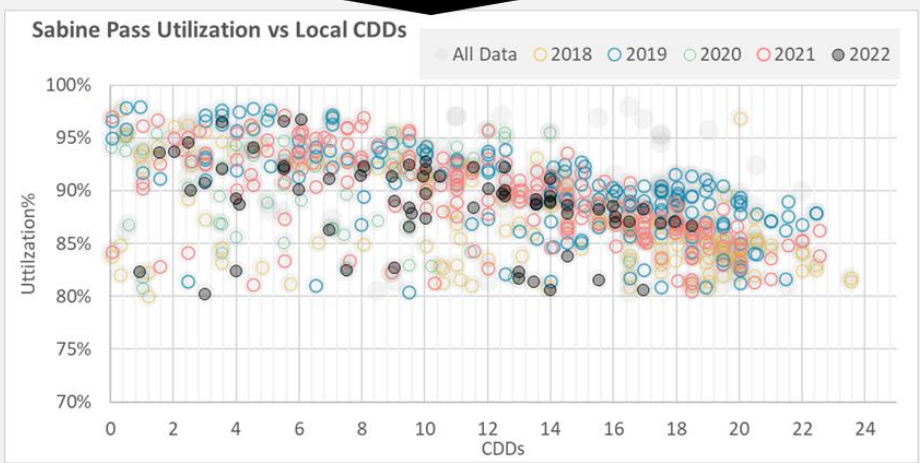
Here is the method I used to create the chart above



Converted to Utilization (as a % of Peak Observed)

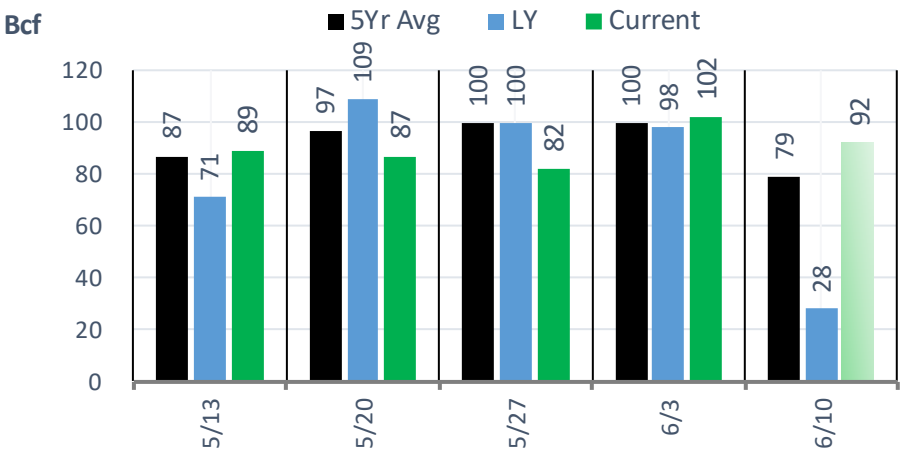


Mathematically remove maintenance period (<80% utilization)

