Expert Commentary

Rising Temperatures and Natural Gas Demand to 2055: Less Heating, More Cooling, More Gas

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Executive Summary

Energy outlooks are normally built on the assumption that future weather will resemble the past. That assumption is becoming harder to defend. Recent summers have shown how strongly heat now drives electricity and gas demand, from record peak loads in India and China to surging LNG imports across South and Southeast Asia and higher gas-fired generation in Europe. This commentary examines what continued warming means for natural gas demand to 2055. It finds that the common expectation, that warmer winters will reduce gas use, captures only half of the picture. Warming reduces the need for space heating, but it increases the need for cooling by more, and much of the additional electricity for cooling is generated from natural gas. The net effect is **higher, not lower, gas demand**.

In the central case, which assumes about 0.6 °C of additional global warming by 2050, in line with the IPCC's intermediate emissions pathway, world electricity demand in 2055 is about 1,500 TWh (2.4%) higher than in the GECF Reference Case Scenario (RCS), which assumes normal historical weather. Gas use in power generation rises by about 174 bcm (8%), while gas use for heating buildings falls by about 67 bcm. For every bcm of gas no longer needed for heating, more than two and a half bcm are needed to generate electricity for cooling. Net gas demand is **about 107 bcm (2%) higher in 2055**, and about 70 bcm higher in 2050.

The effect is back-loaded and highly sensitive to extreme heat. It is modest to 2035 but accelerates thereafter as air-conditioner ownership spreads in hot, fast-growing and rapidly urbanising economies. The range between the cases is wide. Under the IPCC's low emissions pathway and a more muted response, the increase in 2055 is about 30 bcm; under its very high emissions pathway, with more frequent and intense heatwaves, it reaches about 420 bcm. More frequent heatwaves alone, at central-case warming, would roughly double the central result. How often the climate produces extreme heat therefore matters as much as how much it warms on average.

A warmer climate also changes where and when gas is used: from winter heating towards summer power generation, and from mature heating markets towards Africa, Asia Pacific, the Middle East and Latin America. These shifts are already visible in summer LNG contracts, in competition for cargoes during heatwaves and in power shortages where gas supply falls short. They argue for planning gas storage, flexible generation, LNG supply and contracts around extreme summer heat, and not only around cold winters.

1. Introduction: weather is no longer a constant

Temperature has become one of the main drivers of short-term energy demand, and the summer of 2026 brought new records. In India, peak power demand reached about 271 GW in May during severe heatwaves, and gas-fired plants bought around 340% more gas on the Indian Gas Exchange in April–May than a year earlier, running in the evening and night hours when solar output is unavailable (IGU, 2026a). Hotter temperatures lifted Southeast Asia's LNG imports in April–June to 8.9 Mt, compared with 7.8 Mt a year earlier (IGU, 2026a). In Europe, three major heatwaves in May and June raised gas-fired generation by 13% year on year; in the second half of June, as wind output fell by a third, combined-cycle gas output rose by a third (OIES, 2026b).

These are not isolated episodes but signs of a structural change. Air-conditioner ownership is rising quickly wherever incomes grow in hot climates. Fewer than 30% of households in Southeast Asia own an air conditioner today, a share expected to more than double by 2035, and India is set to add more than 250 million units over the next decade (IEA, 2025b). Rapid urbanisation reinforces the trend: India, Nigeria, Pakistan, the Democratic Republic of the Congo, Egypt, Bangladesh and

Ethiopia alone are projected to add more than 500 million city residents between 2025 and 2050, over half of the global increase (UN DESA, 2025).

Yet most long-term outlooks, including the GECF Reference Case, are calibrated to normal historical weather. This commentary asks what happens to electricity and natural gas demand if the climate continues to warm, and what that means for gas markets, infrastructure and security of supply.

