Bulletin of the

Connecticut Academy of Science and Engineering

Volume 26,1 / Spring 2011

The Future of Nuclear Power in Connecticut

[Editor's Note: Author Lee Langston is Professor Emeritus of Mechanical Engineering at the University of Connecticut and Chair of the CASE Nuclear Power Study Committee.]

Electric power provides the means to make modern civilization go. I've often thought that it is like your health: When you have it, you don't think about it. When you don't have it, that's all you think about.

At present, about 20% of US electricity is generated by 104 nuclear power plants across the country. The first, Shippingport Atomic Station, located on the Ohio River 25 miles from Pittsburgh, went online in 1957, and was followed by many more in the next twenty years. But up until last year, no new US nuclear plants had been licensed since the 1970s. The Southern Company is now building two nuclear units at the Vogtle site, where two nuclear units are already operating, on the Savannah River near Augusta, Georgia—the first newly licensed nuclear plants in the United States in over 30 years.

The use of nuclear power to generate electricity in Connecticut also has a long history. Connecticut Yankee, the first of four nuclear power plants in the state, was located at the confluence of the Connecticut and Salmon Rivers and began generating commercial electric power in 1968. In addition, the state has two nuclear plant manufacturers: General Electric Company, with headquarters in Fairfield, and Westinghouse Electric Company in Windsor.

Depending on the season and the time of day, Connecticut's electric power needs can be as high as 6,000-8,000 megawatts electric (MWe). The state's nuclear plants can supply roughly a third of these peak power needs. Nuclear plants run in a base load mode, essentially running continuously at full power, except to shut down every 18 months or so for refueling. According to the latest US Energy Information Administration (EIA) figures, in 2008 Connecticut's net electrical energy generation was 30,409 thousand megawatt hours—and 51% of that was from the state's nuclear plants. Connecticut is one of only six states where nuclear power is the primary means of electrical generation.

Because the contribution from nuclear plants is so important to the state's economy and well-being, last year the Connecticut Energy Advisory Board (CEAB) asked the Academy to conduct a study of Advances in Nuclear Power Technologies. The resulting CASE Nuclear Power Study Committee (NPSC) was formed in July of last year with the goal of completing a report to the CEAB later this year on the latest technology, science, economics and environmental issues associated with nuclear power, to aid in planning for

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Nuclear Power Expert Matzie to Address CASE Meeting

Dr. Regis Matzie will review the status of nuclear power at CASE's May 25 meeting.

As keynote speaker at the CASE Annual Meeting and Dinner (to be held May 25, 2011 at the Stepping Stones Museum in Norwalk), CASE member Regis A. Matzie will review the current status of nuclear power in the United States, some of the features of advanced light water reactors (ALWRs) that are being built today, and unique aspects of small modular reactors (SMRs) that are now being developed and may be in Connecticut's energy future.

Matzie recently retired as Senior Vice President and Chief Technology Officer from the Westinghouse Electric Company, one of the world's largest and oldest nuclear power plant manufacturers. He was responsible for all Westinghouse research and development undertakings and advanced nuclear plant development. Earlier, Matzie was vice president of Nuclear Systems for ABB Combustion Engineering Nuclear Power in Windsor, Connecticut, which was purchased by Westinghouse.

News from the National Academies

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

◆ Latest Dietary Guidelines for Americans Released

The US departments of Agriculture and Health and Human Services have released the *2010 Dietary Guidelines for Americans*, the government's nutritional guidance to promote health, reduce the risk of chronic diseases, and reduce the prevalence of obesity through improved nutrition and physical activity. The committee that developed the guidelines considered several sources of evidence and expertise, including reports from the Institute of Medicine.

