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CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING



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From the National Academies

The following is excerpted from press releases and other news reports from the National Academies (www.national-academies.org).

◆ US Gun Violence Topic of New Report from IOM, NRC

A new report from the Institute of Medicine (IOM) and National Research Council proposes priorities for a national (NRC) research agenda to improve understanding of the public health aspects of gun-related violence, including its causes, implications for public health, and possible interventions. The report concludes that significant progress can be achieved in three to five years through a research program that addresses five high-priority areas: the characteristics of gun violence, risk and protective factors, prevention and other interventions, gun safety technology, and the influence of video games and other media. The report urges the public health research agenda be integrated with research conducted from criminal justice and other perspectives.

The report stems from executive orders issued by President Obama in January 2013 directing federal agencies to

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Cogeneration: Combined Heat and Power *A Powerful Solution to Address the Vagaries of Nature*

New England's recent string of nasty hurricanes and snow storms made it clear that a dependable source of electricity is an absolute necessity. For instance, Hurricane Sandy left more than 8 million homes and businesses without power for an extended period of time; some are still trying to recoup their losses. With extended power outages becoming the norm instead of the exception and Connecticut leading the pack when it comes to rising electricity costs, businesses are taking a hard look at alternatives. They are finding cogeneration (Cogen) or combined heat and power (CHP) generation, to be a powerful solution that addresses the vagaries of Nature.

Average Retail Price of Electricity to Ultimate Customers by End-Use Sector by State, June 2013 and 2012 (Cents per kW-hr)

Census Division and State	Residential		Commercial		Industrial		Transportation		All Sectors	
	June 2013	June 2012	June 2013	June 2012	June 2013	June 2012	June 2013	June 2012	June 2013	June 2012
New England	16.41	16.00	14.06	13.80	12.18	12.54	12.47	6.48	14.52	14.29
Connecticut	17.77	17.32	14.69	14.60	12.58	12.62	10.24	9.06	15.69	15.42
Maine	14.16	14.27	11.00	10.77	7.59	7.48	--	--	11.30	11.22
Massachusetts	15.86	15.52	14.46	14.39	13.34	13.88	13.53	4.64	14.63	14.57
New Hampshire	16.73	16.53	13.53	13.40	11.25	11.71	--	--	14.34	14.28
Rhode Island	16.90	15.32	13.96	12.30	12.38	11.46	13.35	12.70	14.93	13.34
Vermont	17.77	17.11	14.83	14.41	10.30	10.14	--	--	14.62	14.23
U.S. Total	37.04	39.99	33.61	37.07	29.58	32.74	--	--	32.98	36.23

Source: U.S. Energy Information Administration, Form EIA-826, Monthly Electric Sales and Revenue Report with State Distributions Report. [See http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a]

To appreciate the benefits of Cogen/CHP requires a basic understanding of the concept. Simply stated, Cogen/CHP generates heat and power simultaneously. For example, if the extended power outages prompted you to purchase a generator and then you captured the heat it produces while it's running to use as a heating source; you would have your very own Cogen/CHP system.

(See Cogeneration, page 2)

Project Oceanology turns 40!

Project Oceanology, also known as Project O, is an on-the-water marine science education organization that was formed by teachers and public school administrators from Southeastern Connecticut, who recognized the potential and importance of marine science education. Project O's home base is an up-to-date facility with research laboratories, classrooms, a computer lab, a 56-bunk hostel and cafeteria facility on the campus of University of Connecticut at Avery Point in Groton, CT.

With two US Coast Guard-certified research vessels, Enviro-Lab II and Enviro-Lab III, Project O has ready access to Long Island Sound. Using their fleet of small boats and proximity to a variety of marine ecosystems and coastal habitats, Project O offers participants a unique look at the coastline of Southeastern Connecticut. Explorations of Bluff Point Coastal Preserve, the Poquonnock River and Pine Island are some of the adventurous shore excursions provided to students and campers. The combination of access to natural marine

(See Project O, page 8)



Above, Enviro-Lab III is one of two US Coast Guard-certified research vessels used by Project Oceanology, an on-the-water marine science education organization based at UConn's Avery Point campus in Groton. [Photo: Project Oceanology]

Cogeneration *(from page 1)*

However, it takes a lot more to build an integrated Cogen/CHP system, starting with high-temperature heat from the prime mover (heat engine). Prime movers include reciprocating engines, combustion or gas turbines, steam turbines, micro turbines and fuel cells. The heat engine drives a gas or steam-powered generator. The low-temperature waste heat produced by the generator is then used for water or space heating. The waste heat can also be used for cooling via an absorption refrigerator. A variety of fuels are used to power the heat engines including natural gas, oil, and alternative fuels to produce shaft power or mechanical energy. Each heat engine has its advantages and disadvantages.

