

CLIMATE CHANGE:

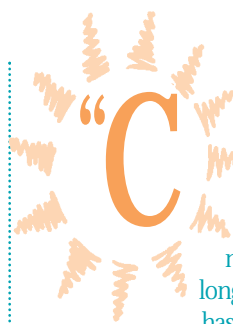
WHAT DOES IT MEAN FOR THE SOUTHWEST?

A report on the September 24, 1998, EPA Regional Conference sponsored by the EPA Office of Policy, Office of Economy and Environment in Phoenix, Arizona

THE SOUTHWEST PREPARES FOR CLIMATE CHANGE



Above: Russell F. Rhoades, director of the Arizona Department of Environmental Quality, said that global warming has "serious implications" for the region and the world. **Below:** EPA Region 9 Administrator Felicia Marcus expressed optimism that "common sense, a clear long-term vision, and a constructive spirit" will prevail in efforts to address climate change.



"Climate change is an issue that deserves our immediate attention," said U.S. Environmental Protection Agency Region 9 Administrator Felicia Marcus, who opened a public conference on global climate change convened by EPA in Phoenix on September 24, 1998.

According to Marcus, efforts to address climate change at the international, national, and local levels have been characterized by "commonsense, a clear long-term vision, and a constructive spirit." This positive and proactive approach has created programs "that make environmental and economic sense on a host of fronts." In fact, she said, voluntary programs sponsored by EPA and the Department of Energy already save Arizona businesses and organizations \$19.6 million each year through greater efficiency in energy use.

The city of Tucson saves \$367,000 and prevents 5.1 million pounds of carbon dioxide emissions annually through energy efficiency initiatives, Marcus said. Arizona Public Service's efficiency measures save \$650,000 a year and prevent 12.5 million pounds of CO₂ emissions annually. "These programs make environmental and economic sense on a host of fronts," she added, "and happily they can help reduce global warming too."

Russell F. Rhoades, director of the Arizona Department of Environmental Quality, welcomed the participants, warning them that global warming has potential consequences "for all of us as citizens, companies, and organizations." Rhoades emphasized that while the goals of the climate treaty negotiated last December in Kyoto, Japan, seem daunting, Americans have proved in the case of conventional air pollutants that it's possible to meet tough standards without making significant changes in lifestyle.

The meeting was co-sponsored by 11 public agencies and private organizations, and was attended by more than 120 leaders and representatives from a wide range of businesses; environmental and civic organizations; federal, state, tribal, and municipal agencies; utilities; academic institutions; and others.

The Arizona Republic, the main newspaper in Phoenix, ran a lengthy front-page story on urban heat islands, referencing the conference.

Following welcoming remarks by Rhoades and Marcus, participants heard presentations about the science of global warming, potential economic impacts on the Southwest, tribal issues, and the policies and technologies that will be needed to slow climate change.

Bill White, senior advisor on climate change to EPA Administrator Carol Browner, provided details on the Kyoto accord. He called the agreement an "important achievement in the best interest of the United States and the global environment," but also a "work in progress." The administration will work to gain new commitments from developing countries before submitting the treaty to the Senate for ratification.

Edward Z. Fox, vice president for environmental health, safety, and new technology ventures at Arizona Public Service, gave the keynote luncheon address in which he outlined the most promising technologies and realistic timeframes for achieving a sustainable energy future.

Other speakers discussed initiatives in agriculture, transportation, solar power, innovative "green" energy and efficiency projects, and sustainable community design.

"We know we can successfully attack global issues once thought impossible," Felicia Marcus said in closing the conference. "We also know that we can change conventional wisdom about what's possible. I'm hopeful that the history books will report that we met this challenge with intelligence, wisdom, and commonsense." ○

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CONFLICTING SIGNALS

"I fully concede that the buildup of greenhouse gases would lead to a warming," said Robert C. Balling, Jr., professor in the Department of Geography and director of the Office of Climatology at Arizona State University. But he emphasized that greenhouse gases are only one of a number of factors affecting the global climate. "There are many things going on in the atmospheric system, and it's very difficult for us to try to identify the exact signal related to the increase in greenhouse gases."