The new guidelines encourage Americans to eat more fruits, vegetables, whole grains, and seafood. They also place greater emphasis on salt reduction for several population groups, and more strongly urge people to watch their calorie intakes and increase their physical activity. IOM has issued several reports that take on chronic disease, obesity, and other nutrition-related dangers. The Dietary Guidelines aid policymakers in designing and implementing nutrition-related programs. They also provide education and health professionals, such as nutritionists, dietitians, and health educators, with a compilation of the latest science-based recommendations. A table with key consumer behaviors and potential strategies for professionals to use in implementing the Dietary Guidelines is included in the appendix.

http://www.dietaryguidelines.gov

◆ USDA Proposes Changes to Foods in School Meals Program

For the first time in 15 years, the US Department of Agriculture has proposed changes to the amounts and types of foods served in the federal school meals program. The new standards would increase the amounts and varieties of fruits, vegeta-

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future electrical power needs of the state. The committee consists of 20 experts from various disciplines. I am the committee chair and Regis Matzie, retired Senior Vice President of Westinghouse Electric Company, is one of the nuclear industry experts serving on the NPSC. Matzie is an Academy member and will be the featured keynote speaker (see page 1), on nuclear energy at the Academy's May 25, 2011 Annual Meeting and Dinner at the Stepping Stones Museum for Children in Norwalk.

The need to be aware of progress in nuclear power is a strong one, not only because of the state's dependence on this energy converter for one half of its electricity, but also because of the public clamor for power conversion processes that don't produce CO_2 and other greenhouse gases. It was only 16 years ago that the state had four nuclear power plants in operation: Connecticut Yankee at Haddam Neck, and Millstone Units 1, 2 and 3 in Waterford—the largest concentration in New England. Currently, the state has only two operating nuclear power plants, Millstone's Units 2 and 3, with the other two plants shut down, having come to the end of their service lives.

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◆ Leading Patrons ◆

The Connecticut Light and Power Company

The *BULLETIN* of the Connecticut Academy of Science and Engineering is published by the Connecticut Academy of Science and Engineering, Inc., 179 Allyn Street, Suite 512, Hartford, CT 06103-1422. Telephone and fax: (860) 527-2161. E-mail: acad@ctcase.org. Web site: www.ctcase.org. To subscribe to the Bulletin, contact us by phone or email or subscribe on our web site. The Connecticut Academy of Science and Engineering is a private, nonprofit public-service organization established by Special Act No. 76-53 of the Connecticut General Assembly.

Connecticut Yankee, with a nominal electrical output of 600 MWe, was retired in 1996, after a service life of 29 years and after producing over 110 billion kilowatt-hours from its uranium fuel. Millstone Unit 1, at the site of so-named granite quarry on Long Island Sound near Niantic, came on line in 1970 and ceased its 660 MWe output on retirement in 1998. This leaves Connecticut with Millstones's Unit 2 and Unit 3 which have a combined electrical output of 2,024 MWe. Unit 2 is licensed to operate until 2035, and Unit 3 until 2045.

Thus, three reasons why Connecticut should plan for future nuclear power plants include the following:

- They have a 43-year history of successful service in the state—a state that has very limited natural energy resources.
- Two of our four nuclear power plants, having reached the end of their design life cycle, have ceased operation.
- It can take a decade (or more) to have a new nuclear power plant conceived, permitted and constructed.

Some CASE NPSC Data

Last year, at the start of the CASE study, the committee commissioned the Connecticut Economic Resource Center (CERC) to conduct a survey to assess the state residents' opinion of nuclear power. The results of a phone survey of 600 residents evenly distributed across the state showed the following:

- The majority (69%) thought that fossil fuels accounted for most of the electricity generated in the state. Only 12% picked nuclear, exceeded by 18% who either didn't know or were not sure how generation occurred, while a remaining 1% avowed renewables.
- Only about 50% knew there were operating nuclear plants in Connecticut and of these, 54% identified Waterford, Millstone or Niantic as the location.
- Respondents favored the use of green/renewable energy over the use of fossil fuels and nuclear power to produce electricity.
- While the majority of respondents believed that Connecticut should reduce its dependence on fossil fuels, in answer to whether the state should build a new nuclear power plant facility to reduce fossil fuel use and address climate change issues, 64% said no, 21% didn't know or weren't sure and 15% said yes.

The above are just a sampling of the nuclear power survey results. To me, one clear finding is the lack of knowledge our state residents have about nuclear power—and on energy matters in general. I remember the answer a French official gave to a question of why the French people didn't follow other European populations after the 1989 Chernobyl disaster and demand an end to France's extensive nuclear power program (which currently provides about 80% of their electrical power). His answer: "Twenty years of public education on nuclear energy." The survey strongly indicates that Connecticut's public needs a basic understanding of energy to make informed choices.

