

“The Times They Are A-Changin’”, a Bob Dylan song

### **CONCLUSION AND OVERVIEW**

The vicious bear slump in NYMEX natural gas (nearest futures continuation) that started after 11/14/18’s 4.929 peak probably will end between mid-February and early March 2019. Assuming normal weather for the balance of winter 2019, major support around 2.40/2.50 probably will hold. Above-average temperatures for the rest of this winter increase the risk of a moderate breach of the 2.40/2.50 floor.

Looking forward over the next several months, NYMEX natural gas (nearest futures) probably will remain in a sideways trend between 2.40/2.50 and 3.20/3.45. However, higher than anticipated United States natural gas production, reduced demand due to milder than expected summer weather, or American economic feebleness may inspire an assault on the lower end of that range. Many important lows in nearest futures continuation have occurred in late August/calendar September.

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What is a “low”, “high”, or “normal” (average, reasonable) inventory is a matter of opinion. In any case, over the past two years, the United States natural gas industry probably has shifted toward a lower level of desired (appropriate, reasonable, normal, prudent, sufficient) stock holding relative to long run historical averages. Structural changes in the US natural gas marketplace have encouraged more widespread (and more aggressive) adoption of a “just-in-time” (lower inventories in days coverage terms) inventory management approach instead of a “just-in-case” (relatively higher stockpiles) method.

Why? One likely factor has been faith that gas production (in 2018, 2019, and thereafter) would remain far greater than that of calendar 2017. Many players therefore probably believe there “always (or almost always) will be enough gas around” to satisfy demand, even during peak consumption periods. Another variable likely encouraging lower inventory in days coverage terms is the substantial expansion of America’s pipeline infrastructure. Thus it has (will) become easier to move sufficient gas to many locations where it is needed. In addition, the growing share of renewables in total US electricity generation arguably to some extent reduces the amount of necessary natural gas inventories.

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Assume an entrenched change in natural gas inventory management practices to the just-in-time orientation. Assume also that from the days coverage perspective (stocks relative to consumption), the “reasonable” level of industry holdings has tumbled by several days relative to historical days coverage benchmarks. Nevertheless, anticipated October 2019 (and October 2020) United States natural gas inventories from the days coverage perspective are substantially lower than the historical average. The natural gas inventory situation therefore is somewhat bullish, particularly from the perspective regarding the close of build seasons at end October 2019 and end October 2020.

Suppose US natural gas output does not surpass current expectations, economic growth remains moderate, weather remains normal, and commodity prices in general (especially in the petroleum

complex) do not collapse. This natural gas inventory situation, assuming it persists, makes it probable that the marketplace eventually will attack and surpass 3.20/3.45.

Although prospects for US natural gas days coverage at end October 2019 and October 2020 at present currently are fairly bullish, end March 2020 inventories appear sufficient. It consequently may be difficult to sustain moves over 3.45/3.70.

Despite the explosive price leap to nearly 5.000 in mid-November 2018, the shattering collapse from mid-December (12/10/18 high at 4.666), signals that many natural gas marketplace participants probably remain complacent regarding the availability of supplies, even in regard to periods of expected or actual high demand. The current sideways trends and relatively modest price heights for the summer 2019 and winter 2019-2020 calendar strips likewise reflect little worry regarding prospective supply availability

However, picture a significantly colder than usual winter (or widespread belief this will occur). A colder than normal winter 2019/20 (or winter 2020/21), assuming low end-October days coverage, boosts the risks of very low inventories at the end of winter and thus substantial (even if brief in duration) bull charges. US natural gas inventories were very low in days coverage terms at end-October 2018. Fears that available supplies (whether in days coverage or arithmetical terms) are or may become tight can prompt feverish scrambles to procure them. Recall the spike from 9/10/18's 2.752 and 10/29/18's 3.100 up to November 2018's summit. In any case, the most probable time for any flight toward or above 4.00/4.10 is close to or during winter.

### **US NATURAL GAS INVENTORIES**

In the following analysis of US working natural gas inventories, bcf levels are from the Energy Information Administration. Recent bcf history and estimates come from its Short-Term Energy Outlook, ("STEO", Table 5a, 1/15/19, next release 2/12/19).

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Historical analysis of working natural gas inventories permits audiences to ascertain the degree of tightness in America's overall supply/demand situation. Arithmetical (bcf) levels are important, but review from the days coverage perspective generally provides greater insight. After all, supply and demand levels in commodity playgrounds can evolve over time, sometimes substantially. For US natural gas, compare calendar year 2018's 81.6bcf/day consumption with 2005's 60.3bcf/d. The EIA forecasts US demand in calendar 2019 will reach almost 82.7bcf/day. Though this is up only 1.3 percent from 2018, it jumps about 11.3pc versus 2017's 74.3bcf/d. The EIA predicts calendar 2020 consumption will rise about 1.1pc year-on-year to 83.6bcf/d.

