

The 2024 worldwide helium market

Helium swings from balance to surplus – but uncertainties remain

By Maura D. Garvey

Our assessment of the worldwide helium demand is about 6.0 billion cubic feet (Bcf) for 2024, while supply will be about 6.5 billion cubic feet, up from about 5.9 in 2023 – putting helium in oversupply.

The storage facilities put in by Air Liquide in Germany and more recently by Air Products in Texas are being utilized to absorb the excess production. The Federal Helium System now owned by Messer is again acting as a flywheel, with excess production reinjected into the field, while Linde's planned storage facility in Texas is not yet online.

This is a significant swing from the shortage in 2022. Helium demand is projected to grow at about 2% to 3% per year over the next five years – much more slowly than the rate of the new planned supply. So, as it stands, worldwide supply will continue to be in surplus if the large new sources of helium continue to come onstream as planned.

Plenty of uncertainty remains, with the new round of European sanctions coming into effect, the geopolitical upheaval from the wars in Ukraine and the Middle East, and ongoing supply chain issues causing longer ocean shipping times, reducing

the available ISO containers. An additional complication may occur if the International Longshoremen's Association (ILA) strikes if an agreement is not reached with the United States Maritime Alliance (USMX) by September 30, the expiration of the current six-year agreement. This will affect container shipping, including helium, from Maine to the Gulf Coast.

2023 did not see supply disruptions at major sources like in 2022 – but a series of unrelated events curtailed production, keeping supply and demand in relative balance. Longer maintenance outages at ExxonMobil, continued reduced supply from Algeria, and Amur not recommencing production until September 2023 reduced production. In addition, the US and European sanctions on Russian imports and use of helium ISOs kept Irkusk and Amur from ramping up supply. (see “The 2023 worldwide helium market,” October 2023, *gasworld US*, page 36).

Intelligas Consulting, on behalf of *gasworld (US Edition)*, spoke with the helium experts and managers at major industrial gas companies, market segment experts, and distributors

throughout the year to get the insider's view of this critical market. Those views and opinions are reflected here.

Global demand

For 2024, worldwide helium demand is estimated by Intelligas Consulting at 6.0 Bcf, which is relatively flat over the past decade due to the three shortages that occurred during that time, including the impact of Covid-19. We calculate that natural demand is closer to 6.5 Bcf.

Worldwide helium demand is forecast to grow at 2% to 3% per year, probably at the slower pace until the global economies recover, the wars in Ukraine and the Middle East conclude, supply chain efficiencies return, and new supplies come to fruition.

Helium suppliers have worked diligently to deliver under these conditions, reminding us again that the helium supply chain is fragile. Fastest growth will be in Asia (4% to 5% per year), particularly China, Korea, and Taiwan with industrialization and semiconductor growth. Slower growth is expected in the US, Europe, and Japan (1% to 1.5 % per year). However, reshoring of supply chains for chip-making in the US and Europe through legislation and expansion in space

