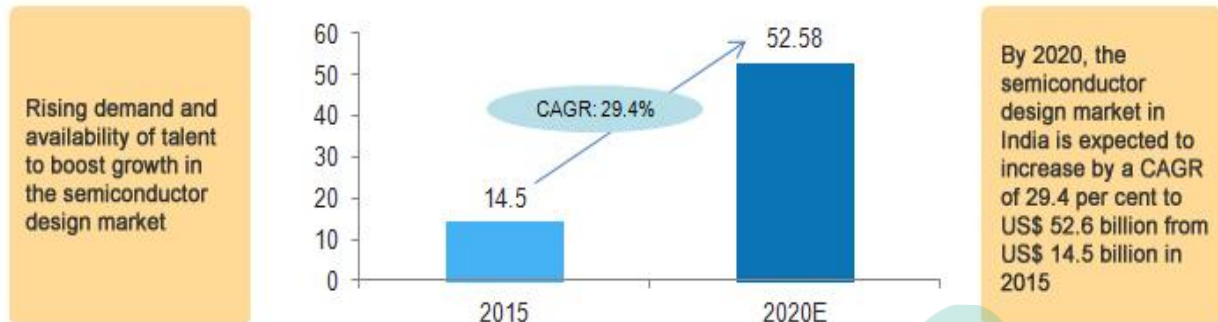


SIGNIFICANCE OF SEMICONDUCTING DEVICE IN INDIAN ECONOMY

GS Paper - 3 - Growth & Development - Indigenization of Technology - Industrial Policy

Semiconductor design market in India (US\$ billion)



Rising demand and availability of talent to boost growth in the semiconductor design market

By 2020, the semiconductor design market in India is expected to increase by a CAGR of 29.4 per cent to US\$ 52.6 billion from US\$ 14.5 billion in 2015

Source: Department of Electronics & Information Technology; Indian Semiconductor Association; E-Estimated; CAGR - Compounded Annual Growth rate

WHY IN NEWS?

Recently, **Ministry of Electronics & Information Technology** has inaugurated the first ever **Semicon India 2022 Conference** under **India Semiconductor Mission** in Bengaluru.

- Semicon India – 2022 has been organized to take forward the vision of the Prime Minister to make India a leader in the electronics manufacturing, semiconductor design, manufacturing & innovation.
- **Theme of the Conference:** Catalyzing India’s Semiconductor Ecosystem.

WHAT ARE SEMICONDUCTORS?

- Any of a class of crystalline solids intermediate in electrical conductivity between a conductor and an insulator.
- Semiconductors are employed in the manufacture of various kinds of electronic devices, including diodes, transistors, and integrated circuits. Such devices have found wide application because of their compactness, reliability, power efficiency, and low cost.
- As discrete components, they have found use in power devices, optical sensors, and light emitters, including solid-state lasers.

WHAT IS THE INDIA SEMICONDUCTOR MISSION?

- **About:**
 - The ISM was launched in 2021 with a total financial outlay of Rs76,000 crore under the aegis of the Ministry of Electronics and IT (MeitY).
 - It is part of the **comprehensive program for the development of sustainable semiconductor and display ecosystem** in the country.
 - The programme aims to provide financial support to companies investing in semiconductors, display manufacturing and design ecosystem.
 - Envisioned to be led by global experts in the Semiconductor and Display industry, ISM will serve as the nodal agency for efficient, coherent and smooth implementation of the schemes.

○ **Components:**

● **Scheme for setting up of Semiconductor Fabs in India:**

- It provides fiscal support to eligible applicants for setting up of Semiconductor Fabs which is aimed at attracting large investments for setting up **semiconductor wafer fabrication facilities** in the country.

● **Scheme for setting up of Display Fabs in India:**

- It provides fiscal support to eligible applicants for setting up of Display Fabs which is aimed at attracting large investments for **setting up TFT LCD / AMOLED based display fabrication facilities** in the country.

