

**MINUTES  
of the  
SECOND MEETING  
of the  
ECONOMIC AND RURAL DEVELOPMENT COMMITTEE**

**July 12, 2018  
University of New Mexico Science & Technology Park Rotunda  
851 University Blvd. SE  
Albuquerque**

**July 13, 2018  
University of New Mexico Lobo Rainforest Building  
101 Broadway Blvd. NE  
Albuquerque**

The second meeting of the Economic and Rural Development Committee (ERDC) was called order by Representative Debbie A. Rodella, chair, on July 12, 2018 at 10:15 a.m. at the University of New Mexico (UNM) Science & Technology Park Rotunda in Albuquerque.

**Present**

Rep. Debbie A. Rodella, Chair  
Sen. Benny Shendo, Jr., Vice Chair  
Sen. Jacob R. Candelaria  
Rep. Rebecca Dow (7/12)  
Sen. Ron Griggs  
Rep. Rick Little  
Rep. Patricia A. Lundstrom  
Sen. Richard C. Martinez  
Rep. Matthew McQueen (7/13)  
Sen. Michael Padilla  
Sen. John Pinto  
Rep. Jane E. Powdrell-Culbert  
Rep. Nathan P. Small (7/12)  
Rep. Candie G. Sweetser

**Absent**

Rep. Tim D. Lewis  
Sen. Pat Woods

**Advisory Members**

Rep. Eliseo Lee Alcon  
Rep. Alonzo Baldonado  
Sen. Craig W. Brandt  
Rep. Kelly K. Fajardo  
Rep. Joanne J. Ferrary  
Rep. Bealquin Bill Gomez  
Rep. Rod Montoya  
Rep. Patricia Roybal Caballero

Rep. Gail Armstrong  
Sen. William F. Burt  
Rep. George Dodge, Jr.  
Rep. David M. Gallegos  
Rep. Yvette Herrell  
Rep. D. Wonda Johnson  
Sen. Carroll H. Leavell  
Rep. Sarah Maestas Barnes

Rep. Patricio Ruiloba (7/12)  
Sen. Elizabeth "Liz" Stefanics (7/12)  
Sen. Bill Tallman  
Rep. Bob Wooley

Sen. Mark Moores  
Sen. Mary Kay Papen  
Rep. William "Bill" R. Rehm  
Rep. Angelica Rubio  
Rep. Nick L. Salazar  
Sen. William E. Sharer  
Rep. Linda M. Trujillo  
Rep. Monica Youngblood

### **Guest Legislators**

Sen. Howie C. Morales (7/12)  
Sen. Clemente Sanchez (7/13)

(Attendance dates are noted for members not present for the entire meeting.)

### **Staff**

Randall Cherry, Staff Attorney, Legislative Council Service (LCS)  
Diego Jimenez, Research Assistant, LCS  
Rebecca Griego, Records Officer, LCS  
Felicia Garcia, Intern, LCS

### **Guests**

The guest list is in the meeting file.

### **Handouts**

Handouts and other written testimony are in the meeting file.

### **Thursday, July 12**

#### **Welcome and Introductions**

Representative Rodella welcomed the committee and members of the audience and asked committee members and staff to introduce themselves. Chaouki Abdallah, Ph.D., provost and executive vice president for academic affairs, UNM, greeted the committee and provided an update on the state of UNM. Dr. Abdallah told the committee that the legislature has invested more than \$20 million in economic development at the university. Those dollars led to hundreds of millions of dollars in federally and privately funded research investments from outside the state.

#### **UNM Research Master Plan**

Gabriel Lopez, Ph.D., vice president for research, UNM, discussed ongoing research projects at the university. Aside from the primary benefits of research, Dr. Lopez noted that research projects train students to work in some of the highest paying fields in the state, which helps accomplish an integral part of UNM's educational mission.

UNM main and branch campuses received more than \$7 million in research funding between fiscal years 2013 and 2018. The top funding agencies include the National Science Foundation (NSF), the Children, Youth and Families Department (CYFD) and the United States Department of Defense (DOD). Contracts and grants awarded to UNM and to students account for more than one-fourth of UNM's revenue — a substantial contribution. Other funding for UNM comes from the state and from tuition and fees. In response to a question, Dr. Lopez explained that research projects for the CYFD vary, but many projects relate to training teachers about issues regarding young children. In response to a question, Dr. Lopez told the committee that the Department of Transportation's (DOT's) financial contributions to UNM support engineering laboratories and various activities, including materials testing and design.

Dr. Lopez discussed the research areas that bring in the most federal dollars and have the largest faculty numbers. These include:

- cross-cutting research areas, such as bio-informatics and collections-based research;
- areas of research and scholarship strength, such as computational and data sciences; and
- developing areas of research and scholarship strength, such as community-engaged arts, education and public health.

In response to a question, Dr. Lopez explained that these areas were defined using surveys of those involved in the research areas. He told the committee that an area that offers potential for substantial growth is public health, with collaboration opportunities among UNM's College of Education, Department of Psychology and College of Population Health. The UNM Health Sciences Center fosters robust collaboration, and it recently received a multimillion, multiyear grant to examine public health and the history of uranium mining.

Dr. Lopez also discussed the Center on Alcoholism, Substance Abuse and Addictions (CASAA). The CASAA has been at the forefront of state and local opioid addiction intervention efforts. The CASAA currently receives the highest level of investment on the UNM main campus.

In response to a question, Dr. Lopez told the committee that autoimmune disease and immunity research at UNM is focused on cross-species disease rather than human health. He stressed that the implications of cross-species disease are very important for human health.

Dr. Lopez provided a summary of UNM's research strategic plan (RSP). The RSP was developed by engaging stakeholders across UNM in working groups that included 50 faculty members and 20 community members. The plan, now in its third year, enables the university to make significant improvements in supporting research and fostering creativity. He discussed the RSP's objectives as they relate to research excellence, human capital, infrastructure, federal and state government relations and corporate relations.

Dr. Lopez then highlighted research projects relevant to economic and rural development. He told committee members that the Office of the Vice President for Research (OVPR) identified three emerging and poised-for-growth research areas for fiscal year 2018: renewable energy; water in the west; and social, cultural, place-based research relating to the southwest. These fields are important to New Mexicans, Dr. Lopez said, and research in these fields attracts investment from out-of-state entities.

