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SANDIA TECHNOLOGY

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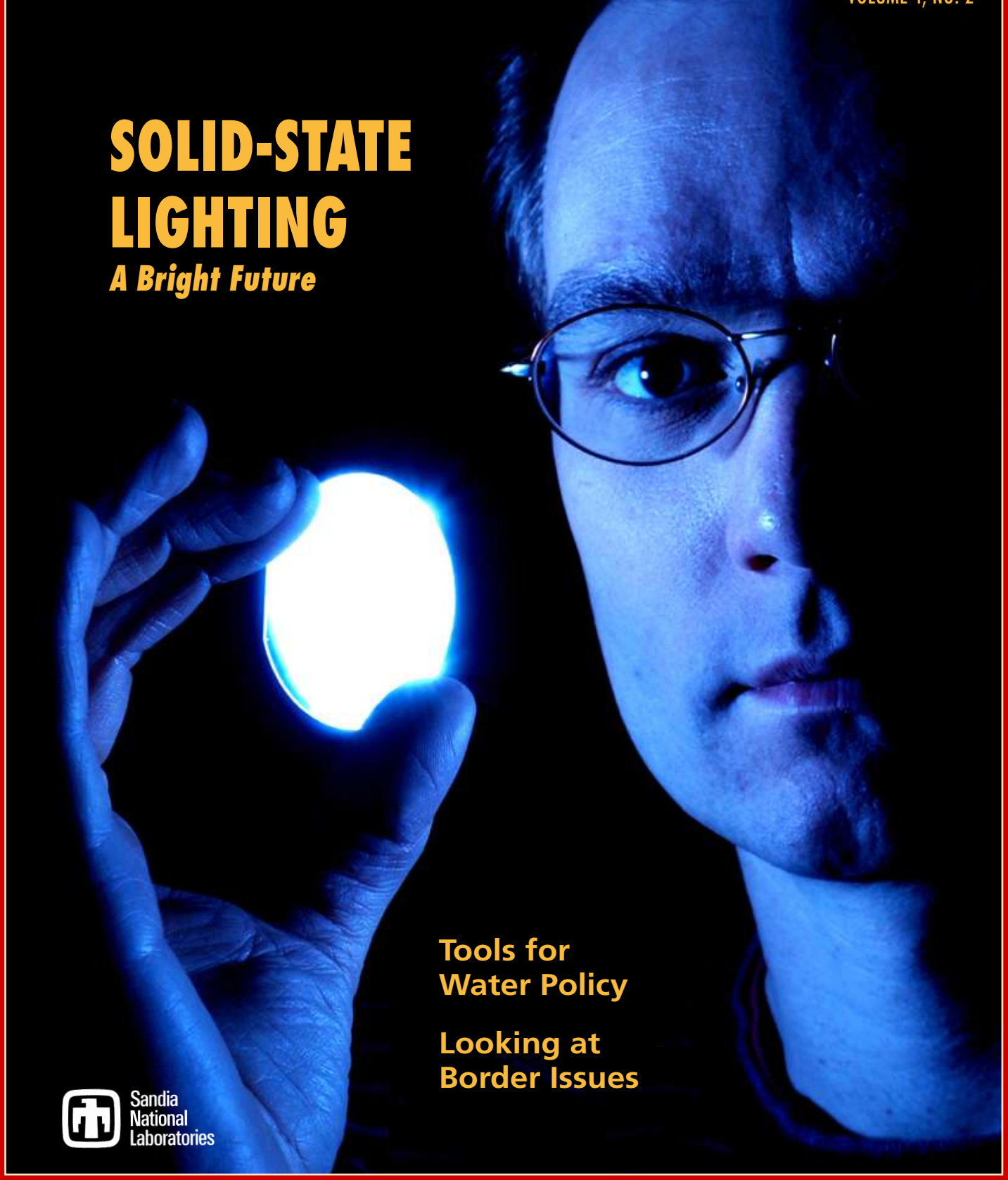
SOLID-STATE LIGHTING

A Bright Future



Tools for Water Policy

Looking at Border Issues

Sandia National Laboratories

ON THE COVER:
Sandia researcher Art Fischer holds a sapphire substrate with indium gallium nitride layers -- a revolutionary new light for the world. This is the base material for a semicionductor light-emitting diodes that emit green, blue, and near-ultraviolet light. See story beginning on Page 2.
Photo: Randy J. Montoya
Design: Doug Prout

Sandia Technology is a quarterly journal published by Sandia National Laboratories. Sandia is a multiprogram engineering and science laboratory operated by Sandia Corporation, a Lockheed Martin company, for the Department of Energy. With main facilities in Albuquerque, New Mexico, and Livermore, California, Sandia has broad-based research and development responsibilities for nuclear weapons, arms control, energy, the environment, economic competitiveness, and other areas of importance to the needs of the nation. The Laboratories' principal mission is to support national defense policies, by ensuring that the nuclear weapon stockpile meets the highest standards of safety, reliability, security, use control, and military performance. For more information on Sandia, see our Web site at *http://www.sandia.gov.*

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FROM THE Editor

Dear Readers:

Our belated Summer Issue has arrived at last and offers examples of some of the breadth and depth of research at Sandia National Laboratories.

