

¡Viva la Física!



Mexico's World Year of Physics 2005 celebrations are meant to show the public how important physics is to daily life. But many of the events are particularly aimed at the nation's youth. Thus it was appropriate that Mexico's official WYP inauguration kicked off in January with a set by the rock band ¡Que Payasos! (What Clowns!). Some 700 invitees, mostly local high-school students, attended the event, held at the National Autonomous University of Mexico's campus in Mexico City. (The university, along with the Mexican Physical Society, covered expenses for PHYSICS TODAY's attendance at the inauguration.) Assisting the guests to their seats were ushers dressed as Albert Einstein (top photo). The event featured comic actor Andrés Bustamante playing Dr. Chunga, who hosted a number of classic physics demonstrations; in the bottom photo, Chunga and some of his assistants prepare to show, with plastic tubes, how vibrating air causes sound.



Follow-up activities at the Mexico City campus will include a year-long series of free lectures, mostly by Mexican scientists, intended for general audiences. Other events are planned throughout the nation. For example, a physics fair will tour the country after its initial run this November in the capital.

Those who cannot attend Mexico's WYP events in person can catch the spirit of the celebration by purchasing national lottery tickets. They're printed with a portrait of Einstein and the WYP logo.

Steven K. Blau



improve things. "This will be a tough year, but I feel that fundamentally we are moving in the right direction and laying the groundwork to ensure this institution's future," Nanos said.

Despite the strident comments he heard in the videocast, Holian says the director's office still has not directly approached him to discuss his Opinion piece. But the UC environment, health, and safety advisory committee did ask him to present his data. "There is a great deal of concern among the [committee] members . . . about the quality of reasoning over the events that led to the shutdown," says Holian. "All the scientists in this meeting told the EHS committee that the one thing missing is communication from the bottom up. . . . There's plenty of orders coming down." Fallin confirms that communication between staff and managers has room for improvement, and says that Nanos has been imploring LANL leadership to do better in communicating with the staff.

Leaving the lab

But the main concern of the employees is the future presence of UC at Los Alamos. "It's a great attraction for staff to work here," says Fallin. The UC board of regents won't decide whether to bid for the new contract until NNSA releases the final version of the request for proposals. The University of Texas, the only other university that was considering a bid, pulled out of the competition early this year.

"When an institution [such as LANL] goes through the level of intense [outside] scrutiny that we have, . . . that has an impact on morale," says Fallin. Although managers acknowledge poor morale, "the only suggestion to improve morale [returning to more flexible work hours] was posed as a question during Nanos's [19 January] videocast," says Hanson. "It didn't come from management."

A large number of LANL's 14 000 employees will be eligible for retirement in the next few years, according to a Government Accounting Office report released last month. As the current UC contract expires, LANL is seeing an increase in the number of employees seeking advice about retiring, says Fallin. "We're aware of the problem of retention," he says.

"After the director's all-hands meeting on July 14 [2004], ugly rumors were flying about. I thought the pension I had earned after 28 years of service might be in jeopardy so I immediately retired," says Larry Creamer, a former LANL engineer. "This action

cost me tens of thousands of dollars in lost salary," he adds. Energy Secretary Samuel W. Bodman, UC President Robert C. Dynes, Senators Pete Domenici (R-NM) and Jeff Bingaman (D-NM), NNSA's Brooks, and Nanos say they are committed to retaining existing benefits and are asking staff to wait until they have all the facts before deciding to retire early.

After concluding that there was a discrepancy between the director's initial reasons for the shutdown and the real safety rate at LANL, Holian says he too has decided to retire. "I don't have any confidence whatever that UC will retain the contract, and if they do retain the contract, I don't have very much confidence that they will listen to what the staff has said," he says.

Fallin disagrees: "LANL is an entirely different place from what it was six months ago. The senior leadership has changed, both attitude and people, and Director Nanos has given the exact type of leadership that is needed to advance this institution."

