# Global Economics Crisis in Japan

Manufacturing

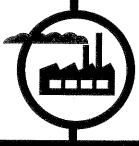
# Now, a Weak Link in The Global Supply Chain

- ➤ The quake may disrupt the flow to tech and auto companies abroad
- ▶ If Japan shuts down, "then no one is going to get their iPad 2"

Samsung Electronics, Ford Motor, and Boeing are waiting for suppliers in quake-stricken Japan to increase one key export: information. A top supplier of high-end components for the global tech and auto industries, Japan may need weeks to recover lost output from the country's strongest earthquake on record, according to a forecast by Barclays Capital. That's why manufacturing executives from San Mateo to Stuttgart are scrutinizing production schedules, searching for backup suppliers, and figuring out how to cope with rising component prices.

The crippled nuclear reactor complex in northeast Japan has resulted in rolling blackouts throughout the country, forc-

JAPANIS STILL A PLAYER



Japan's companies dominate the market for many materials needed to make chips of all sorts. A look at its role in producing chips for customers.

---Bruce Einhorn and Tim Culpan

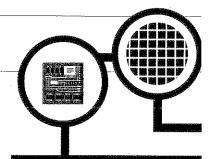
ing Japanese suppliers such as **Sanyo Electric** and **Toshiba** to reduce their production in order to conserve power, water, and materials. If the reduced output continues well into April, the ripple effect will be felt in Seattle. "We're O.K. for a few weeks, and I can't tell you beyond that," says Boeing Commercial Airplanes President James F. Albaugh. Japanese companies design and supply 35 percent of Boeing's new 787 Dreamliner.

Japanese factories produce about one fifth of the world's semiconductors and 40 percent of electronic components, according to CLSA Asia-Pacific Markets. **Sony** makes 10 percent of the world's laptop computer batteries, and other Japanese companies are the dominant suppliers of chemicals that manufacturers need to make chips. "Japan has higher and higher market share of specialty materials as you go up the supply chain," says Tony Tseng, an analyst in Taipei with Bank of America Merrill Lynch.

On Mar. 14, the price of the benchmark DDR3 1-gigabit dynamic random-access memory chip used in all manner of personal computers climbed 7 percent, to \$1.11, the largest gain since Jan. 27, according to Taipei-based **DRAMeXchange**, a research firm that tracks chip prices. Spot prices of the 4-gigabit NAND flash memories that find their way into smartphones, tablet computers, and digital cameras rose 17 percent on the same day.

Toshiba produces 25 percent of the NAND flash chips globally. On Mar. 14, the company temporarily halted operations at plants and offices in areas affected by rolling power outages. If the crisis leads to extended shutdowns, "then we just have an almost apocalyptic shortage," says Jim Handy, an analyst with research firm Objective Analysis in Los Gatos, Calif.

Taiwan Semiconductor Manufacturing (TSM) and United Microelectron-



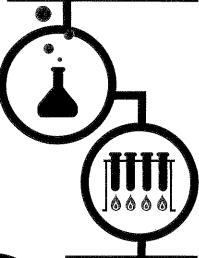
#### FROM WAFER TO CHIP

Chips are etched onto silicon wafers made in Japanese factories run by Shin-Etsu, Sumco, and others: They supply 50 percent of the world's unetched raw wafers. Chip foundries buy millions of Japan's 12-inch wafers.



### POLISHING THE WAFER

Hitachi Chemical has 70 percent of the global market for a type of slurry used by chipmakers to polish wafers and remove imperfections. Hitachi makes the slurry at a plant damaged by the tsunami.



## MADE IN TAIWAN WITH A BOOST FROM JAPAN

Chips made in foundries such as Taiwan Semiconductor Manufacturing power laptops that are assembled in China. To make those chips, TSMC relies on Japanese materials.



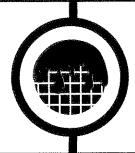
#### IN THE BEGINNING

Japanese companies such as Namiki Precision Jewel and Shin-Etsu Chemical develop the crystals that are turned into silicon waters.

DATA: COMPANY REPORTS, OBJECTIVE ANALYSIS,

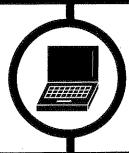
#### PACKAGING THE CHIP

Hitachi Chemical and Mitsubishi Gas Chemical have a combined 90 percent market share for BT (bismaledimide triazine) resin. This is used in the packaging that connects the chip to the circuit board.



#### THE FINAL PRODUCT

TSMC uses these materials to produce specialized semiconductors for customers such as Nvidia, the U.S. company that outsources production of its graphics chips. Nvidia then sells the finished product for use in laptops made by Hewlett-Packard and others.



### AFTERTHECHIP

Other laptop parts are made from Japanese components:

- Japanese companies Kyocera and Namiki Precision Jewel supply about half of the silicon wafers used by Epistar, the Taiwanese producer of light-emitting diodes (LEDs) used in laptop displays.
- Hitachi Chemical and Sony Chemical are the dominant suppliers of ACF, a special type of adhesive used in liquid-crystal display production.
- Sony makes 10 percent of the world's laptop batteries.





#### International Energy Companies

Tokyo Electric Power	-57%
Areva	-20%
Uranium One	-41%
SolarWorld	+24%
Broadwind Energy	+8%
Data-Ricomberg	

ics, the world's largest contract manufacturers of chips, may miss second- and third-quarter revenue estimates because of disruptions to the supply of the Japanese-produced silicon wafers used to make chips, Goldman Sachs analysts Donald Lu, Evan Xu, and Hu Lingling wrote in a Mar. 14 report. South Korea's Samsung and Taiwanese smartphone maker **HTC** are seeking other sources to avoid shortages that might shut production, company spokesmen say.

Typically, big players such as TSM keep a four- to six-week stock of chemical products used to make chips, so uncertainty about maintaining supply from Japan is not a problem for now. However, nobody knows when these companies will be back up to speed. Warren Lau, an analyst in Hong Kong with Samsung Securities, warns that extended delays would be felt by **Apple** and others. "If [the Japanese] cannot supply," Lau says, "then no one is going to get their iPad 2."

The supply outlook for Japanese high-end auto components is less worrisome at the moment. Ford Motor hasn't yet experienced any problems getting nickel-metal-hydride battery packs from Japanese supplier Sanyo for its Fusion hybrid sedan assembled in Mexico, says a company spokesman. Swedish automaker Volvo, now owned by China's

Zhejiang Geely Holding Group, buys about 10 percent of its components from Japan. "Our production won't be affected this week, but then we'll see," says Volvo spokesman Per-Ake Froberg.

Supply of batteries, Blu-ray compact discs, and magnetic heads used in hard disk drives may also be affected by the quake and power shortage, according to a Mar. 14 report by Taipei-based research company TrendForce. "The reality is, the companies don't know the full extent of what's happened," says economist Kim Hill at the Center for Automotive Research in Ann Arbor, Mich. "You can't build a car with 97 percent of the parts. You pretty much need all of them." —Bruce Einhorn, Tim Culpan, and Alan Ohnsman

The bottom line Global technology and auto companies face price hikes, supply uncertainty, and a paucity of information.