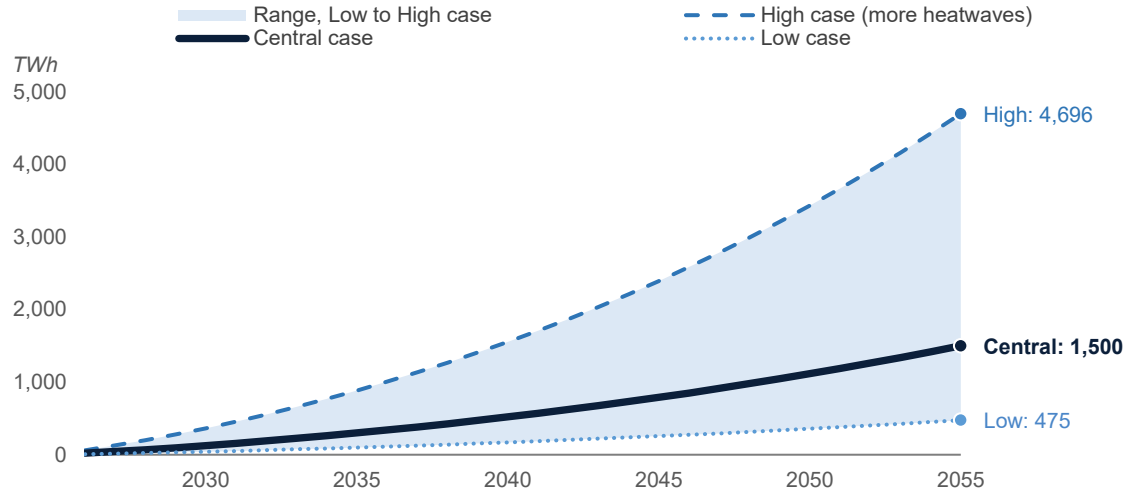
2. Approach

The analysis estimates, country by country, how much electricity and gas demand would differ from the Reference Case over 2026–2055 if temperatures continue to rise. Warming increases the number of hot days that require cooling and reduces the number of cold days that require heating, and the analysis traces both effects through to electricity and gas demand. The three cases are anchored to the IPCC's latest assessment. Human-induced warming reached about 1.36 °C above pre-industrial levels in 2024 and is rising by about 0.27 °C per decade (Forster et al., 2025). For the period around 2050, IPCC AR6 projects best-estimate warming of 1.7 °C under a low emissions pathway (SSP1-2.6), 2.0 °C under an intermediate pathway (SSP2-4.5) and 2.4 °C under a very high pathway (SSP5-8.5) (IPCC, 2021). Measured from today, these imply roughly 0.3 °C, 0.6 °C and 1.0 °C of additional warming by 2050. The **Low case** therefore assumes 0.3 °C, together with a more muted response of demand. The **Central case** assumes 0.6 °C, with year-to-year variability similar to recent experience. The **High case** assumes 1.0 °C and, consistent with stronger warming, more frequent, longer and more intense heatwaves, which accelerate the purchase and use of air conditioners. Two additional runs separate the contribution of stronger average warming from that of heatwaves.

3. Cooling drives a steady rise in electricity demand

Electricity demand rises steadily in all three cases (Figure 1). By 2055 the increase ranges from about 475 TWh in the Low case to 4,700 TWh in the High case, with the Central case at about 1,500 TWh, or 2.4% above the Reference Case; by 2050 the central increase is about 1,115 TWh. The growth accelerates over time because two effects compound: existing air conditioners are used more on hotter days, and more households and businesses buy them, especially where ownership is still low and incomes are rising.

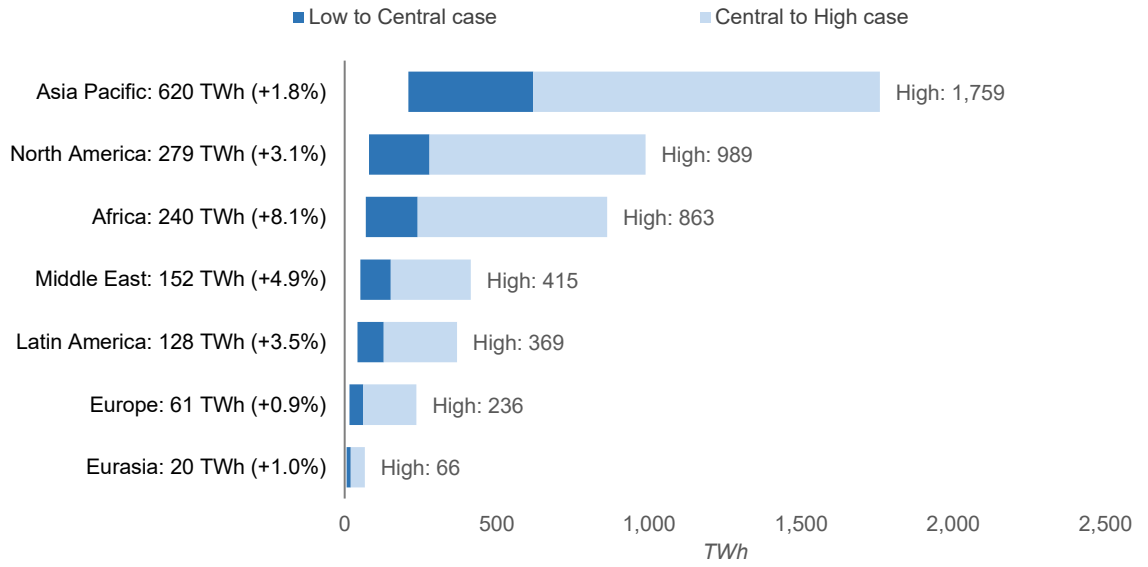
Figure 1: Change in world electricity demand relative to the Reference Case: central path and Low–High range (TWh)



