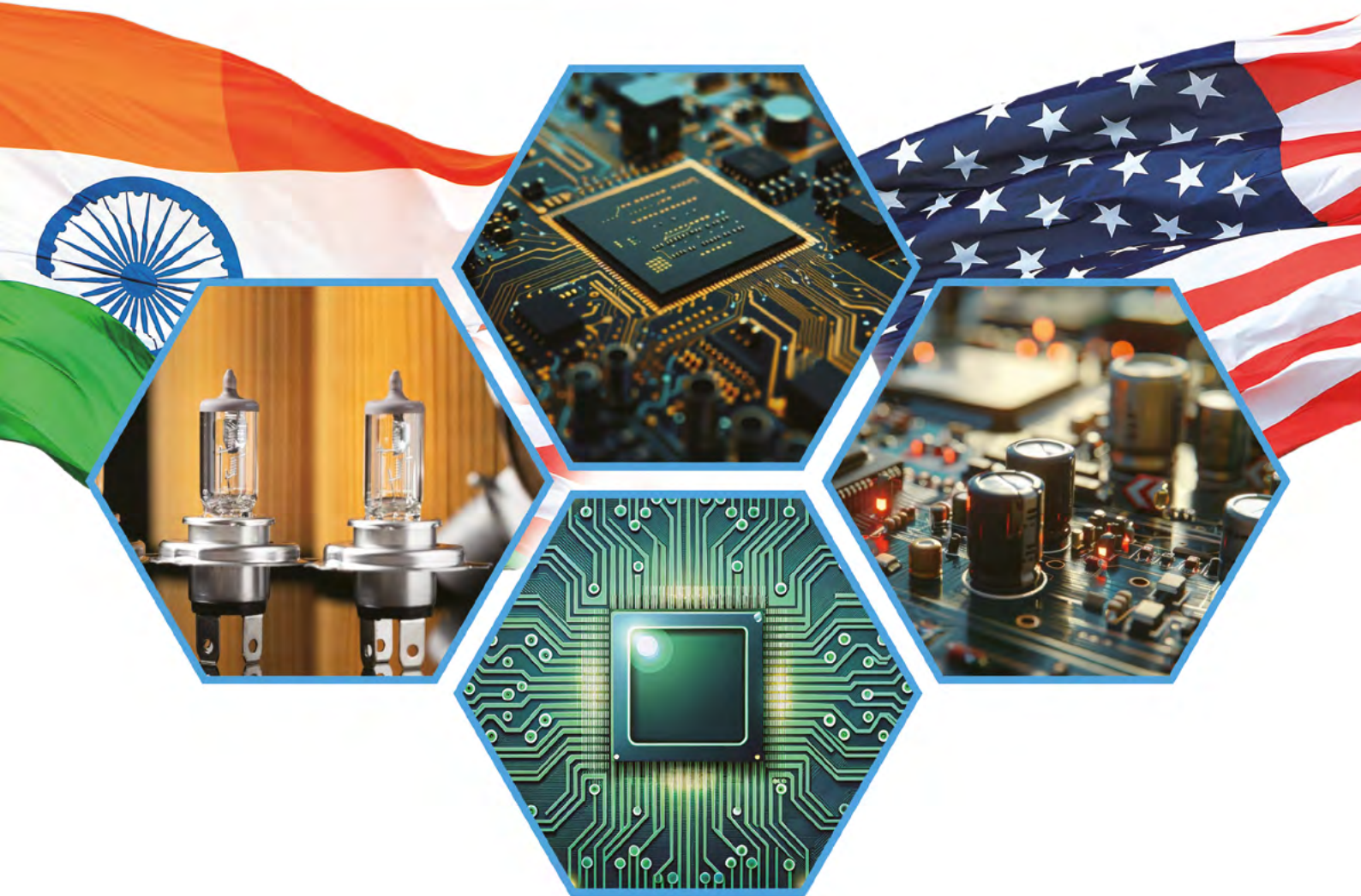




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WHITEPAPER ON **SEMICONDUCTOR ROUNDTABLE SERIES 2025:** **FORGING INDIA-U.S. INNOVATION** **MAHARASHTRA**

KNOWLEDGE PARTNER



Shardul Amarchand Mangaldas

A DECADE YOUNG, A CENTURY STRONG

Synopsis Of Semiconductor Roundtable Series 2025: Forging India-U.S. Innovation

Fifth Roundtable: Maharashtra



A semiconductor is a material that is between a conductor and an insulator with an ability to conduct electrical current. Semiconductors serve as the foundation of modern technology and its importance has expanded exponentially in the recent years considering the advancements in cloud computing, artificial intelligence, smart devices and 5G deployment.