Cogen/CHP plants convert energy in various ways, using different machines/engines that burn fuel to release heat. Larger plants use very efficient gas and steam turbine engines. The University of Connecticut's (UConn) Cogen/CHP plant in Storrs, Connecticut, is one such facility. Smaller CHP plants often use what are essentially internal combustion engines to drive electricity generators, with heat exchangers recovering waste heat in hot water. Nufern, a leading manufacturer of specialty optical fibers, fiber lasers, amplifiers and gyroscope coils, located in East Granby, Connecticut, is currently in the final stages of installing a Cogen/CHP facility, powered by a Caterpillar (Cat®) natural gas-fired reciprocating engine.

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The big selling point for a Cogen/CHP facility is its annual fuel efficiency (+ 75%) and its distributed electric power feature that ensures dependability during power outages. A typical US power plant uses three units of fuel to produce one unit of electricity, resulting in a 33% efficiency rate. The other 67% is waste energy/heat that is vented into the atmosphere. Cogen/CHP plants' fuel efficiency rates are much higher, ranging from 75-90% because the waste heat is recycled into clean electricity and steam that can then be used to heat nearby buildings and assist in various industrial processes. There are environmental benefits as well. Reducing the amount of fossil fuel burned lowers the amount of carbon dioxide entering the atmosphere, thus reducing air pollution and related environmental concerns. And finally, with the increased availability of natural gas via shale gas drilling in the United States, this fuel has become very affordable versus other fossil fuels. However, although natural gas is a cleaner burning fuel, it is not available to all those who would like to use it because many areas in Connecticut lack the infrastructure to deliver it.

The downside of Cogen/CHP plants is the initial cost. However, there are financial resources available to Connecticut businesses. For instance, in July 2013, the Connecticut Clean Energy Finance and Investment Authority (CEFIA) started soliciting bidders to participate in its three-year, \$6 million pilot program for building CHP facilities. CEFIA is offering grants, performance-based incentives and other financial support options.

Despite these obstacles, the annual fuel savings provide a healthy return on investment, typically within two to three years. "If you are using significant amounts of hydrocarbon fuel for heating and have a substantial power load electrically, it's a no-brainer. However, businesses have to be willing to take on the initial capital cost," says Lee Langston, UConn professor emeritus in the Department of Mechanical Engineering and CASE member.

When businesses are considering building a Cogen/CHP plant, UConn's 25 megawatt (MW) Cogen facility is one of their top fact-finding destinations. In full operation since 2006, this facility delivers on the expectations of significant energy savings (\$180 million over its 40-year design life) and carbon dioxide emissions reductions (approximately 30,000 tons annually). In addition, UConn's facility is designed to run as a microgrid, generating and distributing its own electricity campus-wide, thus making the Storrs campus immune to power outages.

UConn's decision to build this \$80 million facility was based on two considerations—climbing energy costs and the fact that UConn was undertaking a 10-year, billion-dollar building program. In 2002, these factors prompted the university to issue a request for proposals to build a new Cogen facility. A year later, a contract was awarded and the facility was completed in 2005. By that time, UConn's energy costs had risen to \$23.4 million annually, comprising about 20% of that year's UConn Storrs physical plant budget, according to Langston. Interestingly, the initial recommendation to build a Cogen facility came from Langston in 1993 and again in 1998. In both instances, Langston wrote letters to UConn presidents about the benefits of cogeneration. To this day, Langston is considered a leading advocate of Cogen/CHP.

UConn's facility consists of three 7.5 MW Solar Taurus™ 70 gas turbines (fueled by natural gas with the option to switch to fuel oil), three heat-recovery steam generators and a 5MW back-pressure Murray Tuthill steam turbine. Also housed in the facility are three steam-turbine-driven 2100-ton York® centrifugal chillers. The campus' electrical load annually ranges from approximately 12 to 24 MW, below its total generating capacity. Due to existing regulations prohibiting publicly funded institutions from selling excess electricity back to the grid, UConn cannot take advantage of this option.

(See Cogeneration, page 7)

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Biomedical Research

\$200 MILLION FOR BIOMED RESEARCH THROUGH NEW CI FUND. **Connecticut Innovations (CI)** announced in June that the State of Connecticut is providing \$200 million in funds for biomedical research in Connecticut. The fund, established in Public Act 13-239; Sec. 72 and named the **Connecticut Bioscience Innovation Fund**, will provide grants, equity investments, loans and loan guarantees to bioscience-related initiatives over the next 10 years. CI, as administrator of the fund, will provide capital to researchers in the early phase of their concept development, helping them transition from laboratory to business in an effort to spur commercialization of more bioscience research and ideas into actual products, services and businesses.

BIOSCIENCE CT MARKS FIRST ANNIVERSARY. **Bioscience Connecticut** marked its first anniversary in June, having created approximately 500 construction and related jobs, with 85% of the work being done by Connecticut-based contractors. The project thus far has leveraged more than \$1.45 million in philanthropic support. Work is in progress for 28,000 square feet of new incubator space for new bioscience industries and start-ups. In addition, a data disaster recovery center will be built as part of the **UConn Health Center's Cell and Genome Sciences Building**. Bioscience Connecticut also allows for a 30% increase in the **UConn School of Medicine and Dental Medicine** class sizes and funds community-based initiatives targeting urgent health care needs. Further plans include developing the **Connecticut Institute for Primary Care Innovation**, a joint effort of the **UConn School of Medicine** and **St. Francis Hospital and Medical Center**, and the **Health Disparities Institute**, a collaboration among community leaders, UConn, and the UConn Health Center.