On September 24, 2010, members of the CASE committee toured the site of the decommissioned Connecticut Yankee (CY) nuclear power plant, located on 600 acres in Haddam Neck.

We walked on the actual site of the CY nuclear plant, which was decommissioned from 1998-2007 with all structures removed from 3-4 feet below ground level. It is now a fairly level field, with a low mound where the pressurized water reactor building sat.

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Biomedical Research

KEY STEM CELL DISCOVERY. Researchers from the **University of Connecticut** and **Yale University** discovered that Lin28, a key gene in stem cell development, also markedly enhances the growth and survival of human embryonic stem cells (*Stem Cells*, March)—a significant finding made possible by funding from the state's stem cell research program. The research team found that Lin28 activates targeted groups of genetic molecules found within a class of molecules called messenger RNAs in order to create proteins that are crucial in maintaining stem cell function and survival. Researchers said the finding could lead to new insights into how stem cells regenerate or repair damaged tissue in a host of diseases.

SCIENTISTS SYNTHESIZE SOUGHT-AFTER ANTI-CANCER AGENT. A **Yale University** team led by Assistant Professor of Chemistry **Seth Herzon** synthesized for the first time a chemical compound called lomaiviticin aglycon, leading to the development of a new class of molecules that appear to target and destroy cancer stem cells (*Journal of the American Chemical Society* online.) Until now, scientists had been unable to obtain significant quantities of the compound, which was originally discovered in 2001 and is produced by a rare marine bacterium that cannot be easily coaxed into creating the molecule. Herzon's team was able to synthesize the molecule in 11 steps starting from basic chemical building blocks.

YALE BIODESIGN INSTITUTE LAUNCHED. Yale University announced the creation of a Biodesign Institute that will leverage expertise of biologists, engineers and researchers in other disciplines to explore how living and material systems operate at the nanoscale. **James E. Rothman**, the Fergus F Wallace Professor of Biomedical Sciences and Chair of the Department of Cell Biology at **Yale School of Medicine**, has been named director and CASE member **T. Kyle Vanderlick**, Dean of the **Yale School of Engineering and Applied Science**, will serve as deputy director. A faculty advisory committee will help oversee the Institute, which is expected to open in early 2012.

DENDRITIC CELLS AND LUPUS. Yale University researchers reduced symptoms of lupus in mice by eliminating a key immune system cell, and in doing so may have identified a new therapeutic target for a variety of other autoimmune diseases (*Immunity*, Dec. 16). The research findings focus on the role the dendritic cell plays in systemic lupus erythematosus, or SLE. Dendritic cells are important for initiating the immune response to pathogens but it is unclear what role they play in autoimmune diseases such as SLE. The Yale team knocked out dendritic cells in lupus-prone mice and found a dramatic reduction in symptoms. They also discovered that knocking out the dendritic cells in lupus mice did not reduce the activation of pathogenic T cells as expected, which means dendritic cells might make a good therapeutic target for lupus and possibly other autoimmune diseases.

Business & Industry

PRATT, CT TO BENEFIT FROM BOEING CONTRACT AWARD. On Feb. 24, the Pentagon announced that it has selected Boeing to build the next generation of Air Force refueling tankers. The $35 billion program is good news for **Pratt & Whitney,** which will assemble some 400 engines in Middletown, two for each of the 179 "NextGen Tanker" aircraft, plus spares. Boeing said the contract would support approximately 50,000 total US jobs with Boeing and more than 800 suppliers in more than 40 states.

ALEXION BUYS CO FIRM FOR $111M. Cheshire drug maker **Alexion Pharmaceuticals Inc.** bought privately held biotechnology firm Taligen Therapeutics, of Aurora, CO, for $111 million, to expand its product portfolio. Alexion's sole product, Soliris, treats a genetic blood disease called paroxysmal nocturnal hemoglobinuria.

PRAXAIR TO SUPPLY CHINESE SOLAR MAKERS. The **Praxair Electronics** division of Danbury-based **Praxair Inc.** entered into contracts with three Chinese solar fabricators to provide silane and other gases used to make photovoltaic panels. The Chinese companies are ShanXi LuAn Solar Energy (Changzhi, Shanxi Province); Changzhou Trina Solar Energy Co. Ltd (Jiangsu Province); and Realforce Solar (Jining, Shandon Province).