With the rising consumption of electronic devices and the growing demand for smart technologies - many of which rely on semiconductors - there is a pressing need for India to establish its domestic semiconductor manufacturing capabilities. This is further amplified by the desire for India to produce these devices locally, reducing dependency on foreign supply chains and bolstering national security. The strategic focus aligns with global trends towards digital transformation and connectivity, positioning India to become a significant player in the semiconductor industry and fostering innovation, employment and economic growth.

To catalyse this transformation, the Government of India has established the India Semiconductor Mission (“ISM”) to encourage manufacturers to set up their semiconductor facilities in India and to enable India to act as a global hub for semiconductor manufacturing and attract both domestic and international investments. By 2030, India’s market for semiconductors is expected to grow to \$110 Billion capturing 10% of the global semiconductor market.

The Government of India has also launched several schemes and guidelines under the ISM, including, the Modified Scheme for setting-up of Semiconductor Fabs in India, Modified Scheme for setting-up of Display Fabs in India, Modified Scheme for Compound Semiconductor and Design Linked Incentive Scheme. The main regulatory authority governing the Semiconductor industry in India is the Ministry of Electronics and Information Technology (“MeitY”).

Recently, the Government of India through the Union Budget 2025 increased the total allocation for MeitY by 48% with a focus on giving a boost to 2 (two) sectors - electronics manufacturing and manufacturing of semiconductors. The allocation for semiconductor projects has been more than doubled to around Rs 2,500 Crores for 2025-26 from Rs 1,200 Crores. The Government of India has received a total investment commitment of Rs 1.52 Lakh Crores for various semiconductor projects.

Synopsis of the Deliberations on Semiconductors

A series of Roundtable deliberations on ‘Semiconductors: Forging India-U.S. Innovation’ were held in the State of Maharashtra with one Roundtable conference in Mumbai, Nagpur and Pune each, by the U.S. Consulate and the Indo-American Chamber of Commerce with its Knowledge Partner, Shardul Amarchand Mangaldas & Co., to discuss the issues, trends, challenges, recommendations and the policy and incentive framework required for nurturing and growth of the Semiconductor industry in Maharashtra. Thought Leaders and various stakeholders, including key Government of Maharashtra and Maharashtra Industrial Development Corporation (MIDC) representatives, academicians and semiconductor industry representatives, came together to have a focussed discussion.

Learnings and Proposed Action Points to Address the Issues, Trends, Challenges and Recommendations for the Semiconductor Industry in Maharashtra

Following are some of the important learnings and action points proposed at the roundtable deliberations to address the issues, trends, challenges and recommendations for the Semiconductor industry in Maharashtra -

- **Awareness Building**

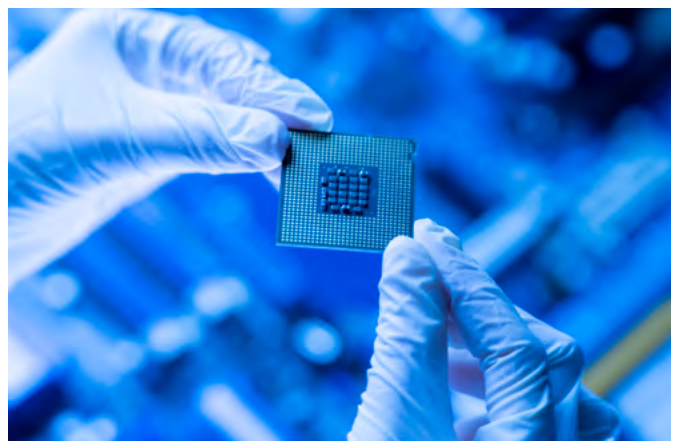
Semiconductors require stringent standards for all activities within the fabrication, designing and supply chain processes and is a focussed and disciplined industry, requiring hard and intense labour with protective gear and equipment. Given this requirement, the workforce requires maturity, in-depth knowledge, high degree of discipline and precision.