UNM granted seven awards out of 20 applications received for research funds in the following fields: two awards for renewable energy; one award for water in the west; and four awards for social, cultural, place-based research relating to the southwest.

In response to a question, Dr. Lopez told the committee that clean energy systems research is wide-ranging, and it is dependent on the focus at the federal level. In recent years, federal focus has moved toward nuclear energy development rather than solar and wind energy, which was the focus of President Barack Obama's administration. He noted that when the federal administration changed, the university experienced a severe reduction in the scope of energy research projects. Further, when the United States withdrew from the United Nations Framework Convention on Climate Change, there was a significant reduction in funding for clean energy research.

A member of the committee asked why only one water-in-the-west grant was funded, considering the water situation in the state. Dr. Lopez responded that grants are dependent on proposals received by the OVPR. For this funding year, the OVPR received only one proposal for water-in-the-west research, and it was funded. The proposal is a collaboration between UNM's School of Engineering and Department of Biology to examine the effects of forest fires on downstream watersheds.

Dr. Lopez reported that the OVPR is improving and growing relationships with the national laboratories. UNM has established an open communication relationship with Los Alamos National Laboratory (LANL), which has resulted in an agreement regarding ownership rights to research and outcomes. However, Dr. Lopez noted, there is currently no joint funding agreement between LANL and UNM.

UNM does not have a corporate industrial relations office, Dr. Lopez said. To enhance corporate-sponsored research, the OVPR has created a corporate relations roundtable. The roundtable brings together stakeholders to share information and develop relationships. UNM's next goal is to develop a central portal website to function as a one-stop site to foster relationships between corporations and the university. In response to questions, Dr. Lopez explained that proposals to establish a corporate relations office have been discussed. He said that the primary focus of such an office would be to engage corporations interested in sponsoring research.

Dr. Lopez discussed UNM's economic development efforts. He said that UNM is very active in patent licensing and creating start-ups, and it has a good reputation for commercializing activities. Since 1996, STC.UNM, the technology transfer arm of UNM, has received 597 United States patents and has executed 583 license and option agreements. One hundred thirteen start-up companies have been formed based on UNM-researched technologies. In 2013, 26 UNM start-ups generated 147 high-paying jobs, \$3.5 million in revenue, \$8.6 million in salaries and benefits and \$4.7 million in goods, services and spending. A committee member observed that, over five years, at a cost of \$140,000 per year, 147 jobs do not represent a significant impact.

Dr. Lopez discussed the Center for High Technology Materials (CHTM) and its impact on the New Mexico economy. The CHTM was established as one of five centers of technical excellence by the New Mexico Legislature with initial funding of approximately \$10 million dispersed from 1983 to 1988. He noted that this strategic investment has paid for itself many times over. Additionally, he told the committee that ongoing investment helps to accomplish the university's educational mission by producing competitive students to fill the best jobs in the state.

A 2014 economic impact analysis by the UNM Bureau of Business and Economic Research (BBER) found that the CHTM has a measurable impact on the economy, creating 131 jobs that produce \$6.5 million in annual labor income and \$11.7 million in annual economic output. The CHTM has received 207 U.S. patents and has led to the foundation of 14 companies started by CHTM faculty and students. The CHTM has also assisted many small companies. The CHTM has received more than \$200 million in externally funded research that has resulted in more than 500 graduate degrees in science, technology, engineering and mathematics (STEM).

In response to a question, Dr. Lopez told the committee that, traditionally, research universities are not focused on innovation but instead are focused on understanding the natural world. He stressed that UNM is primarily a research university. Nevertheless, this research often contributes to economic development through the generation of intellectual property patents, licensing and commercialization.

In response to a question, Dr. Lopez explained that the BBER is a service that reports to the OVPR. The BBER conducts economic analyses for state government and local industries and entities statewide. The BBER now has a more diverse funding portfolio than it has had in the past. He noted that before this diversification, there was concern that funding for research projects was used to support the BBER. The new funding portfolio alleviates this concern.

The OVPR is working with the UNM Office of Government and Community Relations on a bill to establish a fund for research-grant matching funds, which would contribute significantly to institutional infrastructure. He discussed Senate Bill 115 (2018), sponsored by Senator William P. Soules, which would have created a research grants closing fund. The bill died in the Senate Finance Committee.

In response to a question, Dr. Lopez told the committee that this cost-sharing fund would be used to increase New Mexico's capacity for research and assist in seeking federal funding. The proposed fund would have received \$2 million to \$3 million in annual appropriations.

Dr. Lopez discussed New Mexico's Established Program to Stimulate Competitive Research (EPSCoR) funded by the NSF to expand the state's capacity to conduct scientific research. Since 2001, \$184 million in funding has been given to the EPSCoR from the NSF, the United States Department of Energy (DOE) and the National Aeronautics and Space Administration (NASA). Thirty-one faculty hires have been supported by the EPSCoR. Since 2013, EPSCoR project participants secured an additional \$50.3 million, supporting 278 students.

In response to a question regarding capital outlay and research funding, Matthew Munoz, government relations manager, UNM, told the committee that the university submitted a capital outlay request to fund a CHTM acquisition of a sensor for toxic gases. He assured the committee that he would work with the research arm of the university on capital outlay requests moving forward. Representative Rodella requested that each research university produce a list of research priorities for funding endorsement at the committee's final meeting for the 2018 interim.

In response to questioning, Dr. Lopez told the committee that administrative overhead costs attached to grants vary substantially. He said that the administrative overhead cost on an equipment or training grant without indirect equipment purchases is typically approximately eight percent lower than a grant with indirect equipment purchases.

A committee member requested a list of research funding sources, with particular attention to state agencies, including a breakdown of costs and, in particular, administrative costs. The committee member sought to determine how much money is spent on research costs versus administrative costs. Dr. Lopez responded that he would provide a breakdown of funding from the United States Department of the Interior.

Mr. Munoz told the committee that many researchers are involved in UNM's internal building design process due to particular equipment that requires specialized buildings. Researchers and faculty are also involved in UNM's internal general obligation bonding proposal process. The university is proposing to fund the construction of a new \$14 million chemistry building through this bonding process. He acknowledged that projects included in the general obligation bond bill must meet Higher Education Department criteria. Recent buildings included in the bill have been science research buildings.