KAMAN COMPLETES GLOBAL AEROSYSTEMS DEAL. Bloomfield aircraft component manufacturer **Kaman Corp.** completed its purchase of Global Aerosystems LLC of Everett, WA, a firm that specializes in aircraft design and stress analysis. Terms were not disclosed. Global is an employee-owned firm with 120 aerospace engineers and revenues of $20 million last year.

GERBER SELLS LENS BUSINESS FOR $21M. Gerber Scientific Inc. in South Windsor sold its **Gerber Coburn** ophthalmic lens processing business to the newly formed, Connecticut-based company **Coburn Technologies Inc.** for $21 million. Gerber said revenue from the sale would be used to repay debt and for general corporate purposes.

ROGERS BUYS GERMAN FIRM. Killingly manufacturer **Rogers Corp.** acquired Curamik Electronics GmbH, a German maker of power components for energy-efficient electric motors, for $154 million cash. The purchase is in line with Rogers' strategy to refocus its product line on sustainable energy, Internet and mass-transit markets.

Communication

MXENERGY LAUNCHES CABLEVISION CHANNEL. MXEnergy, a supplier of electricity and natural gas in Connecticut, launched MXenergyTV, an on-demand TV channel found on Cablevision iO Channel 654. MXenergy says it is "showcasing the people, places and products that are moving us forward, either through innovation or through environmental protection with energy saving tips." A multi-part series called Attainable Sustainables gives consumers simple tips for saving energy. Segments for the channel are filmed mostly in and around Connecticut.

PRI ASSESSES CT E-GOVERNMENT. A report by the **Legislative Program Review & Investigations (PRI) Committee** entitled *Assessment of Connecticut's Implementation of E-Government* (http://www.cga.ct.gov/pri/2010_ACIEG.asp) found that while

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) 527-2161, write the editors at CASE Bulletin, 179 Allyn St., Suite 512, Hartford, CT 06103-1422, or email us at acad@ctcase.org

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Connecticut has expanded its use of e-government, improvements tend to come from individual departments rather than being implemented systematically. The report's recommendations include the formation of a long-term e-government strategy to be guided by an e-government board and a director from within the Department of Information Technology.

CT HOSPITALS ADOPT ELECTRONIC RECORD GUIDELINES EARLY. Nearly half of Connecticut's nonprofit hospitals committed to early adoption of federal guidelines for digitizing patient health records ahead of a 2015 deadline, authorities say. Fourteen of the state's 29 nonprofit hospitals declared their intention to achieve "meaningful use" of electronic health records technology this year, which would certify them for incentive payments from Medicare and Medicaid. All US hospitals must make their patient records available electronically by 2015 or face federal fines.

HBJ LAUNCHES NEW HEALTHCARE E-NEWSLETTER. The *Hartford Business Journal* began publishing a weekly healthcare e-newsletter in February, replacing its weekly e-version of *Movers & Shakers*. HBJ newsman **Greg Bordonaro** heads the new online publication, entitled *HBJ Today*. Visit www.hartfordbusiness.com for more information or to subscribe.

Education & Cognition

CCAT & DREAM IT. DO IT®. The **Connecticut Center for Advanced Technology (CCAT)** will lead a Dream It. Do It (www.ccat.us) initiative in Connecticut to revitalize the state's workforce and economy. Developed by the Manufacturing Institute in 2005, Dream It. Do It®. is a nationally recognized program that uses cutting-edge marketing to inform students, transitioning workers and military servicemen, and women about career opportunities in manufacturing and key sectors. Through mentoring in schools and community outreach, the program places students on educational pathways that result in an academic degree and a nationally portable, industry-recognized skill credential, according to CCAT.

NEW NURSING SIMULATION LAB. The **University of Connecticut's School of Nursing** opened a fourth medical simulation lab at UConn's Avery Point-Groton campus in connection with the debut of the nursing school's Masters Entry Into Nursing (MEIN) program. MEIN is designed for individuals who have a bachelor's degree in a non-nursing field to pursue a career in nursing. Offering the MEIN program in Groton enables students in eastern Connecticut to be trained locally rather than at UConn's campuses in Waterbury, Stamford or Storrs.

