Long-term confidence in a critical element of the US nuclear deterrent depends on the success of the B61 life extension program (LEP) now underway at Sandia, Labs President and Director Paul Hommert said in recent congressional testimony.

“In order to sustain high confidence in the safety, security, and reliability of the B61 into the next decade, it is our technical judgment that we must complete the life extension program currently being executed,” Paul told the US House of Representatives’ House Armed Services Committee’s (HASC) Strategic Forces Subcommittee during a 90-minute hearing on weapons modernization.

Paul testified that the B61 LEP must be completed because of well-documented technology obsolescence and aging issues that he called “not surprising for a system the oldest units of which were manufactured and fielded in the late seventies, with some components dating to the sixties.”

He testified — along with Gen. C. Robert Kehler, commander, US Strategic Command; Madelyn R. Creedon, DoD assistant secretary for Global Strategic Affairs; and Donald Cook, NNSA deputy administrator for Defense Programs — during the hearing “Nuclear Weapons Modernization Programs: Military, Technical, and Political Requirements for the B61 Life Extension Program and Future Stockpile Strategy.”

(Continued on page 4)
That’s that

There has been an event in modern American history that has been so written about, so commented upon, as the assassination of President John F. Kennedy 50 years ago this month. I don’t think so. And, of course, the very fact that I refer to things that happened a half century ago as “modern” only goes to date me to, me, eighth-grader in 1963, the assassination still feels like current events. To my own adult children, it’s ancient history.

Those of us of a certain age can—and will—tell you (and tell you and tell you) where we were when we heard our president had been shot. I happened to be in Bel Air, California site back then. I had been invited over to a friend’s house by the time my father walked into the room. “What’s going on?” he exclaimed. “Kennedy has been shot.” “Yes,” my mom replied, “in Dallas.” “No,” my dad said, “that is not right.” “Yes,” my mom said, “Dallas.” I realize now we were so wrong about the location. But nobody knew that in the instant of that moment. It was just a gut reaction.

I’ve written before, in the context of 9/11, about those singularities in history where you see the world on one side of that date and on the other seem to exist in different realities. It was like that with the death of President Kennedy. How different? George Lucas conveyed that sense of a lost world perfectly in Graffiti. The main character’s name was John, and he stared down the Russians in the Cuban Missile Crisis, hadn’t he? He had stirred us up, hadn’t he? That was all. Not if you were in eighth grade and had been inspired by President John F. Kennedy to reach higher, to dream bigger, to be better, and do more for your country and the world. That’s how it felt. It really was. And then it was just . . . gone.

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Researchers converting natural gas to liquid transportation fuel via biological organisms

2-year program is a tall order but do-able, says Labs’ Blake Simmons

By Mike Janes

A multi-project, $34 million effort by the Advanced Research Projects Agency – Energy (ARPA-E) is aimed at developing advanced biocatalyst technologies that can convert natural gas to liquid fuel for transportation, and Sandia will use its expertise in protein expression, enzyme engineering, and high-throughput assays to help make it happen.

The ARPA-E program, known as REMOTE, or Reducing Emissions using Methanotrophic Organisms for Transportation Energy, involves 15 projects. Sandia is a part of a two-year, $1.5 million award led by MOgene Green Chemicals, a subsidiary of St. Louis-based MOgene, LC, and will work toward “sunlight-assisted conversion of methane to butanol.”

The broad goal is to have another source of energy in the US that doesn’t have to be imported and could lead to lower CO emissions than conventional fossil fuels. Methanotrophs are microbes that can metabolize methane. Blake Simmons (8630) calls them the “poster child” of organisms capable of metabolizing and converting methane. The goal of the project is to engineer pathways from these organisms into another microbial host that can generate butanol. Butanol can be used as a fuel in an internal combustion engine and has, along with ethanol, long been considered one of the best biofuel options for transportation energy.

“Time and time again, through various LDRDs [Laboratory Directed Research and Development projects] and our work at the Joint BioEnergy Institute [JBEI], Sandia has proven its ability to express proteins that are difficult to express,” Blake says. The lab also possesses engineering and modeling tools as well as the ability to build high-throughput custom enzyme assays, significant proficiencies that can lead to better performance in enzymes. Few research organizations, says Blake, offer that package of technical capabilities to tackle a problem like this one.

