2018 Preview:

Impact of Brutally Cold Weather on Gas and Electricity Markets

- As discussed in our recent ***Special Report***, this winter's natural gas market drivers are new—with significant implications for both electricity and natural gas prices.
- For natural gas to mount a significant rally, projected end-of-winter storage inventories must fall to 1,050-1,150 Bcf or below. The savage cold currently blanketing the US has brought storage close to this danger zone—but not all the way.
- With storage nearing precarious levels, the evolving weather forecast as winter progresses will be critical. Price volatility could be exceptionally high. It will be essential to monitor forecast shifts daily.
- There is still a slim chance that the February–March 2018 natural gas contracts will rise sharply—but only if the current bitter cold causes widespread well freeze-offs, or if temperatures during the next six to eight weeks are much lower than forecast, with repeated rounds of near-record cold. Absent this occurring, the forward curve is likely to decline significantly before winter ends—and even further this spring.
- With US production continuing to soar, LNG exports during the 2018 injection season will be pivotal. If exports are weak, a bloodbath is possible, driving gas prices at Henry Hub to $2.00/MMBtu or lower later this year. Subsequent ***Reports*** will focus on LNG exports in-depth.

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Natural Gas Market Preview: 2018

Gas Supply Glut to Continue

In our last ***Special Report*** we cautioned that, as 2018 was approaching, the natural gas market would be oversupplied in a normal-weather scenario—with the potential for the oversupply to drastically increase thoughout the new year.

This supply glut—the first in six years—is a direct result of runaway production growth in 2017, increasing by 6.3 Bcf/d over the course of the year.

Further, with oil production likely to increase by at least 1.0-1.2 million bbl/d in 2018, causing associated gas to soar, and nearly 3 Bcf/d of new Northeast pipeline takeaway capacity expected to come online over the next few weeks, natural gas production growth could be nearly as great in 2018.

Fundamental Market Changes

This growing supply excess has fundamentally changed how the natural gas market functions.

From 2009 through mid-2017, price movements closely tracked changes in storage inventories vs. the five-year average. This dynamic no longer applies.

Instead, the futures market is implicitly pricing natural gas based upon an end-of-winter storage target of 1,200 Bcf or less, and might be satisfied with an end-of-injection-season target in the fall of 2018 of as little as 3,600 Bcf.

Based upon these factors, we asserted that even if forecasts for very cold weather in late December and early January verified, natural gas prices were likely to remain weak, with a high probability that prices would decline later in 2018.

We also cautioned, however, that weather forecast uncertainty was elevated, and that prices could still rally modestly if temperatures were even colder than WDT and other forecasters were predicting at that time.

Freezing Forecast Shift

Subsequent developments have been consistent with our analysis. During the past two weeks, weather forecasts have trended colder nearly daily. In the aggregate, most weather vendors have added 110 gHDDs or more to their outlooks. An increase of this magnitude adds nearly 200 Bcf to demand, tightening storage considerably.

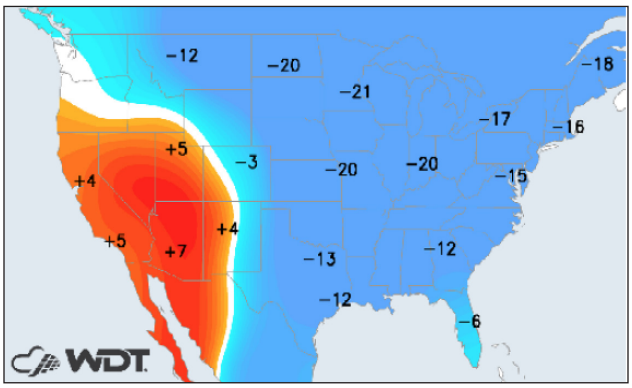
This stunning shift results from the combined impact of:

- Near-perfect conditions developing to create repeated intense cross-Arctic flows blanketing much of the US, with the coldest weather targeting the Midwest and the Northeast—regions in which it has the greatest impact
- Extension of bitter cold weather further into January than previously forecast, with much-below-normal temperatures continuing for 10-12 days longer than expected

The cold air anomaly is particularly extreme for the storage week that began December 29th, which added 59.5 gHDDs and a massive 154.7 Bcf of projected demand over the next two weeks:

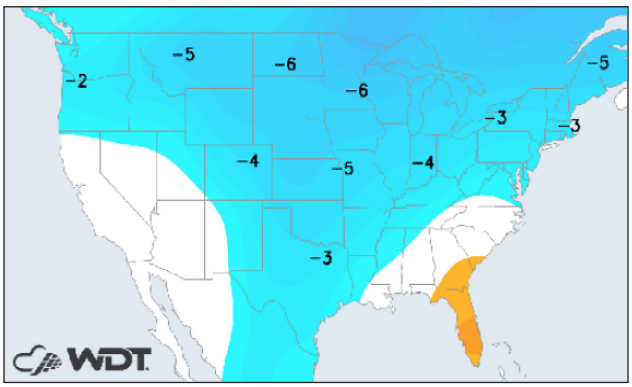
FORECAST ON DECEMBER 29

For Storage Week Ending 01/04



FORECAST ON DECEMBER 15

For Storage Week Ending 01/04



Source: Weather Decision Technologies

Storage Week 1: Gas-Weighted HDDs		
Forecast **288.9 HDDs**	30-Year Norm	214.7
	Anomaly	+74.2
	Δ Since Yesterday	+5.1
	CDDs	0.2

Storage Week 3: Gas-Weighted HDDs		
Forecast **229.4 HDDs**	30-Year Norm	214.7
	Anomaly	+14.7
	Δ Since Yesterday	+0.0
	CDDs	0.5

Storage Week 1: Weather-Driven Demand		
Forecast **94.4 Bcf/day**	Δ Since Yesterday	+2.1
	Δ Since Last Year	+37.0

Storage Week 3: Weather Driven Demand		
Forecast **72.3 Bcf/day**	Δ Since Yesterday	+0.0
	Δ Since Last Year	+15.3

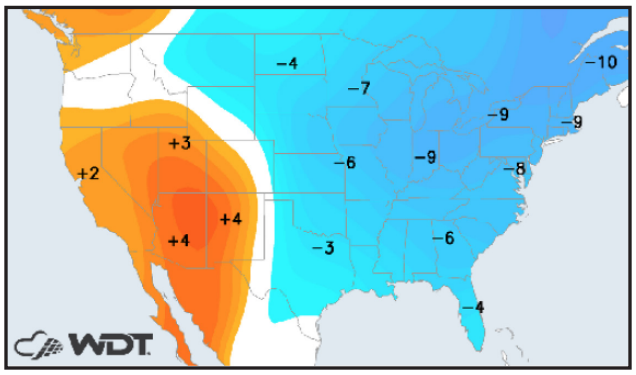
The upcoming week is expected to be one of the coldest on record, with the potential for EIA to report an all-time record withdrawal for the storage week that ends January 4th.

Changes in the storage weeks ended January 11th and January 18th are also dramatic – and nearly as consequential.

Just two weeks ago, both weeks were expected to be significantly warmer than normal, creating renewed downward pressure on futures. The week ended January 11th, however, has reversed course entirely, and is now expected to be much colder than normal. Cold weather is forecast to continue into the week ended January 18th:

FORECAST ON DECEMBER 29

For Storage Week Ending 01/11

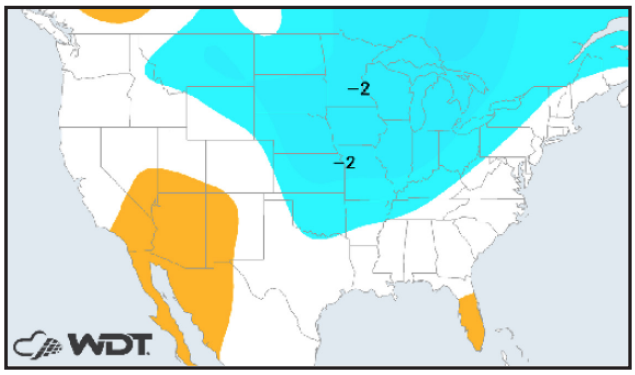


Storage Week 2: Gas-Weighted HDDs		
Forecast **249.0 HDDs**	30-Year Norm	216.6
	Anomaly	+32.4
	Δ Since Yesterday	+8.3
	CDDs	0.2