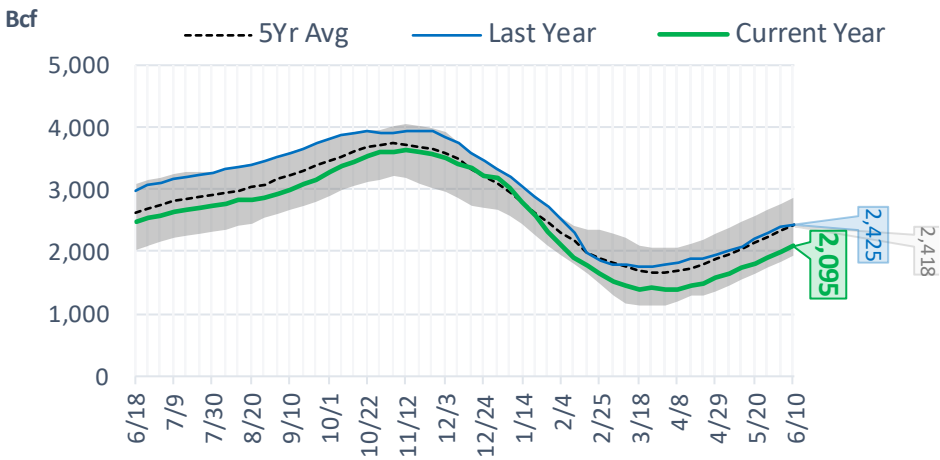


EIA Storage Report

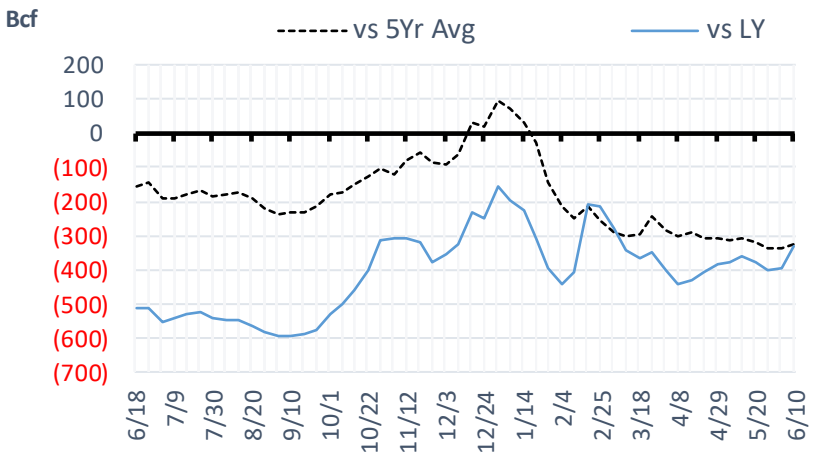
Total Lower 48 YoY Weekly Change



Total Lower 48 Storage Levels



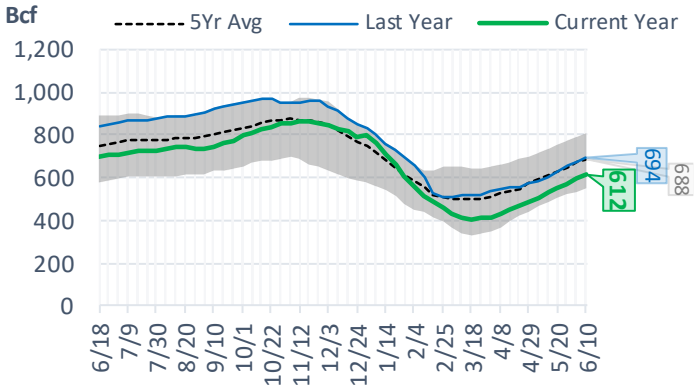
Total Lower 48 LY Surplus/Deficit



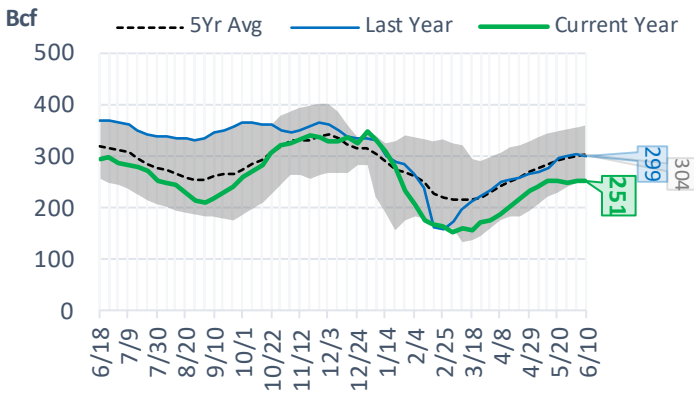
Natural Gas Storage Stats - Last 5 Weeks

Week Ending	Current 10-Jun	Week - 1 3-Jun	Week - 2 27-May	Week - 3 20-May	Week - 4 13-May	Week - 5 6-May
Total Lower 48 Storage Level	**2095**	2003	1901	1819	1732	1643
Weekly Change	**+92**	+102	+82	+87	+89	+76
vs LY	**-330**	-394	-398	-380	-358	-376
vs 5Yr Avg	**-323**	-336	-338	-320	-310	-312
S. Central Salt Storage Level	**251**	251	248	252	251	241
Weekly Change	**0**	+3	-4	+1	+10	+8
vs LY	**-48**	-51	-51	-42	-27	-27
vs 5Yr Avg	**-53**	-50	-49	-40	-33	-35
S. Central NonSalt Storage Level	**612**	593	569	547	531	507
Weekly Change	**+19**	+24	+22	+16	+24	+18
vs LY	**-82**	-85	-87	-84	-74	-79
vs 5Yr Avg	**-76**	-77	-82	-83	-77	-82
Midwest Storage Level	**482**	454	426	394	364	342
Weekly Change	**+28**	+28	+32	+30	+22	+18
vs LY	**-85**	-89	-93	-101	-106	-114
vs 5Yr Avg	**-68**	-69	-68	-73	-77	-77
East Storage Level	**407**	376	345	325	296	274
Weekly Change	**+31**	+31	+20	+29	+22	+21
vs LY	**-52**	-64	-64	-56	-60	-71
vs 5Yr Avg	**-67**	-72	-73	-63	-67	-67
Mountain Storage Level	**122**	118	113	109	103	96
Weekly Change	**+4**	+5	+4	+6	+7	+4
vs LY	**-42**	-41	-37	-34	-31	-34
vs 5Yr Avg	**-25**	-23	-20	-19	-18	-19
Pacific Storage Level	**221**	211	200	193	187	183
Weekly Change	**+10**	+11	+7	+6	+4	+7
vs LY	**-21**	-64	-66	-62	-58	-50
vs 5Yr Avg	**-34**	-44	-45	-42	-38	-32