One can define labels such as supply, demand, and consumption in various ways. Keep in mind that the EIA's summary of actual "total consumption" deals only with that within the United States. The LNG and pipeline import and export data appear in the "supply" section of the STEO report. Thus growing net exports, if added to the actual American consumption, can show a greater "overall" demand number for American-sourced natural gas. Growing net exports also decreases the absolute total of natural gas output available for US inventories.

The days coverage perspective of course does not provide a complete viewpoint on the natural gas inventory situation and related price risks, both in general and at specific delivery hub locations around the country. So fundamental considerations related to days coverage should be

interpreted alongside arithmetic quantities (bcf). After all, commercial participants place arithmetic quantities (bcf) of gas in storage locations with arithmetic capacity; inventory shortage problems or containment difficulties (oversupply relative to arithmetic storage capacity availability) reflect arithmetic levels.

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It is a matter of opinion whether a given natural gas inventory, supply, or demand level is high, low, or normal (average; sufficient). Viewpoints as to whether a given natural gas price is high (or too high), low (too low), or average (normal; reasonable, rational) likewise reflect subjective perspectives.

### **END WINTER 2018-19 DRAW SEASON: MARCH 2019 NATURAL GAS STOCKS**

In the following discussion regarding and tables for US end calendar March working gas inventories, the indicated “year” for a given March derives from the calendar year of the preceding October. Thus the 2473bcf (in actual calendar March 2012) noted for the 2011 “year” is from the end October 2011 to March 2012 winter draw season. This table extends through winter 2018-19; it includes the STEO estimate of 1405bcf for March 2019’s inventory.

	<b>Long Run (1990-2018)</b>	<b>Long Run (1990-2018)</b>		
	<b>End Calendar Month</b>	<b>End Calendar Month</b>		
	<b>Arithmetic (Bcf)</b>	<b>Days Coverage</b>		
	<b><u>Average</u></b>	<b><u>Average</u></b>		
<b><u>March</u></b>	<b>1411</b>	<b>22.1</b>		
	<b><u>Season Highs (Year)</u></b>		<b><u>Season Lows (Year)</u></b>	
	<b><u>(Bcf)</u></b>	<b><u>Days Cover</u></b>	<b><u>(Bcf)</u></b>	<b><u>Days Cover</u></b>
<b><u>March</u></b>	<b>2486 (2015)</b>	<b>33.2 (2015)</b>	<b>730 (2002)</b>	<b>11.6 (2002)</b>
	<b>2473 (2011)</b>	<b>36.9 (2011)</b>	<b>742 (2000)</b>	<b>11.6 (2000)</b>
	<b>2063 (2016)</b>	<b>36.4 (1990)</b>	<b>857 (2013)</b>	<b>12.0 (2013)</b>
			<b>758 (1995)</b>	<b>12.5 (1995)</b>

[For any given arithmetical bcf level, demand matters in the days coverage context. For example, March 2016’s bcf total represented about 27.5 days coverage, modestly above average but not by a massive amount. The 36.4 days coverage for 1990 derived from inventory of 1912bcf.]

<b><u>March</u></b>	<b>Medium Run (2006-2018)</b>
	<b>End Calendar Month</b>
	<b><u>Days Cover Average</u></b>
	<b>24.1 days (2.0 days greater than 1990-2018’s time span)</b>

End March 2019 gas inventories of 1405bcf would be about average relative to the 1990-2018 long run vantage point.

However, March 2019’s 1405bcf stockpile appears bullish from the long run historical standpoint. Its 17.2 days coverage (1405bcf/81.6bcf/day for full calendar year 2018 consumption) stands 4.9 days beneath 1990-2018’s average and 6.9 days under 2006-18’s. Even if end March 2019 inventories are 1500bcf, 18.4 days of coverage remain below average (at 1600bcf days

coverage equals 19.6 days). However, since 17.2 days stands several days above the 11.6/12.5 range of record lows for days coverage, if there has been a dramatic shift toward just-in-time inventory management in the past couple of years, March 2019's anticipated 17.2 days coverage total probably is only slightly bullish.

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For the week ending 1/25/19, United States working gas in underground storage (Lower 48 states; EIA) was 2197bcf, almost the same as the 2211bcf relative to the prior year week. Relative to the five year average of 2525bcf for this date, 1/25/19's total retreated 13.0 percent.