Sandia researchers are at the leading edge of a revolution in lighting that will effect how we see the world, the cost of our future electric bills, and could well lead to a cleaner environment. Another critical issue for the world — water — is also taken up here. Sandia researchers have not only developed a model to help citizens understand water quality and scarcity issues, but are busy applying their work close to home. Meanwhile, along the US-Mexico border, researchers are studying issues that have applications for international boundaries around the globe.

We hope you find something of interest in this variety of stories, punctuated with a number of smaller "news notes," a feature we have revived in these pages from time to time to highlight the variety of research at the Labs.

For those of you expecting an issue dedicated to Sandia sensor work (promised in our Spring Issue), we haven't forgotten. Those articles are in development and will be available in our Fall publication.

As these articles reflect, it's been a busy summer around Sandia.

Will Keener
Editor

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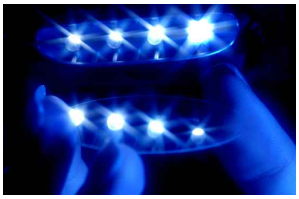
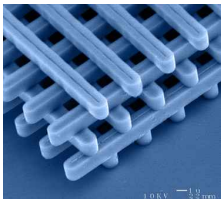
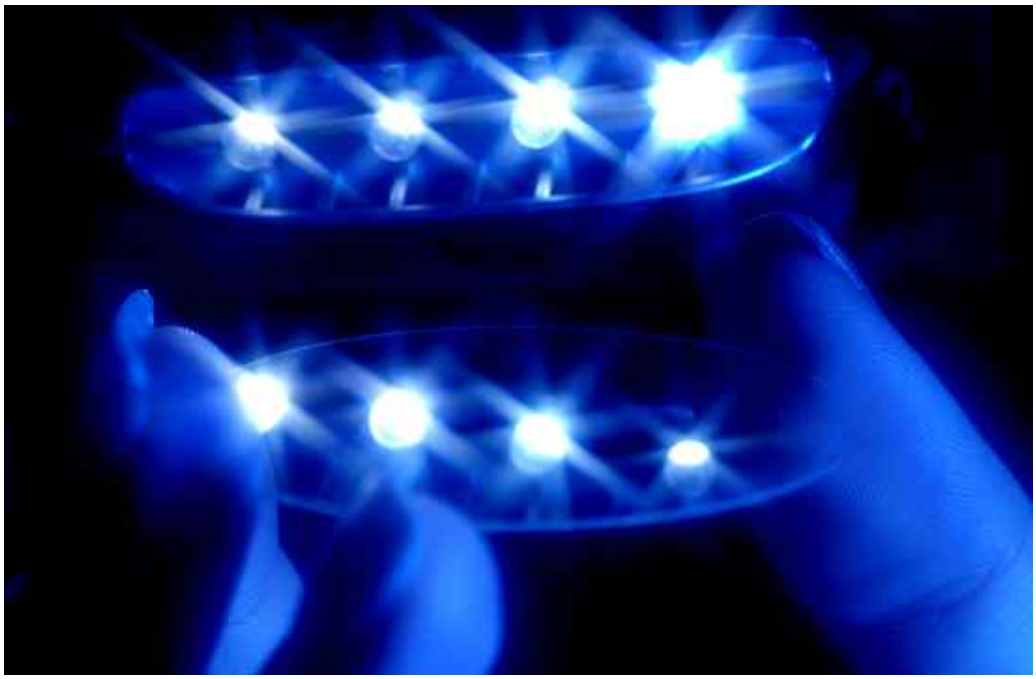




Let the Revolution Begin...
Solid-state Lighting

A revolution is quietly occurring in the way we light our homes, offices and the world. Sandia is among the research entities at the forefront of this effort.



LEDs - the future of lighting?

Scientists at Sandia are addressing one of the world's most vexing and important power problems — low electrical efficiency and high costs of traditional lighting. Tied closely to improved lighting costs and efficiency are a bundle of environmental issues associated with global power generation.

In a revolutionary approach, Sandia research is under way to develop a science and technology base to replace the country's primary lighting source — incandescent bulbs and fluorescent tubes — with solid-state lighting.

Some other researchers at the Labs are taking an even more revolutionary approach to improve an old technology, exploring the potential of a microscopic tungsten lattice to improve the efficiency of traditional lighting sources.
(See page 5.)