Blake acknowledges that meeting the objectives will not be a simple or trivial endeavor. “People have been trying to express this class of enzymes for a couple of decades,” he says. “So this definitely won’t be a slam dunk.”

But based on Sandia’s work with membrane proteins and various tools developed over the years, he thinks the lab is up to the task. “It’s been a confounding scientific challenge for the research community, and this is a notoriously difficult class of proteins,” he admits. “But I think we have the collective experience and capabilities at Sandia to figure it out.”

California retirees reconnect and celebrate at annual luncheon

More than 200 Sandia/California retirees gathered in October for the annual Retiree Luncheon held at the Robert Livermore Community Center. The retirees appreciated the warm and inviting nature of the event, as well as the opportunity to socialize and reconnect.

Dev. 8000 VP Steve Rottler and Transportation Energy Center Director Bob Carling addressed the audience, providing an update of the state of the lab, news about recent accomplishments, and exciting new direction. Community Relations officer Stephanie Beady (8521) discussed the SHARE campaign kickoff and Family Science Night and invited the attendees to both events. Special guest Labs President Paul Hommert also attended the event to socialize and reminisce with the group.

The attendees enjoyed a “Then and Now” slide show that featured photos from the 1950s to present. The retirees also learned about ways to stay involved with Sandia through volunteering for activities like Family Science Night, joining the Retiree Association of Sandia/CAL (RASCAL), and attending events in the Livermore Valley Open Campus such as the Farmers Market.
Funding uncertainties a challenge

Paul Hommert, the SANDIA LAB NEWS November 15, 2013 Page 4

The B61 LEP is an aging weapon, but funding.

The hearing was intended to provide Congress with expert views on the B61 LEP and to advance discussion on addressing a particular problem, Julia said. "The extent to which we can do research challenges all have certain characteristics, including a long but finite life with impacts during the entire length of the work. The challenges require the expertise of a cross section of the Labs' multiple disciplines, ranging from fundamental science to technology application. They also must overcome technical obstacles critical to a mission area and leave a long-term science and engineering legacy for Sandia.

"Sandia excels in bringing together a wide variety of disciplines, going all the way from fundamentals to mission delivery, and we bring that together to focus on addressing a particular problem," Julia said. "The extent to which we can do that differentiates us from the rest of the pack."

Research challenges also couple to mission areas identified in the past year: nuclear weapons, the core of Sandia's work; global nuclear dangers; nuclear assessment and warning; cybersecurity; synergistic defense products, global chemical and biological dangers; secure and sustainable energy future; and leveraged defense innovations. Engineering of Materials' Reliability

The Engineering of Materials' Reliability research challenge is meant to move Sandia from the forensic analysis of failure to a future of predicting engineering reliability based on a fundamental understanding of the mechanisms of degradation and failure, said Justine Johannes, director of Engineering Sciences (1500). The performance of materials over time can vary greatly, and predicting that will require experiments and modeling that take the intrinsic variability of materials into account, she said. The project is led by researchers in engineering and materials science, both in New Mexico and California, and Justine said the challenge will require participation from a much broader community.

The goal is to predict engineering reliability three times faster than is currently possible, while including important materials phenomena and behavior across different scales, Justine said. Such fundamental understanding is vital because much of Sandia's work has a high impact on national security and demands confidence in the ability to predict materials reliability, she said.

Detection at the Limits

The basis of Detection at the Limits is sensor research to develop sensor systems that perform far beyond anything now available — that are as sensitive as theoretically possible to whatever they need to detect, said Org. 2500 Director Anthony Medina, who outlined the research challenge along with senior managers Toby Townsend (5710) and Wahid Hermina (1710). The goal is important because all of Sandia's Strategic Management Units and its seven research foundations do sensor work in some form and have demonstrated impact in their field, Anthony said. In addition, he said, Sandia has unique capabilities because of its Microsystems and Engineering Sciences Applications (MESA) facility. Estimating that Sandia already spends at least $250 million annually on sensor system research, development, and production, Anthony said approximately one out of 10 Sandians already works on sensors. "With our silicon foundry and compound semiconductor microfabs, our more than 200 patents, and more than 40 R&D 100 awards, it's clear we have capabilities that almost no other single entity in the US can match," he said.

