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Research into periods with exceptionally low temperatures

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Report
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GTS is required by law to submit an annual review of the security of the natural gas supply to the Dutch Ministry of Climate Policy and Green Growth. One aspect of security of supply is guaranteeing the supply of gas to protected users during a period of exceptionally high gas demand. Pursuant to the European Regulation concerning measures to safeguard the security of gas supply (2017/1938, Article 6), a Member State must take measures to ensure security of supply during a period of exceptionally high gas demand lasting 7 days and 30 days respectively, occurring with a statistical probability of once in 20 years. The same also applies to a 30-day period in the case of a disruption of the single largest gas infrastructure under average winter conditions.

Because there is a strong relationship between gas demand over a given period and the effective temperature over that same period, GTS has researched the statistical probability of extremely low average effective temperatures during periods of 7 and 30 days. The effective temperature is the daily average temperature measured in De Bilt, which also takes into account wind speed. The calculation of the effective temperature complies with the definition in the Dutch Gas Act.

GTS's research into the statistical probability of extremely low effective temperatures during periods of 7 and 30 days has been reviewed and approved by KNMI (the Royal Netherlands Meteorological Institute). The results of the research are presented in Table 1. The table shows that, with a statistical probability of once every 20 years, an exceptionally cold 7-day period occurs with a 7-day average effective temperature of -10.2°C. For a 30-day period, this is a 30-day average effective temperature of -5.7°C. In other words, a 7-day average effective temperature of -10.2°C and a 30 -day average effective temperature of -5.7°C have a recurrence interval of 20 years. Based on these temperatures, GTS can calculate the amount of exceptionally high gas demand in a 7-day or 30-day period that occurs once every 20 years. This is addressed in the attachment to the letter about security of supply for the gasyear 2025/2026.

Table 1: Recurrence interval of extremely low 7-day and 30-day temperatures. Source: GTS research

Recurrence interval (years)	**7-day average temperature (°C)**	**30-day average temperature (°C)**
0.5	-1.6	1.3
1	-3.4	0.1
2	-5.1	-1.1
5	-7.2	-2.9
10	-8.8	-4.2
20	-10.2	-5.7
50	-12.1	-7.7
100	-13.4	-9.3

The methodology used for the GTS study is similar to that used by KNMI in a study of the recurrence intervals of extremely low, single-day effective temperatures. That KNMI study was commissioned by Gasunie and conducted in 2023. The results of the KNMI study are presented in Table 2. These results show that, statistically, a day with an exceptionally low effective temperature of -14.1°C occurs once every 20 years. It also shows that an effective temperature of -16.0°C occurs once every 50 years. These insights were previously communicated in GTS' annual advice on safeguarding the security of supply.

Table 2: Frequency of extremely low single-day temperatures. Source: KNMI

Recurrence interval (years)	Value (°C)	Lower limit (°C)	Upper limit (°C)
0.5	-4.6	-5.2	-4.0
1	-6.7	-7.4	-5.9
2	-8.6	-9.4	-7.7
5	-10.9	-11.8	-10.0
10	-12.5	-13.5	-11.5
20	-14.1	-15.3	-12.9
50	-16.0	-17.7	-14.2
100	-17.3	-19.7	-14.9

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