Energy

MALLOY PROPOSES AGENCY CONSOLIDATION. Gov. Dannel P. Malloy proposed the creation of a newly consolidated **Department of Energy and Environmental Protection (DEEP)**, to be led by **Daniel C. Esty**, professor of environmental law and policy at **Yale** and a former US Environmental Protection Agency senior official. The DEEP would consolidate the **Department of Environmental Protection** and the **Department of Public Utility Control**, to allow for a more effective coordination of state energy and environmental policies. The governor's office said that the state's energy policy will become centralized in the agency through the creation of two new bureaus: the **Bureau of Utilities Control** and the **Bureau of Energy Policy and Efficiency**, which will include staff transferred from the **Office of Policy and Management's Energy Management Unit.**

COST OF TRANSMISSION PROJECTS. Regional transmission organization **ISO-New England** determined that a portion of the cost of two transmission projects (out of four in Maine, Vermont and Southwest Connecticut) does not qualify for cost sharing and must be borne by Connecticut ratepayers. ISO stated that all of the Maine and Vermont projects were eligible for cost sharing ($1.6 billion split among the six New England states). However, ISO said that $56 million of the $1.26-billion **Middleton-Norwalk Project** and $38 million of the $238-million **Glenbrook Cables Project** were local costs that must be taken on solely by Connecticut ratepayers, bringing to $880 million the total amount that Connecticut will pay for all four projects.

POWER DEALS:

- **UIL Holdings Corp.**, the parent company of **United Illuminating**, completed a $1.3 billion acquisition of **Southern Connecticut Gas Co.**, the **Connecticut Natural Gas Corp.** and the Massachusetts-based Berkshire Gas Co. UIL acquired the companies from a subsidiary of Iberdrola SA for $1.296 billion, less net debt of approximately $331.1 million and a preliminary working capital adjustment of approximately $47 million, resulting in cash consideration at closing of approximately $917.9 million to Iberdrola.

- New England power generator EquiPower Resources Corp. will acquire **Milford Power** and its 548 MW combined-cycle gas turbine power plant. The purchase of the plant gives EquiPower 1,800 MW of capacity in New England.

- New England Power Generators Association (NEPGA), representing 85% of the region's power generators, filed with the Massachusetts Department of Public Utilities opposition to the proposed merger between Hartford-based **Northeast Utilities** and Boston-based NStar. In a statement, NEPGA said the merger as proposed will harm competitive energy markets in New England and roll back consumer protections and environmental benefits that have been achieved over the last ten years.

CL&P PILOTS HOME ENERGY REPORTING PROGRAM. In early February, **Connecticut Light & Power (CL&P)** launched a new home energy reporting pilot program sponsored by the **Connecticut Energy Efficiency Fund** to help customers understand and reduce their energy usage. CL&P sent 24,000 randomly selected customers detailed information about their home's energy usage and tips to increase their energy efficiency. This is the first time a program such as this has been offered in Connecticut. According to OPOWER, the report developer, the program has consistently delivered 1.5- 3.5% in average energy savings to utility customers.

Environment

EPA REPORTS CT FACILITIES RELEASED FEWER TOXIC CHEMICALS IN 2009. The US EPA reported that the 313 Connecticut facilities reporting to it cut their releases of toxic chemicals in 2009 by one-sixth, a decrease from 4.0 million tons in 2008 to 3.3 in 2009. The Connecticut decrease of 18% exceeded the 10% decrease in New England. In Connecticut, the top releases include nitrate compounds, ammonia, zinc compounds,

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sulfuric acid, copper compounds and hydrochloric acid. Facilities with the largest toxic chemical releases in 2009 were: **Dow NA Allyn's Point Plant** (Gales Ferry); **AES Thames LLC** (Uncasville); **Cytec Industries Inc.** (Wallingford); **U.S. Surgical** (North Haven); **GBC Metals LLC** (Somers); **Thin Strip** (Waterbury); **Lake Road Generating Co.** (Dayville); **Summit Corp. of America** (Thomaston); **Sartomer Co. Inc.** (Stratford); **Quality Rolling & Deburring Co. Inc.** (Thomaston); and **Latex International** (Shelton).