In the solid state approach, about 25 Sandia researchers are working on a project that will establish the fundamental science and technology base to replace incandescent bulbs and fluorescent tubes with semi-conductor light-emitting diodes (LEDs.) Senior Scientist James Gee and managers Jerry Simmons and Bob Biefeld, head up the project.

"In some ways the revolution in lighting can be compared to the revolution in electronics that began 50 years ago and is only now reaching maturity," Gee says. "Just as for electronics, glass bulbs and vacuum tubes are giving way to

Sandia researchers James Gee (left) and Jerry Simmons examine an image of light emission from an indium gallium nitride LED. A new substrate for the LED, developed and patented by Sandia, reduces defect densities. (Photo by Randy Montoya)

"This new white light source could change the way we live, and the way we consume energy."

semiconductors. And as in the micro-electronics revolution, many of the possible applications for solid-state lighting will occur in ways that have not yet been envisioned."

LEDs are already found in toys, electronics, traffic lights, automobile signals, and large outdoor displays — devices that require durability, compactness, and cool operation. In some applications they also enable significant cost savings due to their lower consumption of energy: LED-based red traffic lights, for example, consume one-tenth the energy of their incandescent counterparts, enabling them to pay for themselves in as little as one year.

As LED technology matures, revolution leaders expect solid-state lighting to also rapidly outdistance conventional lighting sources in both performance and cost. "This new white light source could change the way we live, and the way we consume energy," says Simmons, who manages Sandia's Semiconductor Materials and Device Science department. "LEDs could be 10 times more efficient than incandescent bulbs and two times more efficient than fluorescents. Clearly, LEDs' replacement of conventional light sources would significantly reduce worldwide energy consumption."

Lighting is presently responsible for roughly 20 percent of electricity consumption. Researchers believe that the development and adoption of solid-state lighting technology could reduce the nation's electrical consumption by about 10 percent.

General Electric first demonstrated LEDs in 1962. The first products were introduced in 1968 — indicator lamps by Monsanto and an electronic display by Hewlett-Packard. LEDs were limited to small-signal applications until 1985 when LED power was increased, resulting in new applications. In 1993 researchers at several universities in the US and Japan developed a blue light LED — based on gallium nitride. Efficiency improvements followed quickly. Today, energy-efficient LEDs are available in red,

Sandia researcher Art Fischer holds a sapphire substrate with indium gallium nitride layers. This is the base material for semiconductor light-emitting diodes that emit green, blue, and near-ultraviolet light. (Photo by Randy Montoya)

green and blue light, making it possible to generate white light for illumination.

However, LED-based light sources are expensive — more than two orders of magnitude more expensive than commercial incandescent light bulbs — and will not be practical until their costs are reduced and efficiency is further increased, Gee says.

As part of the project, Sandia researchers are exploring ways to make LEDs more efficient and less costly, using Sandia's unique capabilities. Among the challenges are:

- Developing an improved understanding of the physics of the gallium nitride base materials of the LEDs,
- Improving optoelectronic devices and materials for abundant photon generation and high light extraction efficiency,
- Improving wavelength conversion and color mixing technologies for generating white light, and
- Improving packaging for high-power LEDs.

Numerous industrial companies, as well as universities, are working to develop technologies for solid-state lighting, explains Biefeld, who manages Sandia's Chemical Process Science department. However, he notes, "in many respects Sandia is unique, due to our extensive capabilities in semiconductor growth and processing, reactor modeling, and experimental and theoretical materials physics, all located at a single institution."

"These are exciting challenges that will engage our scientists over the next several years," Gee says. "Our work will position Sandia to become a leading developer of the science and technology for this revolution in lighting."

Lighting Up the Web

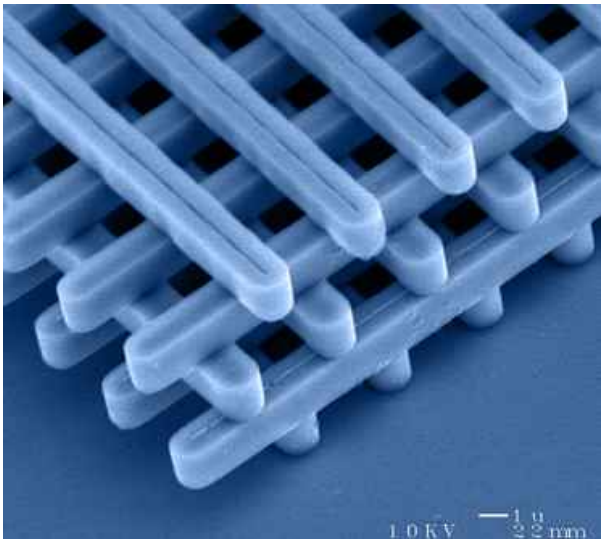
Sandia National Laboratories has launched a new website that will offer comprehensive information on semiconductor light emitting diodes (LEDs) — solid-state lighting. The site can be found at: *http://lighting.sandia.gov/*

The site covers everything from up-to-date science and technology and business news to a calendar of industry events. Also provided are background articles and updates on the proposed national initiative to accelerate progress in solid-state lighting.