● **Scheme for setting up of Compound Semiconductors / Silicon Photonics / Sensors Fab and Semiconductor Assembly, Testing, Marking and Packaging (ATMP) / OSAT facilities in India:**

- The Scheme provides a **fiscal support of 30% of the Capital Expenditure to the eligible applicants for setting up** of Compound Semiconductors / Silicon Photonics (SiPh) / Sensors (including MEMS) Fab and Semiconductor ATMP / OSAT(Outsourced Semiconductor Assembly and Test) facilities in India.

● **Design Linked Incentive (DLI) Scheme:**

- It offers financial incentives, design infrastructure support across various stages of development and deployment of semiconductor design for Integrated Circuits (ICs), Chipsets, System on Chips (SoCs), Systems & IP Cores and semiconductor linked design.

○ **Vision:**

- To build a vibrant semiconductor and display design and innovation ecosystem to enable India's emergence as a global hub for electronics manufacturing and design.

○ **Significance:**

- ISM is of paramount importance to organize efforts for promoting semiconductors and display industry in a more structured, focused, and comprehensive manner.
- It will formulate a comprehensive long-term strategy for developing semiconductors & display manufacturing facilities and semiconductor design ecosystem in the country.
- It will **facilitate the adoption of trusted electronics** through secure semiconductors and display supply chains, including raw materials, specialty chemicals, gasses, and manufacturing equipment.
- It will **enable a multi-fold growth of Indian semiconductor design** industry by providing requisite support in the form of Electronic Design Automation (EDA) tools, foundry services and other suitable mechanisms for early-stage startups.
- It will **also promote and facilitate indigenous [Intellectual Property \(IP\)](#) generation** and encourage, enable and incentivize Transfer of Technologies (ToT).
- ISM will **enable collaborations and partnership programs with national and international agencies**, industries and institutions for catalyzing collaborative research, commercialization and skill development.

WHY IS THE NEED OF PROMOTING SEMICONDUCTOR INDUSTRY SO MUCH?

- Semiconductor is **the heart of modern economics**.
- In today's world of technology, **when almost everything revolves around electronic gadgets, one cannot overstate the importance** these microchips hold. Also known as Integrated Circuits (ICs), **these chips are primarily made out of silicon and germanium**.
- Without these chips, **there would be no smartphones, radios, TVs, laptops, computers or even advanced medical equipment**.
- They are used to **fabricate electronic devices**. Also, with the **emergence of e-vehicles, the demand for semiconductors is expected to see a big boom**.
- The Covid-19 pandemic has shown that the **demand for electronic gadgets will only go uphill from here**.
- In all this, **the industry seems to be an attractive place to make early inroads into**.
 - India's own consumption of semiconductors is expected to cross USD 80 billion by 2026 and to USD 110 billion by 2030.
- There are **not many countries in the world that manufacture these chips**.
 - The industry is dominated by the **United States of America, Taiwan, South Korea, Japan and the Netherlands**.
 - Germany is also an emerging producer of ICs.
- In all this, **it might actually be a good idea for India to get on the bus early**.

WHAT ARE THE INITIATIVES RELATED TO SEMICONDUCTORS?

- **Semi-conductor Laboratory (SCL):**
 - MeitY will take requisite steps for modernization and commercialization of Semi-conductor Laboratory (SCL).
- **For Compound Semiconductors:**
 - Government will support fiscal support of 30% of capital expenditure to approved Compound Semiconductors units.
- **Production Linked Incentives:**
 - Incentive support to the tune of Rs.55,392 crore (7.5 billion USD) have been approved under **Product Linked Incentive (PLI)** for Largest Scale Electronics Manufacturing, PLI for IT Hardware, SPECS Scheme and Modified **Electronics Manufacturing Clusters** (EMC 2.0) Scheme.