NEW LAWS EXPAND BIOMED FUNDING TO COVER STROKE, EXTEND INSURANCE COVERAGE FOR AUTISM. Governor **Dannel Malloy** has signed into law two bills, one to expand biomedical research funds to cover stroke research and the other to extend health insurance coverage for those on the autism spectrum. **Connecticut's Biomedical Research Fund** was initially intended to supplement National Institutes of Health funding. The law to extend health insurance coverage for autism patients in Connecticut was prompted by concern that some patients might lose benefits based upon new diagnosis criteria expected from the American Psychiatric Association.



Business & Industry

SOLAR PANELS FOR SOLAR APPRENTICES. The Energy Systems Sales & Training division of the **Industrial Management & Training Institute of Waterbury (IMTI)**, in partnership with Motech Industries Inc. and Motech Inverters of Taiwan, announced it will install a 45-kilowatt solar photovoltaic system on the roof of the IMTI building. The 174 rooftop panels are expected to decrease IMTI's power bills by \$10,000 annually. The center, which currently uses IMTI trainees to import and distribute the Motech solar panels, plans to eventually manufacture the panels on site. IMTI is the first institution in Connecticut to offer a formal apprenticeship program in the solar industry.

RESPONDING TO THE CHALLENGE. **AgriFuels LLC** of East Hartford and **Owlstone Inc.** of Norwalk on July 11 became the first businesses to receive \$150,000 each through the Connecticut Innovation Challenge Program administered by **Connecticut Innovations**. The program encourages small firms to partner with Connecticut universities to work on technology challenges posed by large corporations. AgriFuels will partner with **Yale University** and **UConn** to address a challenge from BASF to develop green refineries. In response to a challenge from Wallingford-based **Ultra Electronics Measurement Systems Inc.** to develop a more portable and sensitive technology, Owlstone and UConn will work on developing software to detect the threat of airborne chemicals that could be used in the security and defense fields.

ALSTOM TO STAY IN CT. **Alstom**, a high technology power generation firm, announced in July that it would invest \$25 million to modernize its headquarters in Windsor. Additional plans include a new research and development site in Bloomfield with offices, a warehouse, and a laboratory to be completed in 2014. Alstom considered relocating outside Connecticut but with state investment, decided to renovate its existing infrastructure and implement other improvements. The **Connecticut Department of Economic and Community Development** is providing a \$3 million loan at 1% interest for 10 years and a \$500,000 grant to help fund sustainable LEED (Leadership in Energy and Environmental Design) building practices. "We are grateful for the support of state and local officials in keeping that industry-leading research capability here in Connecticut and look forward to having the new facility up and running," said **Tim Curran**, president of Alstom Power U.S.



Communication

CI, INVESTORS BACK PAYVERIS. **Payveris LLC**, a Wethersfield mobile payments software maker, announced in July that it received funding worth \$5.2 million from **Ironwood Capital Connecticut** and **Connecticut Innovations** along with other investors. The funds will provide for sales expansion and marketing efforts to support its growing distribution network. Community banks, credit unions and prepaid-card issuers use Payveris' cloud-based ePayment platform.

CT COMMUNICATION ORGANIZATION ELECTS OFFICERS. This spring, **Gia L. Oei** was elected president of the **Connecticut Chapter of the International Association of Business Communicators**. She is the global communications leader for GE's Industrial Solutions business, responsible for strategy development as well as internal and external communications, media relations, executive communications and community affairs. Others elected include **Deb Dupont**, director of **ING Retirement Research Institute** (secretary); **KC Emery**, a member of the communication team at ING in Enfield (vice president for membership and communications); and **Michael Selissen**, owner of **Case Mountain Communications** (treasurer).



Education & Cognition

CPEP WINS PRESTIGIOUS SUMMER LEARNING AWARD. The **Connecticut Pre-Engineering Program (CPEP) Summer Gaming Challenge** has been awarded the prestigious National Summer Learning Association's (NSLA) 2013 New York Life Excellence in

Items that appear in the In Brief section are compiled from previously published sources including newspaper accounts and press releases. For more information about any In Brief item, please call the Academy at (860) 571-7143, or contact us at acad@ctcase.org.

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Summer Learning Award. The annual award recognizes summer programs that demonstrate excellence in accelerating academic achievement during the summer months. CPEP's Summer Gaming Challenge is a 5-week, 150-hour program for middle school students that blends educational gaming software, face-to-face teacher-led instruction, and "real-world" project challenges. 60% of the participants are African American or Hispanic and 50% are girls. CPEP Board Chairman **Jerry Chanterelle** says the Summer Gaming Challenge has produced dramatic results and is helping close the achievement gap in Connecticut

BUTTONBALL TEACHER HONORED. This spring, **Lisa Gozzo** was recognized with the 2013 "Excellence in Elementary School Science Teaching" from the **Connecticut Science Teachers Association**. She teaches at **Buttonball Lane Elementary School** in Glastonbury. Each year one elementary school teacher demonstrating excellence and innovation in elementary science teaching is honored. Principal **Kent M. Hurlburt** said of Gozzo, "She is an amazing science teacher who brings a passion and energy to her lessons like no other."