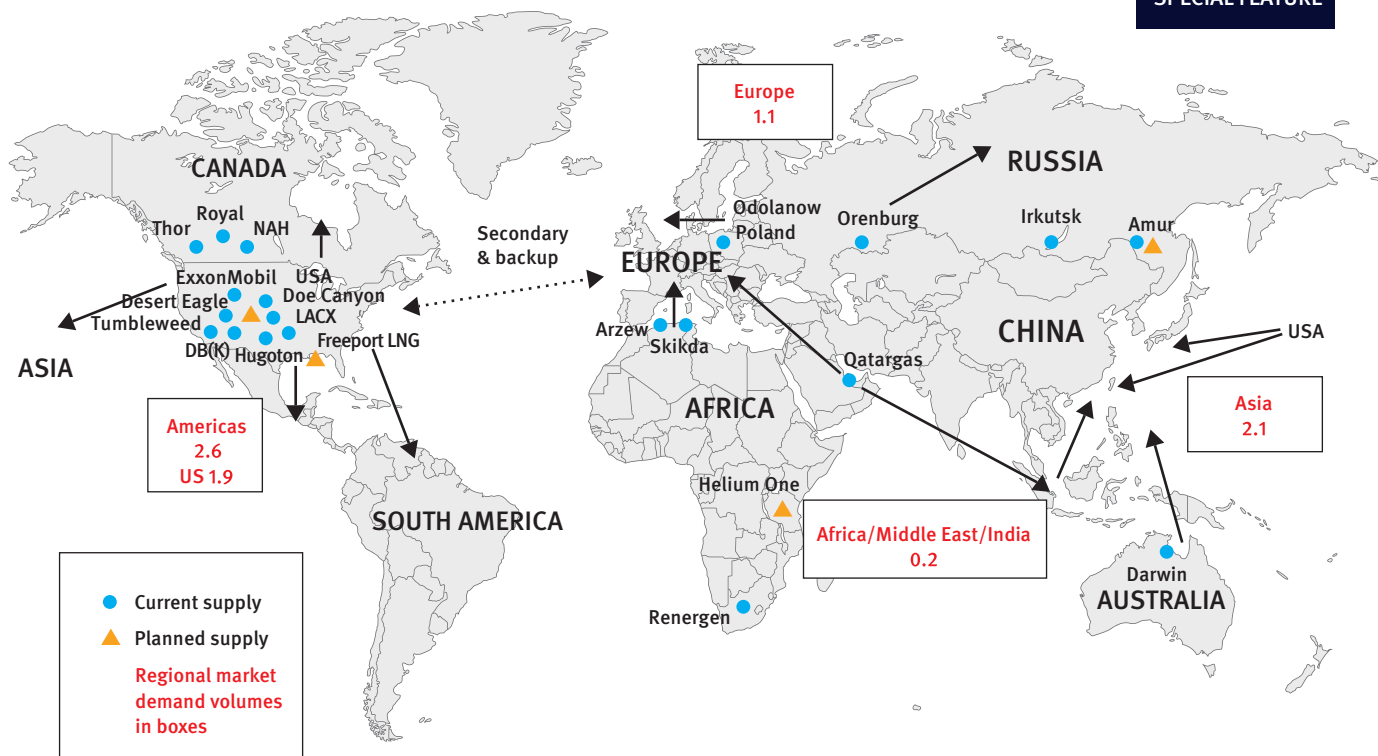


Figure 1. Source: Intelligas Consulting LLC

programs should bring long awaited growth in these more mature markets. The global economy has remained steady but slow in 2024 compared with 2023, according to economic experts. The economy impacts the demand for helium applications, so we can expect the same for helium demand growth. The bringing on of new sources between 2025 to 2028 will support helium demand growth but will keep the world in an oversupply of helium that will need to be stored.

The largest end-uses of helium include electronics (semiconductor and fiber optics for 5G) (21%), liquid helium for magnetic resonance imaging (MRI) manufacturing and service (15%), and gaseous helium for lifting (balloons, airships, etc.) (14%).

Aerospace programs are growing faster than other applications, but currently comprise about 4% of helium demand. Demand for semiconductor device manufacturing shrank by 9% last year and is recovering in 2024, growing at 7%. According to analysis performed by TECHCET,

semiconductor applications comprise around 21% of the global helium market. US semiconductor manufacturing is just over 10% of the global market at present, expected to grow to more than 12% with announced fab expansions. US semiconductor helium demand will be growing by an estimated 5.3% per year, assuming all chip fabs that have been announced come about. Both the US and Europe worked to reshore semiconductors in their regions and support growth through dedicated legislation (Chips Acts). So it is finally looking like we will have the helium supply to support this growth.

Global supply

Worldwide helium supply in 2024 is about 6.5 Bcf, out of balance with demand at 6.0 Bcf, as shown in Figure 1. The restarting of Gazprom's Amur plant September 2023, Irkutsk coming fully online, and several new smaller non-hydrocarbons well sources coming on-stream, mean supply is greater than demand. Since almost all helium is tied to take-or-pay contracts, the

excess helium must be stored to avoid expensive losses. The Air Liquide and Air Products storage facilities, in Germany and Texas respectively, are being utilized to absorb the excess production. The former Federal Helium System now owned by Messer is again acting as a flywheel with excess production reinjected into the field.

The excess supply will affect the industrial gas producers to varying degrees, depending on where they source their helium. There continues to be a flow of supply from the US into Europe, while at the same time supply from Europe into the US, reflecting the complexity of various helium suppliers managing the logistics of supply to end-use customers under contract and managing surplus supply. European Commission (EC) helium export/import statistics reflect the flow of helium to and from the US and Europe.

The import and export statistics into Asia and Europe also provide the value of helium traded. Those landed costs of helium have begun to decline slowly in 2024, reflecting a softening in helium ►

“analysis performed by TECHCET [shows] semiconductor applications comprise around 21% of the global helium market”

- ▶ pricing which is attributable to the oversupply.