WAY FORWARD

- Semiconductors and displays are the foundation of modern electronics driving the next phase of digital transformation under **Industry 4.0**.
- India's PSEs such as **Bharat Electronics Ltd or Hindustan Aeronautics Ltd can be used to set up a semiconductor fab** foundry with the help of a global major.
- India needs to **drop the dream of swadeshi semiconductors**. Instead, **it should aim to become a key player in a trusted, plurilateral semiconductor ecosystem** that keeps key adversaries out.
 - Favourable trade policies are critical for building a plurilateral semiconductor ecosystem.

Source: PIB

NEW DELHI GOVERNMENT VS UNION GOVERNMENT

GS Paper - 2 - Co-operative Federalism - Constitutional Amendments

Centre vs Delhi govt again

WHAT THE BILL PROPOSES

- The term "Government" in any law by the legislative assembly will mean "Lieutenant Governor"
- The assembly shall not make rules or committees to consider day-to-day administration or conduct inquiries
- Rule or committee made before the new amendment comes into force "shall be void"
- Before taking any executive action, opinion of the L-G shall be obtained by a general or special order
- L-G shall have power to reserve for consideration any bill, and any of the matters outside the purview of the powers conferred on the legislative assembly



Bill will define responsibilities in line with the constitutional scheme of governance of national Capital, as interpreted by SC
— AMIT SHAH, UNION HOME MINISTER

DELHI GOVT'S RESERVATIONS

- Article 239AA says legislature can make laws on any matters on state and concurrent list except for issues relating to public order, police and land.
- SC's Constitution bench in 2018 recognised assembly's right, and said Union has exclusive powers only in the above 3 issues.
- SC said L-G should work with aid and advice of council of ministers
- SC order clarified that L-G has not been entrusted with any independent decision-making power
- While any matter of dispute can be sent to President, the SC said it does not mean every matter should be

After being rejected by people of Delhi, BJP seeks to drastically curtail powers of elected govt. Bill is dilution of SC judgment.
— ARVIND KEJRIWAL, CM



WHY IN NEWS?

Due to the absence of statehood for Delhi, there has been a prolonged confrontation on the relative powers between the elected government of **New Delhi and Lieutenant Governor (L-G)** (appointed by the Union Government) for the territorial administration of New Delhi.

- The dispute between the two occurred on many occasions including control over agencies, namely the Anti-Corruption Bureau, the Civil Services and the Electricity Board, etc.
- Further, [the 2021 amendment to the Government of National Capital Territory of Delhi Act, 1991](#), points out that the possibility of conflict is not over.

WHAT IS THE GOVERNANCE MODEL OF NEW DELHI?

- The status of Delhi being a Union Territory under Schedule 1 of the Constitution but christened the '**National Capital Territory**' under **Article 239AA**, engrafted by the Constitution (69th Amendment) Act.
- The 69th amendment to the Constitution of India inserted **Article 239AA**, which declared the **Union Territory of Delhi to be administered by a L-G who works on aid and advice of the elected legislative assembly.**

- However, the 'aid and advice' clause pertains only to matters on which the elected Assembly has powers under the [State and Concurrent Lists](#) With the **exception of public order, police, and land.**
- Further, the Article 239AA also notes that L-G has to **either act on the aid and advice of the Council of Ministers, or he is bound to implement the decision taken by the President** on a reference being made by him.
- Also, Article 239AA, empowers the L-G to refer a **difference of opinion on 'any matter' with the Council of Ministers to the President.**
- Thus, this dual control between L-G and the elected government leads to a **power tussle.**

WHAT IS THE JUDICIARY'S OPINION ON THIS MATTER?