HIGH SCHOOL STUDENTS GET GLIMPSE OF HEALTH CAREERS. It was announced in May that **Manchester High School** is partnering with the **Eastern Connecticut Health Network**, a nursing home and other area medical practices to form a medical careers academy for 10th and 11th grade students considering the medical field. Students will have the opportunity to attend workshops and guest lectures, job shadow and intern in medical health fields. The programs will launch in fall 2013.

MATHALIVE! The **MathAlive! Exhibition**, a traveling exhibit, was at the **Connecticut Science Center** from May 28 thru September 1. Presented nationally by Raytheon Company, the exhibit allows visitors to experience math in action through 40 interactive experiences across six galleries that provide challenges using mathematics as tools to help visitors compete, design, build, optimize and play. The local sponsor of the Connecticut exhibit is **Stanley Black & Decker**. MathAlive! is the largest scale initiative of Raytheon's MathMovesU® national program created to motivate students to understand mathematics as a key to their future.

GRANT ALLOWS CT SCIENCE CENTER TO EXPAND TEACHER TRAINING. The **Connecticut Science Center** recently announced receipt of its largest grant since opening. The donation, from the **Andrew J. and Joyce D. Mandell Family Foundation**, will allow the Center to expand its professional development program from 500 teachers per year to 1,500 per year with graduate-level college credit soon to be offered through Connecticut's **Charter Oak State College**. The Mandells are not disclosing the amount of the grant, but Joyce Mandell said, "Teaching teachers how to connect with their students is one of the more important things that we've ever been involved in."



Energy

ISO-NEW ENGLAND BUDGET SETTLEMENT. The Federal Energy Regulatory Commission approved a settlement between **ISO-New England** and Connecticut in May regarding oversight procedures to reduce the grid operator's 2013 administrative and capital budget by \$2.85 million and establish procedures for Connecticut utility regulators to review and provide feedback on ISO-NE's budget. The settlement resolves a dispute begun in late 2012 regarding a 10% increase in the combined ISO-NE budgets. This settlement also applies to utility regulators in Maine, New Hampshire, and Rhode

Island. Connecticut Attorney General **George Jepsen** said, "These changes will give the New England states better and timely access to ISO-NE budget information and allow regulators to play a more meaningful budget oversight role to the benefit of ratepayers."

SOLAR RESOURCE CENTER OPENS IN WATERBURY. The **Northeast Region Green Distribution and Manufacturing Center**, Connecticut's first solar resource center, opened in Waterbury in late June with the goal of bringing clean manufacturing and solar incentives to Waterbury. The center will undergo a three-phase renovation and marketing campaign, including an upgraded roof and 300,000-watt solar utility system. The building now houses **Energy System Sales and Training LLC, Veeco Electric Inc, and aSolar Inc.**

MICROGRID SITES ANNOUNCED. Governor **Dannel Malloy**, joined by **Department of Energy and Environmental Protection (DEEP) Commissioner Daniel C. Esty** and state and local officials, announced on July 24 that the submarine base in Groton, the **University of Hartford, Wesleyan University** and police and fire stations around Connecticut will be among the first nine sites where microgrids will be installed to provide electricity to critical facilities and town centers 24 hours a day, seven days a week during electric grid outages, including storms. The selected locations are part of recommendations submitted to Malloy after a committee studied the impacts of lengthy power outages following Tropical Storm Irene in August 2011 and a snowstorm two months later. The sites are part of an \$18 million pilot program with an additional \$30 million committed for additional microgrid sites to be added in the next two years. The microgrids will be powered by fuel cells, small-scale gas turbines and anaerobic digesters.

UCONN SIGNS DEAL FOR NEW ENERGY RESEARCH FACILITY.

Fraunhofer Institute for Ceramic Technologies and UConn recently signed a contract to establish a new research facility. The **Fraunhofer Center for Energy Innovation CEI** will develop and commercialize new materials and technologies to improve future energy production and storage. The mission of the center, which will be located at UConn, is to develop advanced technologies related to energy storage, fuel cells, in-stream hydro, power management and distribution through contract research. Research will focus on materials such as metals, ceramics, micro- and nanostructures, as components for fuel cells and electrolyzers. New methods of membrane and catalyst preparation will be developed, particularly for energy-efficient biofuel production.



Environment

BROWNFIELDS GRANTS. In May, the US Environmental Protection Agency awarded \$2.6 million to seven Connecticut agencies to clean up brownfield sites. A total of \$62 million was awarded nationwide, with \$12 million going to New England. Hartford received \$400,000 to clean up two brownfields at the former **Philbrick, Booth, Spencer** factory and a former paint store on Edwards Avenue. The city also received \$200,000 for petroleum cleanup at the **Downtown North Project** on Chapel Street. Other clean-up sites include East Hartford's **Goodwin College**, and sites in **New London, Willimantic, Meriden, Stratford, Bridgeport** and **Plainville**.