Another feature of the website will be a searchable database of relevant patents — a bonus for those interested in tracking the intellectual property in this field.

The site is sponsored and maintained by an internal Sandia research and development team that is working on solid-state lighting. Fulfilling the need for a single, comprehensive source of information, the site will be kept current and focused on this fast-paced technology area. For more information and for cross-linking opportunities, please contact Jeff Tsao at 505-844-7092 or *jytsao@sandia.*

In the Heat of the Light



It's no secret: tungsten-filament bulbs —the most widely used light source in the world — will burn your hands if you try to unscrew one while it's lit. The bulbs are infamous for generating more heat than light.

Now a microscopic tungsten lattice —a filament fabricated at Sandia with an internal crystalline pattern —has been shown to have potential to reduce the amount of wasted infrared energy (heat) when generating useful visible light.

This development has the potential to raise the efficiency of an incandescent bulb dramatically from its current 5 percent rate. The first step toward this goal was achieved at Sandia by researchers Shawn Lin and Jim Fleming and reported in a spring issue of *Nature* magazine. Fabrication of the tungsten lattice was accomplished by use of well-known technologies derived from the semiconductor industry. This means fabrication of such devices could eventually be relatively cheap and easy.

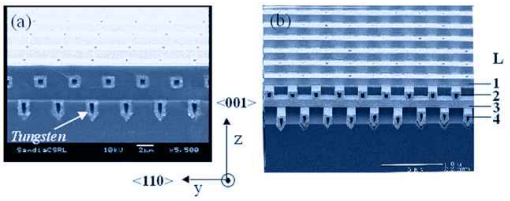
The original idea for the use of photonic crystals — postulated more than a decade ago — was to transmit beams of light at selected frequencies and bend their paths. The lattices, which can for example be made from silicon, consist of tiny bars fabricated to sit astride each other, somewhat like a child's Lincoln Log set, at pre-set distances and angles to form in effect an artificial crystal. Spacing of the bars allows passage of only certain wavelengths. Other wavelengths cannot pass through.

With assistance from colleagues at Ames Laboratories in Iowa, Sandia researchers shifted emphasis from the lattice's ability to guide light to its capability of trapping some frequencies inside the lattice structure. What happens to the energies of the frequencies that are trapped and cannot radiate out of the lattice, they asked.

The researchers built a crystal of tungsten — fabricated at Sandia's Microelectronics Development Laboratory — by creating a structure of silicon embedded in silicon dioxide, removing the silicon, and then using chemical vapor deposition to deposit tungsten into the resulting mold. This work was done on commercially available silicon wafers by modifying standard integrated circuit fabrication processes.

Experiments funded by the Laboratory Directed Research and Development program show that energy underwent a marked absorption increase. This means that energy was being preferentially absorbed into a selected frequency band. Results indicate that the lattice is ideally suited for suppressing undesirable frequencies – thereby increasing the efficiency of energy emitted into the useful visible spectrum.

For further information, contact Shawn Lin, 505/844-8097, or *slin@sandia.gov*



Images of a Sandia 3-D tungsten photonic crystal, taken by a scanning electron microscope. The images taken with and without oxide are shown in (a) and (b), respectively. The spacing of the rods acts to transmit certain frequencies of light. The structures show great promise for generating useful visible light.

WATER by the Numbers

Along with the precious little water found in arid and drought-stricken parts of the world, often come the politics of scarcity. Politics that mean bad policy decisions today may well lead to supply crises and political tensions in the future.

Researchers at Sandia National Laboratories have developed software models they think might help regions with critical water shortages, through sound water management. The computer simulations, called Dynamic Water Budget Models, allow decision makers to see how water policy options selected today would affect a society's water resources in the future.

The models are based on commercially available simulation software Sandia has used to study everything from summer blackouts in California to global nuclear material inventories.

Testing various water policy options is as simple as fiddling with a few knobs, says Dick Thomas, one of the Sandia creators. The research simulations provide immediate extrapolation and visualization of results. Each model is a complex representation of the relationships among ground and surface water sources, recharge rates, groundwater pumping, irrigation, climate, environmental impacts, water quality, economic productivity, and an area's social and cultural foundations.

"The models ask what the water resource picture might be 20 years down the road given today's choices," says Thomas. "This is the only model we've found that allows for big-picture, long-term planning."

Sandia built the first water model in the mid 1990s to examine water trends for China's 10 major water basins. Results showed that water will become a limiting factor in the country's ability to feed itself during the next two decades as China's major agricultural areas run increasingly large water deficits. The simulations were part of a Harvard University study that helped alter the way some experts now think about China's future.