Source: GECF Secretariat analysis based on the GECF Global Gas Model Reference Case Scenario (RCS) (2026).

Asia Pacific accounts for the largest increase in volume, about 620 TWh in the central case in 2055, followed by North America (280 TWh), Africa (240 TWh) and the Middle East (150 TWh) (Figure 2). In relative terms the effect is greatest in Africa, where electricity demand is 8.1% higher, and in the Middle East (4.9%). The Middle East illustrates where many hot economies are heading: cooling already accounts for nearly half of peak electricity demand and a quarter of annual demand in the Middle East and North Africa, and summer demand runs about 50% above the winter average (IEA, 2025a). In Europe, by contrast, cooling accounts for only about 5% of electricity use in buildings, and in Sub-Saharan Africa growth in ownership is held back by affordability.

Figure 2: Additional electricity demand by region in 2055 relative to the Reference Case (TWh)

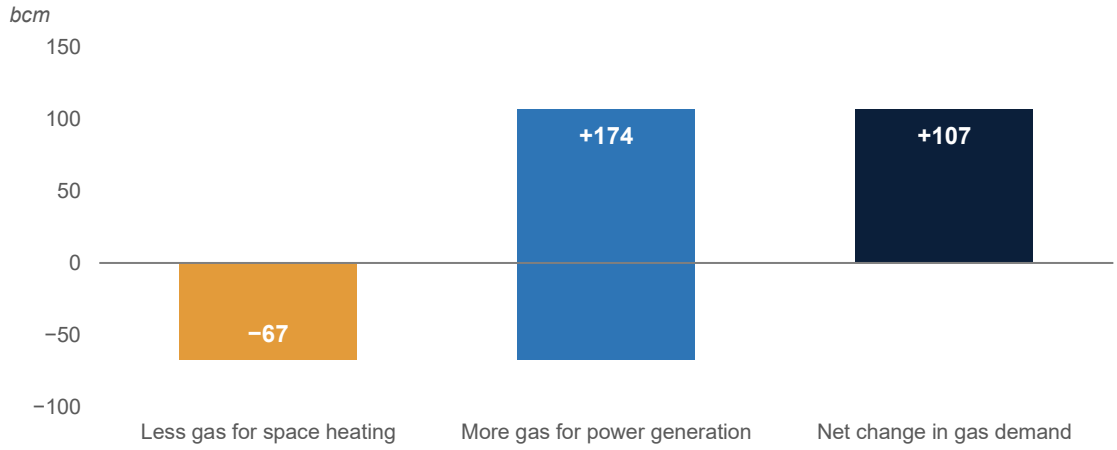


Note: bars run from the Low case to the High case; the change in shade marks the Central case, whose value and share of regional electricity demand are shown next to each region. Source: GECF Secretariat analysis based on the GECF Global Gas Model Reference Case Scenario (RCS) (2026).

4. More gas for cooling than is saved in heating

The central finding of this analysis is that warming raises natural gas demand overall. In the central case, gas used for power generation is about 174 bcm (8%) higher in 2055 than in the Reference Case, while gas used for heating buildings is about 67 bcm lower, giving a net increase of about 107 bcm, or 2% of world gas demand (Figure 3). The two effects do not simply cancel because they occur in different places and at different times. Lower heating demand is concentrated in a limited number of cold-climate markets, whereas higher cooling demand is spread across large, fast-growing economies in hot climates.

Figure 3: From heating to cooling: change in world natural gas demand in 2055 relative to the Reference Case, central case (bcm)



Source: GECF Secretariat analysis based on the GECF Global Gas Model Reference Case Scenario (RCS) (2026).