Balling noted that changes in solar output, volcanic activity, atmospheric dust levels, and El Niño all may have significant warming or cooling effects on climate. So may human-induced effects, such as stratospheric ozone depletion and sulfate aerosols from the burning of fossil fuels. The recent warming trend may have as much or more to do with reduced global volcanic activity, strong El Niños, and high solar activity as it does with greenhouse gases, Balling noted.

Arizona State Professor Robert Balling told the audience that the increase in greenhouse gases is only one of many factors affecting global climate.



Although Balling said that there is "absolutely no doubt" that greenhouse gases are increasing in concentration, he emphasized that the models used by researchers to project future climate change are full of uncertainties. He added that scientists are receiving conflicting signals about the degree to which the planet is getting warmer. Surface-based temperature records indicate that the warmest years on record all have occurred in the past decade, while satellite and balloon records of temperatures in the atmosphere show no warming until 1998. The temperature records are thus "not exactly screaming out" that the world is experiencing a warming consistent with that predicted by climate models, Balling said.

Furthermore, he said, the Intergovernmental Panel on Climate Change has found no evidence that the world's weather is becoming more variable or that extreme events are increasing.

Balling also reported that implementing the Kyoto Protocol on climate change would have almost no effect on climate in the next century, calling it an "infinitesimally small step" toward trying to stop the buildup of greenhouse gases. ○

FACING AN UNCERTAIN FUTURE

Some human-induced climate change appears inevitable, according to Lisa Graumlich, deputy director of Columbia University's Biosphere 2 Center. The areas of controversy center on questions of the nature, regional patterns, and rate of climate change.

Climatologists agree that the first signs of human impact on global climate are being seen now, Graumlich said, but it is hard to predict exactly where, when, and how much climate will change in the future.

Carbon dioxide's concentration in the atmosphere has risen 30 percent since preindustrial times, and methane has doubled. The current

level of CO₂ is greater than it has been in the past 160,000 years, Graumlich said, and the rate of increase is greater than any in the past 20,000 years. If trends continue, a doubling of CO₂ will occur sometime in the next 75-125 years, which will expose the world to CO₂ levels similar to those of 15 million years ago.

"What will these high CO₂ levels mean," Graumlich asked, "and what does this rate of increase mean relative to the past? Will the climate system change suddenly? And how will people cope with resource shortages?"



Lisa Graumlich, of Columbia University's Biosphere 2 Center, said that the atmospheric concentration of carbon dioxide may rise to a level as high as it was 15 million years ago.

Graumlich said that "carbon management" represents a new

challenge for science, land management, and industry. "We don't know how rapidly forests can take up carbon." She noted that the Kyoto Protocol focuses not only on reducing emissions, but also on accounting for carbon uptake by forests and other carbon sinks, particularly those from countries that have large managed forests such as the United States, Canada, and New Zealand. ○

KYOTO AND BEYOND

Despite the scientific uncertainties, we know enough about global warming to justify action, according to Bill White, senior advisor on climate change to the administrator of the U.S. Environmental Protection Agency. "We need to take

"There's an inevitable clash of science and policy, and everyone wants to know what the right answer is."

TIM MOHIN

Corporate Environmental Manager
Intel Corporation

action as an insurance policy against this risk," he said. "We have to start now, because it will take us a long time to get policy instruments in place and to get the world working together to solve this problem."

Recognizing the need to respond, the United States agreed in December 1997 to the Kyoto Protocol on global climate change.

The protocol embodies two of the three major objectives established by the Clinton Administration for its goal of achieving an economically strong and environmentally sound agreement.