According to the National Intelligence Council's "Global Trends 2015" report, half the world's population will lack access to fresh water by 2015. Scarcity of resources is a primary cause of geopolitical tension in many regions of the world, it says.

"We must do something now to prevent water resources from instigating political instability, or prepare for the inevitability of conflict over water," says Sandia

Better water management tools, such as Sandia's Dynamic Water Budget Model, could have applications worldwide as fresh water supplies diminish, says Dick Thomas, who is a co-developer of the model. Others are now applying his work in real-world situations.

"Different users have different ideas about what optimal use of the water resource is."

co-developer Steve Conrad. "It is in our interest to help these governments."

The team next used the Middle Rio Grande Basin, the primary water supply for the Albuquerque, N.M., metropolitan area, to develop the tool further. (See page 8.)

"It's a way of helping our community with sustainability issues while also creating a tool that could help the nation and the world," says Thomas.

The team continues to work with city and state officials to apply the tool to Albuquerque-area policy making efforts.

A similar model of another water basin in rural northern New Mexico is helping farmers and developers see the possible results of various development schemes and agricultural practices. "Different users have different ideas about what optimal use of the water resource is," says Thomas. "We helped get them talking sooner about realistic approaches rather than dwelling on unworkable, unsustainable options."

The team is now exploring the possibility of modeling water issues for basins shared by countries of the Former Soviet Union, for nine countries that border the Nile River, and for the U.S. and Mexico in the El Paso/Cuidad Juarez border area. "Anybody can play their own 'what if' game," says Conrad. "It allows people with different stakes in the outcome to rapidly test the long-term effects of policy options. It's very democratizing."

Anatomy of a RIVER

Calling it "cooperative modeling," two Sandia researchers have taken the Labs' Dynamic Water Budget Model and begun the difficult work of applying it to a real life situation in New Mexico.

The Rio Grande River near Albuquerque, New Mexico.

Vince Tidwell and Howard Passell are using Sandia's Dynamic Water Budget Model – built originally by lab researchers Dick Thomas and Steve Conrad -- to help the Middle Rio Grande Council of Governments and the Middle Rio Grande Water Assembly meet their goal of establishing a comprehensive water plan by next year. This planning process involves local government agencies working with regional stakeholders in Bernallio, Sandoval, and Valencia Counties. It's an area with limited water resources and high water demands from industry, agriculture and a growing population.

In trying to develop a water plan members of the Rio Grande Water Assembly are asking tough questions:

- How can we reduce agricultural water consumption in the valley?
- How will low-flow appliances impact residential consumption?
- Are desalination technologies economically viable for the region?
- How much water can we harvest from rooftops?
- How much water can we save by eliminating non-native trees from the riparian forest?

"Fortunately, many of these questions can be answered in a very quantitative way, and the model can help us do that" explains Passell, who works in Sandia's International Security Initiatives Department. He sees even wider potential for the modeling in a growing number of international settings.

Passell and Tidwell have been working with a modeling team from the assembly on a regular basis to refine the model for the Middle Rio Grande area. "There is a diversity of constituency groups participating on the team, including environmentalists, agriculturalists, and urban developers," says Tidwell, of Sandia's Geohydrology department. "Together we explore the issues and the team helps us to understand and conceptualize systems for which we don't have expert knowledge." Then the two researchers can develop models to reflect the realities of the specific situation.

"In this way, the people developing the plan understand how the model works," Passell notes. "They know what assumptions are involved, what data went into the model and what limitations exist. In this way we build consensus in the model among the team members. It's not just a black box producing mysterious numbers."

NEWS NOTES

It's the size of a bread box. It fits in the overhead compartment on most airlines. And it packs a powerful punch.

Packing a Punch

Working with multiple computers in parallel on problems too large for a single computer, it's called a "portable cluster computer."

Sandia Researchers Rob Armstrong and Mitch Williams built and demonstrated the portable cluster computer. They made it largely from commodity computer parts, but small ones normally intended for use in cars, cell phones and watches, rather than desktop computer components.

Armstrong actually stowed the Linux cluster of four central processing units in an overhead bin on his flight to Denver last year to demonstrate the device at Supercomputing 2001.

"It's useful for tutorials, demonstrations and road shows," Sandia's Williams says. "The alternative for folks who want to go to an exhibition with a cluster computer is to spend months coordinating the shipment of a rack of up to eight full-size personal computers. "In addition to use at remote locations and exhibitions, the cluster may find a niche with those seeking a compact way to capture high horsepower computing, he adds.

In the case of the Sandia version, all the components, except for the clear Lexan case were purchased off-the-shelf from embedded system vendors.

The California researchers have created a web site for those interested in creating their own cluster computer: *http://eri.ca.sandia.gov/*

Assessing Building Risks

Sandia has awarded a worldwide licensing agreement to NeoSafety, a Dayton, Ohio-based risk solutions company, to market RAMPART™ software and co-develop complementary products.