Better sensors require improvements in sensitivity and selectivity, smaller size, lower weight, and lower power, all enhanced by microscale and nanoscale features, Anthony said. Heforesee sensors "limited only by fundamental physical limits."

Toby said there's a need for intelligent sensors to detect at the intent level rather than the production level. "Massive single-sensor data products will be replaced by actionable intelligence "knowledge" products," he predicted. "Data analysis and decision making will no longer be predominately a human endeavor."

Wahid wrapped up the discussion by outlining Sandia's past successes in the sensor field and the need for improvements. He noted sensors could be located on a site or at stand-off ranges, including satellites, and said they might sense biological, atomic, physical, chemical/explosive, or radiation outputs. Wahid said Sandia has had great impact with sensors in the past, including the MicroChemLab, novel magnetoconcentrators, and micro gas analyzer. He said he sees "a strong coupling" between sensor work and all of Sandia's research foundations and challenges.

Research Challenges

High-Yield Fusion. Sandia's overall research objective is to enable its own missions now and in the future while advancing the frontiers of science and engineering. With that in mind, research challenges all have certain characteristics, including a long but finite life with impacts during the entire length of the work. The challenges require the expertise of a cross section of the Labs' multiple disciplines, ranging from fundamental science to technology application. They also must overcome technical obstacles critical to a mission area and leave a long-term science and engineering legacy for Sandia.

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"This is a really, really hard research challenge" because of the multiscale nature of materials behavior, so a broad base of expertise is crucial, she said.

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(Continued from page 1)
An opening ceremony powwow, the first of four events scheduled for Native American Heritage Month by Sandia’s American Indian Outreach Committee (AIOC) in partnership with Sodexo, was held Monday, Nov. 4, in the Thunderbird Café patio area. In the photos here, the Church Family Dancers lead lively Sandians in the Round Dance, a familiar social dance, with accompaniment provided by the Red Road Crossing drum group. In another special event, Sandia’s Diversity organization’s Diversity Cinema screened “Games of the North,” which follows four Inuit athletes as they compete in traditional sports activities that test skills that over the centuries have proven vital for surviving the unforgiving Arctic. Upcoming events include Leigh Cleveland demonstrating Navajo rug weaving (Nov. 18, 11:30 a.m., in the Steve Schiff Auditorium) and a closing ceremony featuring Sandia’s own Ron Hoskie, native flutist, on Nov. 25, also at 11:30 a.m., in the Schiff Auditorium. The AIOC says, “Thank you to all for joining in the celebration of our Native American culture.”

Sandia marks Native American Heritage Month with powwow, other activities
During a week when many Sandians could have been at home due to a shutdown, nearly 200 volunteers participated in a variety of service activities throughout Albuquerque as part of Make a Difference Day.

More than 30 Sandians — mostly from Surety Engineering Dept. 420 — volunteered at Roadrunner Food Bank, where they packaged breakfast cereal for Albuquerque’s hungry children as part of the Kids Backpack Program, and prepared food boxes for seniors.

More than two dozen Labs volunteers also assisted in a complete upgrade of the computer rooms at the Boys & Girls Clubs of Central New Mexico, painting new computer cubicles, setting up computers, and installing software. Sandia also sponsored the installation of new cubicles and new flooring.

Around 20 Sandians worked on science-related activities with children at Explora’s Science in the Park event and at Nuclear Medicine Day at the National Museum of Nuclear Science & History.

Another 15 recruits helped clean up a newly arrived cruise missile as part of Operation Preservation in the museum's sculpture garden.

By Stephanie Holinka

Sandia Labs volunteers participate in many Make a Difference Day activities

By Stephanie Holinka

BOYS AND GIRLS CLUB

Other volunteers painted a client’s apartment at Crossroads for Women, a transition program for homeless women with addictive and mental health disorders. This year Marcey Hoover (420) marked her third consecutive year organizing a Sandia group to help out at Roadrunner Food Bank as part of Make a Difference Day.

“The thought that children in our community may go hungry over the weekend without that backpack is sobering but the thought that I can do something to help, by just giving a few hours of time, is immensely satisfying,” Marcey says.

Boys & Girls Clubs volunteer Stan Hall (9342) says the work is intended to ensure that the next generations of scientists and engineers have the needed education, tools, and development programs to be the best they can.