A member of the committee expressed concern that economic development is not a favored criterion in UNM's process to decide which grants to pursue. Dr. Lopez explained that the university pursues grants based on a desire to build on its strengths. He reminded the committee that the university's mission is not exclusively economic development. Dr. Lopez stated that the system used by UNM is balanced — it builds on strong areas within the university while supporting academic freedom.

## **UNM Innovation Academy**

Robert DelCampo, Ph.D., executive director, Innovation Academy, UNM, gave a presentation on the Innovation Academy. Founded in 2015, the Innovation Academy is focused on fostering student innovation, creativity and entrepreneurship. He discussed the innovation and entrepreneurship culture, noting that:

- 58 percent of college-age students see their futures as being part of a start-up company;
- 67 percent of all new jobs in the United States are created by small and start-up businesses;
- small business accounts for 99.7 percent of all businesses in the United States;
- the United States has an international advantage in innovation due to its diverse population and large university systems; and
- the United States has an individualistic culture that encourages entrepreneurship.

Dr. DelCampo discussed a chart from *The Economist* that displays the most in-demand job skills in the country, which are critical thinking and problem solving; collaboration and teamwork; and technical skills associated with the particular job. He told the committee that most of the skills on the chart are soft skills, which tend to be entrepreneurial skills as well. The Innovation Academy seeks to sharpen those skills to help make students more employable. A member of the committee discussed the importance of soft skills and past legislative efforts to appropriate money for soft skills training.

Dr. DelCampo discussed the traditional and contemporary roles of universities. Traditional roles of universities include commercialization of research and technology transfer. Contemporary roles of universities include entrepreneurship education for technical degrees and fostering team-based approaches to problem solving.

Over the last five years, universities have been expanding entrepreneurship education. Dr. DelCampo told the committee that UNM has taken a different, more inclusive approach to entrepreneurship education by preparing the entire university to make entrepreneurship education available for all fields of study.

Dr. DelCampo discussed the Innovation Academy's background and history. The program was designed to fill the gap in formal education for creativity, innovation and entrepreneurship and to provide students with transferable skills needed to compete in the current job market. He said that the goal of the Innovation Academy is to customize the university's teaching methods based on methods by which students best learn.

The Innovation Academy encourages collaboration with different people and groups to create solutions and develop new ideas. He stressed that the university wants every student to be an entrepreneur and have entrepreneurial skills, regardless of the student's field of study. UNM has asked faculty to consider curriculum that infuses innovation into existing degree programs. The goal in engaging faculty members is to help students have skills that can be articulated on a

resume, leading to employment. In response to a question, Dr. DelCampo said that the Innovation Academy is receptive to assisting community members. Community outreach work will begin in spring 2019.

Dr. DelCampo discussed competitions and challenges hosted by the Innovation Academy. The UNM Tech Navigator Challenge asks students to find new applications for existing licenses and has a \$10,000 prize. The Dion's "Keep it Cool" challenge invited students to find a way to ship Dion's salad dressing while maintaining the temperature at under 41 degrees Fahrenheit to prevent spoilage. A successful design will earn a \$10,000 scholarship and free Dion's pizza for one year.

Other programs, events and courses offered by the Innovation Academy include:

- the 2+1+2 program whereby students can earn three degrees in five years;
- a create-your-own job fair;
- the Innovation Academy toolbox; and
- the collaborative start-up project course, which asks 20 students to create a collaborative business.

Dr. DelCampo outlined the demographics of the Innovation Academy as follows:

- more than 50 percent of students are female;
- more than 50 percent of students are students of color;
- more than 60 percent of students are first-generation college students; and
- a majority of the students are full-time, taking 12 credit hours or more.

Dr. DelCampo discussed the Lobo Rainforest Building. The off-campus building has five floors of student housing. The ground floor of the building houses STC.UNM and the Innovation Academy, in addition to a credit union branch, a cafe and offices for the Air Force Research Laboratory, Sandia National Laboratories and General Atomics.

In response to a question, Dr. DelCampo told the committee that UNM does not have a certified business incubator. The Innovation Academy, described as an entity that leads individuals toward the right places and people to pursue their business dreams, fills that gap. He told the committee that the largest hurdle to overcome for the Innovation Academy is getting students to share their ideas.

A member of the committee announced that the National Conference of State Legislatures (NCSL) is expected to present to the committee in November on preventing "brain drain" and developing apprenticeships programs.

## **New Mexico State University (NMSU) — General Research Update**

Luis Cifuentes, Ph.D., vice president for research, NMSU, told the committee that he began working with NMSU only a few days prior to this meeting. Dr. Cifuentes has been employed by the University of Texas for 22 years prior to assuming his position at NMSU. He discussed the history of land grant universities, describing the history as concurrent with the history of education access. He noted that NMSU is a proud, minority-serving institution that is ranked number one among its peers in science and engineering funding. The university received two honors from the Brookings Institution for the university's ability to improve the lives of students. The university is highly ranked for improving life and upward social and economic mobility.

Total financial awards for 2018 equate to more than \$94 million. Eighty-seven percent of the awards come from federal agencies, including NASA, the United States Department of Health and Human Services and the DOD. Approximately four percent of 2018 awards come from state agencies. In response to a question, Dr. Cifuentes told the committee that recent years have witnessed a lot of federal funding going toward recognizing complicated issues. He said that there is a growing perception that researching from a single approach is not an accurate way to make policy or spur economic development. He told the committee that modern research approaches recognize both scientific and policy issues.

He discussed NMSU's research strength areas, including: water; STEM; computer science and engineering; and space and aerospace. The New Mexico Water Resources Institute at NMSU gives NMSU comprehensive capabilities in water-related research, education, outreach and economic development. The New Mexico Water Resources Institute, which offers extensive expertise on water topics, is composed of more than 80 faculty, researchers and staff from 15 departments within six colleges, as well as staff from the Agricultural Science Center and the Cooperative Extension Service. Water research at NMSU analyzes agricultural water use efficiency; watershed, riparian and aquatic systems; water quality and treatment; and water informatics using geospatial techniques. In response to a question, Dr. Cifuentes told the committee that a burgeoning area of study in water research is commonly termed "the water, energy and food nexus".

Dr. Cifuentes described the framework around agricultural, consumer and environmental sciences (ACES). There are different types of research projects in ACES, including pesticide safety impact, beginning farmers and ranchers and sustainable farming techniques. He told the committee that individual projects may create up to 50 jobs, collectively making a substantial difference for the community.