RAMPART™, an acronym for Risk Assessment Method — Property Analysis and Ranking Tool, is a screening program developed by Sandia researchers to rate the risk to a building by natural hazards, crime and terrorism. Sandia initially designed the software to help the General Services Administration assess the risk of various threatening events to the nearly 8,000 federal buildings it manages nationwide. A group of industry advisors found the RAMPART™ software to be highly effective in determining facility risk.

NeoSafety became interested in the project last year. The company, which was founded in 1997, assists government agencies, insurance companies, property owners and industry in identifying and managing workplace risks. Regina Hunter, Sandia's technical lead on the project says she is pleased at the prospect of working with NeoSafety to develop further software.

For further information:
www.neosafety.com or
Regina Hunter
505/844-5837
rlhunte@sandia.gov

Peace and Economic Development
On the Border

Sandia's long interest in preventing global conflict is taking regional expression with the Bi-National Sustainability Laboratory. It's an effort with worldwide implications for peace and a stronger border economy.

The US-Mexican border: Poverty, lack of basic services such as public health, adequate water supplies, and other resources. These difficulties, combined with the collision of different cultures, easily provide the makings for conflict. Researchers at Sandia looked at the situation and asked a tough question: Can these difficulties be overcome in a peaceful way to nurture a technology-based, sustainable economy?

Their answer: The Bi-National Sustainability Laboratory (BNSL), a concept designed to create a new engine for economic development on both sides of the border. Further, the experience with Mexico can serve as a template for other regions of the world; regions in or on the verge of violent conflict.

Sandia Vice President and Principal Scientist Gerold Yonas, with U.S.-Mexico Foundation for Science Director Guillermo Fernandez signed a memorandum of agreement early this year to pursue the project. Felipe Rubio Castillo, of Mexico's National Council on Science and Technology witnessed the document. In the months since, a number of activities have helped begin a focus for the BNSL concept.

"The signing of the MOU was an important step," Fernandez said of the event. "The Foundation is interested in the BNSL as a concrete way to strengthen economic and other ties on the border." The Mexican National Council on Science and Technology represents a group of 29 Mexican research centers, which are now partnering with Sandia.

"We have a big vision," says Vipin Gupta, Sandia researcher in the Advanced Concepts Group who has spent the past year and a half working on the BNSL concept in the Paso del Norte. "It is getting the attention of people in both the US and Mexico."

The project has now widened from its origins in Sandia's Advanced Concepts Group to other Labs organizations. "While others work these issues, I'm looking at global border issues — moving to an application of the BNSL concept to places like the Middle East," Yonas explains.

"...the bottom line for the border communities will be an improved quality of life."

From Idea to Program

Transition from idea to program is now under way in Sandia's Energy and Critical Infrastructure Strategic Business Unit and Sandia's Corporate Business Development center. Gary J. Jones, manager of the International Partnerships department in Sandia's Corporate Business Development center, cites a number of goals. Among them are:

- Foster long-term, sustainable economic development on both sides of the U.S.-Mexico border;
- Prevent conflict by creating community wealth and well-being across physical and psychological boundaries;
- Help create new small- and medium-sized enterprises, and to strengthen existing ones, resulting in increased numbers of higher paying jobs; and
- Bring new, advanced technologies to commercial fruition.

"Because of its unique role, it is difficult to envision the BNSL as a facility captive to any given US or Mexican government agency," says Jones. "Rather we anticipate that the BNSL will be managed by a non-profit entity capable of accepting funding from public and private institutions in both countries." He acknowledges that the economic goals will take years to fully achieve, but the bottom line for the border communities will be "an improved quality of life."

A spring meeting with both Sandia and Mexican representatives helped to identify some potential projects for BNSL. Five focus areas have been identified to take to a "workshop" level, where participants will convene to discuss specific areas and projects that might be feasible, explains Dan Horschel, manager of the Labs' Environmental Monitoring and Characterization department. "A lot of people are starting to engage and activities are getting under way. It's good to see us pulling together," Horschel says.

The focus areas identified to date include:

- Water and agriculture
- Public health issues
- Secure commerce
- New product development
- Energy and critical infrastructure

In Ciudad Juarez, Mexico's fourth largest city, effluent from two new water treatment plants has only recently begun to meet Environmental Protection Agency minimum standards for US water.

"There is tremendous interest in seeing this initiative work," says Lucinda Vargas, director of Plan Estrategico de Juarez. "Leaders in Juarez — speaking mostly from a private-sector perspective — have been present for briefings on how the initiative is progressing and have shown a willingness, desire, and even eagerness to commit their efforts at making this work."

