

Natural Gas Comment: A Warming Trend, But Not Because of El Niño

- **A Super El Niño on its way...** El Niño and La Niña climate pattern occurrences are often brought up as potential drivers of temperature deviations from average, with Niño patterns in particular typically associated with warmer temperatures. Several scientific organizations, including the US National Oceanic and Atmospheric Administration (NOAA) and the World Meteorological Organization (WMO), are currently calling for a “super” El Niño to form this summer¹. While climate patterns are a complex construct of many different drivers, with predictions typically unstable – and better left to meteorologists – we examine the historical correlation between El Niño and seasonal temperature deviations from average across the US, NW Europe and Asia.
- **...But its signal for summer temperature anomalies is weak.** Across all summers since 1980 we find only a weak correlation between the Oceanic Niño Index (ONI), which tracks the Pacific Ocean surface temperature deviation from average, and peak-summer (Jun-Aug) temperature deviations from average across the Northern Hemisphere. In addition, depending on the sample analyzed, the data suggests a potentially negative correlation between the two variables, suggesting that peak summer temperatures might present cooler than average as the ONI rises (stronger El Niño) (Exhibit 1). This observed weak correlation appears to hold across different samples of the data, as we consider seasonal averages vs month-by-month data, as well as the full sample of summers vs Niño summers only. Accordingly, we keep our peak-summer year-on-year growth forecast for power demand for natural gas unchanged at +0.5 Bcf/d for the US (mainly driven by higher power demand) and -26 mcm/d for NW Europe (mainly driven by higher solar generation and gas-to-coal switching).

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¹ A regular El Niño event occurs when Pacific Ocean surface temperatures reach 0.5°C or higher above average. A super El Niño is an informal way to refer to a strong El Niño, which requires temperatures to be at least 2°C above average.



Exhibit 1: There is a weak relationship between El Niño summer occurrences and peak-summer temperature anomalies

Oceanic Niño Index correlation to peak-summer temperature deviations from the 10-year average over different periods

	Summer temp. deviation vs summer ONI (full sample)	Monthly summer temp dev vs monthly ONI (full sample)	Monthly summer temp dev vs monthly ONI (El Niño summers only)
US	-0.3	-0.3	-0.2
NW Europe	0.2	0.1	0.1
NE Asia	-0.2	-0.2	0.0
South Asia	0.3	0.3	0.0
SE Asia	0.0	0.0	0.2
Sample size	46	138	21

Note: A higher ONI means a stronger El Niño.

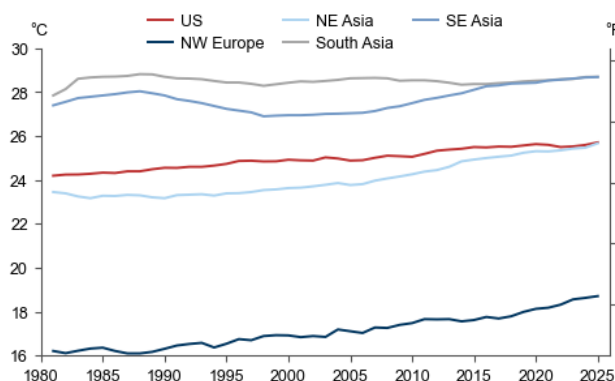
Full sample starts in 1980. All region temperatures are peak-summer gas-demand-weighted. NW Europe includes UK, France, Germany, Belgium and Netherlands. NE Asia includes China, Japan and South Korea. South Asia includes India, Pakistan and Bangladesh. SE Asia includes Taiwan, Thailand, Singapore, Malaysia, Philippines, Indonesia and Vietnam. Peak-summer is defined as June through August. India's ONI-to-temperature-anomaly correlation is also weak when considering April/May as peak-summer.

Source: NOAA, Bloomberg, Goldman Sachs Global Investment Research

- **Summers are getting warmer regardless.** While insight from El Niño summers appears limited, we note that average summer temperatures across all regions are increasing over time (Exhibit 2). NW Europe and NE Asia temperatures² are warming roughly twice as fast as the US, with both of their peak-summer averages rising roughly +0.6°C per decade, while the US warms at roughly +1.0°C every 30 years, the equivalent of roughly 2.4 Bcf/d of extra gas demand. Further, when looking at more than 45 years of data, we see that peak-summers are more likely than not to average hotter than their preceding 10-year average temperature (Exhibit 3).