Storage Week 2: Weather Driven Demand		
Forecast **81.1 Bcf/day**	Δ Since Yesterday	+2.9
	Δ Since Last Year	+9.3

FORECAST ON DECEMBER 29

For Storage Week Ending 01/18



Source: Weather Decision Technologies

Storage Week 3: Gas-Weighted HDDs		
Forecast **220.2 HDDs**	30-Year Norm	216.8
	Anomaly	+3.4
	Δ Since Yesterday	+0.0
	CDDs	0.4

Storage Week 3: Weather Driven Demand		
Forecast **70.6 Bcf/day**	Δ Since Yesterday	+0.0
	Δ Since Last Year	+17.7

Natural Gas Market Preview: 2018

New Ground Rules

Notably, therefore, despite the repeated extreme cold weather during the past two weeks, natural gas initially declined, with the Cal 2018 contracts setting new contract lows just before Christmas. As recently as last Wednesday, the February contract was trading at nearly the same level as two weeks ago.

The market's willingness to shrug off forecasts for some of the coldest weather of the past thirty years is clear and convincing evidence that the ground rules have changed.

Recent Price Movements

Last Thursday and Friday, however, as temperatures plunged, cash prices began to skyrocket. The Day-Ahead market at Henry Hub rose 82.5 cents/MMBtu over a two-day period, from $2.755 on Wednesday to $3.58 on Friday. The price spike at Houston Shipping Channel was even steeper, with jumping $1.88, from $2.755 to $4.33.

In response, the February 2018 contract finally broke out of its recent trading range, gaining 21.5 cents to close Friday at $2.953.

Despite forecasts for some of the most frigid weather in decades over the New Year's holiday, though, the winter-month contracts were not able to solidly break through resistance at $3.00, instead selling off into Friday's close.

This sell-off was due in part to profit-taking prior to the long holiday weekend by traders eager to lock in gains.

Bone-Chilling Cold

When trading resumes in the new year, the direction in which prices move will depend heavily on: (i) the extent of well freeze-offs in Permian Basin and, to a lesser degree, the Northeast (where most wells have been hardened against freezing); and (ii) further shifts in the 15-day forecast during the four-day period between Friday and this coming Tuesday.

Forecasts for New Year's weekend call for temperatures in Permian Basin to drop to as low as 13° F. At these conditions, freeze-offs are certain to occur, reducing production of both oil and natural gas.

The question is how extensive these freeze-offs will be and how long it will take to return the affected wells into service.

Price Shifts Early Next Week

If freeze-offs are modest (shutting in less than 1 Bcf/d of production) and wells can be brought back online quickly, the impact on natural gas prices will be limited.

More extensive freeze-offs, however, (2-4 Bcf/d lasting several weeks), could boost prices for the February contract by 20-40 cents/MMBtu even if Friday's forecast for the second and third weeks of January remain unchanged.

As of December 29th, weather forecast uncertainty for the 11-15 day window and beyond remains high. Days 11-15 on Friday will become days 7-11 and days 16-19 will have become days 12-15.

Natural Gas Market Preview: 2018

While temperatures in the immediate term are likely to remain bitterly cold, by January 2nd the forecast for mid-January and beyond will have changed significantly.

If the forecasts for the storage weeks ended January 11th and January 18th have shifted substantially colder (plausible but not likely), the February contract could re-test resistance at $3.00/MMBtu even if freeze-offs are limited.

If freeze-offs are extensive and lengthy, however, significant further price increases are likely, with February potentially challenging resistance at $3.32 or higher.

The more likely scenario, though, is that Tuesday's forecast for mid-January will be similar to last Friday's or milder. Even if it is similar, the coldest weather will likely have passed, with temperatures returning to close-to-seasonal norms during the storage week ending January 18th.

Further, production in the Northeast could begin to increase significantly, due to start-up of the 1.5 Bcf/day Leach Xpress pipeline (which last week FERC authorized to begin operating on January 1st). Start-up of Phase 2 of the Rover Pipeline could also be imminent.

Absent widespread freeze-offs, prices for the February and March contracts are likely to start heading downward.

Further, a more bearish scenario is also possible (at least 20-30% possibility), with forecasts calling for milder-than-normal weather to return in mid-January for one to two weeks. If this occurs, despite continued near-term bitter cold, the February contract could quickly shed most of last week's gains.