- The **Delhi High Court decided in favour of the Central Government** relying on the status of Delhi as a Union Territory.
- However, the Supreme Court **referred the matter to a Constitution Bench** to decide on the substantial questions of law pertaining to the powers of the elected **government of Delhi vis-a-vis the Lieutenant Governor (L-G).**
- The case referred to the Constitutional bench is known as ***NCT vs UOI case, 2018***. The five-judge Bench opened a new jurisprudential chapter in the Administration of NCT.
 - **Purposive Construction:** The court invoked the **rule of purposive construction to say that the objectives behind the Constitution (69th Amendment) Act** shall guide the interpretation of Article 239AA.
 - This means the **principles of federalism and democracy into Article 239AA**, thereby finding a parliamentary intent to accord a sui generis (of its own kind) status in distinction from other Union Territories.
 - **L-G to Act on Aid and Advice:** The Court declared that the L-G is bound by the **"aid and advice" of the Council of Ministers**, noting that the Delhi Assembly also has the power to make laws over all subjects that figure in the Concurrent List, and all, **except three excluded subjects, in the State List.**
 - The L-G ought to act on the "aid and advice" of the Council of Ministers, except when he refers a matter to the President for a final decision.
 - **Any Matter is Not Every Matter:** Regarding the L-G's power to refer to the President any matter on which there is a difference of opinion between L-G and the Council of Ministers, the Supreme Court ruled that **"any matter" cannot be construed to mean "every matter"**, and such a reference shall arise only in exceptional circumstances.
 - **L-G as facilitator:** L-G shall act as a **facilitator rather than anointing himself as an adversary** to the elected Council of Ministers.
 - **New Delhi Cannot be Given Statehood:** At the same time, the Court ruled that the National Capital Territory of Delhi **cannot be granted the status of a State under the constitutional scheme.**