### THE 2019 BUILD SEASON

	<b>Long Run (1990-2018)</b>	<b>Long Run (1990-2018)</b>	
	<b>End Calendar Month</b>	<b>End Calendar Month</b>	
	<b>Arithmetic (Bcf)</b>	<b>Days Coverage</b>	
	<b><u>Average</u></b>	<b><u>Average</u></b>	
<b><u>October</u></b>	<b>3376</b>	<b>53.0</b>	
	<b><u>Season Highs (Year)</u></b>		<b><u>Season Lows (Year)</u></b>
	<b><u>(Bcf)</u></b>	<b><u>Days Cover</u></b>	<b><u>(Bcf)</u></b>
			<b><u>Days Cover</u></b>
<b><u>October</u></b>	<b>4013 (2016)</b>	<b>66.0 (1990)</b>	<b>39.6 (2018)</b>
	3942 (2015)	60.7 (2009)	<b>2732 (2000)</b>
	3929 (2012)	58.4 (2010)	42.9 (2000)
	3851 (2010)		2810 (1996)
			45.5 (1996)
			2886 (1997)
			46.3 (1997)

[End October 2018's 3234bcf inventory stood far above the deepest prior year arithmetical valleys for end October. However, focusing primarily on the arithmetic bcf level only tells part of the story regarding so-called oversupply (or undersupply). The end October 2018 inventory total attained a new record low for days coverage for that calendar month; 3234bcf divided by 81.6bcf/day consumption for calendar year 2018 equals 39.6 days. Remember the price spike through mid-November 2018 (and prices remained fairly lofty for about a month thereafter) as fears quickly intensified regarding supply sufficiency for the upcoming winter.]

<b><u>October</u></b>	<b>Medium Run (2006-2018)</b>
	<b>End Calendar Month</b>
	<b><u>Days Cover Average</u></b>
	<b>53.8 days (.8 days more than the 1990-2018 time span)</b>

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The EIA forecasts working natural gas inventories will climb to 3758bcf at end October 2019 (STEO, Table 5a). Relative to calendar year 2019 demand of almost 82.7 bcf/day, days coverage at the finish of the 2019 build season will be about 45.5 days (3758bcf divided by 82.7bcf/day).

End October 2019 thus plummets 7.5 days beneath 1990-2018's end October 53.0 days coverage average and craters 8.3 days beneath 2006-18's 53.8 days. Even allowing that the desired (reasonable, typical, normal) level of industry coverage for end October has fallen significantly, it is unlikely that the acceptable average height has plummeted by such a large amount (and so rapidly). Not only is a 7.5/8.3 day cut relative to prior long run averages very substantial in

number of days as well as percentage terms (7.5 days divided by 53.0 days is 14.2 percent). Days coverage of 45.5 days borders that of the three historic lows for end October days coverage achieved prior to end October 2018.

Suppose that the current just-in-case natural gas regime has reduced the normal (average; reasonable) level by five days relative to the 1990-2018 and 2006-2018 averages. Thus the “new normal” will be around 48.0 to 48.8 days. Prospective end October 2019 days coverage of 45.5 days falls beneath this. Moreover, though greater than October 2018’s 39.6 days coverage, October 2019’s anticipated 45.5 day total still is bullish since it hovers within the range of other very low days coverage (42.9 to 46.3 days).

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The EIA predicts a 2353bcf stock build from end March 2019 to end October 2019 (1405bcf to 3758bcf). History suggests that high (low) inventory levels at end-winter probably inspire smaller (larger) builds. The 2014 build season saw a gigantic 2730bcf climb from end March’s 857bcf to end October’s 3587bcf.

Days coverage from end March to end April generally grows by about 2.3 days (2.2 days from the 1990-2008 era and 2.4 days for the 2006-18 period).

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Over the 1990 to 2018 time horizon, what were lofty and low builds in days coverage for the end April to end October period?

**High Days Cover Builds**

**Low Days Cover Builds**

36.7 (2003)  
35.3 (2001)  
34.6 (2014)  
33.5 (2004)

18.2 (2016)  
18.9 (2012)  
20.5 (2017)  
22.2 (2018)  
23.1 (2002)

April 2019’s expected working gas inventory is 1668bcf, or about 20.2 days cover relative to full calendar year 2019 demand of 82.7bcf/d. The build from April 2019’s 1668bcf to end October 2019 is 2090bcf. Days coverage increase 25.3 days (45.5 less 20.2) over that span.

The 1990-2018 average inventory build from end April to end October is 1789bcf, or 28.2 days coverage. For the past thirteen years 2006-18, the average stock increase from end April to end October is 1824bcf, or 26.5 days coverage. The 2090bcf build for the 2019 season, though above the historical average from the arithmetical standpoint, is slightly below normal from the days coverage perspective.