Complex supply chain

Helium is a global commodity delivered through a complex global supply chain, where industrial gas companies seek diversity of sourcing and reliability from sourcing operations. From Figure 1, you can see the complexity of supplying helium, which is perishable under very high vacuum at very cold temperatures, from a very few specialized companies with a few remotely located production plants for delivery to hundreds of thousands of customers all over the world.

Russia sanctions

The sanctions on Russia due to the war in Ukraine will constrain the delivery of Russian helium into the global market except for those countries without sanctions (eg. China and India). This will potentially limit Gazprom's ability to reach full production on the first helium train and could have an impact on startup of the second helium train. The initial sanctions imposed banned the use of US-based and European Union (EU) manufactured ISO containers to move Russian helium. As most of the ISO container fleet is made up of US-based Gardner Cryogenic ISOs and Linde ISOs, this has severely impacted the ability of helium producers to move Russian product. Those containers are included in the US equipment list not allowed in the Russian Federation. At least one

Chinese company has begun producing ISO containers to move the Russian helium, but those ISO containers are not considered the same quality.

Air Products and Linde dropped pursuit of a contract with Gazprom to acquire helium when Russia invaded Ukraine. Other industrial gas companies and smaller helium trading companies have maintained contracts with Irkutsk and Gazprom and have been moving Russian helium primarily into China, but also into Europe and other Asian countries. Gazprom has been actively soliciting buyers for its helium in China and other countries not subject to US trade restrictions.

The EU adopted a 14th sanctions package on June 25, 2024 that comes into effect on September 26 for existing contracts but applies immediately for new contracts after that date. The goal of the new sanctions package is to target the circumvention of helium exports from Russia through non-EU company subsidiaries for EU companies with Russian helium contracts. EU companies with contracts have little recourse but to declare force majeure (FM) as they can't legally move the volume after September 26. As there appears to be about 200 mmcf, annualized, of Russian helium being transported by road and ocean shipping into Europe to meet demand in 2024, this helium will have to be replaced by other existing sources.

With Asian demand at over 2 Bcf per year, the feeling is that Russian volume can be absorbed there instead of in Europe. But issues remain. First, will there be enough non-EU ISO containers to move the Russian helium into Asia? Second, the large semiconductor countries of Taiwan and South Korea have bought very small volumes of Russian helium, possibly due to the concerns about purity. Finally, some large Chinese banks have been reluctant to deal with the Russian banking system for fear of sanctions from US banks,

making payments to Russia difficult. These sanctions will cause disruption and could affect Gazprom's plans.

Status of the ex-Federal Helium System

Messer took over as the third-party operator of the helium production facilities (excluding the pipeline) at BLM in June 2022 and bought it on June 27, 2024. During its tenure, production has been flowing smoothly except for some minor disruptions in April and May 2024. BLM production in 2023 was about 680 million cubic feet (mmcf), up from 452 mmcf in outage-hit 2022. In 2024, it is on track to produce about 500 mmcf for the market, if allowed to extend the lease on the CHEU of which more below.

The BLM accepted Messer LLC's two bids in March 2024, totaling \$423,350,000 for the two opportunities available (comprising 1 Bcf of federally owned crude helium and 800 mmcf of federal crude helium and the Federal Helium System which included the mineral rights to the Bush Dome Reservoir, the remaining government-owned crude helium in the Federal Helium Reserve, the pipeline that connects the Federal Reserve to privately-owned natural gas processing plants and helium refining facilities, the Cliffside Plant facility, and various other assets.).

Messer's bid got federal approval on June 27, 2024. The sale excluded the Crude Helium Enrichment Unit (CHEU) that purifies the crude helium from the Federal Reserve and delivers it into the BLM Pipeline. It is owned by Cliffside Refiners Limited Partnership (CRLP) and leased to the BLM. That lease expired August 11. Messer applied and was granted a temporary restraining order on August 7 to avoid supply disruption and time to negotiate with the CRLP to continue access to the CHEU. Two of the three CRLP partners supported allowing Messer Helium Cliffside LLC (MHC) continued access to the CHEU. But MHC was unable to reach agreement ▶

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► with Air Products, the third partner. The court ordered MHC and CRLP to appear August 23, but that date was extended to September 11. As of the publication of this report, the court has extended the decision by about six more weeks, allowing the plant to continue operating pending reaching a commercial solution with Air Products. If an agreement cannot be reached, MHC would need to build its own CHEU, which could take up to three years. This could take 125 mmcf of helium out of the market for the remainder of this year and about 500 mmcf each year until the new CHEU is built. In addition, crude plants feeding liquid plants through the pipeline, Rock Creek (IACX), DCP Midstream, and Linn Energy, producing about 200 to 400 mmcf/yr would also be affected.