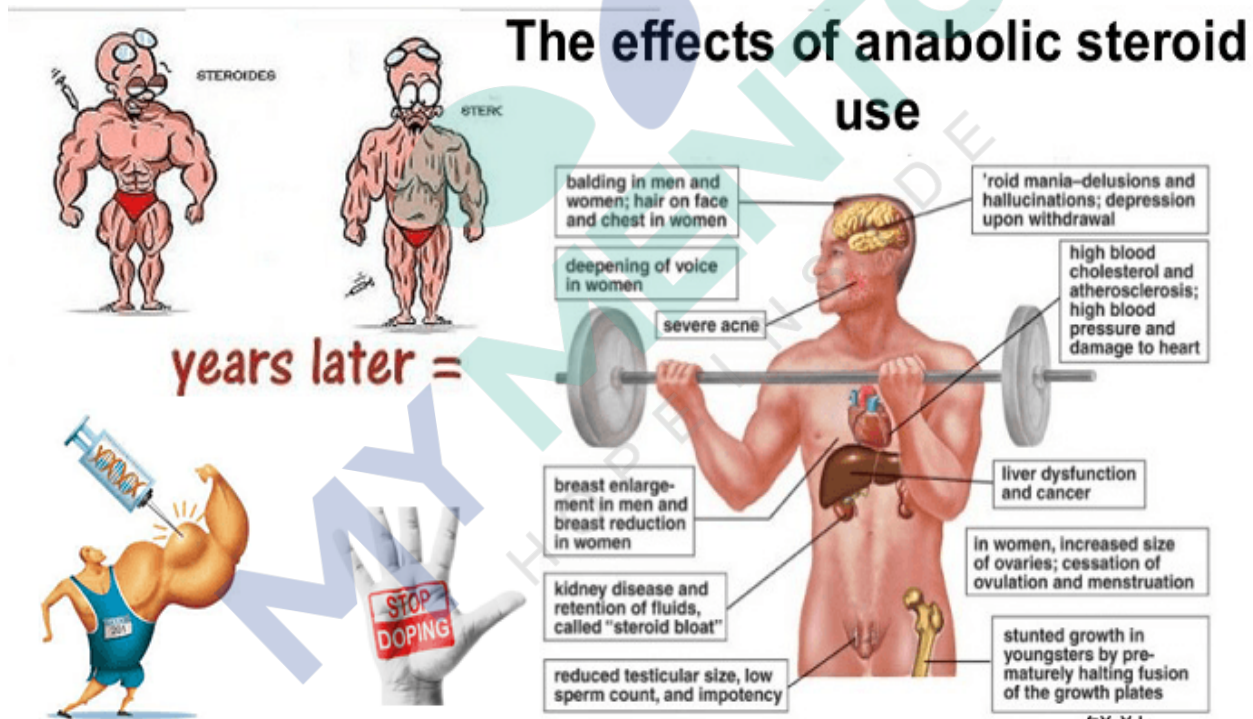
WAY FORWARD

- **Working Through Constitutional Trust:** The apex court had rightly concluded that the scheme set out in the Constitution and the Government of National Capital Territory of Delhi Act, 1991 envisages a collaborative structure that can be worked only through constitutional trust.
- **Ensuring Principle of Subsidiarity:** Subsidiarity — the foundational principle of fiscal federalism — necessitates empowered sub-national governments.
 - Therefore, the central government should move towards allocating greater powers to city governments.
 - In this context, India should emulate several large megapolis around the globe, from Jakarta and Seoul to London and Paris, which have had strong sub-national governments.

Source: TH

ANABOLIC STEROIDS

GS Paper - 2 - Health - Scientific Innovations & Discoveries - GS Paper - 3



WHY IN NEWS?

Two of India's track-and-field Tokyo Olympians failed dope tests for using banned anabolic steroids.

WHAT ARE ANABOLIC STEROIDS?

- **About:**
 - Anabolic steroids are **usually used by bodybuilders**.
 - They are **essentially lab-made versions of the male hormone testosterone** and have a **similar effect of increasing muscle mass** as the natural hormone does.
 - It also **increases male characteristics in a person**, such as facial hair growth and a deeper voice.

○ **Different from Corticosteroids:**

- Anabolic steroids, however, **very different from the steroids that are prescribed by doctors** for inflammations, several autoimmune diseases, or to suppress the body's immune system during a **Covid-19 infection**.
- These medicines/steroids are called **corticosteroids and are lab-made molecules that mimic the action of the hormone called cortisol** that controls the body's stress response, metabolism, and inflammation.
- Unlike corticosteroids, anabolic steroids have limited medical use.

WHAT ARE THEY PRESCRIBED FOR?

- The anabolic steroids have a **very limited medical role and are mainly used by doctors to help patients gain weight after a severe illness or injury**.
- It could **also be prescribed in small doses to the elderly** to build muscle mass and in some cases also helps to treat anemia.
- Doctors may also prescribe the medicine to men who have **low levels of natural testosterone**.
- Some doctors use **it for the treatment of osteoarthritis** (a condition where bones wear down over time).

HOW ARE ANABOLIC STEROIDS MISUSED?

- The anabolic steroids **are misused mainly by those who want to bulk up as it helps increase one's muscle mass**.
- A 2019 study from Bhubaneswar of anabolic steroid users showed that only one of the 74 participants was a professional bodybuilder, with 18.9 % being students, indicating that **it is used by people other than professional athletes**.
- Although no concrete estimate exists of the number of people using the drug across India, a **2018 study from Jammu and Kashmir found that 7.1 % of athletes used it**.

WHAT ARE THE HEALTH IMPACTS?

- Use of anabolic steroids in **the short-term can cause acne and hairfall**.
- Extended misuse of the **substance can also lead to gynaecomastia** (growth of breasts in men) and **erectile dysfunction**.
- In women, **it can lead to growth of facial hair**. It may also cause extreme anger, paranoia, and impaired judgment.

Source: IE

ANANG TAL LAKE IN SOUTH DELHI

GS Paper - 3 - GS Paper - 1 - Medieval Indian History



WHY IN NEWS?

Recently, the Ministry of Culture has ordered the restoration of Historic Anang Tal lake in South Delhi. **National Monuments Authority (NMA)** and **Archaeological Survey of India (ASI)** have asked officials to expedite conservation work so the site could be declared a **National Monument**.

WHAT ARE THE KEY POINTS?