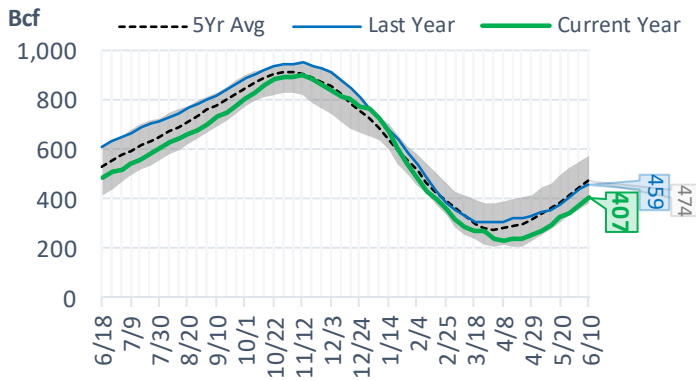
NonSalt Storage Levels



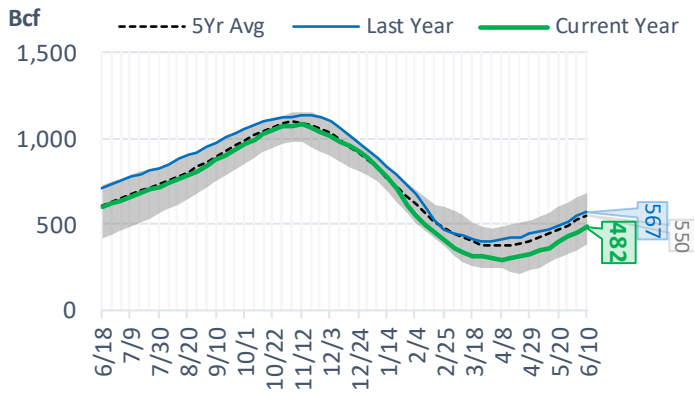
Salt Storage Levels



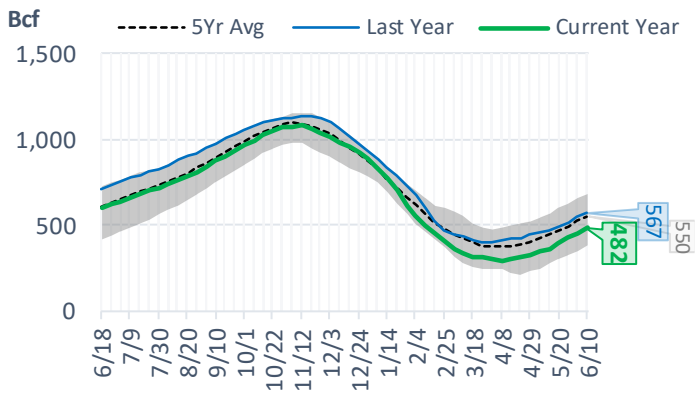
East Storage Levels



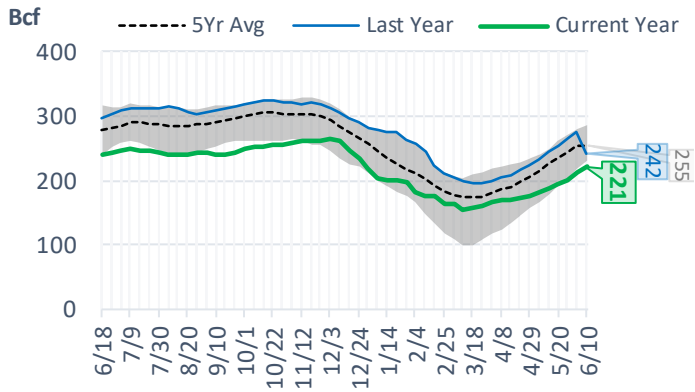
Midwest Storage Levels



Midwest Storage Levels



Pacific Storage Levels



EIA Storage Week Balances

	13-May	20-May	27-May	3-Jun	10-Jun	17-Jun	WoW	vs. 4W
Lower 48 Dry Production	96.2	95.3	96.3	97.0	96.5	96.1	▼ -0.4	▼ -0.2
Canadian Imports	5.2	4.9	4.9	4.8	5.4	6.1	▲ 0.6	▲ 1.1
L48 Power	26.8	30.4	30.0	30.5	32.5	37.8	▲ 5.3	▲ 7.0
L48 Residential & Commercial	14.5	10.0	11.6	9.0	8.4	8.3	▼ -0.2	▼ -1.5
L48 Industrial	20.9	21.3	20.2	21.5	21.5	22.8	▲ 1.3	▲ 1.7
L48 Lease and Plant Fuel	5.2	5.1	5.2	5.3	5.2	5.2	▼ 0.0	▼ 0.0
L48 Pipeline Distribution	2.3	2.3	2.4	2.2	2.2	2.5	▲ 0.3	▲ 0.2
L48 Regional Gas Consumption	69.6	69.1	69.4	68.4	69.9	76.6	▲ 6.7	▲ 7.4
Net LNG Exports	12.2	12.2	13.0	12.8	12.3	10.7	▼ -1.6	▼ -1.9
Total Mexican Exports	7.0	7.0	7.0	7.1	7.1	7.2	▲ 0.1	▲ 0.1
Implied Daily Storage Activity	12.5	11.9	11.7	13.5	12.6	7.6	-4.9	
EIA Reported Daily Storage Activity	12.7	12.4	11.7	14.6	13.1			
Daily Model Error	-0.2	-0.5	-0.1	-1.0	-0.6			

Monthly Balances

	2Yr Ago Jun-20	LY Jun-21	Feb-22	Mar-22	Apr-22	May-22	MTD Jun-22	MoM	vs. LY
Lower 48 Dry Production	87.9	93.2	92.7	93.5	96.0	96.1	96.4	▲ 0.3	▲ 3.1
Canadian Imports	4.0	4.8	6.5	5.2	5.8	5.1	5.7	▲ 0.6	▲ 0.8
L48 Power	34.9	35.9	28.7	25.5	24.7	28.8	35.0	▲ 6.3	▼ -0.9
L48 Residential & Commercial	8.8	8.9	43.3	31.5	22.5	12.3	8.4	▼ -3.8	▼ -0.4
L48 Industrial	20.0	20.2	22.1	19.7	21.4	20.9	22.1	▲ 1.2	▲ 1.9
L48 Lease and Plant Fuel	4.8	5.0	5.1	5.2	5.2	5.2	5.2	▲ 0.0	▲ 0.2
L48 Pipeline Distribution	2.3	2.4	3.5	2.9	2.6	2.3	2.4	▲ 0.0	▼ -0.1
L48 Regional Gas Consumption	70.8	72.5	102.7	84.7	76.4	69.5	73.2	▲ 3.7	▲ 0.7
Net LNG Exports	4.0	10.2	12.4	12.9	12.3	12.5	11.7	▼ -0.8	▲ 1.5
Total Mexican Exports	5.5	7.4	6.2	6.5	6.7	7.0	7.2	▲ 0.2	▼ -0.3
Implied Daily Storage Activity	11.5	8.0	-22.1	-5.4	6.3	12.1	10.0		
EIA Reported Daily Storage Activity									
Daily Model Error									