Suppose marketplace players add the average 1990-2018 days cover build of 28.2 days to April 2019’s 20.2 days of coverage. Then end October 2019 inventories will be 48.4 days, still significantly below the long run average. If a guide adds 2006-18’s average increase of 26.5 days cover to April 2019’s total, end October 2019 supplies equal 46.8 days coverage, a relatively low days coverage elevation for end October.

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End November inventories from 1990-2018 average 3270bcf and 51.3 days coverage. They average a draw of about 106bcf relative to end October.

Sometimes US natural gas inventories accumulate a bit more into calendar November. Over the calendar 2000 to 2018 period, end November stocks have exceeded those of end October three times. Recall 2001 (end October's 3144bcf to end November's 3254bcf, up 110bcf), 2009 (3810bcf to 3837bcf, up 27bcf), and 2011 (3804bcf to 3843bcf, a 39bcf rise).

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The EIA estimates the demonstrated maximum working gas storage volume for the Lower 48 states. It defines this as the sum of the highest storage inventory levels of working gas observed in each storage reservoir over the previous five year period.

Demonstrated underground maximum working gas capacity in the Lower 48 states as of November 2017 was 4317bcf ("Underground Natural Gas Working Storage Capacity"; 3/30/18, next release March 2019). Based upon the EIA's anticipated inventory of 3758bcf for end build season 2019, the US probably will not face containment problems this year.

### **NATURAL GAS STOCKS IN MARCH AND OCTOBER 2020**

The future for US natural gas supply, demand, and inventories for 2020 is murky. Obviously much can happen between now and then. The EIA prediction United States consumption of about 83.6bcf/day for calendar 2020 marches up only 1.1 percent from calendar 2019's 82.7bcf/day demand.

Suppose end March 2020 working gas inventory matches the EIA's 1651bcf prophecy (STEO, Table 5a). Relative to full calendar year 2019 demand of about 82.7bcf/day, that represents 20.0 days coverage. This is 4.1 days under 2006-18's 24.1 day end March average, and is 2.1 days below 1990-2018's long run vista of 22.1 days.

Has the just-in-time inventory method for the US natural gas industry reduced the desired level of days coverage relative to prior long run averages by the same number of days across the entire 12 month calendar? Would storage operators and other commercial firms cut both end October and end March days coverage by five days?

Or, might they instead reduce desired (normal, average) inventory holdings by more days for the build season than the winter draw period? This seems more likely. After all, running out of natural gas inventory obviously is a far greater economic (and political) risk during winter. Thus if the (admittedly conjectural) reduction in desirable end October days coverage due to just-in-time inventory management relative to historical averages is around five days, the related cut for end March (and other winter months) arguably is only two or three days.

Since the US natural gas industry likely has cut desired days coverage levels relative to historical averages, end March 2020 days coverage of 20.0 days probably is about normal.

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The EIA believes end October 2020 inventories will be 3658bcf. Natural gas days coverage at end October 2020 will be about 43.8 days (3658bcf divided by 83.6bcf/day). That end October 2020 days coverage days falls a monumental ten days under the 2006-2018 end October average of 53.8 days and 9.2 days beneath 1990-2018's 53.0 day average.

Let's assume that the natural gas perspective on what constitutes normal (reasonable) inventories in days coverage terms for end October has fallen to around 48.0 to 48.8 days (a five day reduction relative to the 1990-2018 and 2006-18 averages). Thus even though the natural gas industry has slashed its desired levels of days coverage for end October, end October 2020 days coverage of 43.8 days is bullish relative to the recently favored just-in-time standard of about 48.0 to 48.8 days.

### **EXPLODING US NATURAL GAS SUPPLY**

EIA statistics underscore a natural gas production explosion not only in the recent past, but also over the next couple of years (especially calendar 2019). Let's perform year-on-year quarterly comparisons for United States total dry gas production.

First quarter 2018 natural gas supply of about 79.1bcf/day skyrocketed 9.9 percent over 1Q17's 72.0bcf/day. First quarter 2019's expected 89.4 bcf/d balloons 13.0pc over 1Q18's total. Calendar year 2019 dry gas output of about 90.2bcf/day soars 8.3pc beyond calendar 2018's 83.3bcf/d. What about 2020? It grows relative to 2019's though not dramatically. First quarter 2020's 91.5bcf/day output expands 2.3 percent relative to 1Q19. Full calendar year 2020 production of about 92.2bcf/d rises 2.2pc over 2019's output.

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Production estimates and actual output for calendar 2019 and thereafter obviously in part depend on price. The January 2019 STEO (Table 2) projects the Henry Hub spot natural gas price will average \$2.89/mmbtu in calendar 2019 (calendar 2018 was \$3.15), The estimate for calendar 2020 is \$2.92.