First, the protocol includes sound targets and timetables for reducing emissions among major industrialized nations. The targets will be met over a five-year period from 2008-2012, a timeframe that will help "cushion the transition" for businesses and workers. The United States agreed to reduce its greenhouse gas emissions to 7 percent below 1990 levels during that period. Major economic competitors such as Japan and the European Union made similar commitments of 6 and 8 percent respectively.

Second, the protocol includes flexible market-based mechanisms, such as emissions trading, for achieving the targets.

The third objective, to achieve meaningful participation by developing countries, remains to be met. "We're still working hard to achieve that objective before we send the treaty to the Senate for ratification," White said.

In the meantime, the United States will continue to take commonsense measures to reduce emissions, under the existing U.S. Climate Change Action Plan and through new initiatives proposed by the President during his 1998 State of the Union address. The investments that the President is proposing will bring economic and environmental benefits beyond those associated with the control of global warming. "These programs not only reduce greenhouse gases, save money, and save energy, but they control other pollutants besides greenhouse gases," White said.

In conclusion, White declared that "by closely monitoring the science, negotiating a good international framework, and putting in place commonsense domestic programs, we're positioning the United States to prosper even as we aggressively meet the challenge of global warming." ○



Becky Fengler

◀ EPA Senior Advisor Bill White called the Kyoto Protocol an economically sound and environmentally strong agreement.

COOL TOOLS

Using a multi-screen display of urban growth scenarios and three-dimensional model simulations, Wilson W. Orr and Hoyt Johnson III, of the Sustainability and Global Change Program at Prescott College in Prescott, Arizona, demonstrated tools that can help local governments and researchers evaluate the potential regional impacts of global warming. "As decisionmakers we are not helpless," Orr said. "There are technologies to help us illustrate the complexity and interrelationships of a variety of problems."

Orr and Johnson emphasized that the



Becky Fengler



Wilson Orr (left) and Hoyt Johnson, of Prescott College, demonstrated new technologies that can help decisionmakers prepare for climate change.

impacts of climate change and policies to address it will be complex and interwoven with other issues. "Climate change comes on top of an already full agenda that every city council already deals with," Johnson said. Orr added that the Southwest could be affected by impacts taking place in other parts of the country. Changes in water demand in other states, shifts in energy prices, and impacts on crop production could affect how the Southwest copes with global warming. "We are an importer of water, energy, and food," Orr said. Furthermore, he noted, "population growth in the Southwest is a strong issue and is blended into anything we consider."

According to studies cited by Orr and Johnson, the Southwest can expect to warm by 5 to 7 degrees Fahrenheit over the next century, become dryer on average, and experience more intense storms. At the same time, urban growth is expected to continue.

Efforts to reduce greenhouse gas emissions should be good for the Southwest economy, the two researchers said. As Orr emphasized, "Anything that reduces the consumption of resources is an opportunity for families, businesses, and communities" to save money by recycling and reducing energy use. ○

"Climate Change" reports the results of a conference sponsored by the U.S. Environmental Protection Agency entitled, "Climate Change: What Does It Mean for the Southwest?" The conference took place on September 24, 1998, in Phoenix, Arizona.

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For more information about the conference, visit the U.S. Environmental Protection Agency's global warming conference website at: <http://www.epa.gov/globalwarming/conferences/>.

In addition, EPA publishes a number of fact sheets about global warming and energy conservation. Call EPA's Fax-On-Demand Service (202-260-2860) or access EPA's global warming website at <http://www.epa.gov/globalwarming>.

RAIN CHECK

According to William Sprigg, it's crucial that we assess the impacts of global warming, including precipitation, by region. Sprigg, deputy director of the Institute for the Study of the Planet Earth at the University of Arizona, discussed how precipitation levels could vary as a result of climate change. Due to changes in precipitation, some regions may experience flooding, while others will have drought. Even within the same area, rainfall could fluctuate significantly from year to year.