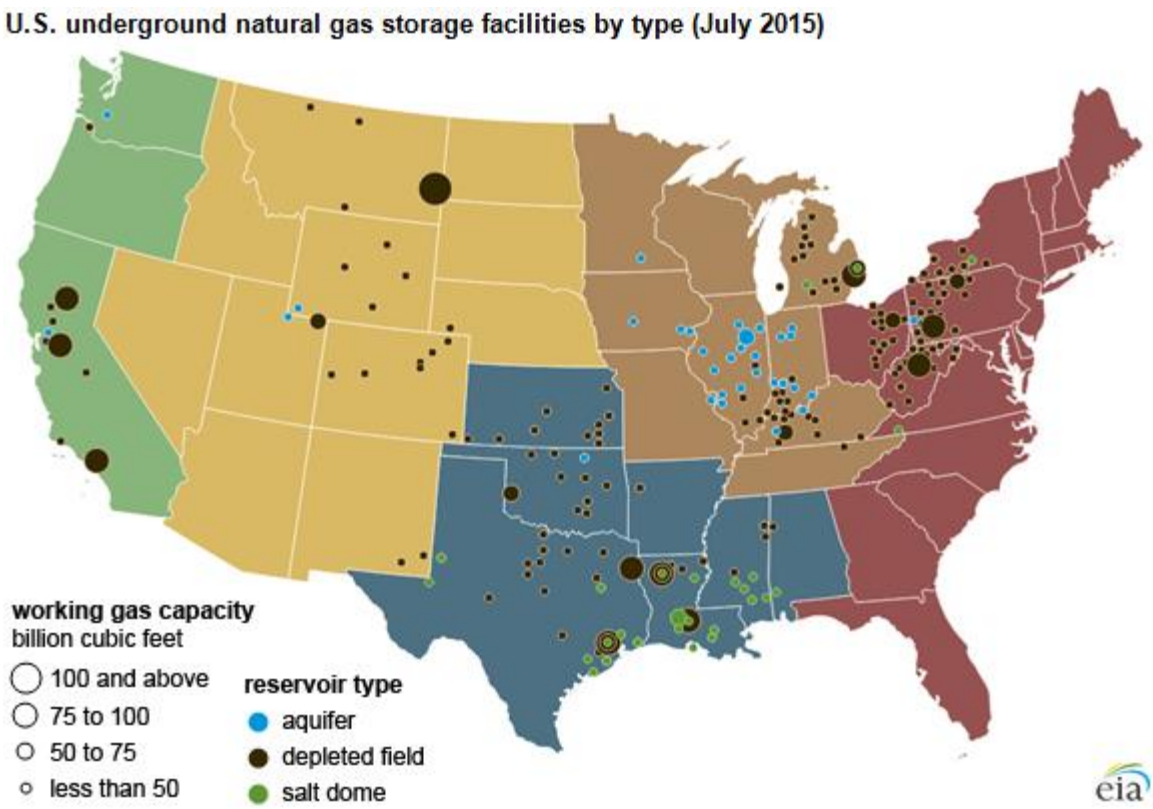
Source: Bloomberg, analytix.ai

Regional S/D Models Storage Projection

Week Ending 17-Jun

	Daily Raw Storage	Daily Adjustment Factor	Daily Average Storage Activity (Adjusted) *	Weekly Adjusted Storage Activity
L48	8.7	-0.3	8.4	59
East	1.4	1.8	3.2	22
Midwest	4.2	-1.1	3.1	22
Mountain	4.6	-3.9	0.7	5
South Central	-3.6	3.8	0.3	2
Pacific	2.1	-0.9	1.2	9

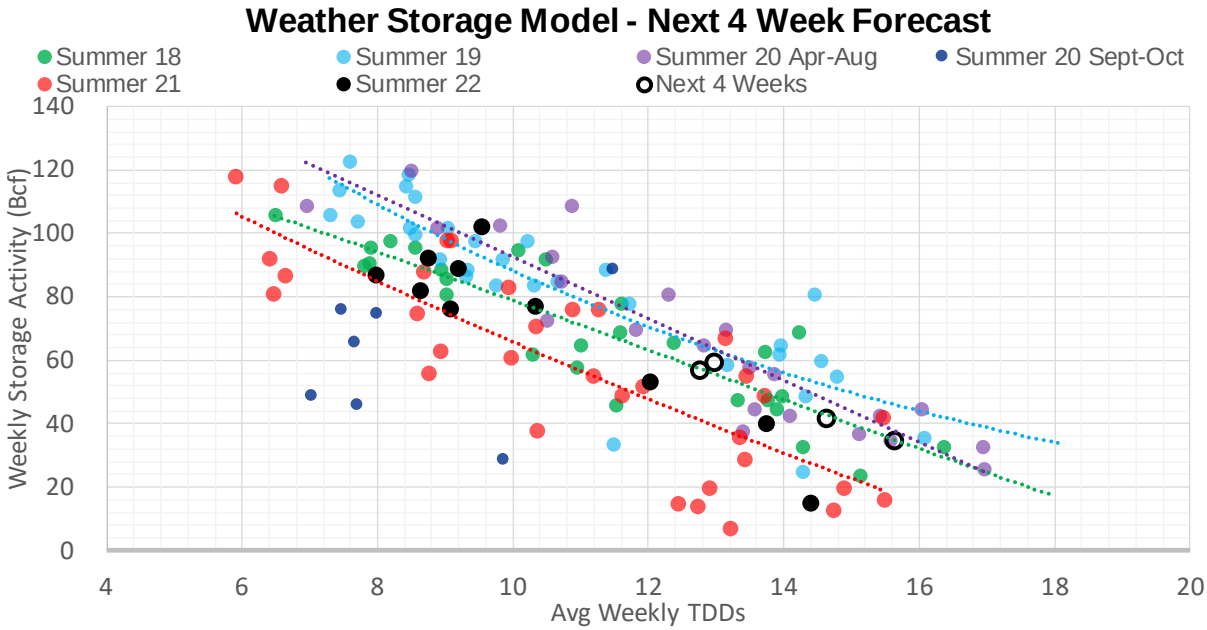
*Adjustment Factor is calcuated based on historical regional deltas