Prospects for helium supply

Several smaller US sources started up or have plans to start up in 2024. These include Linde's 200 mmcf of nameplate capacity at Freeport LNG plant in TX, Desert Eagle Operating's 72 mmcf plant in CO, and NASCO's 80 mmcf plant in Boundary Butte, UT. Proton Green in AZ started up in 2023 but has since stopped production. Avanti Energy's 10 mmcf plant in MT has plans to start up by the end of this year. North American Helium is increasing overall production from its wells in Canada to over 200 mmcf by the end of the year. There are numerous other small well sources companies that have yet to move into production. Funding for these projects may become more difficult if the helium industry remains in oversupply and helium pricing declines.

Blue Spruce Operating is hoping to bring on-stream The Dry Piney helium plant in Wyoming after 2028/29 with a nameplate capacity of 800 mmcf. Funding for this plant is still in progress and may be affected by the helium oversupply.

New offshore sources include: 270 mmcf of nameplate capacity in Irkutsk

“Blue Spruce Operating is hoping to bring on-stream a plant in Wyoming after 2028/29 with a nameplate capacity of 800 mmcf”

Russia, which started up in late 2023; the restart of Gazprom's Amur plant in September 2023 with a nameplate capacity of 750 mmcf; an expansion of up to 300 mmcf/yr at the Arzew, Algeria plant (onstream was originally expected in 2022); and 10 mmcf at Renegen, South Africa (behind the scheduled start).

The 2.1 Bcf at the Russia Amur project by Gazprom that was delayed following plant explosions has once again started up the first of three helium plants. Gazprom started helium shipments from Amur on September 5. The company also plans to launch its second helium plant next year. Given the difficulty moving helium from Russia due to ng sanctions, there is a high possibility of further delay.

The volumes going into China, Taiwan, and South Korea are already under longer term contracts with some of the Tier 1 helium suppliers like Air Products, Linde, and Air Liquide and Tier 2 suppliers such as Matheson and Messer. One or more of these suppliers may terminate their agreements with Gazprom or declare FM given the EU sanctions. Finding replacement buyers will likely hamper the ramping up of production.

Qatar Petroleum announced the Qatar 4 project at the **gasworld** summit in December 2021 in Houston, Texas. The new helium plant is planned to be onstream in 2027 with a nameplate capacity of 1.3 Bcf of helium. Qatar has

also announced plans for Qatar 5 in 2028 with a similar nameplate capacity.

Worldwide regional helium demand

In the Americas (US, Canada, Mexico, and Latin America), the US is the second-largest market for helium worldwide, after Asia, consuming about 32% of the total volume, or about 1.9 Bcf/yr, as shown in Figure 2.

End-users in the region have addressed the constant shortages in the past decade by employing conservation, substitution, recovery, and recycling. Growth over the past few years has been slow, therefore, but fastest in balloons, electronics, and leak detection. The space industry in the US, including NASA and SpaceX, saw increased helium demand driven by a record number of launches. Once the current economic conditions improve and new semiconductor fabs go into production, the US demand growth is estimated at 1.5% to 2% per year.

Other Americas is estimated at 10% of worldwide helium demand with growth similar to the US but driven more by industrialization. Helium supply to Other Americas is from the US.

Asia represents the largest market for helium, with 35% of worldwide demand. Where the US is a mature economy, many regions in Asia are undergoing infrastructure development and semiconductor expansion. China is active in the space sector as well.

In 2024, the first half-year statistics show China is the largest market in Asia (40%), followed by South Korea (24%), Taiwan (19%), Japan (12%) and India (5%). In 2023, there was a noticeable decline in Asian helium imports due to the economic conditions and semiconductor decline. The statistics from the first half of 2024 indicate that helium demand has almost recovered in Korea and Taiwan, but China remains below 2023 demand levels.