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Soaring dry shale gas production over the past several years has captured industry headlines. Advances in drilling productivity (via fracking, especially) have been remarkable. Fewer rigs are producing more supplies.

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In the output context, monitor natural gas production levels and decline rates for natural gas from legacy (older) wells. See the EIA's "Drilling Productivity Report".

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Watch Canadian natural gas output trends. Estimates for Canadian marketable natural gas production for first quarter 2019 suggest slightly lower production relative to 1Q18 (.9 percent) (National Energy Board, 1/23/19).

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The boom in domestic US crude oil output, especially since December 2016, probably has encouraged the natural gas industry to reduce its desired level of days coverage. According to the "Annual Energy Outlook 2019" (1/24/19, p18), "The percentage of dry natural gas production from oil formations increased from 8% in 2013 to 17% in 2018 and remains near this percentage through 2050 in the Reference case."

According to the EIA's Short-Term Energy Outlook (January 2019, Table 4a), prior to the completion of the oil price collapse in 1Q16, Lower 48 crude oil output (excluding the Gulf of Mexico) peaked at 7.7 million barrels per day in March 2015 (compare 4.3mmbd in March 2012).

NYMEX crude oil made a major bottom on 2/11/16 at \$26.05 (\$26.19 on 1/20/16). Crude oil output's downward spiral continued for several more months, reaching a bottom of 6.5mmbd in December 2016.

As prices rallied, Lower 48 crude output raced higher, reaching almost 8.0mm barrels per day in December 2017 and 9.5mmb/d in December 2018. The EIA forecasts calendar year 2019 Lower 48 output will average 9.7mmbd, with calendar 2020 at 10.2mmbd.

### **NATURAL GAS LOCATIONS: A SUPPLY AND STORAGE FOOTNOTE**

The NYMEX natural gas futures delivery location is Henry Hub, on the US Gulf Coast in Louisiana. In the past few years, natural gas production has grown significantly in and around the US Gulf Coast region. On the storage front, salt caverns provide very high injection and withdrawal rates relative to their working gas capacity; base gas requirements are relatively low. Moreover, "most salt cavern storage facilities have been developed in salt dome formations located in the Gulf Coast states." (EIA, "The Basics of Underground Natural Storage"; 11/16/15).

Thus in the area of or around the NYMEX natural gas delivery location, the willingness (incentive) of the natural gas industry to embrace an aggressive just-in-time inventory strategy (lower inventory in days coverage terms) may be particularly strong. In general, all else equal, this inventory orientation in that region arguably will tend to keep prices in that area relatively subdued. However, as autumn 2018's NYMEX nearest futures continuation price leap shows, there will be exceptions, if anticipated or actual inventories in that region approach "dangerously low" levels.

Another footnote: in a world of just-in-time inventory management, as supply/demand can vary significantly between natural gas regions, basis (intramarket spread) relationships and patterns can change rapidly and substantially.

### **PIPELINE EXPANSION; GROWTH IN RENEWABLES**

Pipeline expansion probably is another crucial reason for the decline in US industry target levels for appropriate (adequate) natural gas inventory in days coverage terms.

The EIA's "Today in Energy" ("Northeast region slated for record natural gas pipeline capacity buildout in 2018"; 5/18/18) declared: "EIA expects construction of new natural gas pipeline capacity in the United States to continue in 2018, in particular in the northeastern United States. By the end of 2018, if all projects come online by their scheduled service dates, more than 23 billion cubic feet per day (Bcf/d) of takeaway capacity will be online out of the Northeast, up from an estimated 16.7 Bcf/d at the end of 2017 and more than three times the takeaway capacity at the end of 2014." Much of the pipeline capacity buildout, has aimed at and will continue to focus on supplying natural gas to the Midwest demand market. However, as new pipeline projects come online, they also create outlets for increased production into the Southeast and eastern Canada.

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According to the EIA's "Today in Energy" (1/18/19), natural gas fueled 35 percent of total US electricity generation in 2018, a substantial rise from 2010's 24 percent. Coal's share crashed, from 45 percent in 2010 to 28pc in 2018. In 2016, annual US electricity generation from natural

gas-fired power plants exceeded coal-fired generation. The EIA predicts the natural gas generation share will climb to 37 percent by 2020, with coal's slice declining to 24pc.