Weather Model Storage Projection

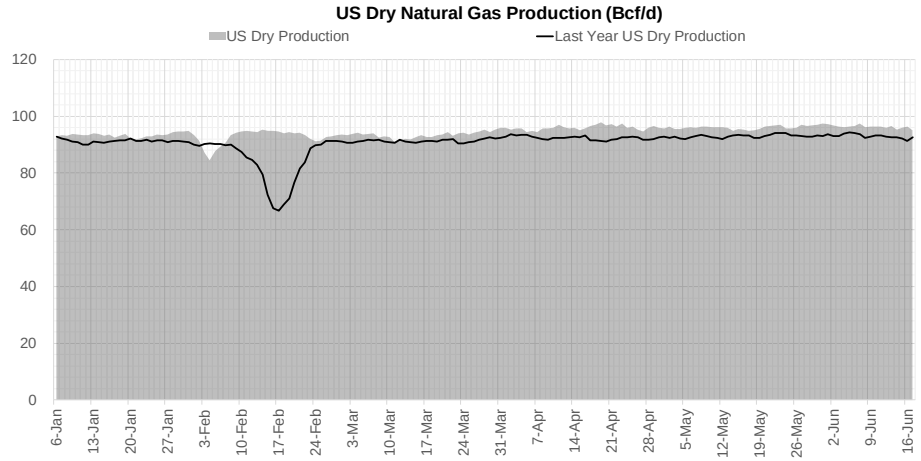
Next report and beyond

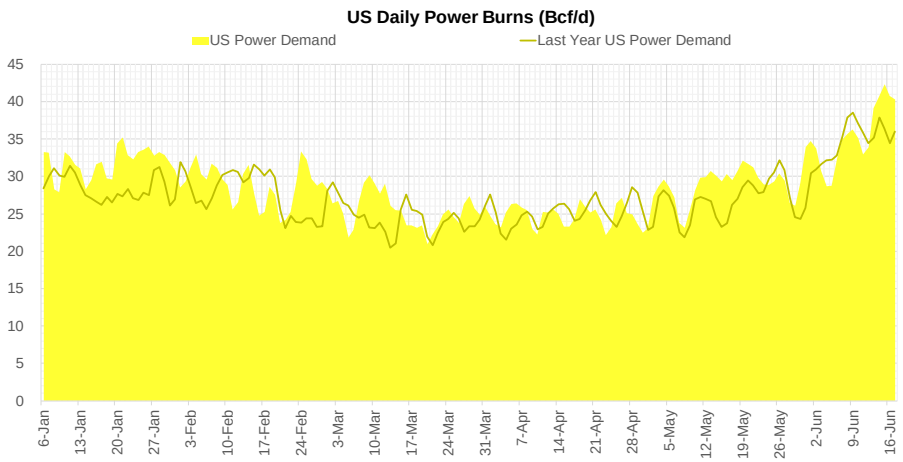
Week Ending	GWDDs	Week Storage Projection
17-Jun	13	59
24-Jun	13	57
01-Jul	16	35
08-Jul	15	42

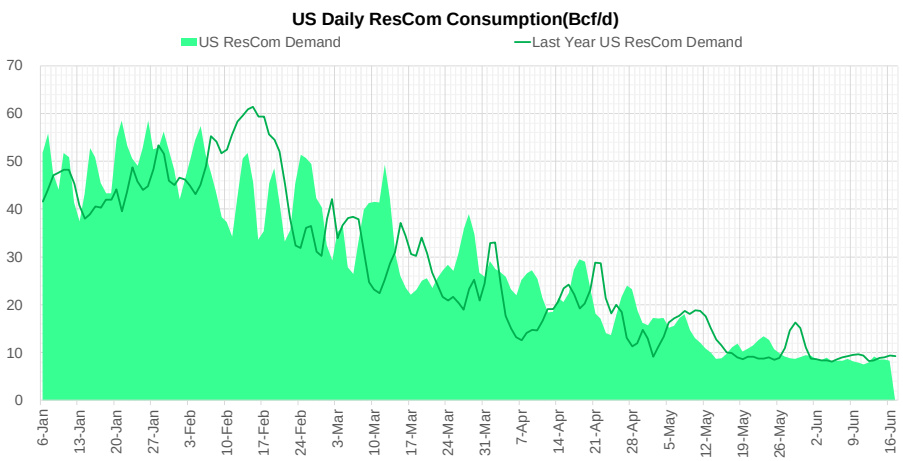


Note: this is not our official end of season forecast. This chart signifies where storage levels end with 10-year normal weather and current market tightness relative to last year