- The lake is situated in Mehrauli, Delhi and is claimed to be created by **Tomar King, Anangpal II**, in 1,060 AD.
 - He is known to have established and populated Delhi in the 11th century.
- The millennium old Anang Tal signifies the beginning of Delhi.
- Anang Tal **has a strong Rajasthan connection** as **Maharaja Anangpal is known as nana (maternal grandfather) of Prithviraj Chauhan** whose fort Rai Pithora is on the list of the ASI.

WHO WAS ANANGPAL II?

- Anangpal II, popularly known as **Anangpal Tomar, belonged to the Tomar dynasty**.
- He was the founder of Dhillika Puri, which eventually became Delhi.
 - Evidence about the early history of Delhi is inscribed on the iron pillar of Masjid Quwaatul Islam, adjacent to Qutub Minar.

- Multiple inscriptions and coins suggest **Anangpal Tomar was the ruler of present-day Delhi and Haryana** in between the **8th-12th centuries**.
 - He had built the city from ruins and under his supervision, Anang Tal Baoli and Lal Kot were constructed.
- Anangpal Tomar II was **succeeded by his grandson Prithviraj Chauhan**.
 - Delhi Sultanate was established in 1192 after Prithviraj Chauhan's defeat in the Battle of Tarain (present-day Haryana) by the Ghurid forces.

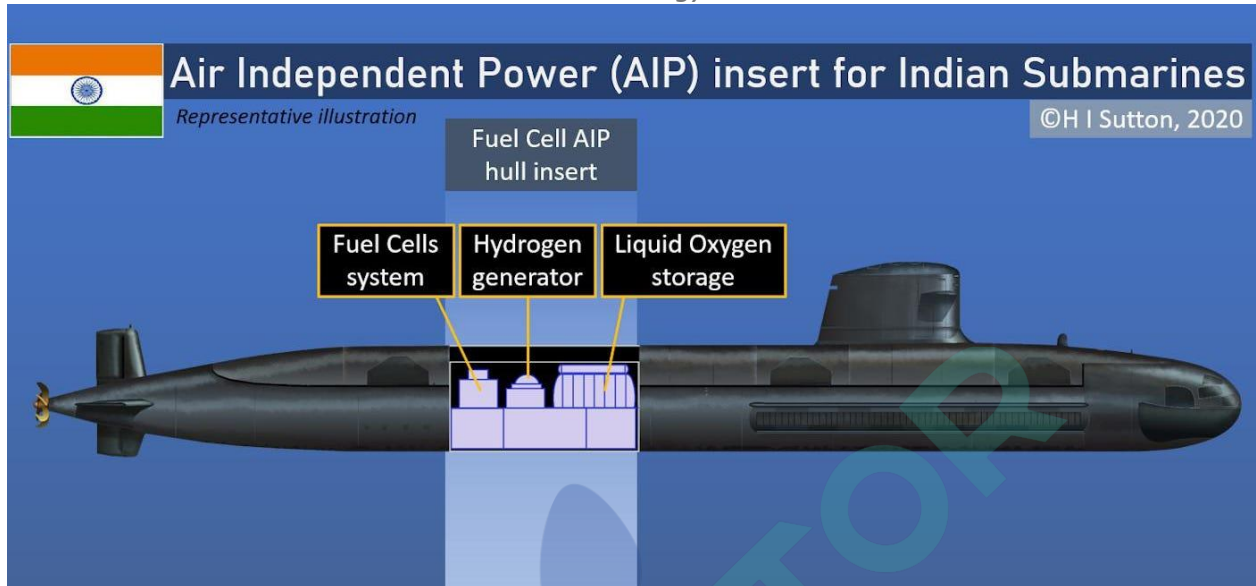
WHAT ARE THE KEY POINTS ABOUT THE TOMAR DYNASTY?

