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BOOM, BOOM, OUT GO THE LIGHTS IN CALIFORNIA, THREATENING MEMS RESEARCH, EQUIPMENT, SAFETY

By Rosemary Clandos

Small Times West Coast Correspondent

When electrical power goes off at microdevice facilities in California, important equipment, research and even public safety could be at stake.

So as Californians prepare for what could be a long, hot summer of blackouts, caused by the state's energy crisis, many MEMS companies are putting safeguards into place to protect people and property.

Paul Maker, manager of the electron-beam lithography lab at the Jet Propulsion Laboratory (JPL) in Pasadena, Calif., said personnel will closely monitor toxic gases that are produced in the process of manufacturing MEMS. Gases such as arsine and ammonia are a big issue around clean rooms, integrated circuit facilities and in semiconductor businesses. Scrubbers are used to clean the air, but if power goes out, that process could be endangered.

The JPL microdevices lab has "sniffers" that monitor the laboratory area. If they find toxic gases, supervisors would evacuate the building, shut off the sources and call the hazardous materials team, Maker said.

Businesses with equipment that could endanger public safety are required by the state and federal governments to have a backup energy system.

After public safety concerns, JPL is also worried about its \$4.7 million electron-beam lithography machine. The machine's temperature must stay within a 2-degree range and the room temperature must be kept at 72 degrees to maintain the machine's tight calibration.

That will be no small feat if a blackout occurs when Pasadena's outdoor temperature soars past 100 degrees, which is not uncommon.

Maker said the lab plans to run city water through the machine's cooling system rather than use water from the building's air conditioning unit. "That will give us reduced capacity but it should hold the machine for about an hour. That electricity will have to come from a diesel motor generator system. We're sacrificing some of the other equipment in the lab so that the status of the e-beam will be preserved."

Maker and his team also has a backup battery system that allows the machine to slowly shut down. If the machine loses calibration due to thermal expansion or a sudden stop, it could require several months of maintenance.

POWER LOSS COULD SPOIL THE SOUP

Farther south in San Diego, General Atomics is also taking precautions for some of their projects. The privately owned company works with the U.S. Department of

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Energy and performs magnetic fusion experiments.

Ironically, the ultimate goal of some of the company's projects is to generate another source of electrical energy.

General Atomics manufactures microstructures that are sold to national labs. The microstructures are targets that are bombarded with numerous laser beams, imploded and analyzed for achieved fusion effects.

Fabrication of the microstructures is done in a carefully controlled environment. Some are made through chemical processes that can take several weeks.

"They have to cook awhile," said Chris Hamilton, director of business and technology development. "Some processes are done through levitation with gases. And when your blower quits, it all slumps down into a nasty puddle at the bottom."

If the power goes out at a critical time in the production process, a lost batch of microstructures could cost \$250,000. "We're being a little careful about what we do," Hamilton said. "If you start to fab a batch -- you know you're going to need reliable power for three weeks. We're getting a relatively modest generator to keep those things from happening. But getting it wired-in is an issue. You can't use extension cords in an industrial setting."

Some places that work with MEMS, such as Lawrence Livermore National Laboratory in Livermore, Calif. east of San Francisco, are exempt from power outages. But that's because they have a national security and defense mission.

PG&E had granted the University of California, Berkeley an exemption because it has a cogeneration power plant, but the exemption was later denied and is being appealed. The university is the site of the Berkeley Sensor and Actuator Center, where researchers have pioneered MEMS developments.

"Blackouts may affect MEMS manufacturing facilities if they're in the middle of a process," said Scott Shackleton, director of facilities for the college of engineering.

The university is putting in uninterrupted power supplies at many campus locations and for computers, especially those on the research level.

BLACKOUTS CAN COME WITHOUT WARNING

Many Edison customers, like Integrated Micromachines Inc. (IMMI) in Monrovia, Calif., have complained about the lack of advance notice for outages.

"We provide as much advance notice as we can, but it's difficult to forecast," said Steven Conroy, spokesman for Southern California Edison. "We can't give them two hours if we only have 10 minutes. We could go into a quick Stage 3 alert without much notice -- if a power plant goes out. It also depends on demand, power supply available and outside temperature."

A Stage 3 alert is the last step before a blackout.

In June, Southern California Edison customers will receive their electric bills with a list of outage group numbers. If an area went into a rolling blackout customers could go to Edison's Web site or call the number listed on their bill to learn when power in their region may go out.

IMMI is monitoring Edison's Web site for an indication of generating capacity and is

trying to forecast blackouts.

"Mainly our concerns are that emergency lights come on and that the fume scrubber continues to operate," said Art Huskey, chief operating officer at IMMI.

"If we think there is going to be a blackout, we avoid starting processes that would be affected by the power failure," Huskey said. "We are evaluating putting in a very large generator system that would backup the whole power system, but it's a very expensive investment -- potentially \$500,000."

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