The issue of precipitation is important for the Southwest, where water resources are limited. Sprigg said that from 1910 to 1995, precipitation levels have changed due to the impact of extreme weather events. For example, during past La Niña events, Arizona experienced less precipitation than normal. Changes in the frequency of El Niño events and summer monsoons also could have an impact on water resources in the Southwest, but these events are not yet included in climate models.

What are the lessons learned? Sprigg quoted a state official who claims, "It would take 1,900 years to recharge the water we have used in the last 50 years." Taking this and similar data into consideration, our need to "mine the past" for trends and extreme events is crucial. Sprigg added that by studying how regional climate changed in the past, researchers can better predict how it may change in the future. ○

▶
University of Arizona researcher William Sprigg described potential impacts of climate change on precipitation patterns in the Southwest.



PREPARING FOR PUBLIC HEALTH IMPACTS

Public health professionals can play a role in reducing the risks of climate change to human health, said Kristine Suozzi, assistant director of the Bernalillo County Environmental Health Department in New Mexico.

First, however, health professionals and the medical community must be made aware of the link between climate change and public health outcomes. They are not looking for diseases such as hantavirus. "We need them to be aware of the symptoms to look for," Suozzi explained. Informing the public also is

"Climate change is a big economic issue for my company."

C.V. MATHAI
Principal Environmental Scientist
Arizona Public Service
Phoenix, Arizona

important. "What we say to them needs to be timely, culturally sensitive, at an appropriate literacy level, and must give people [detection and prevention] skills that they can actually use."

Education may be used as part of a public health strategy, she added. "We need to change public norms and tolerance for certain kinds of behavior," Suozzi said. "We've done it with tobacco and seat belts, and we could do it with issues that affect climate change." For example, better public awareness could help build consumer demand for fuel-efficient vehicles that produce less pollution.



◀
Kristine Suozzi, of the Bernalillo County Environmental Health Department, described how health professionals can reduce risks associated with climate change.

Health officials also should focus on

prevention by watching for precursors of events, such as changes in precipitation that could cause population explosions of mice, which in turn may lead to outbreaks of hantavirus. Surveillance—monitoring, tracking, and communicating such events—is a key component of a public health strategy to reduce the risks associated with climate change.

Finally, Suozzi said, public health professionals should establish multidimensional partnerships among the legal, political, environmental, health, medical, and business communities. ○

THE GILA TRIBE FACES UP TO CLIMATE CHANGE

"Tribal communities bring a fresh perspective to the climate change issue," said Patricia Mariella, "because of their natural resource base, long-term knowledge, and relationship to the environment and ecosystem." Mariella, executive director of the Gila River Indian Community's Department of Environmental Quality, said that since the economies of Native American tribes generally are based on natural resources, their livelihoods are particularly vulnerable to climate change. "Gila River is trying to address 100 years of a lack of resources in basic governmental services," she said. "It's going to take a lot of increased revenue to get up to speed" on preparing for climate change.

The Gila River community is near the cities of Chandler and Phoenix, Arizona. The 12,000 residents of the community live in an

agricultural area of 374,000 acres, of which 40,000 currently are in production. Though the crop mix varies, the community is "heavily into cotton," Mariella emphasized.

Changes in weather often subject agricultural regions to infestations of insects that are not usually found on those farms. Mariella said that the community is using more applications of toxic chemicals than they have in the past. "And that's strictly a result of weather."

Mariella noted the importance of providing tribal communities with information on extreme weather

events and climate change that will help them make the right decisions about pest management and crop strategies. ○



◀ Patricia Mariella, of the Gila River Indian Community, described how Native Americans may be affected by climate change.

OUR SUSTAINABLE ENERGY FUTURE: FACT OR FICTION?

Shifting from a fossil fuel-driven economy to one that runs on renewable energy is feasible—but will take decades to accomplish, according to Edward Z. Fox, vice president for environmental health, safety, and new technology ventures at Arizona Public Service. "It's simply not realistic to think that renewable technology will be able to displace the huge fossil fuel infrastructure in a short period of time."