- Tomara dynasty is **one of the minor early medieval ruling houses** of northern India.
- Puranic evidence (writings of the Puranas) gives its early location in the Himalayan region. According to bardic tradition, **the dynasty was one of the 36 Rajput tribes**.
- The history of the family spans the **period between the reign of Anangpal, who founded the city of Delhi in the 11th century CE**, and the incorporation of Delhi within the Chauhan (Chahamana) kingdom in 1164.
- Although Delhi subsequently became decisively a part of the Chauhan kingdom, numismatic and comparatively late literary evidence indicates that **Tomara kings such as Anangpal and Madanpal continued to rule as feudatories**, presumably until the final conquest of Delhi by the Muslims in 1192–93.

[Source: IE](#)

AIP (Air-Independent Propulsion) Technology

GS Paper - 3 - Indigenization of Technology - GS Paper - 2 - Government Policies & Interventions - Defence Technology



WHY IN NEWS?

Recently, France’s Naval Group declined the bid for the **P-75I Project**, citing it does not use **AIP (Air-Independent Propulsion) Technology** yet.

- Around 10 countries have developed or are close to building AIP technology, and almost 20 nations have AIP submarines.

WHAT IS THE P-75I PROJECT?

- In June 1999, the Cabinet Committee on Security approved a 30-year plan for the Navy to indigenously build and induct 24 submarines by 2030.
- In the first phase, two lines of production were to be established — the first, P-75; the second, P-75I. Each line was to produce six submarines.
 - While the six P-75 submarines are diesel-electric, they can be fitted with AIP technology later in their lives.
- This P-75I project envisages indigenous construction of submarines equipped with the state-of-the-art Air Independent Propulsion system at an estimated cost of Rs. 43,000 crore.

WHAT IS AIP?

- About:
 - AIP is a technology for **conventional non-nuclear submarines**.
 - Submarines are essentially of **two types: conventional and nuclear**.
 - The **conventional submarines use diesel-electric engines**, which require them to surface almost daily to get atmospheric oxygen for fuel combustion.
 - If fitted with an AIP system, the **submarine will need to take in oxygen only once** a week.

- The indigenously developed AIP, which is one of the key missions of the Naval Materials Research Laboratory (NMRL - DRDO), is considered one of the ambitious projects of the DRDO (Defence Research and Development Organisation) for the Navy.
- **Fuel Cell Based AIP system:**
 - In a **fuel cell** based AIP, an electrolytic fuel cell releases energy by combining hydrogen and oxygen, with only water as the waste product ensuring less marine pollution.
 - The cells are highly efficient, and do not have moving parts, thus ensuring that the submarine has a low acoustic emission of sound.

WHAT ARE THE ADVANTAGES AND DISADVANTAGES OF AIP?

- **Advantages:**
 - AIP has a **force multiplier effect on lethality of a diesel electric submarine** as it enhances the submerged endurance of the boat several fold.
 - Fuel cell-based **AIP has merits in performance** compared to other technologies.
 - AIP technology allows a conventional submarine to remain submerged for much longer than ordinary diesel-electric submarines.
 - All conventional submarines have to surface to run their generators that recharge the batteries that allow the boat to function under water.
 - However, the more frequently a submarine surfaces, the higher the chances of it being detected.
 - AIP allows a submarine to remain submerged for more than a fortnight, compared to two to three days for diesel-electric boats.
- **Disadvantages:**
 - Installing AIP **increases the length and weight of the boats**, requires pressurised liquid oxygen (LOX) storage on-board and supply for all three technologies.
 - MESMA (Autonomous Submarine Energy Module) and the Stirling engine have some acoustic noise from moving parts; and the **submarine's unit cost increases by around 10%**.

WHAT SUBMARINES DOES INDIA HAVE NOW?

- India has **16 conventional diesel-electric submarines, which are classified as SSKs**. After the last two Kalvari Class subs are commissioned under P-75, **this number will go up to 18**.
- India also has **two nuclear ballistic submarines, classified SSBN (Submersible Ship Ballistic Missile Nuclear)**.
- By the time P-75I is completed under the 30-year project, **India is projected to have six diesel-electric, six AIP-powered, and six nuclear attack submarines**.