REDUCED CARBON FOOTPRINT GOAL OF CYBER-CHALLENGE.

On May 20, more than 60 freshmen from **East Hartford High School, New Britain High School** and **Wilby High School** in Waterbury competed in the Cyber-Challenge, an event sponsored by the **Connecticut Business & Industry Association** and funded by a \$1.2 million grant from the National Science Foundation to

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develop solutions to complex, real-life problems in science, technology, engineering, and math. The students competed to find ways to reduce their schools' carbon footprint. The event took place in Berlin where students presented projects for energy-savings strategies developed with engineers from **Northeast Utilities**, **UTC Aerospace**, and **General Electric**. The three schools are eligible for up to \$23,000 in state and private grants to implement the students' plans.

MATTRESS RECYCLING BILL. On May 20, Connecticut passed the nation's first "extended producer responsibility" bill (Public Act No. 13-42) for mattresses, requiring mattress manufacturers to finance and manage a mattress collection and recycling program. The measure is expected to save local governments about \$1.3 million annually and increase recycling opportunities for businesses. Officials estimate statewide municipalities manage more than 175,000 discarded mattresses each year, with 95% of the mattress materials easily recycled.

CT LAKES STOCKED WITH CATFISH. In May, officials from the **Department of Energy and Environmental Protection (DEEP)** stocked lakes and ponds across Connecticut with 21,000 channel catfish to promote fishing and offer more outdoor activities for residents. Seven lakes and ponds in urban areas were stocked with adult catfish 14 to 18 inches long and weighing more than two pounds. DEEP Deputy Commissioner **Susan Whalen** says the agency wants to provide family recreational opportunities close to home for residents.

DEEP WARNS OF CLIMATE CHANGE CONSEQUENCES. The **Connecticut Department of Energy and Environmental Protection** issued a warning in July regarding serious consequences of climate change that will affect agriculture, dams and levees, waterfront habitats and public health. Concerns include rising sea levels, which could leave **Hammonasset Beach State Park** mostly under water by the end of the century. The report states that most agriculture in Connecticut is likely to be "highly impacted" by climate change "and most of these potential impacts are negative." Agriculture Commissioner **Steven Reviczky** noted that climate change is "going to require some adaptation."



Food & Agriculture

REGIONAL AG COUNCIL ESTABLISHED. The first **Regional Agriculture Council** was established in May to support farming in 17 municipalities and promote agriculture-friendly land use and municipal policies in the **Lower Connecticut River Valley**. The council intends to serve as an information and education liaison between farmers, municipal boards and commissions, elected officials, nonprofit agencies, and civic organizations. It is also expected to provide information on municipal land use regulations related to agriculture, guidance and information on tax programs and policies, as well as to help with conflict resolution while identifying economic opportunities for towns and farmers.

CT FIRST TO PASS GMO LEGISLATION. On June 3, Connecticut became the first state to pass a bill requiring food manufacturers to label products containing genetically modified ingredients with Public Act No.13-183, An Act Concerning Genetically-Engineered Food. The compromise legislation includes a provision that four northeastern states with an aggregate population of 20 million also adopt a labeling provision, including at least one state bordering Connecticut. Qualifying states include Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, New York, Pennsylvania or New Jersey.

PILOT PROGRAM FOR ANAEROBIC DIGESTION PLANTS. In June, the **Connecticut Clean Energy Finance and Investment Authority** launched a three-year Anaerobic Digestion Pilot Program that seeks participants to develop digestion plants that use decomposing food to generate electricity. This \$6 million pilot program grew out of a 2011 law (Public Act No. 11-80; Section 103(b)) calling for grocers and major food users to send food waste to digestion plants for processing. Connecticut currently does not have any digestion plants but this new program provides developers greater flexibility to plan and open their projects. The pilot program offers grants, loans, and financing for projects.

HELP FOR STORM-DAMAGED FARMS. On June 23, Governor **Dannel Malloy** announced the designation of \$5 million in grants to help storm damaged farms. He made the announcement one week after visiting the **Killam and Bassette Farmstead** in Glastonbury, which suffered flood damage from heavy rains. Individual farm awards depend upon how many applications are received. "Over the last two years, our state's farm sector endured a series of severe weather-related blows that have put many of their businesses in peril," Malloy said in a statement. "Agriculture is an industry with tremendous growth potential, contributing \$3.5 billion to Connecticut's economy and accounting for about 28,000 jobs in our state. Unfortunately, federal crop insurance programs that protect large farms in other parts of the country aren't designed for small diversified farms like ours."



Health

STUDY SHOWS NO INCREASED RISK TO P&W WORKERS. After an 11-year study, researchers at the University of Pittsburgh and the University of Illinois at Chicago announced in May that no significant increase in cancer rates was found among workers at **Pratt & Whitney**. 723 workers diagnosed with malignant, benign or unspecified tumors between 1976 and 2004 were identified as part of the study. Researchers examined work documents and cancer registries of 222,123 men and women who worked in one or more of eight Connecticut Pratt & Whitney plants between 1952 and 2001. They also reviewed 11 chemical or physical agents on the basis of known or suspected carcinogenic potential that could affect the central nervous system or other organs. Lead study author Gary Marsh said employees working at Pratt & Whitney before 2002 can be reassured that working at Pratt "does not increase your risk of developing brain cancer and does not increase your risk of dying." The study, one of the most comprehensive in an occupational setting, is the first large-scale study of workers in the jet engine manufacturing industry.