However, Fox said in his lunchtime keynote address, there are significant opportunities for renewables in developing countries as well as applications in the United States. Taking advantage of those opportunities will help build manufacturing capacity and lower the price of renewable technologies so they are ready to come on board over the next 10-50 years, a time during which most existing power plants will be retired.

At present, renewables are more expensive than fossil fuel technologies, but Fox expects their costs to fall significantly by 2010-2025.

Currently, a natural gas combined-cycle power plant has a total installed cost of \$400-\$800 per kilowatt. By 2005, that should drop to \$250/kw. Microturbines, small gas-fired engines that can provide power to individual buildings, also should cost about \$250/kw by 2005. Two apple-sized microturbines, combined with a small generator, could power an entire house from a unit no bigger than a large shoebox.

"This technology is in use today by the military, so we know it works," Fox said.

In contrast, renewables' costs are much higher. Wind power runs about \$900 to \$1100/kw. By 2005, prices are expected to come down only slightly, to \$800/kw. Solar power currently costs \$8,000 to \$10,000/kw installed. By 2005, this will drop significantly—to about \$3,500 per kw—but it still won't be competitive with gas.

Fuel cells are a promising alternative, according to Fox. They generate power with hydrogen, the most abundant energy resource in the universe. Fuel cells today cost \$2,000 to \$70,000/kw. By 2005, some fuel cell technologies may drop to \$1,000/kw.

The cost disparity between gas and renewables "will not change overnight," Fox said. But he described four niche markets that can be exploited to increase the manufacturing capacity for renewables and reduce unit price.

First, international markets, particularly in developing countries, represent a major opportunity. Second, off-grid applications represent a growing market within the United States from rural developers, ranchers, and telecommunications companies. A third market is "green pricing," whereby consumers choose to pay an extra amount on their electricity bill for power produced from renewable sources.

The fourth niche market for renewables is in peak-shaving applications. Peak energy rates (such as those at midday in summer) are very expensive, and renewables are frequently competitive at that price

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◀ Arizona Public Service Vice President Ed Fox presented a clear-eyed view of our sustainable energy future.

▶ Solar energy activist Toby Schneider prepared hors d'oeuvres, baked bread in his solar ovens, and served them to conference participants.



◀ GM's EV1 electric car, owned by Arizona Public Service, was on display at the conference. GM currently is leasing the EV1 in Arizona and California.

STATES IN EPA'S REGION 9

California
Nevada
Arizona
Hawaii

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level. Fox predicted that large companies increasingly will buy renewable energy technologies, such as solar power, and install them at their own facilities to shave peak electricity costs. Renewables also can be used to avoid the charges that utilities will begin levying for the use of their wires as utility restructuring takes place throughout the country.

"Renewables are ready today for niche markets, but not for prime time," Fox concluded. "As we move into the future and technology breakthroughs occur over the next 10-15 years, as utility restructuring creates real opportunity for distributed generation, and as we start to exploit the opportunities for renewable technologies in the developing world, then we will see renewables come into their own. We will see sustainable technologies begin to significantly penetrate the market and, sometime in the 2020-2040 timeframe, we will really start to achieve a sustainable energy future." ○

GOING SOLAR

In response to the keynote address, Michael Neary, executive director of the Arizona Solar Energy Industries Association, said, "I wish I could say that what you just heard from Ed Fox was completely wrong, and that he was hiding something from you. But unfortunately I can't. Solar is more expensive in many applications than buying power from the grid."



Becky Fengler

Michael Neary, executive director of the Arizona Solar Energy Industries Association, assessed the market for solar power and hot water.

However, Neary added, there are a number of non-electric solar applications that are cost-effective. Solar water heating in particular is a promising technology in the sunny Southwest. "The average solar water heater replaces an electric water heater and will avoid production of 2,800 pounds of pollution annually," Neary said.