This does not mean that gas meets all of the additional electricity demand. In the central case, it covers less than half of the additional generation, and the rest comes from other sources, especially renewables, in line with how power systems have responded in recent hot years. Gas nonetheless carries more than its average share of the power mix, because of when and where the additional demand occurs. Five factors explain this. First, cooling demand peaks in the evening and at night, after solar output fades. During India's 2026 heatwaves, gas-fired plants ran mainly in these hours, and with coal plants often already running at full output, gas becomes the marginal source of power and LNG the marginal source of gas. Second, heatwaves often come with still air, so wind cannot fill the evening gap either: in Europe in the second half of June 2026, wind output fell by a third while combined-cycle gas output rose by a third (OIES, 2026b). Third, storage cannot close the gap on its own. The Reference Case already includes about 3,300 GW of battery capacity by 2055, but this capacity is largely used to shift solar output into the evening, and with two to four hours of storage it cannot cover heatwaves that last several days.

Fourth, heat and drought also weaken other low-carbon sources, reducing hydropower and, in some cases, nuclear output and leaving the gap to dispatchable plants. During Brazil's 2021 drought, gas-fired generation nearly doubled and around 40 mcm/d of regasified LNG fed the power system, while Colombia relied on LNG to keep gas plants running during the 2023–2024 El Niño (IGU, 2026b). In 2025, a 12% fall in EU hydropower raised gas use in power by 12% (GIIGNL, 2026), and in June 2026 France took 4.1 GW of nuclear capacity offline because river water was too warm for cooling. Fifth, most of the growth in cooling demand is in the Middle East, South Asia and Africa, where gas is the main dispatchable fuel and the main constraint is peak capacity rather than annual energy. Power plants also operate less efficiently at high temperatures, so each unit of electricity requires slightly more fuel. Taken together, these factors mean that each additional TWh of weather-driven electricity requires about 0.1 bcm of gas, in line with the response observed in recent hot years.

The increase builds gradually. In the central case, net gas demand is only about 8 bcm higher in 2035, as lower heating demand largely offsets higher gas use for power in the early years. It reaches about 23 bcm in 2040, 42 bcm in 2045, 70 bcm in 2050 and 107 bcm in 2055. Planning horizons that end in the 2030s will therefore tend to understate the effect.

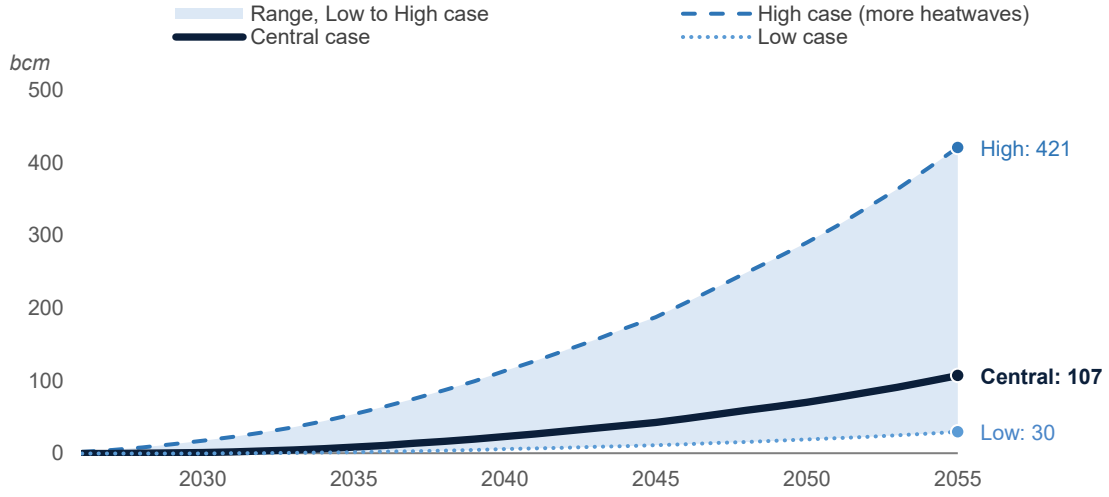
Heat does not always translate into more gas, and the analysis takes this into account. Milder winters reduce heating demand: in Europe, the difference between a cold and a warm winter is

worth about 20–25 bcm of gas demand (OIES, 2026a), and a mild winter contributed to lower Chinese LNG imports in 2025 (IGU, 2026c). High gas prices can shift peak generation to coal, more efficient air conditioners reduce the electricity needed for each unit of cooling, and solar output partly coincides with daytime cooling demand. These factors are reflected in the Low case. Even so, the conclusion that warming raises gas demand is robust. Because the gas saved in heating is small relative to the additional electricity needed for cooling, net gas demand rises as long as gas meets more than about a fifth of the additional generation, only slightly above its average share of the power mix. This is why even the Low case, with its stronger solar and efficiency gains, still shows gas demand about 30 bcm higher by 2055, because the cooling peak extends into the evening, when solar output is no longer available.