Proposed Action Points -

- It is important to create awareness about semiconductors, its significance, applications, emerging trends and technologies, and the growing need for semiconductor fabs and chip manufacturing processes in the current ecosystem.
- Keeping in mind the discipline, the requirement of hard and intense labour with protective gear and equipment, it is important to foster and nurture the minds of the students in school itself, regarding the various opportunities and the economic and financial prospects, that the semiconductor industry actually has to offer vis-à-vis other IT and electronics enabled industry.
- The State Government should also consider employing semiconductor industry veterans as a faculty to conduct knowledge sharing sessions after working hours and on weekends.
- Considering the growing demand of semiconductor fabs and chip manufacturing hubs, the State Government can identify specific industries and their immediate, short-term and long-term needs and tailor-make a curriculum for students and educational institutions to get a theoretical and practical understanding of the intricacies involved in the manufacturing process. In turn, the industry can offer internships and employment opportunities to students, as a part of their placement and recruitment process with a view to encourage more students to engage with the semiconductor industry.
- All entrepreneurial start-ups, incubators and accelerators in the semiconductor industry should also form a part of universities and educational institutions. This shall enable start-ups to also draw resources and infrastructure from the universities in a cost-effective manner. In turn, universities would also gain hands-on personal experiences.

- **Skilling**

The Semiconductor industry is an extremely specialised industry, requiring stringent standards for all activities within the manufacturing and supply chain process. Given this requirement, even the workforce requires specialised training with high-end laboratories and simulation hubs. It is critical to have a skilled workforce who possess the technical expertise and competencies with respect to semiconductor fabs and chip manufacturing processes.



Proposed Action Points -

- The Government of Maharashtra has developed dedicated Skilling Universities and Skill Development Centres to create the required skilled workforce. However, there is still a growing need for public-private partnerships to set-up more Skilling Universities, Skill Development Centres and Centres of Excellence across India, especially in Tier-II and Tier-III cities with a view to multiply the number of skilled workforces in the near future for the rapidly expanding Indian semiconductor industry.
- While the existing universities in India have the required capabilities and technical competencies for skilling of the new workforce to develop new innovative technologies, know-how and intellectual property (IP) having huge economic value, it is imperative that industries having the business acumen, resources and investing capacity, partner with such universities and skilled talent in a cohesive and collaborative manner, whereby the newly developed technologies can be scaled, co-owned and commercially exploited for the benefit of the entire semiconductor industry.
- Considering the above, the Government of Maharashtra must curate a comprehensive program including a 'Train the Trainers Program', which will facilitate existing universities in India to partner with foreign universities and enable them to conduct mentorship, knowledge exchange and training programs for interested stakeholders and students, to raise awareness and to enhance their overall technical abilities in the semiconductor technologies and developments around the world.

- **Investment**

Setting-up semiconductor fabrication plants and chip manufacturing facilities is a capital-intensive endeavour, requiring significant financial investment, specialised raw materials, advanced high-tech equipment, sterile controlled environment, continuous power supply and vast quantities of clean water. Given these complex demands, creating a conducive investment ecosystem is vital for the growth and sustainability of the semiconductor sector.

Proposed Action Points -

- The Government of Maharashtra should create a robust ecosystem incentivising banks, financial institutions, NBFCs, private equity funds and venture capitalists who are focussed on funding and investing in semiconductor industries, technologies, research and development laboratories, Skill Development Centres and Centres of Excellence.
- Further, the Government of Maharashtra can also provide financing and lending facilities at concessional rates for semiconductor industry members or educational institutions dedicated to the semiconductor sector. These financing options should be tied to specific performance benchmarks, industry standards and achievement of identified milestones to ensure accountability and measurable progress.
- It is also important to create a separate Advisory Board comprising of Government representatives, technical experts, investors and interested stakeholders which will focus and facilitate the necessary support, nurturing and growth of the start-ups in the semiconductor industry.
- To create a master plan for the semiconductor ecosystem ranging from the basic to high-tech /sophisticated



semiconductor fabrication, products and components design and target services that are tied to the end use and customers which are in India and outside India.