The use of solar hot water systems has been limited in some areas by deed restrictions designed to prevent unsightly collectors on roofs. But the new generation of solar collectors is different. "We've begun installing systems that blend in with the architecture of the house," Neary said.

Swimming pool heating is probably the biggest market for solar, and one of the best values, according to Neary. An average solar pool heating system will save about 10,000 pounds of pollution per year.

Neary noted that Arizona has established a portfolio standard for solar-produced electricity as part of its utility restructuring process. The standard

requires utilities to obtain 0.2 percent of their power from solar, starting in 1999. The requirement will increase by 0.2 percent annually until it reaches 1 percent in 2003.

As demand increases for solar technologies, prices will come down, Neary said. "It's a matter of recognizing which applications are cost-effective for which areas. Educating yourself about what is cost-effective ultimately will bring more solar to the marketplace." ○

EXAMINING AGRICULTURE

The agriculture sector is very adaptable, according to James Lowenberg-DeBoer, professor in the Department of Agricultural Economics, Purdue University. Agriculture already adapts continually to new technologies, new government policies, and new economic and trading conditions.

Agriculture also is likely to adapt successfully to gradual climate change, Lowenberg-DeBoer said. Breeders would develop new varieties that are tolerant to higher temperatures, frost, and drought, with a wider resistance to pests and diseases.

Although breeding for average changes in rainfall and temperature is feasible, he said, breeding for increased *variability* in those factors is harder to do." Climate change also will require improved scouting for pests and diseases in crops, and crop consultants will have to be aware of a wider range of control strategies.

"Pest problems don't stop with harvest," Lowenberg-DeBoer pointed out. "Crops often need to be stored for months, and if conditions become warmer or more humid, it could cause storage problems."

Lowenberg-DeBoer also noted that climate change "isn't happening in a vacuum." Other large-scale changes are underway that may require larger adaptations by the agriculture sector, such as the globalization of markets, growth in the size of farms, the shift from spot markets to supply chains, and the use of information technology in precision agriculture.

Agribusiness has been interested in taking part in research efforts to adapt to climate change, Lowenberg-DeBoer said, but hasn't "seen the profit potential yet." He noted that producers currently are more concerned about climate variability. "El Niño gets a bigger response from them than long-term climate change." ○



James Lowenberg-DeBoer, of Purdue University, predicted that agriculture will adapt to gradual climate change.

TRANSPORTATION CHALLENGES

Almost every sector of American society depends heavily on the transportation system, said Karen Heidel, environmental consultant with the Arizona Department of Transportation. Currently, transportation and related expenses account for 11-18 percent of the nation's gross national product. The transportation network represents a "vast economic lifeblood," Heidel said, carrying 12.4 billion tons of freight per year with a value of \$440 billion.

The transportation system has increased in efficiency and speed, Heidel noted, but it also has facilitated the expansion of urban areas and deterioration of the urban core. Key issues facing this sector include capacity, accessibility, safety, and sustainability.



◀ Karen Heidel, of the Arizona Department of Transportation, discussed ways to reduce greenhouse gas emissions from the transportation sector.

Since 1950, the U.S. population has grown by 75 percent, while vehicle miles traveled have increased by a factor of 5. Heidel said that 25 percent of urban interstates now carry more than 100,000 vehicles per day, far more than the system was designed for.

Emphasis on accessibility has renewed concern about the links between national and state investment in transportation systems and local land use policies. "Much of the population growth and development are occurring in outlying areas," Heidel said, "and land use policies often permit more development than existing roadway structure can withstand."