5. Extreme heat matters as much as average warming

The range between the cases is wide: in 2055 the increase in gas demand ranges from about 30 bcm in the Low case to about 420 bcm in the High case (Figure 4). Two factors explain the gap between the High and Central cases, and they are of similar size. Stronger average warming, 1.0 °C instead of 0.6 °C, would on its own raise the increase in 2055 from about 107 bcm to about 215 bcm. More frequent, longer and more intense heatwaves at central-case warming would on their own raise it to about 220 bcm. In other words, heatwaves alone add about as much gas demand as the entire effect of average warming in the Central case, and the two effects reinforce each other when they occur together.

Figure 4: Change in world natural gas demand relative to the Reference Case: central path and Low–High range (bcm)



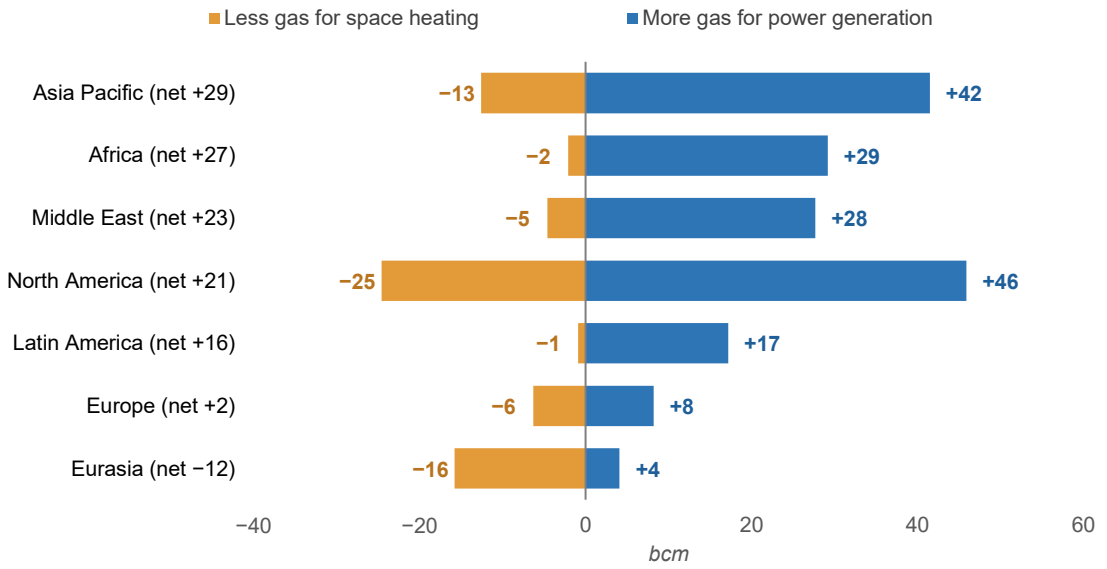
Source: GECF Secretariat analysis based on the GECF Global Gas Model Reference Case Scenario (RCS) (2026).

The sensitivity of demand to heat is also rising as ownership spreads. In India, each 1 °C rise in temperature added more than 7 GW to peak demand in 2024, compared with about 4 GW in 2019 (IGU, 2026a). Extreme heat also concentrates demand in time: during the June 2026 heatwaves in Europe, spreads between midday and evening power prices reached USD 600/MWh in several markets (IEA, 2026). Infrastructure, supply and contracting decisions calibrated to average conditions therefore risk being under-sized for the conditions that matter most to the system: sustained periods of extreme heat, when electricity demand, gas burn and prices all peak at the same time.

6. Demand shifts towards hot, fast-growing markets

A warmer climate shifts gas demand geographically, from mature heating markets towards emerging economies in hot climates (Figure 5). In the central case in 2055, the largest net increases are in Asia Pacific (+29 bcm), Africa (+27 bcm), the Middle East (+23 bcm), North America (+21 bcm) and Latin America (+16 bcm). North America shows both the largest increase in gas for power (+46 bcm) and the largest decrease in gas for heating (−25 bcm). Europe sees a small net increase (+2 bcm), as additional cooling slightly outweighs lower heating needs. Eurasia is the only region where gas demand falls (−12 bcm), because lower heating demand outweighs the modest increase in cooling.

