

# Students, faculty design green way to absorb power plant waste

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Updated: 05/10/2009 11:09:39 PM PDT



Student, Zekil Patel, and CSUN graduate Mikhael Yefimov stand next to pipeworks that feed waste water and carbon dioxide to cooling towers from a 1 megawatt fuel cell power plant in the middle of the campus. A tropical rainforest has sprouted at California State University Northridge. A 13,000 square-foot garden of 165 plant species is being fed by water and carbon dioxide emissions from the school's new 1 megawatt fuel cell power plant. Northridge, CA. (Photo by John McCoy/staff photographer)

Move over, Tarzana. As drought dries the Southland, Cal State Northridge has sprouted a new home for the jungle yodeler - a subtropical rain forest.

The campus at Nordhoff Street and Lindley Avenue has already won national awards for its fuel-cell power plant, the largest operated by any university in the world.

Now it has created a "rain forest" of 115 tropical species that inhale its greenhouse gas and ingest its wastewater stream, the first such design on the planet.

"It's just been so much fun," said Tom Brown, executive director of facilities management, peering into an undergrowth of 14 species of ferns planted late last month. "It's absolutely one of the highlights of my life.

"We expect a parrot to show up any time."

The university built its award-winning 1-megawatt fuel-cell plant two years ago after its main plant hit capacity during hyper campus growth.

The \$3 million fuel-cell plant, which converts natural gas into electricity via an electrochemical process, now supplies 18 percent of the campus' electricity and air conditioning needs.

But while the combustion-free plant produces zero particulate emissions, it cranks out planet-warming carbon dioxide, in addition to wastewater high in potassium chloride.

So faculty members joined students to design a "green" means to absorb the waste.

"It's really great," said Zekil "Zeke" Patel, 24, a graduate engineering student from Mumbai, India, who shared in the project's design. "It's a great opportunity for students on campus. And it's really great to see it work."

As Patel watched, the fuel-cell plant hummed next to a lush garden a half-block long punctuated by eight large cooling towers. Jungle photos have been hung from each tower, depicting slithering crocodiles and crouching lions.

But rather than spew 3,600 cubic-feet per minute of carbon dioxide into the sky, as traditional condensers do, the gas is aimed into a bed of flowering tulip trees, hibiscus, cana lilies and more.

Warm humid air from nearby classrooms wafts into the forest.

And up to 6 gallons a minute of wastewater rich in plant nutrients leaches into the soil, with a soft mist spritzing over Eden.

The photosynthesis fueled by CO<sub>2</sub> and rich wastewater spurs garden bamboo to shoot up 14 inches a week.

"What we're going for here is a marriage between nature and technology, because this equipment is usually hidden on rooftops," said Ben Elisondo, manager of Physical Plant Management. "It's an educational experience for students."

But while Brown was quick to credit a team of mostly graduate students, they were quick to credit the plant systems veteran of two-plus decades.

"First, it was kind of overwhelming," said engineer Mikhail Yefimov, a Russian native and student team supervisor for the plant and rain forest now working for a local energy firm. "But Tom Brown is a tenacious guy.

"He always comes up with crazy ideas and somehow makes (them) work perfectly. It's amazing."

Last month, California State University, Northridge, won a "Chill Out: Campus Solutions to Global Warming" award from the National Wildlife Federation for its innovative power plant.

Next month, the university is scheduled to receive a University of California/California State University Sustainability Award for its groundbreaking rain forest.

To create more alternative energy, the university has installed six microturbines and 6,000 solar panels, which generate 800,000 watts of power.

The fuel-cell plant, from FuelCell Energy Inc., was funded by a \$2.25 million grant from The Gas Co. and a \$500,000 grant from the Los Angeles Department of Water and Power.

"The charge to these students was to make this the most sustainable plant we can ... to minimize our impact on the environment," Brown said. "What I think we're most proud of is our student design team and their collaboration with faculty.

"They were to do real-world innovation."