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Helium Supply Crisis — Qatar Attack Threatens India's Semiconductor Ambitions

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WHY IN NEWS

Iran's attack on Qatar's Ras Laffan LNG hub on March 2 disrupted approximately 33% of global helium supply, threatening India's semiconductor manufacturing plans and escalating costs for hospital MRI services across the country.

Why Helium Is Critical

Helium (He, atomic number 2) is the second lightest and second most abundant element in the universe but is **extremely rare on Earth** — it is extracted as a byproduct of natural gas processing and **cannot be synthesised or recycled economically**.

Helium in Semiconductor Manufacturing

APPLICATION	ROLE
Cooling	Cools semiconductor fabrication chambers and MRI superconducting magnets to near absolute zero
Carrier gas	Used in Chemical Vapour Deposition (CVD) — deposits thin films on silicon wafers
Leak detection	Helium's small atomic radius (31 pm) makes it ideal for detecting microscopic leaks in chip packaging
Lithography	Used in Extreme Ultraviolet (EUV) lithography environments to prevent contamination
Purging	Flushes oxygen and moisture from process chambers

Beyond Semiconductors

- **MRI machines:** Liquid helium cools superconducting magnets to -269°C (4.2 K)
- **Space launches:** Pressurises fuel tanks (ISRO, NASA, SpaceX)
- **Welding:** Shielding gas for arc welding of reactive metals (aluminium, titanium)
- **Deep-sea diving:** Heliox mixture (helium + oxygen) prevents nitrogen narcosis

The Supply Disruption

Qatar's Ras Laffan Industrial City is the world's largest LNG processing complex and a major helium source:

METRIC	DATA
Ras Laffan share of global helium	~33%
Attack date	March 2, 2026 (by Iran)
Global helium production (pre-attack)	~180 million cubic metres/year
Top producers	US (~40%), Qatar (~33%), Algeria (~10%), Russia, Australia

Impact on India

Semiconductor Sector

India's ambitious semiconductor programme faces potential delays:

PROJECT	LOCATION	PARTNER	STATUS
Tata Electronics Fab	Dholera, Gujarat	PSMC (Taiwan)	Under construction
Micron ATMP facility	Sanand, Gujarat	Micron Technology (US)	Nearing completion
HCL Fab	Greater Noida, UP	—	Planning stage
CG Power OSAT	Sanand, Gujarat	Renesas (Japan)	Under construction

All these require reliable helium supply for fabrication and testing processes. A sustained shortage could delay commissioning timelines.

Healthcare

- Indian hospitals report **rising MRI costs** and longer wait times
- Each MRI machine uses ~1,700 litres of liquid helium
- Helium refills cost Rs 15–25 lakh per machine; prices surging post-attack
- Some smaller diagnostic centres may shut down MRI services temporarily

India Semiconductor Mission (ISM)

Launched in 2021 under the Ministry of Electronics and Information Technology (MeitY):

FEATURE	DETAIL
Budget	Rs 76,000 crore (~$10 billion)
Objective	Build domestic semiconductor and display fabrication ecosystem
Incentives	Up to 50% capital subsidy for fab units
Design support	Up to Rs 15 crore per chip design
Key body	India Semiconductor Mission (ISM) under Digital India Corporation

UPSC RELEVANCE

Helium properties, Ras Laffan, India Semiconductor Mission budget, EUV lithography, CVD process

Technology indigenisation, supply chain vulnerability, energy-tech nexus, India's semiconductor strategy

📌 FACTS CORNER — KNOWLEDGEPEDIA

HELIUM — KEY PROPERTIES:

Atomic number: 2; symbol: He; noble gas

Boiling point: -268.93°C (4.22 K) — lowest of any element

Non-renewable: Extracted from natural gas; escapes Earth's atmosphere if released

Global production: ~180 million cubic metres/year

Top producers: US (~40%), Qatar (~33%), Algeria (~10%), Russia, Australia

INDIA SEMICONDUCTOR MISSION:

Launched: 2021 under MeitY

Budget: Rs 76,000 crore ($10 billion)

Tata-PSMC fab: Dholera, Gujarat

Micron ATMP: Sanand, Gujarat

Goal: Make India a global semiconductor hub by 2030

OTHER RELEVANT FACTS:

Ras Laffan: World's largest LNG industrial city; located in Qatar's northeastern coast

Qatar LNG capacity: ~77 million tonnes/year (world's 2nd largest after Australia)

EUV lithography: Uses 13.5 nm wavelength light; only ASML (Netherlands) makes EUV machines

CVD: Chemical Vapour Deposition — key step in chip fabrication for depositing thin films

Sources: Business Standard , The Hindu , MeitY

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