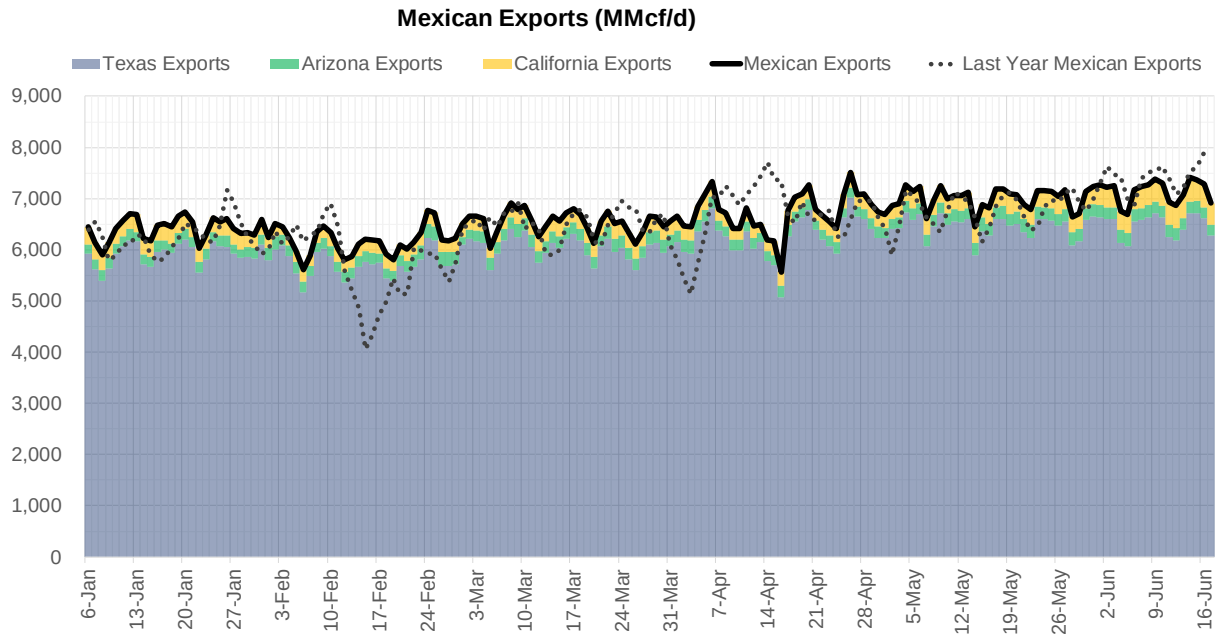
Supply – Demand Trends

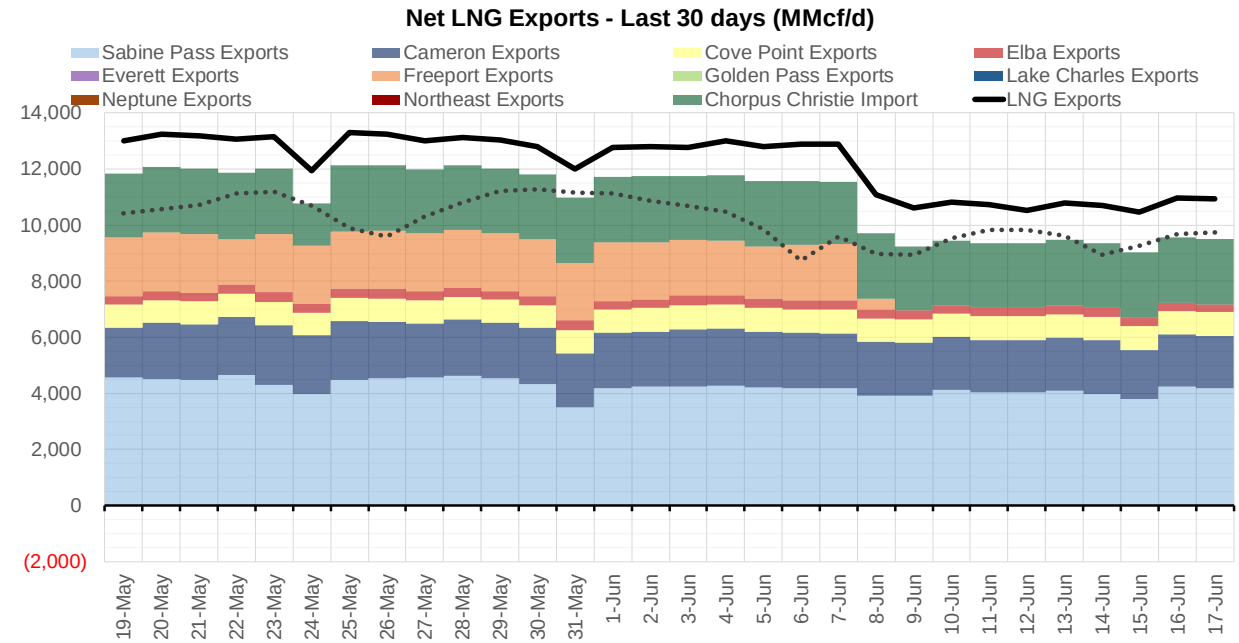






Source: Bloomberg





Source: Bloomberg

Nat Gas Options Volume and Open Interest

CME and ICE data combined

CONTRACT MONTH	CONTRACT YEAR	PUT/CALL	STRIKE	CUMULATIVE VOL
7	2022	C	8.00	3449
7	2022	P	7.00	3436
7	2022	C	10.00	2401
7	2022	C	9.00	2339
7	2022	P	6.00	2314
7	2022	C	7.80	1852
3	2023	C	1.00	1746
3	2023	P	1.00	1746
7	2022	P	6.50	1744
7	2022	P	7.50	1743
8	2022	P	7.00	1570
7	2022	C	8.50	1566
8	2022	C	10.00	1315
10	2022	P	6.00	1296
8	2022	P	7.50	1184
9	2022	C	8.00	1179
7	2022	P	5.50	1080
7	2022	C	6.00	971
10	2022	C	20.00	958
7	2022	C	7.50	923
7	2022	P	8.00	882
7	2022	P	7.25	871
2	2023	C	8.00	870
10	2022	P	6.50	860
7	2022	C	8.60	859
8	2022	C	15.00	855
8	2022	P	6.00	840
9	2022	C	9.00	838
8	2022	C	14.00	825
7	2022	P	6.25	798
8	2022	C	8.00	735
10	2022	P	7.50	707
4	2023	P	3.00	700
5	2023	P	3.00	700
6	2023	P	3.00	700
7	2023	P	3.00	700
8	2023	P	3.00	700
9	2023	P	3.00	700
10	2023	P	3.00	700
8	2022	C	12.00	681
7	2022	P	6.75	654
10	2022	C	10.00	654
7	2022	C	7.75	653
9	2022	C	8.75	650
1	2023	P	7.50	650
4	2023	P	3.50	650
5	2023	P	3.50	650
6	2023	P	3.50	650
7	2023	P	3.50	650

