RBC Thought Leadership

Briefing: Helium

Overview

Helium is a critical gas used across several applications, most notably within healthcare (MRIs) and electronics (semiconductors), each accounting for about 25% of global consumption. Due to the unique properties of helium, there are no viable substitutes for most applications. Liquid helium, earth's coldest liquid at -269C, is ideal for ensuring control of chip temperatures – increasingly important for AI and high-end computing.

Controversially, helium is not part of the U.S.' critical minerals list given the country is a net exporter. However, dwindling supplies, a depleted reserve, and growing demand from semiconductors has put helium back on the watch list with the U.S. likely on course to become a net importer for the first time over the last century.

1. Multiple critical uses across numerous (growing) applications

- Helium is integral to the medical industry (MRI) and essential for fiber optic cables and datacenters
- Also widely used for industrial purposes including aerospace, military applications, semiconductor manufacturing, small modular nuclear reactors, gas detection, space exploration and cryogenics
- Unique characteristics makes helium un-substitutable and problematic; helium is extremely light weight (lighter than air) making it difficult to store, cannot be synthesized and recoverable in few locations

2. Dwindling U.S. supply amidst a global shortage

- U.S., Qatar and Algeria are currently the largest producers of helium and make up an estimated 90% of productive capacity (47%, 34% and 9%, respectively)[1]
- However, U.S. production is in decline driven by historically ample helium reserves and more recently, the nature of shale production resulting in unrecovered helium[2].
- The U.S. is anticipated to be a net importer of helium over the next three to five years[3].
- Complications at Russia's Amur project (fire, sanctions) has taken 2 bcf/yr off of supply, resulting in a current global helium shortage
- Future production growth (2024-2030) is expected to come almost entirely from Qatar[4]

3. AI, datacenters (semiconductors) may be particularly exposed to supply constraints

- Semiconductor demand is amongst the fastest growing end use for helium
- Limited supplies of helium results in rationing towards 'most critical use'. Medical use is prioritized, along with other key government uses (defense, space exploration, etc.)
- Government purchasing of helium is subject to Buy American provisions, which may result in supply constraints and/or high prices[5] for commercial AI / semiconductor use (forced to buy external market)
- Major tech companies (AMZN, MSFT, GOOG) all depend on helium to maintain datacenters

Key Challenges

- Very opaque market. No publicly traded helium market or published price but rather dictated by arms-length contracts among producers/end-users – reducing investor appetite and hindering capital flows
- Oligopolistic market. Large global helium producers and industrial gas distribution companies control the market, leaving the market sensitive to supply shocks (unplanned maintenance, geopolitical events in Russia and/or Middle East)
- For Canada, quality of reserves (concentration of helium) appears inferior to the U.S., where concentrates range between 4-14% across emerging projects[6] (typical concentration is ~1%)

The Opportunity

- Helium market expected to see strong growth, driven by increasing demand from semiconductors
- Canada is 5th largest prospective resource (AB and SK), but less than 2% of annual global production[7]
- Substantial room for growth to feed the U.S. market (U.S. is largest consumer of helium) especially in light of recent strategic U.S. investments to reshore semi manufacturing (CHIPS Act, Bipartisan Infra Bill)
- Geopolitical/oligopolistic concerns likely results in diversification of U.S. imports to Canada's benefit
- Sourcing from Canada is easier/cheaper – transport must occur within ~40 days or will evaporate
- Helium already named a critical mineral in Canada

References:

1. Data sourced from U.S. Geological Survey (USGS)
2. Helium is produced in association with natural gas production. Before shale production, vertical drilling was conducive to helium recovery but shale production (through fraccing) results in unrecovered helium (it escapes).
3. Data taken from First Helium (HELI.V) November 2024 investor presentation, and aligned with expert views
4. Data taken from Helium One (GBX.L) June 2024 investor presentation, sourced from AKAP Energy
5. Helium prices typically averaged US$200/mcf between 2013-2018, US$250/mcf in 2019 and US$325/mcf in 2020 and 2021. Yet, we are seeing contractual rates much higher; NASA entered into a purchase price agreement at US$1,200/mcf in September 2022. Royal Helium entered into a term agreement with a space launch company at US$450/mcf. Spot pricing is estimated to be up to US$950/mcf.
6. Emerging projects' helium concentrations: Ramsay (AUS): 18%, Jet Stream (US): 14%; Voyager (US): 8%; Tocito Dome (US): 7%; Galactica (US): 6%; Holtbrook Basin (US): 5%; Dineh Bi Keyah (US): 3%, Itumbula (TNZ): 3%
7. Data taken from First Helium (HELI.V) November 2024 investor presentation