Prices for the Rest of this Winter

During the remainder of the winter, price movements will depend heavily on two factors:

- The frequency and intensity of further rounds of very cold weather—especially in January and February (from a climatological standpoint, the heart of the winter heating season);
- The end-of-winter storage target implicitly priced into the market.

Continued growth in production will also play a role.

As discussed further below, under scenarios that still have a reasonable possibility of occurring, weather-driven demand between mid-January and the end of March still could be as much as 250 Bcf above or below normal—a potential swing of 500 Bcf between the high and low end of the range. In our judgment, the most likely outcome is for weather for the balance of winter to average slightly below climatological norms.

If this occurs, between now and the end of March we would expect balance of 2018 contracts to fall 25-30 cents/MMBtu from closing prices last Friday.

Depending upon actual weather, however, prices could fall even more steeply or spike even higher than occurred last week, with balance of 2018 contracts trading as much as thirty cents above last Friday's close for a period of several weeks.

It will be important, therefore, for traders to act cautiously. Unless and until confidence in weather forecasts increases, large bets in either direction should be avoided. Instead, the focus should be on short-term price movements, based upon the evolving 15-day and 16-22 day forecast windows, with traders using tight stops and being quick to take profits.

The market reaction to the evolving weather forecast, however, will be driven by a different set of standards than in previous years. We currently are in the midst of a four-week period in which, if current forecasts hold, the amount of natural gas withdrawn from storage could total in 1.0 Tcf—rivaling the largest withdrawal's ever over a four-week period. At the end of this time, the amount of gas in storage could fall as much as 441 Bcf below the five-year average:

Week Ended	*Projected Storage Change (Bcf)*	*Remaining Gas in Storage (Bcf)*	*Storage Surplus/Deficit vs. Five-Year Average*
12/28/17	-204	3,128	-190
1/4/18	-338	2,790	-329
1/11/18	-276	2,514	-407
1/18/18	-200	2,314	-441
Total	-1,019		

Source: Weather Decision Technologies

Prior to this winter, withdrawals of this magnitude just as the heart of the withdrawal season is beginning, would have triggered a major rally, especially since current forecasts call for temperatures that are colder than most recent years for the rest of the winter.

This winter, however, is different. With natural gas production continuing to grow at record rates, traders increasingly believe that unless the amount of natural gas in storage falls to extremely low levels (e.g., below 1,100 Bcf), any storage deficit that develops this winter can be readily overcome during the 2018 injection season.

Thus, while the potential for a four-week string of record or near-record draws could give the market pause and slow the pace at which prices decline, it is not sufficient, without more to trigger a sustained rally.

This does not mean that end-of-winter storage is irrelevant. From an operating standpoint, pipeline operators generally believe that it is necessary to maintain at least 850-950 Bcf in storage. If projected end-of-season storage starts to drop precipitously, the risk premium built into the February and March 2018 futures contracts could start to increase, with particularly steep increases if projected end-of-March storage starts to fall below 1,000-1,050 Bcf.

Absent repeated Arctic incursions throughout the rest of the winter and/or prolonged large-scale well freeze-offs, however, this does not appear likely to occur.

Ability to Predict Intensity and Duration of Cold Air Limited

Over the past six to seven weeks, there have been three sudden massive shifts in short-term forecasts—a sudden loss of nearly 100 Bcf of expected demand just before Thanksgiving, a second even larger loss in expected demand in early December and a sudden massive increase in demand in the past two weeks at a time when forecasts were already calling for much colder than normal weather.

In the face of these forecast busts, it may be tempting to blame weather forecasters, based upon the assumption that they should have been able to anticipate the shifts. To do so, however, would be a mistake—in effect, shooting the messenger.

Weather forecasters have recognized since winter began that the most likely pattern this winter would be for weather conditions to swing back and forth between one-to-three-week periods of colder-than-normal weather and one-to-three weeks of much warmer weather (a pattern similar in some respects to the 2013-2014 "Polar Vortex" winter).