CT BROWNFIELD CONVERSION HONORED, GREEN CIRCLE AWARDS ANNOUNCED. The **Connecticut Brownfields Redevelopment Authority** received the Project of the Year Award from the Northeastern Economic Developers Association for its efforts in turning a former East Hartford tank farm into the 109,000 sq. ft. riverfront campus of **Goodwin College**, used by more than 2,500 students. In other news, 28 Connecticut civic organizations, individuals and businesses were honored for their environmental efforts with the state's annual GreenCircle Awards from the state **Department of Environmental Protection** (DEP). Since the programs's inception in 1998, more than 750 awards have been granted to businesses, institutions, individuals and civic organizations for their involvement in over 1,100 projects. For a complete list recipients, see http://www.ct.gov/dep/cwp/view.asp?A=2708&Q=323940.

DEP RECEIVES UNDERWATER RESEARCH CAMERA. The state **Department of Environmental Protection's Office of Long Island Sound Programs** received a state-of-the-art underwater research camera on behalf of the **New England Regional Ocean Council** from Coastal America's Corporate Wetlands Restoration Partnership (CWRP). Coastal America is a partnership between federal, state and local governments and private organizations. The camera will be used by the DEP to study coastal and marine habitats and for public education efforts.

BIOLOGICAL CONTROL OF TICKS. As a result of research conducted at **The Connecticut Agricultural Experiment Station**, an insect-eating fungus called *Metarhizium anisopliae* F52 has been registered for the control of the deer (or blacklegged) tick, which transmits the pathogens of Lyme disease, babesosis and human granulocytic anaplasmosis. Novozymes Biologicals, Inc. of Salem, VA, registered the fungus as Tick-Ex with the US Environmental Protection Agency (EPA) and the **Connecticut Department of Environmental Protection**. Experiment Station scientists **Kirby Stafford** and **Anuja Bharadwaj** found a spray of the fungus on grass could control 53-74% of nymphal ticks for 5 weeks during the summer. More than one application may be necessary for the entire tick season. Although the supply of the product will probably be limited in 2011, it should be widely available in 2012, providing another tool for the integrated management of ticks and prevention of illnesses that they transmit.

Food & Agriculture

REVICZKY NAMED AG COMMISSIONER. **Gov. Dannel Malloy** selected Coventry farmer **Steven K. Reviczky** as the state's commissioner of agriculture. Most recently Reviczky was executive director of the **Connecticut Farm Bureau**. Prior to that, he was a property agent with the **Connecticut Department of Agriculture's Farmland Preservation Program**. Reviczky also served as the agency representative to the **State of Connecticut Council on Soil and Water Conservation**, the **Quinebaug-Shetucket Heritage Corridor Natural Resources/Agriculture Committee**, and the **Farm Transfer & Farm Succession Working Group**. Reviczky is a former First Selectman in **Ashford** and a public policy & government graduate of **Eastern Connecticut State University**.

'CT GROWN' EXPANDED TO FORESTRY PRODUCTS. The **Department of Environmental Protection (DEP)** announced the expansion of the Connecticut Grown program to include the state's forestry products like lumber, firewood and Connecticut-made wood products. **Christopher Martin,** director of the division of forestry at DEP, says the hope is that CT Grown will do for forestry products what it has done since 1968 for locally produced food and agricultural products. Connecticut is 60% forested, says Martin, and a federal inventory shows that state's forests are declining. Wood products with the CT Grown label must be sustainably harvested in compliance with local and state regulations and vendors in the program agree to be audited randomly. DEP is currently developing criteria for different product types.

WATCHING FOR INVASION BY AN ASIATIC PEST. This spring, the state **Department of Environmental Protection,** in collaboration with the federal Animal Plant Health Inspection Service (APHIS), **The Connecticut Agricultural Experiment Station**, and the **University of Connecticut Cooperative Extension System**, and with assistance from the **Connecticut Department of Transportation**, will set up monitoring traps for the emerald ash borer. The state regulatory authority for plant pests lies with the Experiment Station, which surveys for insects and plant pathogens that threaten trees or agricultural crops. The emerald ash borer has been found nearby in neighboring states but not yet in Connecticut.

