



## Tapping into Helium Reserves

**For Prelims:** Helium, Carbon footprint, Radioactive elements, Nuclear magnetic resonance (NMR)

**For Mains:** Significance of Helium Gas, Uses of Helium, Shortage of Helium.

### Why in News?

Researchers propose a **new model to tap into [helium](#) reserves to address shortage issues** and a recent new study suggests that reservoirs of this gas, with **no [carbon footprint](#)**, likely exist in geological formations beneath the Earth.

- The helium production process comes with a high carbon footprint as **its production is related to drilled natural gas or oil**.

### What is the Proposed Model to Tap Helium Reserve?

- The **gas can be produced and stored in crystalline basement rocks**, dense rocks that extend from the mantle to the near-surface or surface.
  - These rocks naturally contain **uranium and thorium**, both of which decay to form helium naturally.
- These rocks are **30-40 kilometre thick**. They have also existed for millions or billions of years, allowing large amounts of helium to be produced and stored.
- Also, these rocks could also be a source of hydrogen. The model showed that **energy generated from the radioactive decay of uranium and thorium** could split water to form hydrogen.

### What is the Significance of Helium Gas?

- **About:**
  - Helium is a **noble gas and has a closed-shell electronic configuration**, making it stable and unreactive.
  - It has the **lowest boiling and melting points of any element** and exists only as a gas, except under extreme conditions.
- **Discovery of Helium:**
  - Helium was **first discovered in 1868 by French astronomer Jules Janssen and English astronomer Joseph Norman Lockyer**, who observed a yellow spectral line in the light emitted by the sun during a solar eclipse.
    - Helium gets its name from the **Greek word "helios," which means [sun](#)**.
- **Sources and Extraction of Helium:**
  - Helium is the **second most abundant element in the universe**, after hydrogen. However, **it is relatively rare on Earth, with most of it being produced by the decay of [radioactive elements](#)** in the Earth's crust.
  - Natural gas is the primary source of helium on Earth.
    - Helium is extracted from natural gas using a process called **[cryogenic distillation](#)**.
- **Reserves and Production:**

- As of 2022, the reserves of helium in the **United States has the largest reserves of helium** globally followed by Algeria and Russia.
- **India's Rajmahal volcanic basin in Jharkhand** is the **storehouse of helium** trapped for billions of years.
- **Uses of Helium:**
  - **Balloons and airships** (because it is lighter than air and does not react chemically with other elements).
  - **Industrial applications**, including **welding, cooling, and as a protective gas** in the production of semiconductors and fiber optic cables.
  - In **medical applications**, such as **magnetic resonance imaging (MRI)**, as a cooling agent for superconducting magnets.
  - It is also used in [nuclear magnetic resonance \(NMR\)](#) spectroscopy and as a carrier gas in gas chromatography.
- **Shortage of Helium:**
  - There is currently a shortage of helium in the world, with **demand outstripping supply**.
  - The shortage is due to a variety of factors, including the **shutdown of some helium plants, the increasing demand for helium in emerging economies**, and the lack of new helium sources.
    - The shortage of helium has led to concerns about its use in balloons and airships, as well as its use in medical and industrial applications.

## Conclusion

The proposed model for tapping into **carbon-free helium reserves** could provide a **sustainable and cost-effective solution** to the current helium shortage, with the added benefit of hydrogen production.

[Source: DTE](#)

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