However, despite this growing share of natural gas within America's electricity generation domain, another reason for a slide in the desired (reasonable) level of days coverage probably relates to the growth of the renewable energy realm. The share of the renewables universe (hydropower, wind, solar, etc.) as a percentage of US electricity demand (all sectors) has grown in recent years. The 2015 share stood at about 13.4 percent. Renewables took 15.0pc of electricity demand in 2016 and grabbed 17.0pc in 2018. Total US electricity generation falls 1.9 percent in calendar 2019 versus calendar 2018, with calendar 2020 about unchanged relative to 2019. However, electricity generation from renewable energy sources creeps higher from 2018 through 2020 (see Table 7d of the January 2019 STEO). EIA data thus unveil a 17.9 percent share for renewables for calendar 2019, growing to 19.6pc in 2020.

### **THE EXPORT SCENE: LNG AND PIPELINES**

The forecast leap in American natural gas production from 2018 to 2019 (and 2020) relative to the smaller bounce in consumption over that time span tends to pressure prices lower as well as encourage the embrace of just-in-time inventory strategies and thus lower gas stockpiles.

However, noteworthy climbs in net US liquefied natural gas exports are bullish. They reduce the difference between actual natural gas output and "total consumption" in the EIA's STEO statistics. Net LNG exports for calendar 2019 rise to 4.9bcf/day from calendar 2018's 2.8bcf/d. LNG net exports in calendar 2020 blossom to over 6.5bcf/d. Contractual commitments for LNG exports tend to reduce available inventories. Thus the US liquefied natural gas net export trend is slashing the potential inventory available in practice to the US marketplace, and thus diminishing (all else equal), the "free supply" of arithmetic and days coverage inventory totals.

Net exports via pipelines to meet foreign demand also helps to tighten the United States inventory situation. In calendar 2018, America was a net importer of natural gas via pipeline of about .7bcf/day. In calendar 2019, the US becomes a net exporter over pipelines of almost 1.1bcf/d. The net export total expands to over 1.6bcf/d in calendar 2020.

Thus for calendar 2019, subtract the net 4.9bcf/day of LNG exports as well as the net 1.1bcf/d of pipeline exports from 90.2bcf/day total dry gas production. That leaves about 84.2bcf/d. Adding about .2bcf /d for supplemental gaseous fuels makes supply 84.4bcf. This 2019 output total clearly exceeds forecast calendar 2019 total consumption of about 82.7/bcf, but the excess is not as dramatic as a cursory glance at total dry gas production suggests. The extent of 2019 actual oversupply relative to demand also will depend on what occurs in practice regarding the category of "net inventory withdrawals" (STEO estimates at 1.2bcf/d) and a supply/demand "balancing item" (about .6bcf/d). For calendar 2019, this 1.8bcf total subtraction from 84.4bcf/d makes the STEO's total primary supply and total consumption levels the same, about 82.7bcf/d.

### **"TECHNICAL" AND OTHER FACTORS**

Alvin Toffler's "Future Shock" (Chapter I) notes: "Future shock...the shattering stress and disorientation that we induce in individuals by subjecting them to too much change in too short a time."

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Chronicles and interpretation of natural gas price history can venture beyond the NYMEX nearest futures continuation contract. Wall Street trend seekers may elect to review individual actual contract months (such as the NYMEX October 2019 natural gas futures contract). Marketplace gazers may analyze several trading months of a gas season (such as the NYMEX summer 2019 and winter 2019/20 calendar strips) or entire calendar years (like the calendar 2021 strip of contracts). They may study intramarket spreads (such as NYMEX October 2019/January 2020 or March 2020/April 2020), prices in other regions than the NYMEX realm, and basis (intermarket) relationships. Marketplace wizards can derive insight into and tell tales regarding natural gas domains and their past, present, and potential bull and bear patterns by analyzing electricity, coal, petroleum, and other financial battlefields, as well as assorted additional economic and political phenomena. In natural gas as in other territories, supply/demand investigation can intertwine with so-called technical analysis.

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What are significant support and resistance levels for NYMEX natural gas (nearest futures continuation contract)?

Major support sits at 2.40 to 2.50. Note the six notable lows in the past two and one-half years around 2.50: 8/12/16's 2.523, 11/9/16's 2.546, 2/22/17's 2.522, 12/21/17's 2.568, 2/15/18's 2.530, and 3/26/18's 2.565. A fifty percent crash from 4.929 (11/14/18) is 2.465 (the low since 11/14/18 is 2/5/19's 2.639, a 46.5pc withering). Recall 1/8/16's interim top at 2.495. A fifty percent rally from 3/4/16's major low at 1.611 is 2.417. The major bottom of 9/4/09 was 2.409. The key summer 2019 calendar strip low was 2.470 on 2/24/16, adjacent in time 3/4/16's major trough at 1.611 in nearest futures continuation.