He discussed the Stronger Economies Together (SET) program. NMSU has facilitated the establishment of nine SET regions in 32 of New Mexico's 33 counties. Los Alamos County is not participating in the SET program.

Dr. Cifuentes discussed plant and soil science, which studies the development of and evaluation methods for microbiological and chemical analysis; transcriptome sequencing of new world miracle trees; population rootstock development; and the development of a comprehensive and effective state pesticide regulatory program.

Dr. Cifuentes noted the strength of NMSU's medical and health services research, which involves emerging pathogens, cancer research, neuroscience, public health and biomedical education and training.

NMSU regards public access to research as an important tenant for the community and university. He discussed NMSU's STEM Outreach Center, which provides out-of-school programs, teacher professional development, curriculum and educational resource kits, parent and family outreach, summer camps and quantitative and qualitative assessments. The out-of-school programs serve students between kindergarten and eighth grade. The teacher professional development program is available to all participating after-school program teachers. The STEM Outreach Center's activities for 2018 will contribute to Dona Ana County:

- 36 jobs to the local economy;
- \$1,278,592 in labor income;
- \$1,792,110 in value-added benefits; and
- an overall economic output of \$2,702,267.

Dr. Cifuentes discussed economic development in the context of research. The primary contribution made by research is that of educating and graduating students and creating a better educated and trained workforce. He said that the primary goal of economic development is to create jobs that will keep youths and jobs in the state.

He told the committee that NMSU has a long history of space science research, and he discussed the Apache Point Observatory. Continued operation of the observatory provides more than \$2 million annually in local salaries, employs 30 people and adds \$200,000 in annual purchases and services to the local economy.

The NMSU Unmanned Aircraft Systems (UAS) test site provides rural and economic development from UAS flight testing, mid-altitude long endurance flight operations and critical infrastructure inspections. NMSU UAS capabilities improve and enhance the safety of electrical utility and dam inspections by examining infrastructure through mapping and modeling, geolocation mapping of assets, detailed safety inspections and emergency response planning. Dr. Cifuentes said that the applications for using UAS in rural development are critical. Other research on the use of UAS envisions using drones as a cheaper way to deliver blood to rural areas in emergencies.

NMSU also has a notable history with energy and biofuels research, Dr. Cifuentes said. Federal funding for research in these fields fluctuates with changing priorities in federal

administrations. Dr. Cifuentes told the committee that NMSU Chancellor Dan Arvizu was previously the director of the DOE's National Renewable Energy Laboratory, so he anticipates that renewable energy research will continue to be a priority for the university. Research in these fields include algal biofuels, microgrids, solar and wind energy and fuel cells.

He noted that New Mexico is comparatively behind in start-up creations and discussed NMSU's Arrowhead Center. The purpose of the Arrowhead Center is to promote entrepreneurship and innovation and create economic opportunities in the region. The center is a regional hub for entrepreneurship and innovation, connecting people with products to resources that can help people achieve their goals. The center provides resources that help create jobs and grow businesses. The economic impact of the Arrowhead Center includes \$125 million in labor income, the creation of 993 jobs and \$2.6 million in public and private investments.

Dr. Cifuentes discussed the Idea Network of Biomedical Research Excellence (INBRE) program. This program brings New Mexico's educational institutions together and champions biomedical and community-based research excellence. This is achieved through the development of innovative, supportive and sustainable research environments. An economic analysis of the INBRE program from 2009 through 2018 showed a total effect of 598 new jobs, \$15 million in labor income and \$39 million in economic output.

Dr. Cifuentes closed his remarks by acknowledging that public universities perform research to reflect public will and turn knowledge into social and economic developments. Universities are primed to achieve these goals with a wide variety of disciplines.

In response to a question from the committee, Dr. Cifuentes discussed hemp research. Following the passage of bills allowing hemp-related research in the state and a lawsuit that ultimately resulted in the bills becoming law, the New Mexico Department of Agriculture (NMDA) is moving forward with developing regulations for research. He told the committee that questions remain regarding tetrahydrocannabinol (THC) content in hemp and how that could impact federal funding. Currently, the university does now allow THC to be kept at laboratories.

A member of the committee announced that the NMDA will hold hearings regarding hemp rules in October and November. The committee member said that New Mexico has fallen behind other states regarding hemp research progress. He told the committee that most states allowing industrial hemp require less than three percent THC content for hemp, with the exception of Colorado, which allows higher percentages. The University of Kentucky has been growing copious amounts of industrial hemp though its university extension programs. The committee member warned that other states, such as Oregon, Washington and California, all have burgeoning research programs that may surpass New Mexico.

While responding to a question, Dr. Cifuentes told the committee that a collaborative effort is essential to reaching economic development goals. He hopes to join the business incubator and research in collaborative efforts to help achieve economic development goals.

## **Approval of Minutes**

On a motion made by Senator Padilla and seconded by Senator Martinez, the minutes from the first meeting of the ERDC were approved.

## **New Mexico Institute of Mining and Technology (NMIMT) — General Research Update**

Van Romero, Ph.D., vice president of research and economic development, NMIMT, discussed past NMIMT research, such as the proximity fuze developed during World War II, that spurred other explosives research. Currently, funding for explosives research annually yields \$10 million to \$50 million for NMIMT.

Dr. Romero discussed research related to energetic materials. With about 50 undergraduates employed in research efforts, this research field has become the largest employer on campus. Research conducted at NMIMT also includes the areas of chemistry and mechanical and electrical engineering.

Dr. Romero briefly discussed industrial research at NMIMT and showed a video of an ammonium nitrate bomb. The bomb is used to generate diamond powder for drills and other tool tips.

Dr. Romero also told the committee about the Enhanced Novel Explosives (ENE) program. Research for this program simulates explosives in a scaled urban environment. ENE research receives funding from the federal Department of Homeland Security (DHS). Program objectives include the evaluation of blast overpressure and damage from an ENE in an urban setting; design and construction of a scaled urban environment; and the combination of all results into a comprehensive database to deliver a software tool that will predict ENE damage in urban environments. Researchers test shockwaves and explosives in city environments and are able to test different explosives in the same environment.

Dr. Romero informed the committee that bridge suspension technology designed at NMIMT will survive an explosion. The technology has been used on the double-decked suspension George Washington Bridge crossing the Hudson River in the Manhattan borough of New York City.