Thus far, this is exactly what has occurred. Predicting what this will mean in terms of total space heating demand is a much more difficult issue, for two reasons:

- First, the exact timing, duration and intensity of cold air intrusions cannot accurately be predicted more than a few days ahead of time. The intensity of the cold spell, for example, can be heavily affected by: (i) the exact position and timing of blocking conditions in the Pacific Northwest or Gulf of Alaska; (ii) the Arctic Oscillation (AO); (iii) the timing of progression between phases of the Madden-Julien Oscillation in the tropics; and (iv) a number of other factors—none of which can be predicted with precision more than a few days in advance.

  Further, even if the intensity matches expectations, the exact timing of the transition between warmer-than-normal weather and the next cold air intrusion and the number of days before these conditions reverse is even more difficult to predict.

  This is a critical issue, since even a one or two delay in either the start or end of the cold air intrusion at the heart of the winter space heating season can increase or decrease demand by 30-50 Bcf in the blink of an eye—much as has already happened this winter.

- Further, as WDT noted in an earlier report, as a result of changing climate trends, warm periods tend to be much warmer than in the past and to last warmer. This can negate the impact of colder periods in some instances but not others.

  This forecast uncertainty is likely to continue for much of the winter. As the experience so far this winter with repeated sudden 100 Bcf swings vividly teaches, it would be a serious mistake to assume that what currently appears to be the "best" forecast will necessarily validate.

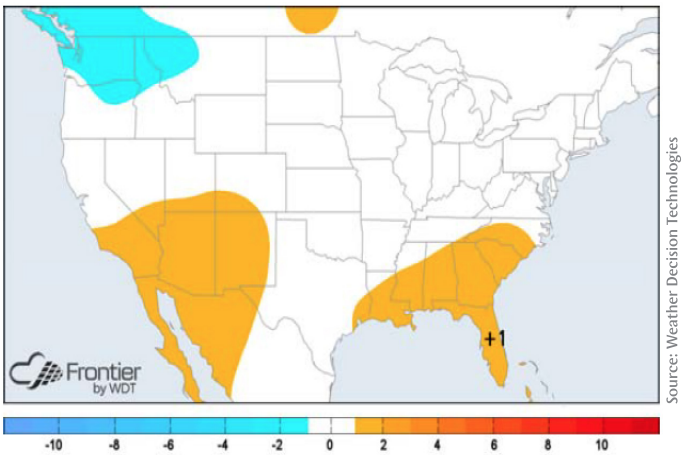
The analysis below must be read with this in mind.

In Our Current "Most Likely" 16-30 Day Forecast, Prices Likely to Retreat by the End of this Coming Week

Our most recent 16-30 day forecast calls for temperatures to revert to seasonal norms over most of the country during the second half of January, with milder-than-normal temperatures in the Southeast and desert Southwest:

FORECAST ON DECEMBER 28

For Storage Week Ending 01/26



Source: Weather Decision Technologies

Over the course of next week, as the fifteen-day forecast continues to roll forward, the market is likely to focus increasingly on this forecast, which calls for a total of 451.4 gHDDs nationally. This is far above last winter but 10.6 gHDDs below the thirty-year norm, and whopping 125 gHDDs below the storage week ended January 4th.

If this forecast verifies, demand for natural gas could fall by more than 20 Bcf/day from this week's record levels, undercutting cash market demand.

Further, and even more importantly, ***despite*** extreme cold weather in late December and the first two weeks of January, the amount of natural gas in storage will still be on a trajectory to end March at 1,250-1,275 Bcf. This is well above the level that would cause a major storage squeeze before the withdrawal season ends.

If this scenario plays out, therefore, futures prices could soften significantly during the second and third week in January, with the February contract potentially falling to $2.64/MMBtu or lower.