CONTRACT MONTH	CONTRACT YEAR	PUT/CALL	STRIKE	CUMULATIVE OI
8	2022	C	10.00	45479
7	2022	C	11.00	40981
8	2022	C	12.00	36261
10	2022	C	6.00	35484
8	2022	C	10.50	31197
10	2022	P	6.00	23930
7	2022	C	10.00	23801
9	2022	C	6.00	23690
10	2022	C	5.00	23569
7	2022	C	9.00	23362
7	2022	P	6.00	23223
7	2022	C	9.50	23194
8	2022	C	12.10	22006
8	2022	P	6.00	21050
9	2022	C	10.00	20970
10	2022	P	3.00	20875
10	2022	P	3.50	20745
7	2022	C	11.10	20512
10	2022	P	2.50	19870
8	2022	C	6.00	19644
5	2023	P	2.00	19452
9	2022	P	4.00	19315
7	2022	C	6.00	18994
7	2022	C	8.00	18687
7	2022	C	7.00	18515
12	2022	C	5.00	18221
9	2022	C	7.00	18046
8	2022	C	7.00	17994
8	2022	C	9.00	17378
7	2022	P	7.00	17259
10	2022	P	2.00	17258
7	2022	P	3.25	17194
10	2022	C	10.00	17009
1	2023	C	10.00	16649
3	2023	C	10.00	16493
10	2022	P	4.00	16368
8	2022	P	7.00	16234
10	2023	P	2.00	16105
9	2022	C	4.00	15970
2	2023	C	10.00	15686
7	2022	P	5.50	15353
9	2022	P	2.50	15292
7	2022	P	3.50	15279
10	2022	C	8.00	15006
7	2022	P	5.00	14911
9	2022	P	2.75	14883
9	2022	P	3.00	14601
8	2022	P	3.00	14554
10	2022	P	3.25	14551
7	2022	P	3	14532