FOUNDATION TO FOCUS ON HEALTH EQUITY. The **Connecticut Health Foundation** announced in May that over the next five years, it will focus on health equity, including ensuring that residents enrolled in affordable health insurance plans understand the health care system and receive affordable, comprehensive care. The Foundation notes that minorities are five times more likely to be without health insurance, resulting in late or no prenatal care during the first trimester for 22% of African-American women and nearly 24% of Latina women. The foundation will continue funding initiatives related to oral health and children's mental health for the next two years. After that, both areas will become part of its health equity focus.

LAMPP GETS \$2M GRANT. In May, the **Connecticut Department of Economic and Community Development** announced a \$2 million grant to **Connecticut Children's Medical Center's LAMPP Project**

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(LAMPP), an early intervention and prevention program to promote healthy homes and prevent lead poisoning. The funds will support LAMPP's work to remove lead and other health and safety hazards from housing units serving low- and moderate-income families.

YALE STUDY TO FOCUS ON PRENATAL CARE FOR HIGH RISK COMMUNITIES. On July 1, the **Yale School of Public Health** announced it received a grant from the **United Health Foundation** for more than \$4 million to spearhead a project designed to improve birth outcomes. The project will focus on group prenatal care and rigorous evaluations of its effects, implemented in communities at high risk for adverse perinatal outcomes. Pre-term births in the United States currently account for more than one-third of US health care spending for infants, or about \$26.2 billion, with the medical costs for these births 10 times greater than for full-term babies.



High Technology

ADVANCED MANUFACTURING IN THE CLASSROOM. This summer, in a program administered by the **Connecticut Business and Industry Association**, ten Connecticut high school teachers and college instructors learned how to incorporate advanced manufacturing into lesson plans. Teachers had the opportunity to work with the latest industry practices and technologies. Each teacher received a \$4,000 stipend for working at manufacturing companies and adding work-based projects to their curriculum.

CCAT TO EXPAND EAST HARTFORD INCUBATOR. The **Connecticut Center for Advanced Technology (CCAT)** recently announced expansion of its East Hartford facility, adding 10 new offices and allowing its business incubator to grow beyond its current 30 startups. The facility offers resources including offices; laboratories for manufacturing, including additive manufacturing; research and development space; and meeting facilities. The Incubator is run in conjunction with **UConn's Entrepreneurial Center and Intellectual Property Law Clinic**, the **Connecticut Technology Council**, and the **University of Hartford Partnership Office**.

UCONN TEAM GROWS WORLD'S SMALLEST METALLIC NANORODS. On May 28, **UConn** announced that university researchers had developed "some of the world's smallest metallic nanorods," with broad implications for manufacturing and microelectronics. Principal Investigator and CASE Member **Hanchen Huang** led the team that developed a closed-form theory for metallic nanorod growth by physical vapor deposition. The UConn team applied this information and successfully grew gold nanorods 10 nanometers in diameter—the smallest ever recorded using physical vapor deposition. The discovery is expected to have a major impact in electronics, energy and manufacturing.

PRINTING ANATOMICAL MODELS WITH 3D TECHNOLOGY. In June, radiology resident **Mark Michalski** and **Joseph Zinter**, assistant director of **Yale's Center for Engineering Innovation and Design (CEID)**, produced a plastic 1:1 scale model of a knee in preparation for a complicated surgery on a man's knee and the large tumor growing in it. The "printed" knee included the femur, fibula, tibia, patella, tendon, and the tumor. The 3D model allowed **Dieter Lindskog**, an orthopedic surgeon, to "feel the actual tumor location in the bone..." The three-dimensional anatomical replicas produced at the CEID are idiosyncratic, usually diseased, anatomy of specific human patients—unique models that can be helpful to

medical students, clinicians, and, Michalski hopes, patients trying to understand what's happening inside their bodies.



Transportation

BOND COMMISSION APPROVES \$537M. More than \$537 million in borrowing was authorized by the **State Bond Commission** in late July to help fund construction and maintenance projects across Connecticut, including money for improving state highways, bridges, and rail and transit systems. **Connecticut Department of Transportation** Commissioner **James Redeker** said the state money would qualify Connecticut for about \$600 million in federal matching funds this fall. Projects to receive funding include resurfacing 250 miles of state highways, widening I-84 in Waterbury, reconstructing exits along I-84 in the Danbury area, and 40 bridge restoration projects, including continuation of New Haven's Q Bridge work along I-95. The commission approved \$115 million for the Fix-it-First State Bridges and Roads program, which focuses on preventive maintenance and repair.