Exhibit 2: Average peak-summer temperatures are warming across all regions

Rolling 10-year average peak-summer temperature

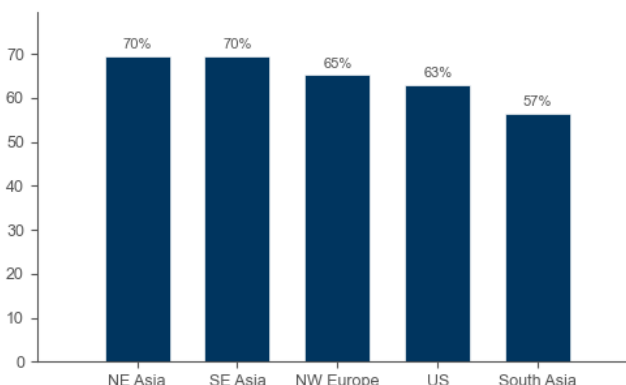


Peak-summer is defined as June through August. All regions are peak-summer gas-demand weighted.

Source: Bloomberg, Goldman Sachs Global Investment Research

Exhibit 3: Summer temperatures are warmer than the preceding 10-year average 57% to 70% of the time

Percentage of occurrences when regional peak-summer temperature deviation is higher than the prior 10-year average, %



Sample starts in 1980. Peak-summer is defined as June through August. Based on peak-summer gas-weighted temperatures across all regions.

Source: Bloomberg, Goldman Sachs Global Investment Research

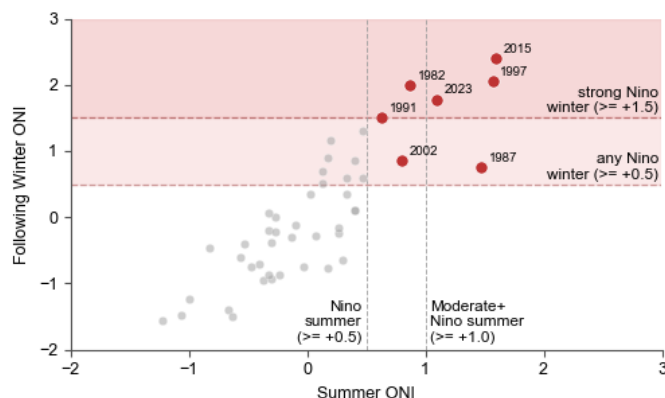
- **What this means for winter.** While all seven Niño summers observed in the past 45 years led to Niño winters, we find that the correlation between winter Niño

² All regional temperatures are peak-summer gas-weighted.

occurrences and winter temperature anomalies, though typically positive, is also weak (Exhibit 4, Exhibit 5), as we discussed previously. That said, much like in summer, average winter temperatures³ have gradually risen (Exhibit 6, Exhibit 7). This suggests we would not be wrong to consider warmer risks going forward - for both summer and winter - but that does not appear to be driven by El Niño.

Exhibit 4: Since 1980, all El Niño summers developed into an El Niño winters

El Niño summer ONI vs the following winter ONI



ONI = Oceanic Niño Index; sea surface temperature anomalies in the Pacific ocean. A higher ONI means a stronger El Niño.

Source: NOAA, Bloomberg, Goldman Sachs Global Investment Research

Exhibit 5: There is a weak relationship between El Niño winter occurrences and winter temperature anomalies

Oceanic Niño Index correlation to winter temperature deviations from the 10-year average over different periods

	Winter temp. deviation vs winter ONI (full sample)	Monthly winter temp dev vs monthly ONI (full sample)	Monthly winter temp dev vs monthly ONI (El Nino winters only)
US	0.2	0.1	0.3
NW Europe	0.3	0.2	0.1
NE Asia	0.3	0.2	0.0
Sample size	46	230	75

Note: A higher ONI means a stronger El Niño.

All region temperatures are winter demand-weighted. NW Europe includes UK, France, Germany, Belgium and Netherlands. NE Asia includes China, Japan and South Korea. Winter is defined as November through March.

Source: NOAA, Bloomberg, Goldman Sachs Global Investment Research

³ All regional temperatures are peak-winter gas-weighted.