Heidel noted that there are three options available to minimize greenhouse gas emissions from the transportation sector: change the vehicles used, change vehicle fuels, or change the way the infrastructure works. Work is underway in all three areas, such as the Clinton Administration's Partnership for a New Generation of Vehicles, in which auto makers have pledged to develop a production prototype car by 2004 that is three times more energy efficient at no compromise to size, safety, comfort, or cost. ○

ENERGY FROM WASTE

Turning the conference participants' attention to success stories, Ethel DeMarr, manager for environmental planning and issues management at Salt River Project (SRP), a major Arizona power and water utility, described a 6 megawatt landfill gas-to-

energy facility that SRP is proposing to construct at the Salt River Pima/Maricopa Indian Community. Michigan-based DTE Biomass Energy is constructing a state-of-the-art system to collect gas from the landfill, and SRP will purchase the gas to generate electricity. The system will include a 25 kilowatt solar dish that will generate electricity when the sun shines.

DeMarr said that climate change was "the driving force" that prompted the utility to explore the option of capturing landfill gas. "If we could harness methane emissions at landfills, we could make significant reductions in our greenhouse gas emissions," DeMarr said. SRP voluntarily committed to reduce its emissions.

Other motivations for the project include positioning SRP as a provider of "green" energy, strengthening its customer relationship with the Salt River Pima/Maricopa Indian Community, taking advantage of an opportunity to reduce greenhouse gases locally, and, finally, "because it's the right thing to do."

Incentives such as tax credits make the project financially attractive. "Landfill gas-to-energy projects offer low-cost green energy and a low-cost way to get significant reductions in greenhouse gas emissions," DeMarr said. "In addition to greenhouse gas reductions, we are taking waste and turning it into energy. We're

investing in a technology for the future. On a corporate level we get financial and image benefits. And the community benefits as well." ○

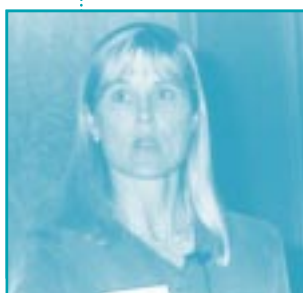
RE-ENERGIZING ARIZONA'S BUILDINGS

Jim Westberg knows how to make buildings "smarter." Westberg, manager of the Energy Conservation and Engineering Program at the Arizona Department of Commerce's Energy Office, works with owners and building managers to improve the energy efficiency of their properties. The improvements he suggests and helps to implement not only make the environment cleaner but save money as well.

Westberg's office performs energy audits and then recommends energy-saving measures. "A good candidate is a commercial building that has at least 50,000 square feet, has a utility cost of \$2 per square foot, and is at least 10 years old," Westberg said. "The older the building, the more likely we're going to find some measures." The Energy Office also audits apartment buildings that have at least 15 units. Once the audit is completed, the office offers a loan program to implement the recommendations.

One of Westberg's projects is a renovation of the lighting and cooling systems in 23 state government

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▶ Ethel DeMarr described a major Arizona utility's new landfill methane energy project at the Salt River Pima/Maricopa Indian Community.

Continued on from page 7



◀ Jim Westberg, of the Arizona Department of Commerce's Energy Office, described how energy efficiency improvements have saved the state nearly \$1 million per year.

buildings in Tucson and Phoenix. The buildings, which total 1.5 million square feet, needed

23,000 new light fixtures. "We spent over \$1 million," Westberg said, "and the new fixtures are saving \$400,000 a year." In addition to lights, 21 of the original cooling systems were between 17 and 35 years old, and very inefficient. "By buying and installing efficient systems," he added, "we had energy savings on utility bills of close to \$400,000." Although the entire project cost \$4.7 million, the state saves close to \$1 million annually.

Westberg, demonstrating that cost-saving measures can be identified quickly, pointed to the hotel conference room's lighted exit signs and said, "You could replace the bulbs in the signs with a 4-watt LED—they probably use 40 watts of electricity right now—and make a tremendous impact." ○

A NEW COMMUNITY BUILDS TOWARD THE FUTURE

Welcome to Civano. This community now under development on the east side of Tucson, Arizona, will become home to an estimated 5,000 people within the next 8 to 12 years. Civano is a public-private partnership between Tucson and the private community of Civano. John Laswick, manager of the Sustainable Communities Program at the City of Tucson's Office of Special Projects, called Civano a community dream. "Civano is smart growth," affirmed Laswick.