NTSB SCHEDULES OCTOBER HEARING ON ACCIDENTS. The National Transportation Safety Board (NTSB) announced in late July that it will hold a hearing Oct. 22 and 23 in the wake of two recent Metro-North accidents. The board will hear testimony on several issues including track inspection and maintenance, passenger car safety standards, crash worthiness, policy and practice of roadway worker protection and the state's organizational safety culture. A May 15 inspection of a MetroNorth rail line two days before a train derailed in Connecticut on May 17 found a rail joint with inadequate supporting ballast and indications of vertical track movement near the point of derailment, according to the National Transportation Safety Board (NTSB) preliminary report issued June 6. The crash injured 73 passengers, two engineers and a conductor. NTSB estimates damage at \$18 million.

STATE ANNOUNCES GRANTS FOR CHARGING STATIONS. On July 9, the **Connecticut Department of Energy and Environmental Protection** and the **Connecticut Department of Transportation** announced \$200,000 in grants to fund proposals to install electric vehicle charging stations. The money will be awarded for proposals that provide the most matching money, are most accessible to the public and place charging stations in geographically diverse areas. Up to \$2,000 will be awarded per grant. The goal is to increase the number of charging stations from the current 81 to 200 by the end of 2013.

RAILROADS RECEIVE FUNDS TO MODERNIZE TRACKS FOR FREIGHT. Four railroad companies received \$8 million from the state of Connecticut in May to modernize the state's track system for easier freight transport. **New England Central Railroad** received \$3.6 million to upgrade the mainline track between New London and the Massachusetts border to accommodate 286,000-pound rail cars. The **Central New England Railroad** received \$2.5 million to upgrade track and grade crossing signals between Hartford and Bloomfield on the state-owned **Griffin Line**. **Naugatuck Railroad** received \$1.6 million to replace ties, worn rails, and improve the **Frost Bridge Road** crossing in Watertown, and the **Providence & Worcester Railroad** received \$750,395 to rehab 26 miles of the Norwich Branch Line between Plainfield and the Massachusetts border, including adding new cross-ties, spikes, and ballast so rail speeds can increase.

— Compiled and edited by Wendy Swift

From the National Academies *(from page 1)*

improve knowledge of the causes of firearm violence, interventions that might prevent it, and strategies to minimize its public health burden. One of these executive orders charged the Centers for Disease Control and Prevention with identifying the most pressing firearm-related violence research needs. In turn, CDC and the CDC Foundation asked IOM and the Research Council to recommend a research agenda on the public health aspects of firearm-related violence. The committee determined potential research topics by surveying previous relevant research, receiving public input, and using expert judgment.

www.nap.edu/catalog.php?record_id=18319

◆ Bringing a Systems Engineering Approach to Health

The US health care enterprise can promote better health at lower cost by using a systems engineering approach that takes into account the ways in which all involved people, processes, and organizations influence patient care. In general, these elements are poorly coordinated, leading to problems with the safety and quality of health care, as well as unnecessary duplication and waste. That is the message of a new Discussion Paper being released today by the Institute of Medicine and the National Academy of Engineering. "Bringing a Systems Approach to Health" gives examples of systems engineering solutions that have improved health care delivery and suggests ways of expanding such approaches more broadly. The authors stress that while a limited number of health care organizations have seen substantial improvements from such systems approaches, most of these cases have depended on an exceptional combination of leadership, culture, and resources.

www.nae.edu/85943.aspx

◆ A Plan for Evaluating Obesity Prevention Efforts

Obesity poses one of the greatest public health challenges of the 21st century, creating serious health, economic, and social consequences. Despite increased efforts to characterize, comprehend, and act on this problem, further understanding is needed on the progress and effectiveness of implemented preventive interventions.

An Institute of Medicine (IOM) committee developed a concise and actionable plan for measuring the nation's progress in obesity prevention efforts—specifically, the success of policy and environmental strategies recommended in the 2012 IOM report *Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation*. The committee's report offers a framework that will provide guidance for systematic and routine planning, implementation, and evaluation of the advancement of obesity prevention efforts. The report's recommendations focus on efforts to increase the likelihood that actions taken to prevent obesity will be evaluated, that their progress in accelerating the prevention of obesity will be monitored, and that the most promising practices will be widely disseminated.

www.iom.edu/reports/2013/evaluating-obesity-prevention-efforts-a-plan-for-measuring-progress.aspx

◆ Aligning Engineering Education and Experience to Meet the Needs of Industry and Society

Industry and society depend on engineers for the design and production of safe, reliable, efficient goods that meet customer needs and are competitive in the global market. Given the large number of engineers in the United States approaching retirement, there has been much debate about whether there will be a sufficient number of engineers to meet industry and societal needs. Although US colleges and universities produce technically competent graduates who understand engineering concepts and demonstrate the ability to apply them in the real world, they often lack the people skills ("soft" skills) that enable them to meet their full potential, according to the author of an article in the Summer 2013 issue of *The Bridge* from the National Academy of Engineering.

