

INDIA'S SEMICONDUCTOR MISSION MIGHT NEED A COMPASS

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3D rendering of cyberpunk AI. Circuit board. Technology background. Central Computer Processors CPU and GPU concept. Motherboard digital chip. Tech science background. | Photo Credit: Getty Images/iStockphoto

The United States Department of Commerce and its Indian counterpart have recently concluded a memorandum of understanding in March 2023 to ensure that subsidies by each country do not come in the way of India's semiconductor dreams, as espoused by the much publicised semiconductor policy launched in December 2021. The U.S. Department of State has also engaged with India to beef up sector-specific export control laws in the semiconductor space — which India has agreed to, as in recent media reports.

While these seem pre-conditions in a long dance orchestrated by bureaucrats on both sides, will they lead to a global major such as Intel to invest in India in order to set up a greenfield 300mm wafer fabrication plant costing over \$10 billion? The premise of this question is based on the ongoing two-year dance between Intel and Indian government ministers who were seen courting the Intel CEO at Davos, and New Delhi hoping that Intel Foundry Services (a business unit within Intel formed after Intel's takeover of the U.S.-Israel based Tower Jazz Speciality Foundry) will build a greenfield plant, most likely in Dholera, Gujarat.

The facts on the ground do not support such an eventuality in a world where Intel remains preoccupied with setting up fabs inside the U.S. So where does Indian semiconductor policy need to go from here?

The Semi-Conductor Laboratory (SCL) was set up in Mohali in 1983 by the then central government, with the vision of creating an electronics ecosystem in an era when Keltron, Uptron and Webel were fledgling entities in a pre-liberalised India aimed at consumer electronics. However, shocks, of the opening up of markets for consumer goods in 1991 and a fire that broke out in 1989 at the SCL, dashed these hopes. Some funding from the central exchequer to revive the plant to a 180 nm node pilot line to meet the strategic needs of the country did come by but the facility has, by and large, remained an unfulfilled dream in its mission of creating a domestic semiconductor ecosystem. SCL Mohali can be viewed as a technology stack similar to others such as Aadhaar, Aarogya Setu and the Unified Payments Interface (UPI) acting as a force multiplier effect, encouraging many integrated circuit design startups in India to consider designing for India.

The institutional framework for such a shift in focus already exists with the transfer of SCL back to the Ministry of Electronics and Information Technology (MeITy) after a 15-year stint as a laboratory within the Department of Space, as part of the new semiconductor policy announcement in December 2021. However, a year into such an announcement, no joint venture partner has been found, keeping SCL employees in limbo. During this period, the focus at MeITy seems aimed at attracting Intel into India to set up a fab. This can be inferred from the wording of the request for proposals and signalling from MeITy Ministers. However, Intel primarily operates at <22nm node and 300mm, requiring over \$10 billion in upgrade cost to the SCL.

An alternate approach could be to leverage human and capital assets at the SCL to build on what exists in a targeted manner, to jumpstart the semiconductor mission by taking advantage of recent technological breakthroughs in a class of semiconductors that do not need advanced lithography equipment. The “More than Moore” segment of >180 nm node involving mixed signal analog (BCD and SiGe), wide bandgap (GaN, GaAs, Silicon Carbide) for RF and power markets leveraging existing lithography capability already in place at the SCL. In this scenario, an investment of \$50-\$100 million may result in the development of Indian solutions for automotive electronics (EV traction inverters/on board chargers), PV-Inverters, 5G infra-power amplifiers, railway electronics (traction inverters), creating the Indian equivalent of Bosch, Siemens, ABB, Mitsubishi Electric, Thales and ELTA.

However, the upgrade has to be backed by subsidies aimed at fabless design houses with proven design (sales of >\$100 million per year) willing to fabricate at the SCL in the 180nm+ node (and possibly transfer process intellectual patents if they have any). The subsidies have to be aimed at global design companies with products aimed at India-specific markets such as motor drives for BLDC fans or e-bike chargers. Unfortunately, the existing DLI/PLI schemes provide no such incentives to proven global fabless design companies.

The recent efforts by the India Semiconductor Mission to open up subsidies to global small and medium-sized enterprises in the upstream supply chain are welcome because an existing facility like the SCL will benefit from this. But this is not enough in itself unless coupled with the incentives defined above and also upgrades targeted at different sets of players.

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The stakes are high as a lack of clarity and inaction may lead to India completely missing out on the semiconductor fabrication bus, yet again, unless there is course correction on incentive targets. Finally, to execute this vision in the next five years, the SCL needs a full-time director with prior “More than Moore” foundry experience than have a career scientist from the Department of Space, as is the case now. This is because there is a multifaceted market that needs to be served.

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