EXPLAINED

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Semiconductors are the thumbnail-sized building blocks of almost every modern electronic device from smartphones to connected devices in the Internet of Things (IoT) | Photo Credit: Getty Images

The story so far: In a bid to make India's <u>\$10 billion chip-making</u> initiative more attractive to investors, the Centre on September 21, <u>approved changes to the scheme</u> for the development of a semiconductor and display manufacturing ecosystem in the country.

Semiconductors are the thumbnail-sized building blocks of almost every modern electronic device from smartphones to connected devices in the Internet of Things (IoT). They help give computational power to devices. The global semiconductor industry is currently valued at \$500-\$600 billion and caters to the global electronics industry currently valued at about \$3 trillion.

The basic component of a semiconductor chip is a sliver of silicon, which is etched with billions of microscopic transistors and projected to specific minerals and gases, forming patterns to control the flow of current while following different computational instructions. The most-advanced semiconductor, developed in 2020 is known as the 5nm, having 16 billion transistors. Semiconductors having higher nanometre value are applied in automobiles, consumer electronics and so on, while those with lower values are used in devices such as smartphones and laptops.

The chip-making process is complex and highly exact, having multiple other steps in the supply chain such as chip-designing done by companies to develop new circuitry for use in appliances, designing software for chips and patenting them through core Intellectual Property (IP) rights. It also involves making chip-fabrication machines; setting up fabs or factories; and ATMP (assembly, testing, marking and packaging).

The chip-making industry is a highly-concentrated one, with the big players being Taiwan, South Korea and the U.S. among others. In fact, according to a New York Times estimate, 90% of 5nm (nanometre) chips are mass-produced in Taiwan, by the Taiwan Semiconductor Manufacturing Company (TSMC). Therefore, the global chip shortage, U.S.-China tensions over Taiwan, and the supply chain blockages owing to the Russia-Ukraine conflict have led major economies to enter the chip-making sector with a renewed push. For example, the U.S. announcement of \$52.7 billion in government funding for the CHIPS and Science Act and the EU's Chips Act that will mobilise €43 billion for public and private investments.

In December 2021, India announced its roughly \$10 billion dollar production-linked incentive (PLI) scheme to encourage semiconductor and display manufacturing in the country. It also announced fiscal support for a design-linked initiative (DLI) scheme to drive global and domestic investment related to design software, IP rights etc. According to the Electronics and IT Ministry, semiconductor demand in India would increase to \$70-\$80 billion by 2026 with the growing demand for digital devices and electronic products.

The new changes announced last Wednesday seek to harmonise government incentives for all technology nodes of semiconductors, according to the Minister of State for Electronics and IT Rajeev Chandrasekhar. In the previous version of the scheme, the Centre was offering to fund 30% of the project cost for 45nm to 65nm chip production, 40% for 28nm to 45nm, and 50% or half of the funding for chips 28nm or below. The modified scheme provides uniform 50% fiscal

support for all nodes. Besides, it will provide 50% of capital expenditure for other steps of the process as well (chip design and ATMP).

Mr. Chandraekhar explained the new scheme was brought in after months of discussions with industry stakeholders and potential investors, so that all areas of chip-making are encouraged to create an integrated ecosystem in India, rather than manufacturing here and having to package and test chips elsewhere. The government said that the PLI and DLI schemes had attracted many global semiconductor players for setting up fabs in India and the modified programme would expedite these investments and bring in more applicants.

So far, <u>Vedanta and Taiwanese chipmaker Foxconn</u> have signed an MoU to set up a 1,54,000 crore semiconductor plant in Gujarat. Two other projects have also been announced — <u>a \$3</u> <u>billion plant</u> in Karnataka by the International consortium ISMC (a joint venture between Abu Dhabi-based Next Orbit Ventures and Israel's Tower Semiconductor) and a <u>\$3.5 billion plant</u> in Tamil Nadu by Singapore's IGSS Ventures. The modified scheme also emphasised the production of the 45nm chip, which is fairly less time-consuming and economical in terms of production. The government said that these chips had high demand, driven primarily by automotive, power and telecom applications.

While the scheme is an encouraging move, chip production is a resource-intensive and expensive process. While the new scheme provides equal funding for all steps of the process, the outlay of the scheme remains \$10 billion. Notably, just the setting up of one semiconductor fab requires an investment of anywhere between \$3 and \$7 billion. Analysts, while positive, are concerned that not much of the current scheme outlay would be left to support other elements including display fabs, packaging and testing facilities, and chip design centres. They also argue that the initial funding should focus on areas like design and R&D, for which India already has an established talent pool.

Also read | When the chips are down: on India's semiconductor mission

According to a *Financial Times* analysis, while India focuses on "lagging-edge" technology nodes in the start to supply to the automotive and appliance sector, creating global demand may be difficult as giants like Taiwan offer viable cutting-edge chip-tech worldwide. Thus, attracting global players to set up here would be beneficial as they come with their customer base.

Chip-making also requires gallons of ultrapure water in a single day, which experts say, could be a task for the government to provide to factories, compounded also by the drought conditions which often prevail in large parts of the country. Besides, an uninterrupted supply of power is central to the process, with just seconds of fluctuations or spikes causing millions in losses Another task for the government is to drive up consumer demand in the semiconductor industry to not end up in a situation where these ventures remain successful only till taxpayers are forced to fund required subsidies.

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