• Incentives

Currently, the Government of Maharashtra is offering various incentives, including 30% subsidies for setting-up semiconductor fabs and chip manufacturing facilities. 50% product-linked incentives (PLI) are also being made available in addition to the above along with state goods and service tax (SGST) benefits.

However, as the industry continues to evolve, it is essential to extend incentives across the entire semiconductor value chain, including research, development, education and support services, to foster comprehensive growth and innovation.

Proposed Action Points -

- There is a growing requirement to incentivise the entire semiconductor supply-chain. In this regard, the Government of Maharashtra can formulate a comprehensive policy to disburse benefits and provide targeted incentives and subsidies to educational institutions and entities connected with the semiconductor industry. This would encourage the growth of critical areas such as research and development, technology development and skill-building.
- Further, the Government of Maharashtra should also provide targeted incentives, subsidies / rebates for entities across sectors, who provide mature high-end educational institutions with incentives to share knowledge, technology know-how, teacher's training programs and provide mentor-mentee programs to educational institutes who do not have the necessary facilities, infrastructure and training programs.
- Keeping in mind the existing landscape of Maharashtra, the State Government should develop a blueprint which is customised to the State's available resources, vigilant native inhabitants and abundant development potential that is still under-utilized till date. Such blueprint must be created with a vision to establish an economically and environmentally sustainable model of doing business in Maharashtra.

• Accreditation

- There is a need to bridge the gap between the current academic curriculum and practical requirements, competencies and technical knowledge required in the semiconductor industry.
- While there may be a few programs / initiatives / training sessions currently being undertaken, they seem to be microscopic in respect to the overall training requirements of the semiconductor industry.

Proposed Action Points -

- Considering the above, there is a need for specialised courses and targeted curriculum which addresses the specialisation required in Semiconductors applicable to different industrial segments.
- It is also critical to ensure that the same are accredited by the Government of Maharashtra based on internationally recognised standards for global recognition and awareness.
- There is an urgent need for strategic and collaborative partnerships that can be undertaken between research institutes, incubators, accelerators and the industry with a functional objective that is practical, economically viable and scalable. The research, procedure, processes and initiatives will need to be



validated by an industry specialising in the relevant area(s) and the development of the semiconductor industry should provide for pooling of resources and infrastructure, that can support the clusters of the semiconductor industry.

• **Supply Chain and Logistics**

Semiconductor fabrication and chip manufacturing processes have specific requirements such as a need for cold-chain and temperature and humidity-controlled storage facilities. Controlling temperature and humidity is crucial to the longevity and performance of semiconductors. Semiconductors are extremely sensitive and operations through a semiconductor can be impacted by temperature fluctuations or contaminants such as dust particles or dirt.

Proposed Action Points -

- Given the technical requirements of the materials required in the semiconductor fabrication and chip manufacturing processes and keeping in mind the emerging technologies and specific requirements such as cold-chain and humidity temperature-controlled storages, it is critical to have a continuous supply and logistics ecosystem.
- Long lead times for new fabrication facilities and capital-incentive investments can create a gap between supply and demand. Logistical challenges like transportation bottlenecks, port congestion and increased shipping costs can delay the delivery of spare parts, components and finished goods. Accordingly, it is important to create a robust supply and logistics ecosystem for the semiconductor industry, keeping in mind the requirements, the geography and topography of specific regions in India.
- The State Government and local authorities along with the support of the MIDC, must encourage development of more clusters and common ecosystem in Pune for the semiconductor industry and supply-chain, through establishment of a regulatory framework and providing the necessary infrastructure. Industries may be provided with subsidies and concessional lending (by offering lower interest rates and longer repayment periods) and other tailor-made incentives based on the activities undertaken by the concerned organisation. Such clusters will assist in facilitating the implementation of best practices and provide interested stakeholders with access to information and economic support. The Government of Maharashtra should also consider developing comprehensive contingency plans to mitigate the impact of potential supply chain and logistics disruptions.
- Since India is still in the growing stages in the semiconductor industry, it is also important to have bilateral agreements with nations to ensure continuous supply of certain fragments of the semiconductors, which are required in the semiconductor fabrication and chip manufacturing processes. Such partnerships would also support the stability and scalability of India's emerging semiconductor supply chain.