Dr. Romero told the committee that the basis for "3-1-1 rule" for allowing fluids and other goods on commercial air flights was established at NMIMT. Research performed by NMIMT established that three ounces or less of an explosive liquid or mix will not critically damage an aircraft.

He discussed an emerging threat from foreign enemies using drones, and he showed the committee a video of a drone detonating a one-pound explosive behind a moving vehicle. The university is also researching methods to use drones for counter-security measures, Dr. Romero said. He told the committee that the Federal Aviation Administration will not allow the university to shoot down aerial drones, so other ways to subdue aerial drones must be found.

NMIMT helps address national security concerns by hosting anti-terrorism events and first responders training. This service provides \$22 million per year to the university and fills many hotel rooms each year in the community for these events. Participants and financial providers for these training simulations include the Federal Emergency Management Agency, the Transportation Technology Center and the National Disaster Preparedness Training Center.

Training simulations are held at NMIMT's Playas Research and Training Center. Dr. Romero played a CBS news segment regarding the training center, which provides a return-on-investment ratio of 41:1. In response to a question, Dr. Romero told the committee that the Playas Research and Training Center has a typical modern town infrastructure that is ideal for testing cybersecurity and border issues, including electronic fences and detection methods.

He told the committee that the school's primary customer is the DHS, which studies issues relating to South America and Mexico. He stressed that the Playas Research and Training Center is an excellent location for simulation and development research. He reported that NMIMT anticipates receiving \$4 million over the next three years to use the Playas Research and Training Center as a cybersecurity test range for government agencies. This commitment to use the Playas Research and Training Center will result in more jobs, more people and more economic development in the area.

Dr. Romero discussed energy-related research performed in several programs, including mineral engineering, petroleum engineering and chemical engineering. He discussed the statutorily created New Mexico Petroleum Recovery Research Center (PRRC) and the sequestration of carbon dioxide in a depleted oil reservoir. Carbon sequestration research employs advanced reservoir modeling and computer simulation tools, laboratory tests, field measurements and monitoring efforts to understand, predict and monitor geomechanical and hydrogeologic processes associated with down-hole injection of carbon dioxide. Ultimately, the models and data will be used to predict storage capacity and physical and chemical changes in reservoir properties, such as fluid composition, porosity, permeability and phase relations. A better understanding of carbon dioxide reservoir interactions resulting from this project will improve industrial economic and rural development flooding practices.

Dr. Romero discussed geothermal resources in Socorro. Socorro has a ground water upwelling from depths of up to four kilometers. La Jencia Basin to the west of Socorro is the source of Socorro's geothermal waters.

In response to a question, Dr. Romero told the committee that NMIMT has one of the largest greenhouses in the country. While the geothermal water is not hot enough to produce energy, it is the appropriate temperature to increase production of agricultural products such as tilapia, roses and tomatoes. Researchers extract water from the ground to harness the heat from the water before returning the water to the pool. One result of this project is an extended growing season. Dr. Romero told the committee that in order to produce electricity, the temperature of the water would need to be at least 180 degrees Celsius to create usable steam.

NMIMT has an agreement to work with Massachusetts Institute of Technology (MIT) on research for molten oxide electrolysis. Dr. Romero believes that MIT selected NMIMT as a research partner for this project because, in addition to NMIMT research successes, New Mexico has access to iron ore and cheap direct-current electricity.

The Incorporated Research Institutions for Seismology (IRIS) Portable Array Seismic Studies of the Continental Lithosphere (PASSCAL) Instrument Center is a consortium of more than 100 universities dedicated to the operation of science facilities in support of cutting-edge seismological research. The IRIS PASSCAL programs contribute to scholarly research and education through the EarthScope program. The EarthScope program gains support from the NSF to deploy seismic instruments, global positioning systems and other instruments to study the processes that cause earthquakes and volcanic eruptions.

The EarthScope program is an exploration of the four-dimensional structure of the earth, Dr. Romero said. The USArray is an integral part of the EarthScope program that consists of four interrelated parts. The USArray is a 15-year program to place a dense network of permanent and portable seismographs across the country. Dr. Romero told the committee that NMIMT was selected over Stanford University in the awarding of this research contract.

Water research at NMIMT is composed of earth science, atmospheric physics and mechanical engineering. Dr. Romero discussed the geophysical research center, which houses the Langmuir Laboratory for Atmospheric Research, and highlighted research on hydrology and involvement with the Sustainability of Semi-Arid Hydrology and Riparian Areas (SAHRA) organization. The vision for SAHRA is to develop an integrated multidisciplinary understanding of semi-arid region hydrology and to build partnerships with a broad spectrum of stakeholders (both public agencies and private organizations). The goal is to effectively manage water resources and rationally implement public policy. SAHRA's purpose is to inform and support water professionals by conducting stakeholder-relevant research, education and knowledge transfer activities. SAHRA's geographical focus is on the San Pedro, Val Verde, Rio Grande and Rio Conchos basins. This area spans from southern Wyoming to central Mexico and from western Arizona to central Texas. SAHRA's partner institutions include NMIMT, UNM, the University of Arizona, the United States Geological Survey and Sandia National Laboratories.

NMIMT also houses the Institute for Complex Additive Systems Analysis, which focuses on management, computer science and engineering to protect the nation's digital infrastructure systems. Dr. Romero discussed cybersecurity-related research performed by computer science and electrical engineering students but could not divulge many details on these projects due to the classified nature of this field of research. Students working in this field must pass a federal background check and receive a security clearance.

Dr. Romero discussed astronomy operations at NMIMT. NMIMT partners with the National Radio Astronomy Observatory and National Optical Astronomy Observatory. Collectively, these agencies operate the Magdalena Ridge Observatory, the Very Large Array, the

Long Wavelength Demonstrator Array and the Magdalena Ridge Observatory Interferometer. He told the committee that the Magdalena Ridge Observatory and the Magdalena Ridge Observatory Interferometer are the most ambitious observatories in the world. He briefly discussed astrophysics-related research and the Cavendish Laboratory at the University of Cambridge.

Dr. Romero described biomedical and bio-informatics research at NMIMT, including microbiology, applied and system ecology and comparative biomechanics, physiology and mathematical modeling. Microbiology research involves examining molecular ecology, bio-remediation, bacterial physiology, animal-microbe symbioses, emerging pathogens, pathogen navigation through the environment and the effect of climate change on evolution and genetic transfer of antibiotic resistance.