Support beneath this for nearest futures is at 1.90 to 2.00. A price gap lurks around 2.00 (5/26/16 high 1.985, 5/27/16 low 2.101). The 4/19/12 major trough was 1.902.

Important resistance for NYMEX natural gas hovers at 3.20 to 3.45. Double the 3/4/16 major bottom of 1.611 gives 3.222. A fifty percent fall from 2/24/14's pinnacle at 6.493 equals 3.247. The 5/2/17 interim crest at 3.431 represented an important drop-off point, as did 11/13/17's 3.231. A notable price gap within the 3.20/3.45 range emerged in January 2018: 1/29/18's low 3.297, 1/30/18's high 3.259. Recall 10/13/16's interim high of 3.366.

On the way up relative to current levels, note the gap from 3.047 (1/25/19; three times the all-time low is 3.060) to 2.983 (1/28/19). Note 6/18/18's interim high at 3.053.

A substantial barrier looms around 3.70. Recall the price gap after 12/28/16's 3.994 peak. The 12/30/16 low was 3.690, the 1/3/17 high 3.568. The 1/29/18 high at 3.661, which ended the ferocious rally from 12/21/17's 2.568 low, did not completely fill that gap (though the autumn 2018 rally did so).

The 4.00 to 4.10 range represents major resistance for NYMEX natural gas. First, 12/28/16's 3.994 summit initiated a significant price drop (36.9 percent) to 2/22/17's trough at 2.522. The price gap from the 4.075 low on 11/28/14 to the 4.041 high on 12/1/14 remained unfilled for almost four years, and the rally above it in autumn 2018 stayed above that gap for less than a month. Four times the all-time low for natural gas equals 4.080. A 150 percent rally from 1.611 (3/4/16) gives 4.028. A fifty percent retracement from 6.493 (2/24/14) to 1.611 (3/4/16) is 4.052.

Substantial resistance resides around 4.90 to 5.10. The 11/14/18 peak was 4.929. Recall the critical price collapse point following February 2014's summit, 6/16/14's 4.886. Five times the all-time low is 5.100.

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For trend direction and timing, watch NYMEX intramarket spreads alongside flat (outright) NYMEX natural gas price moves. For example, the March 2019 less April 2019 spread enjoyed a glorious rally alongside nearest futures continuation. However, after its awesome peak on 11/14/18 at 1.745 backwardation (11/2/18 interim low was .249), it suffered a murderous collapse alongside the bloody tumble in nearest futures continuation. For the March 2020 less April 2020 spread, significant resistance is at .40 to .42 cents (backwardation), with important support around .23 to .25.

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The majestic rally and agitating collapse in the NYMEX nearest futures continuation battleground in autumn 2018/winter 2019 contrasts with the broad sideways and relatively narrow price trend in the summer 2019 and winter 2019/20 calendar strips.

At present, distant month price levels and trends arguably do not fully reflect relatively bullish October 2019 and October 2020 inventories. The NYMEX summer 2019 calendar strip established a low at 2.542 on 5/10/18. Its recent plateau was 2.958 on 12/10/18 (2.927 on 1/15/19). The winter 2019/20 strip low in spring 2018 was 5/9/18's 2.785; 8/2/18's 2.790 and 9/17/18's 2.779 neighbored (recall the major bottom at 2.750 on 2/25/16). The winter 2019/20 strip's recent high was about 3.100 (12/10/18 at 3.099, 1/25/19 at 3.105).

To some extent, the sideways trends in the summer 2019 and winter 2019/20 calendar strip marketplaces probably reflects the shift to just-in-time inventory practices and consequently the absence of substantial concern regarding inventory availability, even during winter. Based on the most recent STEO, anticipated October 2019 and 2020 inventories in days coverage terms, though relatively low, float several days above October 2018's depth.

Assume just-in-time inventory management attitudes reign. To what extent has there been, or will there be, hedge selling from natural gas producers? Around what price points does short hedging become noteworthy, \$2.50, \$3.00, \$3.50, or higher? Potential buy-side hedgers, given anticipated natural gas production gains (as well as pipeline building and the growing role of renewable sources for power supply), may not rush to establish forward pricing (unless inventories appear very likely to be inadequate).

However, even with the popularity of just-in-time inventory perspectives and practices, if natural gas inventories head to "low" or "very low" levels in days coverage terms, natural gas price fireworks can erupt. From its 9/10/18 interim low at 2.752 (10/29/18 low 3.100), prices leaped 79.1 percent higher to 11/14/18's 4.929 summit (the ascent from 2/15/18's 2.530 trough to the peak was 94.8 pc). Recall also the entrancing rapid price blast-off for nearest futures of 42.6 percent from 2.568 (12/21/17) to 3.661 (1/29/18).