• **Technology**

Presently, the Indian semiconductor industry is at nascent stages. Technology with respect to semiconductor fabrication and chip manufacturing processes is available on license basis but are prohibitively expensive. Additionally, indigenous technology with respect to semiconductors are facing difficulties in obtaining registrations as an intellectual property and consequent global recognitions.

Proposed Action Points -

- The Government of Maharashtra should enter into bilateral arrangements with countries which have advanced semiconductor capabilities to create synergistic alliances for setting-up of technology and know-how, sharing, licensing and transfer arrangements that are negotiated on a holistic basis for the benefit of young start-ups, MSMEs to enable a shorter gestation period and lead time.
- It is critical to fast-track the overall process for obtaining Intellectual Property rights (IP) in respect to semiconductor fabrication and chip manufacturing processes.

- Further, it is important for the Government of India to provide access to a repository containing the list of entities specifying the available technologies, which can be availed on a licensing basis.
- The Government of Maharashtra should consider entering into public-private partnerships with industries owning the intellectual property, with a view to commercialise the use of such technologies and the research and development (R &D) initiatives on a wide scale.
- Landmark innovations/solutions, research papers, services and learnings must be documented properly to create a Knowledge Bank, which must be made available to everyone by hosting them on various government portals.
- **Appointment of a Core Steering Committee**
 - The Government of Maharashtra should appoint a Steering Committee comprising of the necessary experts in regard to the semiconductor industry including technocrats, experts in the field of infrastructure and planning, policy, financial, legal, accounting and education.
 - The Core Steering Committee shall create a blueprint of the entire advancement in making the State of Maharashtra a viable and thriving destination for semiconductor industry and its allied chain of services.
 - The Core Steering Committee shall prepare a priority based blueprint with immediate, short-term, mid-term and long-term vision with the entire chain of stakeholders, processes and requirements.
 - Based on the blueprint, the Core Steering Committee shall create sub-committees which shall concentrate on the requirements of the specific aspect of development (immediate, short-term, mid-term) and focus on the necessary aspects to ensure each of the areas of development receive focused attention on resources, policy(s), infrastructure, industrial and export-oriented hubs, technical, financial, legal, accounting and supply chain support.
 - The Core Steering Committee shall be responsible for enabling innovative solutions as may be necessary to bring the necessary support, resources and technological know-how for a domain, region and/or a specific project(s) through Public Institutions and Private Partnerships.

The Government of Maharashtra has a great opportunity to make Maharashtra the ‘Go-To’ State for an end-to-end high-tech ecosystem. The focus of this objective should be to create in a step-by-step manner, the capability, infrastructure and the skill-sets that are necessary to fulfill and deliver the promise of excellence.

While the high-tech semiconductor industry requires extremely heightened capabilities and technical know-how, there is much that the State of Maharashtra can offer for relatively simpler yet significant projects in the value chain of the semiconductor ecosystem.

By doing so, the State of Maharashtra shall establish itself as a reliable partner to the industries that require varied semiconductor applications and gradually evolve to take on more complex projects in both product development, process and service delivery.

The key takeaways from the interactions with various stakeholders in Maharashtra have been: (i) the urgent need for strategic and collaborative partnerships that are undertaken between research institutes, incubators, accelerators and the industry with a functional objective that is practical, economically viable and scalable, with a view to enhance their overall technical abilities in the semiconductor technologies, the emerging trends and developments in the Semiconductor industry around the world; and (ii) to create awareness in schools, colleges and universities across India about semiconductors, its significance, applications, emerging trends, and the growing need for semiconductor fabs and chip manufacturing processes in the current ecosystem and the urgent requirement to introduce semiconductors in the school curriculum itself, considering the growing demand for semiconductor fabs and chip manufacturing hubs in India.

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