The applied and system ecology program works to develop drought-resistant crops, Dr. Romero said. He told the committee that the program researches topics such as how microbes support the growth of cannabis. Researchers examine soil nutrient cycling, disease and pest control and improved sustainability. He explained that cannabis is not brought on the campus because that would jeopardize federal funding. In lieu of cannabis, NMIMT uses surrogate plants.

He discussed comparative biomechanics physiology and mathematical modeling. Researchers in these fields examine topics such as variations affecting the evolution of structures; morphogenesis of hearts; and odor capture by crabs and insects. Researchers use computational modeling, experimental fluid dynamics and high-speed videography in this program, which is a collaboration with LANL.

He discussed cell and molecular biology research at NMIMT. In addition to saving lives, drugs developed at NMIMT also provide a significant economic boost. NMIMT-developed drugs include anticancer, antibacterial and antiparasitic drugs as well as antimicrobial creams. Water purification and biosensors are also significant areas of cell and molecular biology research at NMIMT.

Dr. Romero told the committee that one barrier to economic development is finding investors. Persuading potential investors can be difficult since the school requires that all funded work must be done in New Mexico.

Dr. Romero discussed the August 2011 "big science issue" of *Popular Science*. In this issue, NMIMT was featured twice in an article on the "ten most awe-inspiring projects in the universe". The top most awe-inspiring project in the universe was the IRIS PASSCAL Instrument Center. The eighth featured project on the list was the Very Large Array.

Payscale.com analyzed annual pay for bachelor's-level graduates without higher degrees, and it determined that NMIMT was among the top-10 state universities in terms of salary potential for its graduates. A study by the NSF ranked NMIMT as fourteenth in the top 50 universities that

produce Ph.D. students. NMIMT is the highest-ranked public institution for the production of Ph.D. students.

He reported that the NMIMT general obligation bonds board advised the university to make research a lower priority when taking projects to the legislature for approval. Instead, it recommended a focus on funding brick-and-mortar projects. He told the committee that a matching fund for research grants would help bring more money and jobs to New Mexico.

A committee member discussed a presentation on cybersecurity that occurred in a past meeting of the interim Science, Technology and Telecommunications Committee at NMIMT. The member noted that legislators should be more attentive to threats to cybersecurity. Dr. Romero noted that students at NMIMT are working with General Motors to develop coding protections for vehicles with keyless entry.

### **Superfund Program Overview and Obligations**

Michaelene Kyrala, director of strategic initiatives and policy, Department of Environment (NMED), discussed the Superfund program and its benefits to economic development.

She explained that a Superfund site is one that is extremely contaminated and has had hazardous materials dumped on it without proper management and precautions. The hazardous materials at a Superfund site can contaminate the land, air and water around it, potentially causing serious harm to humans and the environment. Past locations designated as Superfund sites include dry cleaners, landfills, mining operation sites and rail yards.

In 1980, Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act to protect humans, wildlife and natural resources. The act established a federal "Superfund" to clean up uncontrolled or abandoned hazardous waste sites.

Ms. Kyrala explained the Superfund site cleanup process. The United States Environmental Protection Agency (EPA) is the only entity that can designate a site as a Superfund priority. Once a site is designated as a Superfund site, the EPA is responsible for oversight of its remediation. The EPA can either require the parties responsible for contamination to clean the site or require them to reimburse the government for EPA-led remediation efforts. If a site does not have a viable responsible party, the site is designated as an orphan site, and the EPA becomes responsible for funding and cleanup. In response to a question, Ms. Kyrala explained that, once a site is listed as a Superfund priority, the NMED treats all sites with equal priority.

The EPA pays for the entire Superfund assessment, and it may take several years before a site is put on the priority list. Following the designation as a Superfund priority site, the EPA pays 90 percent of the cost of cleanup while state governments pay the remaining 10 percent. After a 10-year period, the state becomes responsible for 100 percent of cleanup.

The amount of money requested by the NMED is heavily leveraged by the federal government. Ms. Kyrala explained that by the end of the 10-year period of federal oversight, there is generally only limited work remaining, which can be performed at a lower cost. In response to a question, Ms. Kyrala explained that after the 10-year period, most work entails monitoring and preventing the spread of hazardous materials. She told the committee that it can be difficult to predict the length and costs of a cleanup project. Remedial system construction time frames are very difficult to predict, as the EPA must prioritize construction based on site risk and funding availability.

In New Mexico, the Superfund program is managed by the Groundwater Quality Bureau of the NMED. She told the committee that currently there are 16 Superfund sites in New Mexico dispersed throughout the state. Of those 16 sites, eight are orphan sites. New Mexico is required to contribute funds for the cleanup and long-term maintenance of the eight orphan sites. Additionally, Ms. Kyrala said that there are three de-listed sites containing waste repositories, meaning that they must undergo operations and maintenance in perpetuity.

Ms. Kyrala discussed NMED financial needs. Known costs for years 2020 through 2023 total \$1.259 million. Unknown costs will be determined as current projects progress.

She discussed several specific projects. A pump and treat method reduced contamination in ground water from the Fruit Avenue Plume in Albuquerque to a point that remedial efforts moved to monitored natural attenuation. The Grants Chlorinated Solvents Plume had extremely high concentrations of tetrachloroethene, which was boiled out of shallow ground water and collected. This strategy significantly reduced concentrations in the ground water. Photographs from both sites can be viewed in the handout, Ms. Kyrala said.

Ms. Kyrala discussed the community and economic benefits of Superfund cleanup, which include:

- clean ground water and drinking water;
- reclaiming and reusing thousands of acres of formerly contaminated land;
- protecting public health;
- restoring the environment;
- supporting positive economic and social outcomes in communities;
- deterring blight, vandalism and trespassing;
- identifying long-term site stewards while considering future use;
- engaging vulnerable communities; and
- long-term protection of remediated sites.