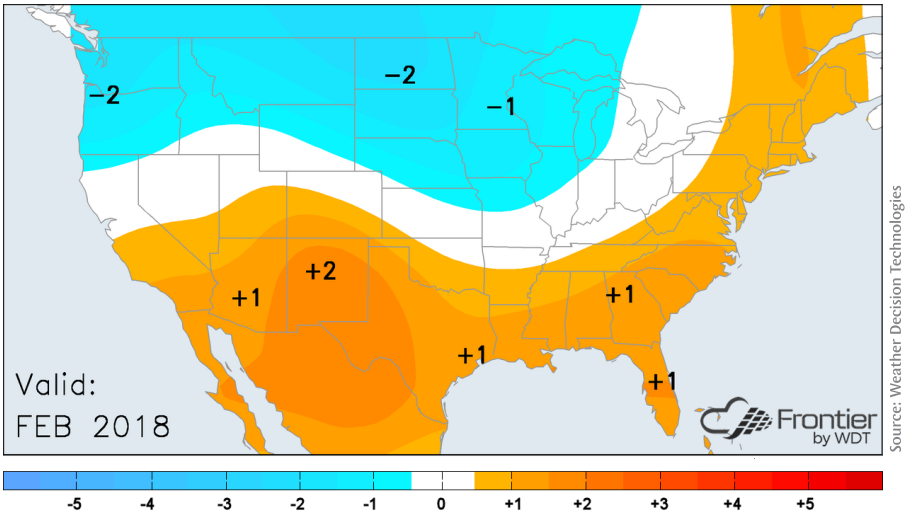
The likelihood that there will be at least some moderation in temperatures in mid-January is reasonably high, pushing prices lower. Further, to the extent the mid-January forecast varies from the map above, it is more likely to be warmer, increasing the likelihood that at least for a brief period the $2.64/MMBtu target will be met.

The duration of the expected warm spell, and timing and intensity of the colder episode expected to follow are much less clear. It will be critical, therefore, to track Week 3 in our daily ***Energy Flash Report*** closely in order to anticipate possible further shifts in the market —potentially in either direction.

While Uncertainty Regarding Remainder of Winter is High, Odds Favor a Significant Further Price Decline

Our "most likely" forecasts for February and March are not nearly as cold as current forecasts for January but are still much colder than in most recent years. For February, the forecast is mixed, with slightly colder-than normal to seasonal weather in the key Midwest regions but warmer than normal temperatures in the Northeast, the Southeast and other regions:

Most Likely Forecast for February 2018 (as of 12/28)

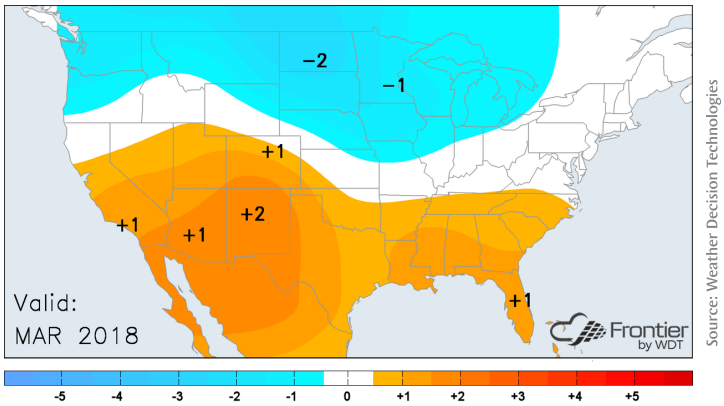


Source: Weather Decision Technologies

Aggregate gas-weighted Heating Degree Days total 703 gHDDs, just 2% less than the 717 gHDD thirty-year norm.

Our "most likely" March forecast is slightly more bullish, with slightly colder than normal weather over a larger portion of the Midwest and seasonal weather in the Northeast:

Most Likely Forecast for March 2018 (as of 12/28)

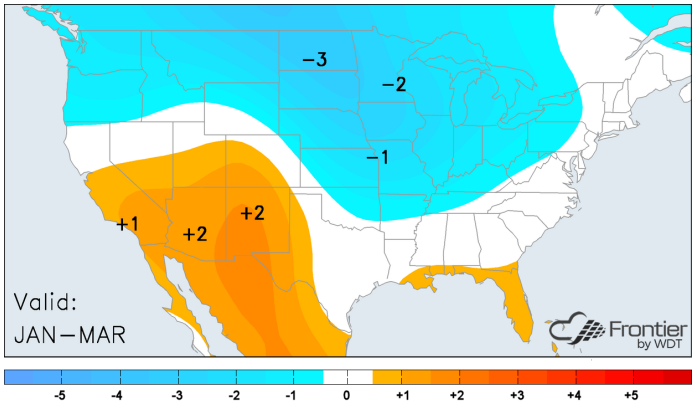


Source: Weather Decision Technologies

Aggregate gas-weighted Heating Degree Days total 563 gHDDs, just 7 gHDDs below the thirty-year norm.

