

SEPT 2022 BRAIN TEASER & SOLUTION

What is Going to Happen to Europe this Winter?

Europe has a natural gas shortage due to reduced supply of Russian gas, potentially facing an energy crisis this winter. However, some analysts say Europe has done a good job building natural gas storage levels to the comfort zone, fears are overblown, and Europe should be fine this winter. There is a lot of confusion and fear about potential scenarios and a humanitarian crisis. You have been called in to assess plausible scenarios and determine potential mitigation actions. The problem is extremely complex, but you have quickly gathered some realistic estimates for a first pass simple overview. European natural gas storage has a capacity of 3,500 BCF and is projected to be 85% full by the start of winter. Normal winter gas demand is 55 BCFD (50 for a mild winter; 60 for a cold winter). Gas supply is constant at 45 BCFD, of which Russian gas is 15 BCFD.

In winter natural gas is drawn from storage to meet demand in excess of supply. Storage levels typically drop to as low as 20% winter end. Levels below 10% are historic and would trigger a crisis. Your plausible scenarios are outlined in the table below. Your job is to populate the table to determine the ending storage level in BCF and percent fill, and the timing of when storage runs out, if applicable.

Notes:

- This first exercise is for a simplistic overview: for now, keep it simple without adding complexity
- Europe natural gas dynamics are very different from east to west and north to south; for this exercise consider Europe overall as a unit able to distribute gas evenly throughout as needed
- Assume all gas rates are fixed (constant) throughout the winter
- Assume winter starts on Oct. 1 and ends on Mar. 31
- All numbers have been translated to BCF or BCFD
- BCF is a volumetric unit standing for billion cubic feet of natural gas
- BCFD is BCF per day representing the rate of natural gas flowing either demand or supply.

What is Going to Happen to Europe this Winter? SDP Brain Teaser Sep-2022	Winter Supply BCFD	Winter Demand BCFD	Winter Deficit BCFD	Winter Storage Draw BCF	Winter Ending Storage BCF	Winter Ending Storage Pct Fill	Winter Linear Shortfall Days	Winter Empty Estimate Date
Scenario 1: Normal Winter with Full Russian Gas Supply								
Scenario 2: Normal Winter with 50% Reduced Russian Gas Supply								
Scenario 3: Normal Winter with no Russian Gas Supply								
Scenario 4: Normal Winter with no Russian Gas Supply Consumption Reduced 10%								
Scenario 5: Normal Winter with no Russian Gas Supply Consumption Reduced 10% and one third of Russian gas replaced								
Scenario 6: Cold Winter with no Russian Gas Supply Figure out a realistic combination to end with 15% storage.								
Scenario 7: Mild Winter with no Russian Gas Supply. Figure out a realistic combination to end with 15% storage.								

<u>The answer to the Sept 2022 Brain Teaser - What is Going to Happen to Europe</u> <u>this Winter?</u>

What is Going to Happen to Europe this Winter? The problem calls for a simplistic modeling of gas flows and storage levels over the winter season, Oct. 1 to Mar. 31, 182 days. The table below shows the results and math. Scenarios 6 and 7 are respectively for: i) cold and mild winter; ii) reducing consumption by 15% and 6%; iii) replacing 50% and 25% of Russian gas; iv) to arrive at 15% and 16% of storage by end of winter. Note there are many other reasonable combinations.

In spite of Nord Stream pipelines down resulting in minimal Russian gas, Europe is doing a great job building storage by increasing supply and reducing demand, while weather is cooperating. However, winter cold blasts can quickly draw down gas storage, which means there is still plenty of uncertainty remaining.

What is Going to Happen to Europe this Winter? SDP Brain Teaser Sep-2022	Winter Daily Supply BCFD A	Winter Daily Demand BCFD B	Winter Daily Deficit BCFD C	Winter Storage Draw BCF D	Winter Ending Storage BCF E	Winter Ending Storage % Fill F	Winter Linear Shortfall Days G	Winter Empty Estimate Date F
Math (Vol1 = Initial Storage = 3,500 * 85% = 2,975 BCF)	Per Given Info	Per Given Info	B-A	C*182	Vol 1-D	E/3,500	If E=0; (Vol1- C)/(B-A)	If E=0; ~Apr 1 -G
Scenario 1: Normal Winter with Full Russian Gas Supply	45.0	55.0	10.0	1,820	1,155	33%	N/A	N/A
Scenario 2: Normal Winter with 50% Reduced Russian Gas Supply	37.5	55.0	17.5	3, 185	0	0%	12	Mid-March
Scenario 3: Normal Winter with No Russian Gas Supply	30.0	55.0	25.0	4,550	0	0%	63	Late January
Scenario 4: Normal Winter with No Russian Gas Supply Consumption Reduced 10%	30.0	49.5	19.5	3,549	0	0%	29	Early March
Scenario 5: Normal Winter with No Russian Gas Supply Consumption Reduced 10% and one third of Russian gas replaced	35.0	49.5	14.5	2,639	336	10%	N/A	N/A
Scenario 6: Cold Winter with No Russian Gas Supply Figure out a realistic combination to end with 15% storage.	37.5	51.0	13.5	2,457	518	15%	N/A	N/A
Scenario 7: Mild Winter with No Russian Gas Supply. Figure out a realistic combination to end with 15% storage.	33.8	47.0	13.3	2,412	564	16%	N/A	N/A