Ms. Kyrala discussed the Terrero Mine. It has not been designated a Superfund site, and Superfund-designated money cannot be used to clean up this site. She told the committee that between 1926 and 1939, the Pecos Mine and El Molino Mill processed about 1.3 million tons of ore and about 40 million tons of minerals, including zinc, lead, copper, silver and gold. At the

time, the mine and mill were the largest employers in New Mexico. The DOT and the Department of Game and Fish (DGF) used mine waste on nearby campgrounds and roads. Freeport McMoRan, Inc., is paying 80 percent of the cleanup costs, while the NMED, on behalf of the DGF and the DOT, pays 20 percent. There is an outstanding balance of \$194,000 for this site cleanup. She told the committee that there is an estimated future cost of about \$60,000 per year for the next three years.

In response to a question, Ms. Kyrala told the committee that the Atchison, Topeka and Santa Fe Railway (AT&SF) sites are not orphan sites and that the AT&SF is responsible for paying for the cleanup of those sites.

In response to a question, Ms. Kyrala told the committee that she will provide a list of the projects to committee staff, including project status, whether the projects are listed as orphans or have a separate party responsible and the area and acreage reclaimed for each project.

In response to a question from the committee, Ms. Kyrala explained that the jet fuel spill on Kirtland Air Force Base has not been designated a Superfund site. Instead, the NMED has partnered with the United States Air Force and others to work on the plume. She said that a lot of work is being done to protect water and limit the spread of the hazardous materials. The NMED's chief scientist reports that the project is progressing very well.

### **Public Comment**

Susan Gordon, coordinator, Multicultural Alliance for a Safe Environment, told the committee about her work on uranium and mining issues in the Grants mining district. During the 2018 session, she worked with Representative Johnson on a bill to fund a study of jobs created from Superfund programs. She told the committee that the large corporations receiving contracts for cleanup temporarily import workers to New Mexico and then leave when cleanup is completed.

### **Recess**

The committee recessed at 4:00 p.m.

### **Friday, July 13**

### **Reconvene — Introductions**

Representative Rodella reconvened the meeting at 9:05 a.m. and welcomed members of the committee and guests to the meeting. Committee members and staff introduced themselves.

### **Carbon Capture/Sequestration Research**

Plamen Atanassov, Ph.D., director, Center for Micro-Engineered Materials, and distinguished professor of chemical and biological engineering, UNM, discussed research at UNM. He told the committee that research at UNM is conducted by a variety of academic units

and several research centers. He discussed the OVPR centers and institutes, noting that the OVPR oversees the BBER, CHTM and EPSCoR.

Dr. Atanassov described a number of current and past projects, including photovoltaic and thermophotovoltaic research at the CHTM. He noted that current UNM efforts include an investigation of III-Sb PV cells on gas and silicon substrates.

Dr. Atanassov discussed research into combining photovoltaic and thermoelectric generators to take advantage of sunlight. He suggested that this technology could replace the need for coal-burning plants in the region.

He also discussed advances of nanomaterials research at UNM. Nano-stabilized enzymatic membrane for carbon dioxide capture meets DOE standards for carbon dioxide sequestration. This technology won a first place "R&D 100" gold medal for green technology. Currently, a company in Albuquerque is working to commercialize this product.

Dr. Atanassov discussed research performed using electricity to convert carbon dioxide to carbon monoxide. He noted that this could lead to transforming carbon dioxide into useable fuels.

In response to a question, the committee was informed that UNM is also working on solar storage cells and technology, which is a critical effort in the development of solar technologies.

Dr. Atanassov also described research at UNM regarding oil and gas wellbores. The research team seeks to improve wellbore integrity to prevent the escape of carbon dioxide. The university, in conjunction with LANL, is developing acoustic measurement tools for use in wellbores to detect leakage pathways. By adding special nanomaterials to cementitious materials, improvements can be made to improve the acoustic contrast of wellbore cements to simplify detection of leakage pathways.

UNM is also working to understand the effects of carbon dioxide on climate change and the environment; currently, it has six research projects relevant to that goal.

Dr. Romero discussed the intersection of environmental concerns and enhanced oil recovery. He provided a brief history and explanation of carbon dioxide enhanced oil recovery; carbon capture, storage and utilization; and case studies of carbon capture and utilizations for enhanced oil recovery.

In response to a question, Dr. Romero explained that fracking occurs during the first drilling sequence. Secondary recovery uses water to displace oil that could not originally be reached, producing another 35 percent of oil from the well. The tertiary method for recovering oil pushes carbon dioxide into wells, allowing the well to produce oil for an additional 30 to 40 years. This technology must be used on older wells and cannot be used on newer, horizontally drilled wells.

In response to a question, Dr. Romero explained that fracking began in the early twentieth century and was initially used on water wells. Recently, evidence from Oklahoma suggests that fracking may induce seismic activity. There is no evidence of seismic activity caused by injecting carbon dioxide into wells. He explained that New Mexico has different geology than Oklahoma, and only minor seismic activity has been detected here. There is some suspicion that one or two earthquakes may have been caused by fracking, but researchers have not yet determined what triggered those events.

In response to a question, Dr. Romero explained that the reason for using water as the secondary method to extract oil is that approximately five to 20 barrels of water are extracted per gallon of extracted oil. Water removed during the initial extraction process is reused in the second extraction stage.

Relevant research at UNM seeks to utilize carbon dioxide to allow isolated pockets of oil to be pumped from the ground. Impacts for oil-producing companies include increased recovery, as two-thirds of all oil in a well is stranded, a market advantage and increased positive public perception. Dr. Romero suggested that this technology could play a big role in carbon capture, carbon taxes and moving the market forward. He told the committee that this research could be beneficial for New Mexico and similar states.

In response to a question, Dr. Romero confirmed that 92 percent of re-injected carbon dioxide stays in the ground and that, if not captured, 100 percent of the carbon dioxide would be freely released into the environment.

In response to a question, Dr. Romero explained that research at universities produces technology and products that are not market-ready. At UNM, once a technology is ready for market, STC.UNM can create a new business, purchase an existing smaller business or combine businesses. He explained that older factories are not equipped to adopt technology developed at UNM. However, he explained that as new facilities are built, the latest technology will be incorporated. He expressed his opinion that giving carbon tax breaks could pique the interest of oil producers, potentially causing them to move into the state.

In response to questioning, Dr. Romero explained that the PRRC was created in statute to assist smaller producers. Frequently, the smaller producers perform research and initial drilling until a larger company purchases the smaller entity.

In response to a question, he said that UNM is the lead entity on technology development of catalytic membranes of ammonia synthesis, adding that there is a link to energy storage in those findings. He explained that ammonia synthesis was originally created to assist in agriculture, but shortly after the outbreak of World War I, ammonia was designated for explosives research.