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One should not be dogmatic about calendar month timing regarding major trend shifts in NYMEX natural gas nearest futures continuation. Although marketplace history need not repeat itself, either entirely or even partly, history can offer guidance. Also, trading warriors should monitor trend changes in actual contract months and strips, not only in the nearest futures continuation contract.

Many important trend changes in nearest futures NYMEX natural gas have occurred in mid-to-late calendar February. As for major highs, recall 2/24/14's peak at 6.493 and 2/25/03's 11.90 pinnacle. Major bottoms include 2/24/97's 1.680 and 2/26/99's 1.625 (part of a double bottom with 8/27/98's 1.610). In the past two years, interim lows have occurred in mid-February, on 2/22/17 at 2.522 and 2.530 on 2/15/18. Although the major bottom on 3/4/16 of course was not in calendar February, it is fairly close in time to past late calendar February highs and lows. Thus for the past three years, there have been important bottoms "around" mid-to late February.

Dismal major bottoms might occur later than the mid to late February (early March) time frame (especially if the balance of winter 2018/19 is very warm), as 4/19/12's major trough shows.

In the current bear move since 11/14/18's high, a final low might occur even later, perhaps as part of a double bottom tied to a trough established around mid to late February/early March 2019. Marketplace timing history indicates the potential for a significant uptrend to start (or resume) in calendar August or September. Several major lows in NYMEX natural gas have appeared in late August and calendar September. Recall 8/27/98 at 1.610, 9/26/01 at 1.760, 9/22/03 at 4.390, 9/16/04 (final bottom) at 4.520, 9/27/06 at 4.050, and 9/4/09's 2.409. See also the 1.735 valley on 9/5/96. A minor low in the recent bull charge was 9/10/18's 2.752.

With the exception of a top over 20 years ago (9/23/92 at 2.790), highly significant summits have not occurred in the August/September calendar period window.

Early calendar August usually does not display major bottoms. An important trough occurred over 25 years ago at 1.396 on 8/1/90. Yet there have been a few notable interim lows in the past several years. In the bull move which culminated in the February 2014 top, 8/8/13's low at 3.129 stands out (it matched 2/15/13's 3.125 level). Keep in mind the 8/12/16 interim trough at 2.523.

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Natural gas prices often travel substantially independently of both petroleum (and commodities "in general") and so-called "international" or "financial" marketplaces and variables. Trend changes in NYMEX natural gas need not roughly coincide with one in the petroleum complex or commodities in general, or in currency, stock, or interest rate arenas.

Nevertheless, bullish and bearish natural gas price movements at times have intertwined with those in the petroleum complex (and commodities in general) and the S+P 500. The S+P 500 made a major bottom in first quarter 2016 (1/20/16 at 1812; 2/11/16 at 1810). So did nearest futures continuation NYMEX crude oil (1/20/16 at \$26.19; 2/11/16 at \$26.05). NYMEX natural gas established its major low not long thereafter with 3/4/16's 1.611.

After the S+P 500 attained its all-time high on 9/21/18 (2941)/10/3/18 (2940), it rapidly dropped about twenty percent to 12/26/18's 2347. NYMEX crude oil's major high was 10/3/18's \$76.90. It precipitously fell 44.9 percent to \$42.36 on 12/24/18. The high in NYMEX natural gas nearest futures, 11/14/18, occurred several weeks after (but still fairly close in time to) those peaks in the S+P 500 and NYMEX crude oil. As NYMEX natural gas (nearest futures) made its major bottom in 1Q16 several weeks after those in the petroleum complex and the S+P 500, arguably it will make an important low in the relatively near future, especially given that several important natural gas marketplace turns have occurred around mid-to-late calendar February. (However, natural gas has its own supply/demand picture. So if the balance of winter 2018-19 is significantly warmer than normal, that may postpone the establishment of the natural gas bottom).

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The CFTC's Commitments of Traders is sometimes a helpful indicator for predicting (or confirming) significant trend changes and adventures in natural gas marketplaces. Review the benchmark NYMEX and ICE natural gas contracts (futures and options combined) plus the NYMEX European look-alike options contract. In the natural gas complex, sometimes (but not always) key highs and lows in price occur alongside notable levels in the net noncommercial position.

Due to the recent US government shutdown, the most recent available Commitments of Traders is that for 12/31/18. The natural gas complex had a modest net noncommercial long ("NCL") position of about 49,000 contracts (1.6 percent of total open interest). The recent net NCL high occurred around the time of 11/14/18's 4.929 peak in NYMEX nearest futures. On 11/27/18, the net NCL was about 106,000 contracts (3.3pc of total open interest); on 11/13/18, it stood at 103m contracts (2.9pc).

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