How green is Silicon Valley?

Chip making touted as a green industry, but some environmentalists disagree

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NEW YORK (CNNfn) - It has been touted as a green industry, and while the U.S. semiconductor sector says it is no smokestack industry, others contend that it still creates some serious environmental effects.

. Contamination and depletion of ground water levels, possible ozone-depleting emissions and hazardous chemicals that find their way into the local ecosystem are some of the harmful effects listed by environmental activist groups.

. However, semiconductor companies say they are not only working toward, but also are making progress on, cleaner technologies.

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The semiconductor process

. Computer chips are made of a solid, crystalline material, usually silicon. Manufacturing these chips requires extremely clean and precise conditions, as any impurities will damage a semiconductor's ability to do its job.

. Achieving those conditions also requires large amounts of water and chemicals. According to a study done by the SouthWest Organizing Project (SWOP), A New Mexico-based environmental group, making a single six-inch silicon wafer requires the following resources:

- 2,275 gallons of deionized water
- 3,200 cubic feet of bulk gases
- 20 pounds of chemicals
- 285 kilowatt hours of electrical power

. Water use, specifically, is a concern for environmentalists. In order to keep the chips clean during the process, large amounts of water are needed, a particular burden for water-strapped areas of the Southwestern United States.

. SWOP's Co-director Jeanne Gauna used Intel Corp.'s Rio Rancho, N.M., plant to illustrate the industry's side effects. "They use millions of gallons of water. Right now we have an aquifer drying up," said Gauna.

. Intel spokesman Chuck Mulloy, however, says his company is a leader in adapting cleaner technology. He said that Intel's size -- it is the world's largest chip company -- makes it even easier for it to adopt new technologies.

. "We can afford, and do spend, for nothing but the very best in terms of environmental, health and safety issues," said Mulloy. "We can afford it and we don't cut corners. It's critical to our business model and our business success."

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. Ironically, the industry's large need for water grows out of an attempt to make the industry more environmentally sound.

. Previously, chip firms used chemicals that environmentalists believed harmed the ozone layer. IBM developed a water-based cleaning method using so-called surfactants. Unfortunately, that created a new round of environmental issues.

. The "ultrapure" water that chip companies use is not simply pumped out of the ground. It must be subjected to a process, known as reverse osmosis, that removes impurities.

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It can take as much as two gallons of incoming water to make one gallon of ultrapure water.

. However, an osmosis system running at 50-60 percent (typical for the Southwest) uses two gallons of ground water to make 1 gallon of ultrapure water. And afterwards, whatever water is not recycled must re-enter the surrounding ecosystem.

Greener pastures?

. While the industry currently uses large quantities of water, gases and acids to make its products, semiconductor firms say they are working constantly to find greener alternatives. But environmentalists say chip makers aren't implementing them as quickly as they could.
. The Silicon Valley Toxics Coalition, an environmental group, says other methods show promise, particularly in the cleaning process.
. The Coalition advocates a "closed loop" production method in which the companies re-use treated waste water, thus reducing the amount of waste re-entering the surrounding area.

SVTC chief Ted Smith says several promising "dry cleaning" technologies have emerged, such as using lasers to keep chips clean, but semiconductor companies are reluctant to use them.
. "They are constantly developing new technology, and health and environmental concerns take a back seat," he said. "Even if you can demonstrate an advance, [if] it doesn't pay for itself in 18 months, they aren't interested."
. Not everyone has found the industry so obstinate. L. Rafael Reif, a professor of electrical engineering at the Massachusetts Institute of Technology, said chip companies have been very receptive to his research into non ozone-harming materials.
. "It's moving very fast," said Reif. "Our goal was higher environmental standards without compromising [chip-making] performance. When you start doing that, companies pay attention."

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Intel says it is making progress on its own. In its most recent annual environmental report, the company said 50-70 percent of the industrial water used at its facilities is recycled ultrapure water. It also says it recycled 40 percent of its waste chemicals.

-- *by staff writer Randy Schultz*

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