Civano's planners hope that the town will become a model for sustainable development. Built on 1,145 acres, the community has dedicated 35 percent of its lands as parks and open space. In addition to promoting a community spirit through innovative design, Civano is pedestrian-friendly and its buildings complement the surrounding Sonora desert.

The community will save money and reduce energy use by using new alternative energy sources. Another goal is to reduce potable water use by more than 50 percent. Laswick maintains that by reducing the demand for water, the city will save \$100,000 a year once the project is built.



◀ Tucson's John Laswick described Civano, a community under development in the east side of the city that embodies the concept of "smart growth."

Civano's residents will have the opportunity to use a 1-acre neighborhood

"downtown," a recreation center, and a community garden and learning center. "The streets are narrow to reduce the urban heat island effect; we're slowing down traffic; we're cutting costs in building infrastructure," said Laswick. Homes at Civano are built to standards that are 50 percent above the current model energy code.

On the business side, Civano has a 65-acre Environmental Technologies Business Center. Its first tenant is Global Solar, a manufacturing facility that builds photovoltaic cells. Community planners are targeting other businesses that produce or market ecologically sound technologies.

Laswick is optimistic that Civano will become a model for similar communities across the country. "I think it's time for developers to realize that environmentalists live in houses, too," he said. ○

CONFERENCE SPEAKERS

Robert C. Balling, Jr., Ph.D., Professor, Department of Geography, and Director, Office of Climatology, Arizona State University

Ethel DeMarr, Manager for Environmental Planning and Issues Management, Salt River Project

Edward Z. Fox, Vice President, Environmental Health, Safety, and New Technology Ventures, Arizona Public Service

Lisa Graumlich, Ph.D., Deputy Director of Biosphere 2 Center, Columbia University

Karen Heidel, Ph.D., Environmental Consultant, Arizona Department of Transportation

Hoyt Johnson III, Technical System Coordinator, Sustainability and Global Change Program, Prescott College

John Laswick, Manager, Sustainable Communities Program, City of Tucson Office of Special Projects

James Lowenberg-DeBoer, Ph.D., Professor, Department of Agricultural Economics, Purdue University

Felicia Marcus, Regional Administrator, U.S. Environmental Protection Agency, Region 9

Patricia Mariella, Ph.D., Executive Director, Department of Environmental Quality, Gila River Indian Community

Michael Neary, Executive Director, Arizona Solar Energy Industries Association

Wilson W. Orr, Director, Sustainability and Global Change Program, Prescott College

Russell F. Rhoades, Director, Arizona Department of Environmental Quality

William A. Sprigg, Ph.D., Deputy Director, Institute for the Study of Planet Earth, University of Arizona

Kristine Suozzi, Ph.D., Assistant Director, Bernalillo County Environmental Health Department, New Mexico

Jim Westberg, Manager, Energy Conservation and Engineering Program, Energy Office, Arizona Department of Commerce

Bill White, Senior Advisor to the Administrator for Climate Change, U.S. Environmental Protection Agency

Moderator: Paul Johnson, Team Lead, Marketing and Outreach, U.S. Department of Energy, Seattle Regional Support Office

Moderator: Alan C. Lloyd, Ph.D., Executive Director, Energy and Environmental Engineering Center, Desert Research Institute, University and Community College System of Nevada

Moderator: Nancy Skinner, Executive Director, ICLEI-U.S. Office, The International Council for Local Environmental Initiatives

For more information about the conference, visit the U.S. Environmental Protection Agency's global warming conference website at: <http://www.epa.gov/globalwarming/conferences/>.