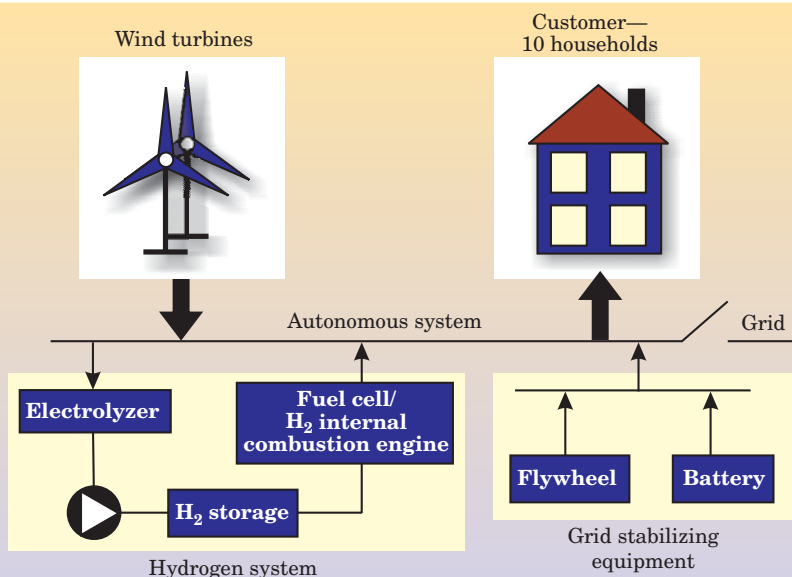
Paul Guinnessy

Windy Island Hosts Energy Trial

A pilot test in energy self-sufficiency is under way on Utsira, a tiny windswept island off Norway's southwestern coast. The experiment combines wind and hydrogen energy to serve 10 of the island's 100 households.

"It's the first autonomous experiment using only renewable energy and hydrogen," says Bard Hammer-

vold, communications manager for the roughly \$6 million experiment, a partnership of Hydro ASA; Enercon, the German company that provided the wind turbines; and the Norwegian government. The main purpose of the Utsira experiment, says Torgeir Nakken, the Hydro physicist overseeing project R&D, "is to show that it



Two 46-meter-tall wind turbines on Norway's island of Utsira (right) are part of a prize-winning experiment in renewable energy. Excess energy is stored as hydrogen (diagram) and used when the wind doesn't meet demand. The turbines' production is sufficient to export energy to the mainland grid.



actually delivers reliable, robust, high-quality power to customers all the time."

"The problem with renewable energy—solar, wind—is that it is intermittent," says Nakken. "To have a stable supply, so you can deliver even when you don't have wind, storage is key. Hydrogen is one way of storing electrical energy."

The Utsira setup consists of two 600-kW wind turbines, an electrolyzer that uses excess energy to break water molecules into oxygen and hydrogen, a generator and fuel cell to reconvert the hydrogen into electrical energy, and a stabilizing system. Says Nakken, "You measure wind production and power demand. As long as the production is larger, we serve customers directly." That, he adds, is 80–90% of the time.

When wind energy production dips below demand, the system automatically draws on backups. That happens when the winds are too weak or too strong; to protect from mechanical damage, the turbines slow down for wind speeds greater than 25 m/s, and stop above 34 m/s. Fluctuations in wind energy production are smoothed over by tapping kinetic energy from a flywheel (see diagram). For gaps longer than a few minutes, energy is recovered from hydrogen. The system stores up to 12 m³ (at a pressure of 200 bar) of gaseous hydrogen, enough to supply power to participating Utsira residents for two or three days. If that were to fail, the mainland grid would serve as a backup.

Actually, only about half of the energy from one of the turbines is dedicated to the pilot test; the rest feeds directly into Norway's main electrical grid. The peak demand has been 50 kW, says Nakken. Half of one wind turbine gives 300 kW. That's oversized, he says, "because you want to minimize the hydrogen part for technical and financial reasons. Instead of a large storage capacity, you want to have a large turbine."

For the hydrogen conversion, the combustion engine is established technology based on the diesel engine. The Utsira experiment also has a 10-kW fuel cell. Says Nakken, "Without a doubt, the biggest unknown lies with the fuel cell. They are costly and their reliability for such applications is not proven. We decided we wanted a small fuel cell as a demonstration. It may be the choice of the future." The combustion engine, he adds, "is noisier and not that efficient. But at least you know it works—and the cost is not more than one-tenth of a fuel cell."

Bringing down costs "is vital" if the

wind-hydrogen system is to be scaled up, says Hammervold. John Olav Tande, a scientist at SINTEF Energy Research in Trondheim, Norway, says testing the combination is a good idea. "You can learn a lot, and assess the ability of industry to build such systems." But, he adds, "hydrogen is not necessarily the answer."

The autonomous wind-hydrogen system might be an answer for remote areas, says Nakken. Less than halfway through the two-year experiment, he adds, "we have already had inquiries from Siberia and the Azore Islands." The Utsira experiment dovetails with nonbinding goals of the European Union (Norway is not a member) to get 12% of energy from renewable sources by 2010 and 20% by 2020.

Utsira's roughly 250 residents "are excited," says Jostein Austrheim, the farmer who leases the land to the wind-energy project. "We don't know when the power comes from the grid, wind, or hydrogen. It's fantastic. Maybe [the experiment] will attract tourists."

Toni Feder

US High-Tech Economy Slipping

In the wake of the Bush administration's fiscal year 2006 budget proposal that left federal support for most basic research flat or declining, a coalition of industry, academic, and science groups has developed a broad set of benchmarks to persuade policymakers that US leadership in technological innovation is slipping.

The Task Force on the Future of

American Innovation, formed last year to cast in economic terms the political discussion of federal funding of basic research, released benchmarks in mid-February with the hope of influencing this year's science funding debate on Capitol Hill. "The object of this is to try to get policymakers in Congress to understand how the competitive world economy has changed," said Doug