Water Quality and Delivery

Gray Lowrey, a researcher in Sandia's Solar Thermal Technology department, spent a month this summer traveling with a group of scientists to look at water issues in the border state of Chihuahua, Mexico. On his 3,000-mile trek with other scientists from New Mexico, Lowrey saw numerous problems with water delivery and treatment.

In Ciudad Juarez, Mexico's fourth largest city, effluent from two new water treatment plants has only recently begun to meet Environmental Protection Agency minimum standards for US water. There is also speculation that the main fresh water resource for the city — the Hueco aquifer — may run dry within the next few years. In other parts of Chihuahua there are no water systems at all, he reports. People retrieve water from wells that are unprotected and often contaminated.

These problems have negatively affected the Mexican economy and driven rural workers into cities and north across the US-Mexican border.

The trip was part of a Rotary International Group Scientific Exchange. Upon its conclusion, US and Mexican representatives met at Taos, New Mexico, to discuss improved water delivery and purity for the borderlands. They generated a report outlining 15 projects Rotary Clubs could possibly implement over the next few years.

Another public health related project under way is the deployment of a Sandia-developed system to detect disease outbreaks. Deployed in southern New Mexico with the state's Department of Health, the Rapid Syndrome Validation

This architectural concept of a Bi-National Sustainable Laboratory (BNSL) illustrates the idea that this research effort should literally and figuratively straddle the US-Mexico border. Following formal agreements earlier this year, researchers are now beginning to put programs in place to make the BNSL a reality.

"Even a delay of one day in the early recognition of unusual patterns can mean the difference between saving or losing many lives with certain highly communicable diseases".

Project (RSVP) can provide timely information to physicians even before a major upswing in patient visits. The system tracks "syndromes" – which are carefully chosen combinations of signs and system that may reflect any of a myriad of specific disease types – rather than specific diseases. The latter requires laboratory testing (and the selection of the correct tests, of course) and thus is inherently delayed. "Time is of the essence in tracing any infectious disease outbreak," says Senior Sandia Scientist Alan Zelicoff, a physician/physicist who developed the system. "Even a delay of one day in the early recognition of unusual patterns can mean the difference between saving or losing many lives with certain highly communicable diseases".

Working with Dr. Gary Simpson of the New Mexico Department of Health, the system has been deployed at the Memorial Medical Center, the largest comprehensive medical-care campus in Las Cruces, New Mexico.

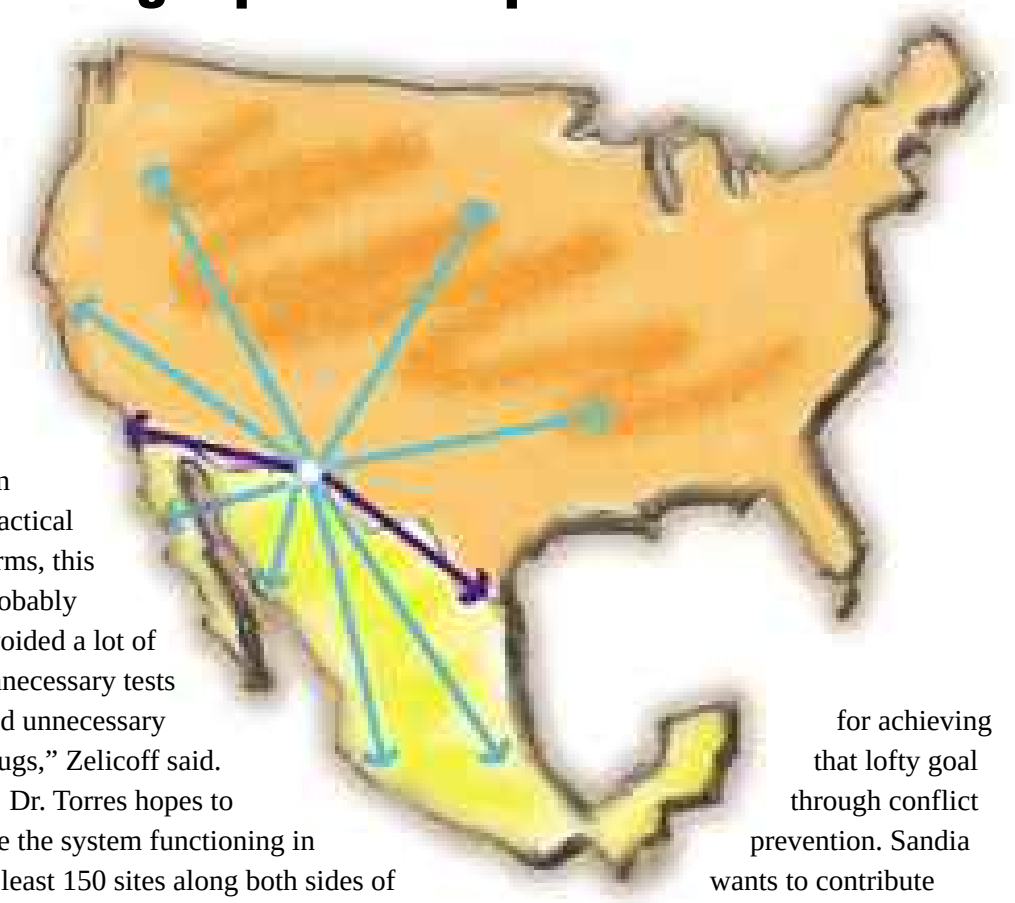
Dr. Catharine Torres, pediatrician and commissioner on the US-Mexico Border Health Commission, recently demonstrated the system by entering a case she was handling — a child with influenza-like symptoms. Thirty-three doctors, nurse practitioners and nurses have access to the center's RSVP system. Each case takes about 30 seconds to enter.