Make a Difference Day is the largest national day of community service, held annually at the end of October. Each year, Sandia volunteers, as well as volunteers throughout Albuquerque, work on service projects to improve the quality of life in the community.

NUCLEAR MEDICINE DAY

OPERATION PRESERVATION

CROSSROADS FOR WOMEN

SCIENCE IN THE PARK
Note: The Classified Ad dead- line for the January 10, 2014 paper will be 5 p.m., Monday, Dec. 23. This change in the deadline applies only to the Jan. 14 paper.

MISCELLANEOUS

CARPET CLEANER, Bissell Pro-Hot 2X, used once, w/parfume, 128 oz., $35, Garavalc, 39-5593.

COFFEE MAKER, Krupps, 12-cup, never used $100. Wills, 304-1034.

YARD SALE, Nov. 23, 8 a.m., Vivian Dr. NE, near San Antonio & Louisiana, reasonable prices for everything. Whitfield, 505-312-6668.

**OCCASIONALLY** Leucroy Warehouse 102, 2 channels, 60 MHz B.W., 1-1/2 yrs. old, $1,000, new arrival, $650. Winstun, 291-6980.

**DEEDED TIME-SHARE POINTS, 500, Club Wyndham, great getaways worldwide, try before you buy, end of season, depending on length of the address.**

**BUY OIL HEATER, 150, $50, Walmart store spares, good condition, $50, MBA, 291-6980.

**DRIVEWAY CLEANING, PROFESSIONAL cleaning of all 4 alay wheels, for Toyota Corolla, get ready for winter, $200. Andies, 379-3418.

**SOFA, Design Warehouse, slipcovered, $145, matching easy chair, $200; king size futon, $75, Vankree, 268-1688.

**ANTIQUES WAREHOUSE, 300, Santa Fe Rd., 505-4; poster bed, wood, Queen, Retail $1,299, asking $400. Thomas, 488-3407.

**LAWN MOWER, low-hour, fits various lawn mowers/tractors, for easy pickup of materials, $100. Faithca, 877-8223.

**HEATED HOSE, Pirit, 100 ft., provides up to 150° F. **

**COMPUTER DESK, w/printer stand, $100; METAL TRASH CAN, $20. Thomas, 388-3407.

**COFFEE MAKER, Krupps, 12-cup, never used $100. Wills, 304-1034.

**CARPET CLEANER, Bissell Pro-Heat 2X, OBO. Rankin, 505-238-9963.

**HOT TUB, OBO; will sell camper separate.**

**SQUAD 2 into service and into Gate 1. ERT Emergency Response Team pushed the new van into service and into Gate 1. ERT Emergency Response Team pushed the new truck (squad) — dubbed Squared 2 — into service. The new truck will transport members of the Sandia Emergency Response Team and their equipment to perform their missions of emergency medical services, ham radio, and search and rescue. The new Squad 2 replaced a 1993 model, which was stolen last summer after it returned from duty. Sandia’s only other new squad — Squared 1 — was acquired back in 2002.

*Why so why would you push a brand new truck?* asked Sally Uebelacker, senior manager in Security and Emergency Management, who attended Squared 2’s dedication ceremony on Nov. 5 outside Gate 1. The practice has a history:

The new Squad 2 replaces a 1993 model, which was a gift from Los Alamos National Laboratory after they retired it. Why would you push a brand new truck? asked Sally Uebelacker, senior manager in Security and Emergency Management, who attended Squared 2’s dedication ceremony on Nov. 5 outside Gate 1. The practice has a history:

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By Nancy Salem

The people who work in Tech Area 5 share a mission but not a language. “Even though we’re in the same organizations supporting the nuclear weapons complex, we use words differently because we don’t all have the same technical background,” says Shawn Howry (1382).

Warren Strong, manager of Nuclear Materials Management Dept. 1386, and Dave Wheeler, manager of Nuclear Quality & Requirements Dept. 1382, had talked about the need for differently trained people to understand the fundamentals of nuclear engineering. “We agreed that workers with various kinds of expertise in this division should know more about radiation and nuclear technology.”

Warren and Dave envisioned a course that would offer nuclear engineering, radiation, and technology training to people without that educational background. Earlier this year, Dave and Shawn got to work on the idea. Their first step was the University of New Mexico, where they approached long-time nuclear engineering professor Bob Busch, no stranger to Sandia. He had worked and interned at the Labs dating back to the 1970s.