Asian demand growth going forward is estimated to be 4% to 5% CAGR coming

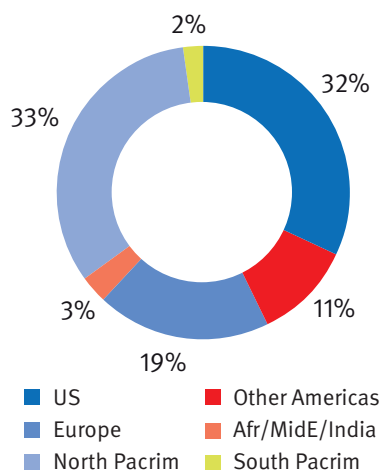
2024 Worldwide helium demand
=6.0 Bcf

Figure 2. Source: Intelligas Consulting LLC

out of the economic downturn, apart from Japan. Japan is a more mature market where demand growth has been steady for the past few years and is expected to demonstrate this pattern in the future. Helium demand in Asia is being driven by the space program, significant investments in MRI, and expanded electronics manufacturing in semiconductor and fiber optics.

Qatar and Russia are the primary suppliers of helium for China. Qatar and the US are the primary suppliers of helium in Taiwan and Korea. Russian helium makes up 2% and 5% of Taiwan and Korea helium imports, respectively. The exports from the US have been declining since Qatar 1 and 2 began operations, and now Qatar 3, and as the US BLM production has dropped off. The cost to ship from the US historically was lower due to favorable distribution economics from western US sourcing and fast container shipping from Long Beach, California. However, since the pandemic and issues with container traffic on the East and West coasts of the US, container shipping rates from the US to China increased, making Qatar helium more favorable.

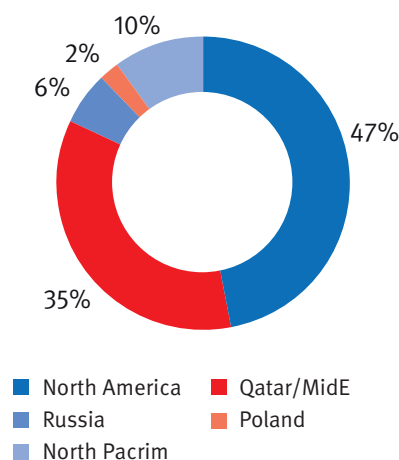
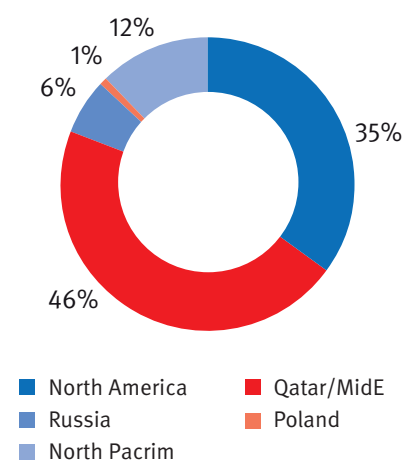
2024 Worldwide helium supply
=6.5 Bcf

Figure 3. Source: Intelligas Consulting LLC

Europe comprises about 19%, or 1.1 Bcf, of worldwide helium demand. Demand growth is expected to be 1% to 2% per year going forward, similar to the US, once the economic conditions in the region improve following the energy impacts of the Ukraine war. Helium applications are as saturated in Europe as they are in the US. However, reshoring of chip manufacturing has the potential to boost demand. Currently, Qatar, Algeria, and the US are the primary suppliers to Europe, with some internal production at the small Polish helium plant in Odolanow. Backup imports from the US are seen in the European Commission import statistics. However, Algeria via Europe also ships volumes of helium to the US.

Rest of the World (ROW) – Africa/Middle East/India together represent 3% of the global market. These regions traditionally have contributed to strong demand growth from infrastructure development and are expected to grow moderately in the next few years, as supplies allow, at about 2% to 3% per year. Supply to

2029 Worldwide helium supply
=8.7 Bcf

ROW is primarily from Qatar and Algeria, reflecting proximity.

Regional worldwide helium supply

Worldwide helium supply for 2023 is estimated at about 6.5 Bcf, as shown in Figure 3. Production is estimated to grow about 6% per year through 2029 should Gazprom continue a slow ramp up of Amur helium production. This rate of production outstrips the pace of global demand growth, continuing the current helium oversupply. Excess helium will need to be stored.

North America will shrink from 47% of supply to 35% of supply by 2029. Qatar will increase from 35% of supply to 46% of supply as Russia ramps up from 10% of supply now to 12% by 2029.