A Valuable Aid

"The system is a valuable aid, Says Dr. Torres. "Before we never really knew what the rest of the state was doing. The reporting system was slow and difficult. Now we can just push a button and get information."

Statistics indicate the system is catching on with hospitals, Zelicoff reports. In the Las Cruces case, the data in the system resulted in an alert to physicians about a sudden increase in flu and RSV, even before they began to see patients in their offices.

A strategic partnership



Sandia's mission is to help our nation secure a peaceful and free world through technology. The BNSL is a means for achieving that lofty goal through conflict prevention.

"In practical terms, this probably avoided a lot of unnecessary tests and unnecessary drugs," Zelicoff said.

Dr. Torres hopes to see the system functioning in at least 150 sites along both sides of the border. Currently, there are six sites near Brownsville, Texas and six more coming on line to the north in the Lubbock, Texas area, Zelicoff says. The BNSL focus on public health and the likelihood that the secure commerce focus will include a public health component offer the possibility of introducing the RSVP system on the Mexican side of the border, he suggests.

There is a long ways to go with the BNSL concept, says Jones, but it's off to a good start. "Sandia's mission is to help our nation secure a peaceful and free world through technology. The BNSL is a means for achieving that lofty goal through conflict prevention. Sandia wants to contribute towards the US aim of building a strategic partnership with Mexico. The BNSL is vehicle for making such a substantive contribution."

(Photos by BNSL team.)

NEWS NOTES

"With this technique a police officer could swab somebody right at the scene and have a reading in seconds."

Finding the Shooter

Explosives experts at Sandia have been working with a Colorado company to come up with a technique that will help police officers at a crime scene to quickly narrow the list of suspects in a shooting to those who have recently fired a gun.

"The speed in being able to focus on a more limited array of suspects in critical to law enforcement's ability to solve a crime. The faster we are able to identify them, the more likely we are to convict them," says Greg MacAleese. He heads Law Enforcement Technologies (LET), Inc. in Colorado Springs.

Whenever a gun is fired, the shooter gets sprayed with an invisible blast of chemical residues that are byproducts of the incomplete combustion of gunpowder, primer, and lubricants from the weapon. Sandia worked with LET to develop a method to detect gunshot residue on an individual's hands, arms, or clothing.

"With this technique a police officer could swab somebody right at the scene and have a reading in seconds," says Sandia principal investigator Pam Walker. Sandia has licensed the technique to LET, which is now marketing kits under the name "Instant Shooter ID Kit."

For more information:
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770 Wooten Rd, Suite 109, Colorado Springs, CO 80915, phone 719/380-5557, or email at *gmacaleese@aol.com*

NEWS NOTES

The project is part of the Department of Energy Russian Transition Initiative.

Sandia project lead Mark Vaughn with a prototype back-support system. The high-tech support is intended to reduce lower back pain. (Photo by Bill Doty)

Reducing Back Pain

Sandia is working through government and industry partners to commercialize a unique back support cushion. The cushion relieves lower back pain and offers relief to a range of users — from office workers and truck drivers to quadriplegics and others immobilized by reason of occupation or health.

The device makes use of 16 pre-formed inflatable bladders to help muscles in the back that are intended by nature to support the spine. There is no direct contact between the chair-back device and the spine, explains Sandia Researcher Mark Vaughn.

Los Angeles-based Numotech will market the patented support. Sandia has been involved with electronic work on the device to improve reliability, Vaughn says. Another goal has been to shrink pumps, batteries and circuits. The current auxiliary box measures about a foot square and four inches deep, but the goal is to incorporate it into the support itself.

The back support work is being done in conjunction with a Russian manufacturing corporation, Spektr-Conversion, and M.R. Beal, a New York investment bank. The project is part of the Department of Energy Russian Transition Initiative. The initiative aims at providing work for Russian weapon scientists who otherwise might be hired by unfriendly countries or groups to make nuclear weapons.

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"This new white light source could change the way we live, and the way we consume energy."

Jery Simmons
Semiconductor Materials Device Science
Sandia National Laboratories

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