Industry, society, and engineering schools can and should collaborate to ensure a sufficient number of qualified and capable engineers to meet industry and society needs. Some of the strategies to achieve these goals include assigning new students to cohorts, having engineering professors teach mathematics and physics, providing projects for first- and second-year engineering students, and internships, according to the article's author.

www.nae.edu/Publications/Bridge/81221/81233.aspx

Cogeneration *(from page 2)*

The system works as follows:

- Each of the three 7.5MW gas turbines drives a water-cooled electric generator.
- The exhaust from the gas turbines (temperature peaks at 900°F) passes into a heat recovery steam generator.
- The steam generator produces low and high-pressure steam.
- Low-pressure steam is piped throughout the campus to heat the buildings. When air conditioning is needed, this same low-pressure steam is used to power turbines that drive three refrigeration compressors.
- High-pressure steam powers one single-stage turbine. The turbine drives a water-cooled electric generator that provides additional electric power and higher combined-cycle thermal efficiencies.
- Because the exhaust from the steam turbine is now at a reduced pressure and temperature it can be added to low-pressure steam to either heat or cool the Storrs' campus buildings. "Basically, this portion of the energy conversion cycle in UConn's Cogen/CHP plant is making three uses of one unit of gas turbine fuel," says Langston.

On a smaller scale, Connecticut manufacturer Nufern is in the process of adding a Cogen/CHP plant to their existing microgrid. Due to critical power requirements, Nufern cannot risk losing

power for more than a fraction of a second. They already had an online Uninterruptible Source (UPS) system. This UPS system has an automatic transfer switch that senses when a utility outage occurs and automatically starts Nufern's 800 kW diesel generator and transfers load to this emergency source. When normal grid power returns, the control system automatically switches back and shuts down their emergency generator. Nonetheless, Nufern started running critically low on diesel fuel to power its UPS system during the extended power outage that followed Hurricane Sandy. About the same time Nufern was expanding their facility, necessitating adding another 100 kW average load to their existing 1.2MW electrical system and increasing the 700 ton existing cooling capacity with the addition of a 150 ton absorption chiller. The difference in natural gas cost versus electricity cost per Btu delivered and the constant need for both heating and cooling year round were among the key factors leading Nufern to seek the more cost-effective cogeneration system.

Nufern President Martin Seifert (CASE member) and his team considered several alternatives before selecting a reciprocating engine for their CHP plant. They chose a 600 kW Caterpillar (Cat) natural gas-fired reciprocating engine because of its dependability and well-understood lifetime cost of ownership. The engine drives a Cat electric generator set to produce electricity, while jacket water and exhaust gas cooling circuits are fed through heat exchangers to

(See Cogeneration, page 8)

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Cogeneration *(from page 7)*

transfer the waste heat from the engine to Nufern's hot water plant. The hot water is used for part of Nufern's HVAC requirements, including facility cooling via the use of an absorption chiller on the hottest summer days. New paralleling switchgear allows Nufern to operate with the local utility power source and transfer back to independent operation seamlessly.

Nufern's new CHP system will provide 600 kW of electrical cogeneration, and either 150 tons of absorption chilling, or 2,000,000 Btu/hour of heat. When asked if there were any roadblocks to installing a CHP plant, Seifert said the permitting process is fairly time consuming. "Everyone is very cooperative and gracious, but it's taking us a lot longer than expected to get all the permits and certifications we need to begin operating our facility." Nonetheless, Seifert believes they made the right decision and expects to recoup the up-front capital costs in three years via sizeable annual energy and demand penalty savings (a demand penalty is the cost a utility charges for the peak demand of a customer whether they reach it or not; a customer can use CHP capability to meet their internal peak demand, reducing the peak demand on the utility company and resulting in a savings over the longer term).

The increasing interest in Cogen/CHP systems has an element of déjà vu. While Cogen/CHP systems may be considered new, in actuality Thomas Edison built the first Cogen/CHP system in lower Manhattan in 1882. His Pearl Street Station produced steam in the process of generating electricity, while using waste heat to warm nearby buildings achieving 50% efficiency. The downside of his Cogen/CHP system was its limited scope—only a square mile radius from the Station. As customer demand increased, new regulations were established promoting rural electricity via centralized power plants managed by regional utilities. These regulations

discouraged decentralized power generation, including Cogen/CHP systems.

However, in Connecticut the climate is right for businesses to consider Cogen/CHP systems for meeting their energy needs, as well as renewable energy installations. With the passage of two more clean energy programs in June 2013, the state has a variety of resources and tools available to businesses and consumers. —**Deb Mearman, freelance writer**

Project O *(from page 1)*

environments and research laboratories makes Project O's programs a hands-on science rich experience.

Project O recently wrapped up its summer camp series. Both day and residential camp programs embarked on field study excursions that combine exploration of marine environments and habitats with laboratory research activities.

Project O also offers school-year programs for school groups (fifth grade up to the university level). These field study excursions feature hands-on, minds-on marine science that supplements classroom curriculum. Project Oceanology laboratory programs model the science lab portion of Connecticut standardized testing.

Public offerings include oceanographic research, lighthouse and seal watch cruises; as well as birthday parties and scout programs.

For more information, call 1-800-364-8472 or visit our website: www.oceanology.org.