We forecast that worldwide supply will be in surplus for the foreseeable future as new large sources of helium come onstream barring any supply disruptions. The MHC court case to reach an operating agreement with the CRLP complicates this picture, as that production volume is equivalent to the surplus, leaving the industry just back in balance with demand should the MHC plant shut down for three years to build a new CHEU. ▶

► North American supply is a conundrum, therefore. The ex-Federal Helium System owned by MHC is on track to produce 500 mmcf in 2024, pending the outcome of the court case with Air Products. There are also other crude plants supplying helium to process plants on the BLM pipeline that would also be impacted. Outside of the Hugoton in the US, the largest helium production source in the US is the ExxonMobil plant in LaBarge, Wyoming, which is projected to produce 1.4 Bcf in 2024. Other smaller sources account for about an additional 600 mmcf of supply and include Doe Canyon (AP), Freeport LNG (Linde), DBK Helium, IACX, NTEC, Tumbleweed, and recently Desert Eagle Operating. Paradox Resources has filed for bankruptcy. There are Canadian sources such as North American Helium listed that contribute to this volume.

In the US and Canada there continues to be activity in non-hydrocarbon sourcing. These are smaller projects to recover helium as the primary product from small gas fields with higher concentrations of helium. Many of these companies are seeking capital and development of these sources is now in jeopardy given the oversupply situation.

Offshore supply is also hard to predict with confidence. As mentioned earlier, helium was shut down in Arzew as a result of high natural-gas demand in Europe. Algeria normally compresses NG into liquid form (LNG) at Arzew for global transport by ship and that plant has yet to begin producing helium.

Air Products first announced its Arzew expansion projects in late 2018. Sonatrach will recover helium from two existing liquefied natural gas (LNG) facilities and deliver the gas to Helios's plant in Arzew, increasing capacity for liquid helium. Air Products expected its expansion projects to produce soon. However, the expansion has yet to boost supply from Algeria.

The Renergen project to recover helium (20 mmcf) from natural gas in South

“Qatar and Russia are the primary suppliers of helium for China. Qatar and the US are the primary suppliers of helium in Taiwan and Korea”

Africa is meant to come on-stream this year. There are plans for phase II helium production to bring on 390 mmcf/yr. No on-stream time has been announced.

The Helium One project began drilling its maiden well in June 2021 to develop large scale helium production from gas in Tanzania. In July 2022 it confirmed a notable helium gas show in the Tai-1 well, which is now being sidetracked due to an unspecified setback to the program in Tanzania. Since then, no firm dates for production are set.

Future worldwide helium demand and supply

Future projections are based on modeling by Intelligas of demand and demand data and how helium markets are expected to recover.

Our assessment of the 2024 worldwide market for helium sets demand at about 6.0 Bcf while supply is 6.5 Bcf. We can expect worldwide growth of around 2% to 3% CAGR over the next five years. This will all put helium in oversupply for the foreseeable future.

The Irkutsk Oil Company supply did not come on until late 2023 (270 mmcf/yr), but it is clear Russian sanctions will impact ramping up production and shipments to Europe. The Russian Amur far east project (2.1 Bcf/yr once fully loaded) has been ramping up and has contributed to putting supply in surplus. Overall supply from Russia is estimated at about 600 mmcf in 2024. Given the sanctions, ramping up looks unlikely.

Outlook

Intelligas estimates future worldwide helium demand growth overall will be 2% to 3% over the next five years, slower in the first few years as the global economy recovers and semiconductors ramp up. Important geopolitical supply chain risks remain, including the Russian war in Ukraine, Middle East stability, and sanctions on Russia.

The world's helium demand-supply relationship should remain in surplus and foster demand growth from 2025/6 as the chip fabs ramp up and space activity increases. The Russia sanctions uncertainty points to a slower ramp up in production there. The status of the MHC injunction case against the CRLP and reaching a commercially viable solution to continue using the CHEU also contributes to uncertainty of future supply.

The intensity of helium usage will be greatest in Asia, barring any supply chain disruptions. Future demand for helium will grow the fastest in Asia, where MRI development, chip manufacturing, and space program usage will drive growth. Future demand growth in the mature economies of North America, Europe, and Japan will be slower at about 1% to 1.5% per year. However, this could be higher. The uncertainty in future economic conditions in all geographies will affect overall growth in helium demand.

Supply reliability has come at a price for end-users. But with oversupply, helium price is softening. But the helium business is never short of uncertainties and there are plenty still about. **gw**

ABOUT THE AUTHOR

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