Figure 5: Change in natural gas demand by region and use in 2055 relative to the Reference Case, central case (bcm)



Source: GECF Secretariat analysis based on the GECF Global Gas Model Reference Case Scenario (RCS) (2026).

This shift reinforces trends already under way. In July 2026, Egypt imported a record 1.68 Mt of LNG as power demand approached its seasonal peak (MEES, 2026), and LNG imports into the Middle East and Africa rose by about a third from June to July on summer temperatures (Rystad Energy, 2026). Where gas supply falls short in summer, systems turn to more expensive and more polluting alternatives or to load shedding: in Kuwait, a sharp fall in gas deliveries to power plants doubled gasoil burn in spring 2026, as temperatures exceeded 45 °C (MEES, 2026). For gas suppliers, the regions where warming adds most to demand are those that will place a premium on reliable, flexible supply during the hottest months of the year.

7. Implications for storage, LNG trade and security of supply

Annual volumes understate the operational implications. Gas storage was built around winter: the world's 424 bcm of underground working gas capacity is designed to be filled in summer and drawn down in winter (IGU, 2025). As cooling demand grows, summer becomes a second peak that competes with storage injection. Asian cooling demand in the third quarter already overlaps with Europe's refilling season, and in the second quarter of 2026 Asian buyers outbid European utilities for spot and flexible cargoes as El Niño raised cooling demand, reducing European injections (OIES, 2026b). By June 2026, EU storage was only 43% full, compared with 53% a year earlier (IGU, 2026a). At the same time, the summer–winter price spread that pays for storage has become less reliable, turning negative in early 2025 (OIES, 2025). A flatter or summer-peaking demand profile increases the value of fast-cycling storage, such as salt caverns, which hold 9% of working

gas capacity but provide 27% of peak withdrawal capacity (IGU, 2025), and of flexible gas-fired plants able to follow steep evening ramps.

LNG markets are already adapting. Buyers are contracting specifically for summer: QatarEnergy agreed to deliver 24 cargoes to Egypt during summer 2026, and Egypt has chartered floating regasification units to meet its summer peaks (GIIGNL, 2026). As cooling demand grows across the Northern Hemisphere, summer LNG demand will become stronger and more synchronised, increasing competition for cargoes during heatwaves and the value of destination flexibility in contracts.

Security of supply is also at stake. Heatwaves tend to coincide with stress across the power system: demand peaks, hydropower and some thermal output decline, and reserve margins narrow (IGU, 2026a). In 2024, temperatures above 50 °C combined with gas shortages led to rolling blackouts of up to six hours a day in Egypt, and Egypt, Iran, Iraq and Kuwait all resorted to load shedding (IEA, 2025a). As cooling demand grows, the reliability of gas supply during summer peaks becomes as important as it has traditionally been in winter.

These findings suggest three priorities for policymakers, investors and the industry. First, energy outlooks and system planning should account for continued warming rather than assume normal historical weather. Second, gas storage, pipeline and LNG capacity, and the flexibility of supply contracts, should be stress-tested against extreme summer heat as well as cold winters. Third, investment in flexible gas-fired capacity and in efficient cooling equipment should be planned together, since both determine how much additional gas a warmer world will require.

8. Conclusions

Rising temperatures will not reduce natural gas demand; they will raise it. In the central case, which follows the IPCC's intermediate emissions pathway, the additional gas needed to generate electricity for cooling is more than two and a half times the gas saved in heating, and world gas demand is about 107 bcm higher in 2055 than under normal weather. The effect grows over time, could roughly double if heatwaves become more frequent and intense, and could reach about 420 bcm under the IPCC's very high emissions pathway.

A warmer climate therefore reshapes gas demand along two dimensions: seasonally, from winter heating towards summer power generation, and geographically, from mature heating markets towards hot, fast-growing economies. The early signs are already visible in record summer peaks, summer-specific LNG contracts and competition for cargoes during heatwaves. For GECF Member Countries and consuming countries alike, recognising these shifts in planning, investment and contracting will be essential to keep gas supply reliable and affordable in the conditions that matter most: the hottest days of the year.

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