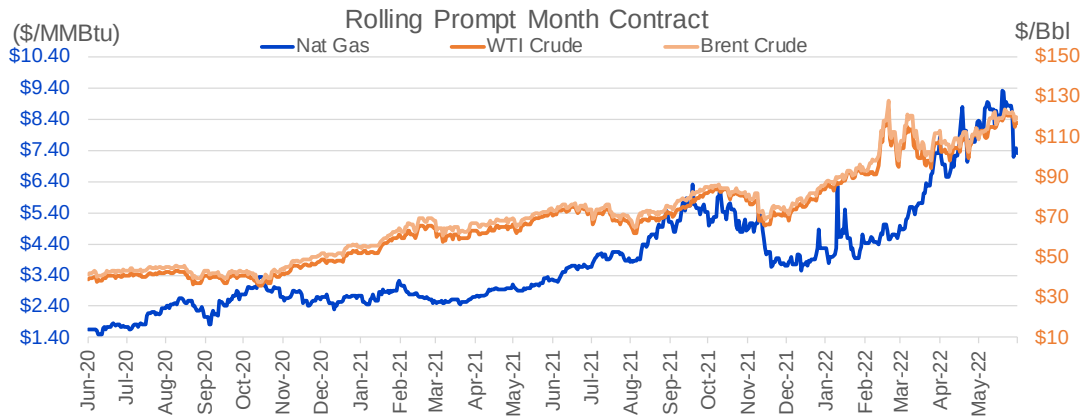
Source: CME, ICE

Nat Gas Futures Open Interest

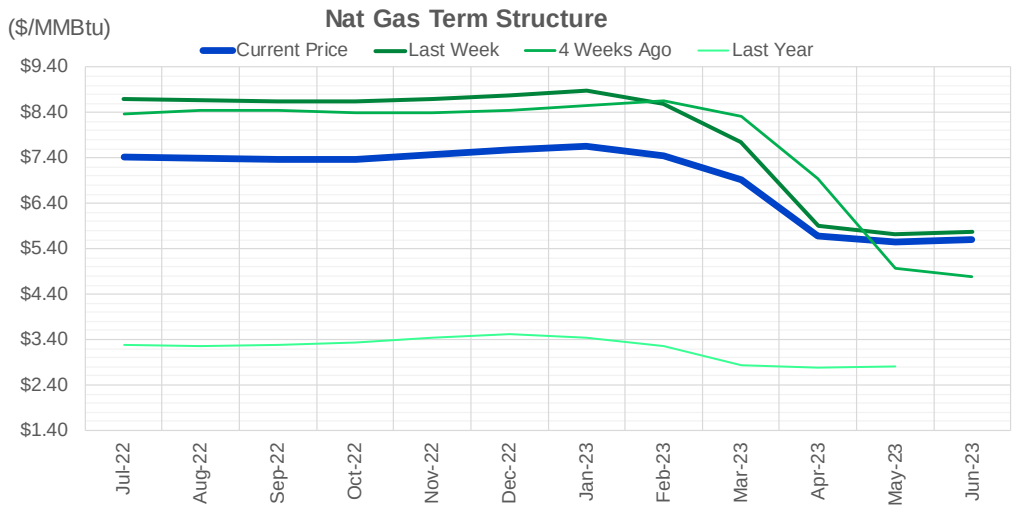
CME and ICE data combined

CME Henry Hub Futures (10,000 MMBtu)				ICE Henry Hub Futures Contract Equivalent (10,000 MM			
	Current	Prior	Daily Change		Current	Prior	Daily Change
JUL 22	51790	62018	-10228	JUL 22	86152	89012	-2861
AUG 22	98761	96324	2437	AUG 22	67059	65932	1127
SEP 22	148922	150687	-1765	SEP 22	78627	77482	1145
OCT 22	98768	95974	2794	OCT 22	72764	71996	768
NOV 22	52875	53366	-491	NOV 22	59654	58831	824
DEC 22	50725	50680	45	DEC 22	62133	61978	156
JAN 23	62038	60309	1729	JAN 23	67593	68276	-684
FEB 23	27060	27684	-624	FEB 23	53683	54035	-352
MAR 23	47057	47313	-256	MAR 23	53455	53562	-106
APR 23	62919	62580	339	APR 23	52106	52007	99
MAY 23	61135	61403	-268	MAY 23	51110	50894	216
JUN 23	23546	23696	-150	JUN 23	45078	44835	243
JUL 23	24224	24120	104	JUL 23	44010	43868	142
AUG 23	16055	16032	23	AUG 23	43298	43071	227
SEP 23	18420	18600	-180	SEP 23	42488	42320	169
OCT 23	40848	41839	-991	OCT 23	49862	50269	-407
NOV 23	11669	11496	173	NOV 23	43798	43751	47
DEC 23	12348	13130	-782	DEC 23	40032	39970	62
JAN 24	19840	20159	-319	JAN 24	39584	39642	-58
FEB 24	6149	6159	-10	FEB 24	27157	27151	7
MAR 24	14226	14223	3	MAR 24	32333	32019	314
APR 24	13446	13406	40	APR 24	27218	27215	3
MAY 24	6787	6763	24	MAY 24	26332	26321	11
JUN 24	2164	2162	2	JUN 24	22449	22493	-44
JUL 24	1964	1964	0	JUL 24	22525	22564	-39
AUG 24	2946	2952	-6	AUG 24	22519	22559	-41
SEP 24	1384	1394	-10	SEP 24	22013	22051	-38
OCT 24	7198	7203	-5	OCT 24	25052	24977	76
NOV 24	4525	4513	12	NOV 24	23305	23360	-55
DEC 24	7111	7104	7	DEC 24	25421	25480	-59

Source: CME, ICE



Market Report



	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
Current Price	**$7.420**	**$7.406**	**$7.370**	**$7.369**	**$7.463**	**$7.574**	**$7.669**	**$7.457**	**$6.906**	**$5.674**	**$5.547**	**$5.598**
Last Week	$8.699	$8.679	$8.649	$8.637	$8.690	$8.781	$8.872	$8.602	$7.750	$5.917	$5.723	$5.768
vs. Last Week	-$1.279	-$1.273	-$1.279	-$1.268	-$1.227	-$1.207	-$1.203	-$1.145	-$0.844	-$0.243	-$0.176	-$0.170
4 Weeks Ago	$8.368	$8.455	$8.444	$8.402	$8.383	$8.441	$8.559	$8.655	$8.306	$6.955	$4.977	$4.788
vs. 4 Weeks Ago	-$0.948	-$1.049	-$1.074	-$1.033	-$0.920	-$0.867	-$0.890	-$1.198	-$1.400	-$1.281	$0.570	$0.810
Last Year	$3.251	$3.271	$3.259	$3.277	$3.331	$3.436	$3.514	$3.448	$3.263	$2.834	$2.770	$2.798
vs. Last Year	$4.169	$4.135	$4.111	$4.092	$4.132	$4.138	$4.155	$4.009	$3.643	$2.840	$2.777	$2.800

	Units	Current Price	vs. Last Week	vs. 4 Weeks Ago	vs. Last Year
NatGas Jul21/Oct21	$/MMBtu	2.224	0.000	0.000	2.200
NatGas Oct21/Nov21	$/MMBtu	0.361	0.000	0.000	0.308
NatGas Oct21/Jan22	$/MMBtu	-1.817	0.000	0.000	-2.049
NatGas Apr22/Oct22	$/MMBtu	2.047	-1.572	-0.946	2.023
WTI Crude	$/Bbl	117.59	-3.920	5.380	46.550
Brent Crude	$/Bbl	119.81	-3.260	7.770	46.730
Fuel Oil, NY Harbour 1%	$/Bbl	97.18	0.000	0.000	0.000
Heating Oil	cents/Gallon	457.13	16.760	77.930	250.450
Propane, Mt. Bel	cents/Gallon	1.22	-0.017	-0.015	0.273
Ethane, Mt. Bel	cents/Gallon	0.66	-0.020	0.065	0.383
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

6/17/2022

Baker Hughes

U.S. Breakout Information	This Week	+/-	Last Week	+/-	Year Ago
Oil	584	4	580	211	373
Gas	154	3	151	57	97
Miscellaneous	2	0	2	2	0
Directional	39	1	38	14	25
Horizontal	674	6	668	249	425
Vertical	27	0	27	7	20
Canada Breakout	**This Week**	**+/-**	**Last Week**	**+/-**	**Year Ago**
Oil	104	10	94	30	74
Gas	52	5	47	9	43
Major Basin Variances	**This Week**	**+/-**	**Last Week**	**+/-**	**Year Ago**
Ardmore Woodford	3	1	2	1	2
Arkoma Woodford	4	0	4	3	1
Barnett	4	0	4	3	1
Cana Woodford	29	2	27	14	15
DJ-Niobrara	15	0	15	6	9
Eagle Ford	69	1	68	37	32
Granite Wash	1	-1	2	-1	2
Haynesville	69	1	68	20	49
Marcellus	39	0	39	12	27
Mississippian	2	0	2	2	0
Permian	345	0	345	108	237
Utica	12	0	12	3	9
Williston	38	0	38	21	17