There is a significant possibility, however (roughly 30%) that balance of winter forecasts will be significantly colder than these forecasts suggest:

Cold January–March Scenario: 30% Likelihood (as of 12/28)

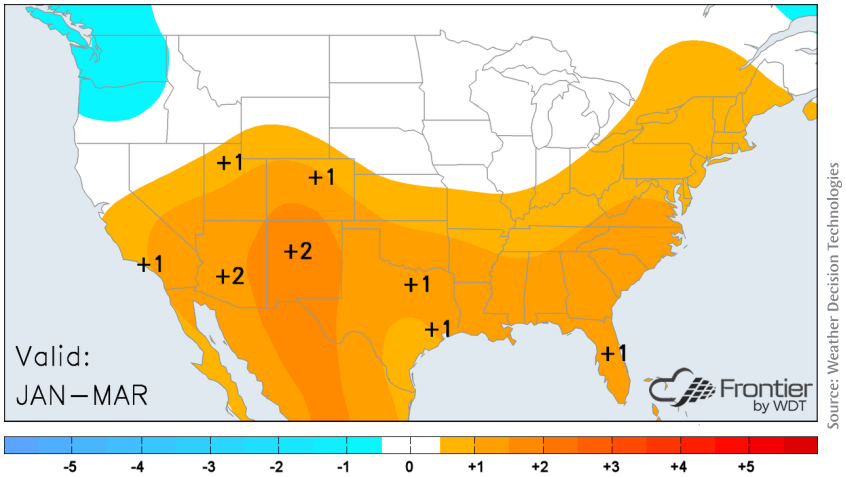


Source: Weather Decision Technologies

If this forecast validates, gHDDs during the remainder of this winter could be 100-150 gHDDs higher than in our "most likely" scenario, adding as much as 200-250 Bcf of increased demand.

While less likely, a much warmer scenario can also not be ruled out:

Warm January–March Scenario: 15% Likelihood (as of 12/28)



Source: Weather Decision Technologies

Under this scenario, gHDDs would be 100 gHDDs or more lower than under our most likely scenario, ***reducing*** demand by 150-200 Bcf—a 450 Bcf swing relative to the cold scenario.

The three weather scenarios have very different consequences regarding the path natural gas prices might follow this winter. Under the "most likely" scenario, storage would still be on a trajectory to end the 2018 injection season at close to 4,100 Bcf—a trajectory the market is unlikely to accept.

To better balance the market, at a time when production is likely to still be growing at a blistering pace, we would expect the April-November 2018 futures contracts, which closed at an average price of $2.783/MMBtu Friday, to drop by 25-30 cents by the end of March.

In the warm scenario, prices would be likely to plunge even further, with the April-November contracts potentially dropping to $2.25/MMBtu.

In the cold scenario—which has nearly a one in three chance of occurring—prices would be even stronger. If much colder than normal weather returns during the last week in January and last several weeks (which is still plausible), prices could climb in late January and early February, with the March contract potentially spiking to as high as $3.32/MMBtu and the April –November contracts rising significantly above $3.00.

Even in this scenario, however, storage would still be on a trajectory to end winter above required levels. By March, therefore, we would expect prices to return to last Friday's levels if no lower.

Bleak Prospects for the 2018 Injection Season

Further, even in the cold scenario above, storage would be on a trajectory to end the injection season 200-300 Bcf above required levels, even if 2018 exports are at the high end of the expected range.

As a result, absent extreme cold weather for much of the rest of the winter and/or massive freeze-offs, further downward pressure would be inevitable, pushing prices to $2.40-2.50/MMBtu next spring.

If LNG exports disappoint and/or production grows more rapidly than the 6.5 Bcf/day level assumed in our analysis, the damage could be severe, potentially pushing prices below $2.00/MMBtu for several months.

2018 is likely to be a high-stakes year for the industry. An acute level of vigilance and sound hedging strategies will be critical. ■

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Led by Andy Weissman, EBW AnalyticsGroup offers independent, cutting-edge expert analysis of natural gas, electricity and crude oil markets. Our research publications, models, and consulting services have been correctly assessing where the markets are likely to head next for more than a decade.

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