Busch agreed to teach a nuclear engineering fundamentals course in Tech Area 5 over the summer. The course ended up designed for technical and non-technical people. “A very diverse group of people showed interest in attending,” Shawn says. “For some it was a refresher on the technical side of nuclear engineering and for non-technical people it was a great chance to gain some language and giving insight into what they hear and do in their organizations.”

Drinking from a fire hose

The course had 10 two-hour sessions held in Tech Area 5. Busch modified his sophomore-level introduction to nuclear engineering for a wider audience. “It was crammed full of information. At times it was like drinking from a fire hose,” Shawn says. “We wanted a curriculum that would keep the technical people challenged and help the non-technical students. Bob tailored the course to a happy medium.”

The class drew a core group of 20 students from nine departments. Four were nuclear engineers. The students were assigned to teams with a mix of technical and non-technical people who got together each week for a once-a-week class to discuss lessons and make sure everyone was keeping up. Team leaders helped answer technical questions and provide mentorship. “Having these small teams and being able to interact internally was huge,” Shawn says. “We could help each other answer questions and work things out.”

Among the curriculum topics were Nuclear Reactions, Radioactive Decay, Interaction of Heavy Charged Particles and Matter, Neutron Cross Sections, and Ranges of Betas. There were no tests or grades, and Busch provided problems of different difficulty that let students work at their own level and pace.

Chris Hall, a contractor in Dept. 4126, says he graduated in geodesy 25 years ago, so it was a bit of a challenge to get back to that type of math. “I then had to fumble on and stay on,” he says. “It was fun — challenging, but fun.”

Chris says the course broadened his perspective on safety. “I take all the radiation training, but this was much more comprehensive,” he says. “And it was a lot more interesting to understand not just how radioactive material decays but how and why certain isotopes are used for certain experiments, and why certain thresholds can be reached or not reached. It was valuable.”

Jamie Arnold, a mechanical engineer who worked in explosives and rocket testing, recently transferred to Nuclear Engineering & Maintenance Dept. 1185. “My background is technical but didn’t necessarily lend itself to what we do here,” he says. “This course gave me a really good overview and better understanding of what the nuclear engineers can do and why. I was learning from the first day even though I’ve been in engineering my whole career.”

Shawn did not bring a nuclear background to the course. “It was tough, but in a good way,” he says. “It was totally new content outside my profession of organizational learning. Sophomore-level nuclear engineering — it posed challenges for me. But in the end I understood more. It helped me listen differently. We were not expected to be experts, just more knowledgeable about the fundamentals.”

Kelsey Curran, a contractor in Dept. 4126, says she enjoyed digging into the how and why of nuclear reactions. “I’m not a nuclear engineer so it was great to get a more in-depth understanding of that field,” she says. “I came away with a better knowledge base to ask more in-depth technical questions and have a better base for understanding.”

I enjoyed the opportunity to connect with both academia and other organizations at Sandia to expand my knowledge and understanding of nuclear engineering.”

Stronger relationship with UNM

The course built relationships within and between organizations. Shawn says, “What better way to share what we do than in a class like this where we get together on a regular basis,” he says. “A lot of us interacted but didn’t really know each other. You start putting names to faces and learn more about people across the Labs.”

Warren says the course met his expectations and will help the organization. “We want to reach people in quality assurance, management, system design, safety assurance, program control, and other fields so they can feel plugged into the nuclear part of the organization,” he says. “People can be better at what they do if they know more about the end product.”

Dave says a goal of the course was to strengthen Sandia’s relationship with UNM. “There should be a very strong connection between the UNM nuclear engineering program and Tech Area 5,” he says. “This was an opportunity to leverage their skills in teaching and educating our staff.”

The course was successful enough that Warren and Dave say they will look at offering more classes, some more technical and others less. Busch says he would welcome the chance to teach more at Sandia. “It was a great experience, a learning experience,” he says. “This was a different audience for me. They had questions I had never thought about. It was fun.”

The final class featured tours of two nuclear reactors used in research, the Am Russell Core Research Reactor (ACRR), the course helped differently trained people in TA-5 understand the fundamentals of nuclear engineering. (Photo by Shawn Howry)