### **Albuquerque Economic Development (AED) Committee**

Joe Farr, AED Executive Committee and senior vice president, Gemini Rosemont Commercial Real Estate; Gary Tonjes, president, AED; and Dennis Houston, retention and expansion consultant, AED, discussed economic development issues in Albuquerque. Mr. Farr discussed his role in Gemini Rosemont Commercial Real Estate, explaining that the entity manages \$2 billion in real estate investments throughout the United States. He stated that his experience in real estate has allowed him to observe why a business decides to stay, leave, expand or take other actions potentially harmful to the city or state.

He explained that AED is not a chamber of commerce. Instead, it is a private nonprofit organization. A majority of AED funding comes from private companies that pay dues ranging from \$2,000 to \$30,000 per year. Companies participate in this entity because they want to see the Albuquerque business community improve and progress. AED also receives limited funding from grants and quarterly meetings. Ultimately, the goal of AED is for a business to support and bring other businesses to the Albuquerque area economy.

AED has operated under the same mission since its founding in 1960. It attempts to attract and grow businesses that sell 50 percent or more of produced goods and services out of state in an effort to bring money from other states into New Mexico.

AED markets the Albuquerque metro area to site location consultants, industries, influencers and media around the world by conducting sales-mission trips; participating in industry-specific trade shows; hosting special events, such as familiarization tours; advertising in key publications; and developing marketing materials such as AED's website, videos, social media campaigns and more.

Mr. Farr told the committee that he has observed that tax incentives are not a critical factor when a business is considering a location. Prior to consideration of incentives, businesses are more likely to examine an area for economics, demographics, retailers and employee availability. He added that incentives might be used to differentiate one location from an otherwise similar location, but incentives should not be included as part of a first-location pitch. AED has been responsible for bringing 30 companies to the area in the last eight years, creating 5,000 new jobs in the Albuquerque metro area.

Mr. Houston told the committee about his work encouraging retention and expansion of businesses currently located in the Albuquerque metro area. He begins with a one-hour initial visit with a company to learn about the company's concerns that keep it from growing. Regardless of how company officials answer that question on constraints to growth, AED begins working to minimize or eliminate the constraint.

In response to a question, Mr. Tonjes stated that primary issues that stall economic development in the area vary depending on the economy. When the nationwide economy is weak, the top problem is finding financing, but when the economy is strong, businesses' main difficulty

is finding employees with skills and who are ready to work. He explained that AED is not aware of how many businesses do not consider moving to Albuquerque due to the crime rate.

Mr. Houston, in response to a question, explained that companies seek available workers in an area perceived as a pro-business climate. He explained that Texas has a powerful economic development brand and is growing in population at a rate faster than most areas of the country. He said that Texas provides incentives to win projects. He told the committee that currently New Mexico competes adequately against Texas and Arizona and at higher levels than in previous years.

Mr. Houston discussed tools available to AED to complete its mission. These tools include: the Local Economic Development Act (LEDA); the Job Training Incentive Program (JTIP); and manufacturing tax credits. He discussed eliminating the tax credits and replacing them with a sales tax exemption to be consistent with the surrounding states.

Mr. Houston told the committee that the JTIP has been funded for 46 years, but in three of the last five years, the fund has run out of money before the end of the fiscal year. He told the committee that to qualify for the JTIP, the companies must adhere to several specific requirements, such as being economically based in New Mexico, adding new well-paying full-time jobs and generating more than 50 percent of their revenue from outside the state. He told the committee that some companies will hire without JTIP assistance but others will not.

Mr. Tonjes discussed the need for robust funding for the JTIP and the LEDA. He told the committee that the LEDA is responsible for bringing Keter Plastics to a facility in Belen that had been vacant for nearly a decade. He told the committee that over the last six months, AED has vetted a number of good opportunities. He expects to announce several deals prior to the next legislative session. He requested that the legislature keep JTIP funding at \$40 million.

### **Funding Opportunities for Rural Development**

Mark Scheffel, senior vice president, Advantage Capital, explained that he is a former two-term Colorado state senator and tax attorney. He currently works with Advantage Capital, a small business investment firm managing \$3 billion in investments across 700 companies. Advantage Capital targets businesses that would otherwise struggle to attract capital, such as those in rural areas.

Mr. Scheffel told the committee that New Mexico currently has an opportunity to create an investment fund to specifically target areas that experience trouble attracting capital. He said that the national economy is doing well, including a strong banking sector. He told the committee that New Mexico's economy is doing well in some areas, but certain quadrants of the economy are missing opportunities due to their rural locations.

He discussed an article written by John Cook on the states that attracted the most venture capital in the fourth quarter of 2017. The top-ranking states include California, New York,

Massachusetts and Washington. He said that New Mexico competes most directly with the states in the Four Corners region, but the rest of the country and the entire world should be viewed as competitors for retaining or landing businesses.

Mr. Scheffel discussed a 2017 report that studied the benefit flows from small business job creation and growth. One investment firm surveyed 10 of its active portfolio companies and saw that 13,512 jobs were supported, including created and retained jobs. He said that 80 percent of companies surveyed offer health insurance benefits; 53 percent provide employee training; and the average full-time wage offered is more than 15 percent higher than the national average at \$54,865. He told the committee that the free market will drive money to good businesses and that a program like the one recommended would allow investment firms to partner with local banks.

He briefly discussed a LegisBrief published by the NCSL. The article discusses the lack of economic recovery in rural areas and associated population loss in those areas.

He told the committee about two models for investing in rural America through special-purpose funds — a tax credit fund and a grant matched by a private capital fund. Both models require businesses to show job growth or they lose their grant or tax credit. He told the committee that transparency and accountability are crucial to ensure that either option works as intended. He described the methods as a combination of debt and equity targeted at opportunity zones.

In response to a question, Mr. Scheffel told the committee that he intends to make a presentation to the interim Revenue Stabilization and Tax Policy Committee. In response to a question, Mr. Scheffel declined to answer as to why Advantage Capital stopped participating in the New Markets Tax Credit Program in New Mexico because he did not work with the firm at that time.

### **Adjournment**

There being no further business before the committee, the second meeting of the ERDC for the 2018 interim adjourned at 3:00 p.m.