GRANTS FOR SPECIALTY CROPS. The Connecticut Department of Agriculture issued a request for grant applications for projects that solely enhance the competitiveness of specialty crops. Specialty crops are defined by the USDA as fruits and vegetables, dried fruit, tree nuts, maple syrup, honey, horticulture, and nursery crops (including floriculture). Projects can last up to three years and must benefit the specialty crop industry as a whole. Applications are due via email to the Connecticut Department of Agriculture by May, 17, 2011. For more go to www.ct.gov/doag and search for "specialty crop."

Health

DANBURY HOSPITAL TO EXPAND. **Danbury Hospital** is planning a $150 million construction project to add nearly 300,000 square feet to its campus. Hospital officials say the addition is needed due to lack of space in the hospital's current emergency room. The current emergency room is equipped for 40,000 patient visits annually but actually sees nearly 70,000 patients. The project will include a new emergency room capable of 88,000 visits per year, a new patient tower with more private rooms and a welcoming center.

HARTFORD HEALTHCARE COMPLETES EYE SURGERY CENTER DEAL. **Hartford Healthcare** completed its $28 million acquisition of Newington-based **Constitution Eye Surgery Center.** The deal makes Hartford Healthcare a major player in Greater Hartford's outpatient ambulatory eye surgery industry. Hartford Hospital officials said the acquisition is part of a strategic plan to create a regional center for excellence in eye-related care.

AETNA EARLY DELIVERY PREVENTION INITIATIVE. Hartford health insurer **Aetna** announced a number of infant safety programs that encourage women, doctors and hospitals to limit

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electively scheduled deliveries until after a minimum 39 weeks of pregnancy. The initiative, which is being launched in collaboration with the March of Dimes, The Leapfrog Group and others, aims to prevent early deliveries when they are not medically necessary. **Marjorie Schulman**, an Aetna senior medical director with 25 years of experience as a neonatal intensive care (NICU) doctor, says that every week prior to 39 weeks that a baby is delivered, the chance of health and development problems requiring NICU care nearly doubles.

PREVENTING FALLS AMONG OLDER ADULTS. New guidelines recommend exercise, including slow, controlled movements like tai chi, as a way to prevent falls among older adults. **Yale School of Medicine Professor Mary Tinetti,** a CASE member, co-chaired a panel of experts who developed the guidelines for the American and the British Geriatrics Society (*Journal of the American Geriatrics Society*, January). Falls are not only associated with significant injury and death in the older population, but are also linked to reduced independence and early admission to long-term care facilities.

INFANTS WHO RECEIVE ANTIBIOTICS AT RISK FOR ASTHMA, ALLERGIES. Children who receive antibiotics within the first six months of life are at a significantly increased risk of developing asthma and allergies by six years of age, even without a genetic predisposition, new research by the **Yale School of Public Health** suggests (*American Journal of Epidemiology* online.) The research shows that infants exposed to antibiotics during their first six months of life were up to 52% more likely to develop childhood asthma and allergies than their peers who did not receive antibiotics. While previous studies have also suggested this, those studies may have been biased because antibiotics are used to treat respiratory tract infections that could themselves be early symptoms of asthma. The Yale study sought to eliminate this bias and concluded that antibiotic use increased risk of childhood asthma even in children who have not experienced respiratory tract infections and in children whose asthma is first diagnosed after three years of age.

High Technology

YALE SCIENTISTS UNVEIL WORLD'S FIRST ANTI-LASER. Scientists at **Yale University**, led by physicist and CASE member **A. Douglas Stone**, have built the world's first anti-laser, in which incoming beams of light interfere with one another in such a way as to cancel each other out (*Science*, Feb. 18). Stone and his team published a study last summer explaining the theory behind an anti-laser, demonstrating that such a device could be built using silicon. After working with Yale physicist **Hui Cao**'s experimental group, the team actually built a functioning anti-laser, which they call a coherent perfect absorber (CPA). The team focused two laser beams with a specific frequency into a cavity containing a silicon wafer. The wafer aligned the light waves in such a way that they became perfectly trapped, bouncing back and forth indefinitely until they were eventually absorbed and transformed into heat. Stone believes that CPAs could one day be used as optical switches, detectors and other components in the next generation of computers, as well as in radiology, either for therapeutic or imaging purposes.

RED DWARF STARS FAR MORE PREVALENT THAN PREVIOUSLY THOUGHT. Using powerful instruments on the Keck Observatory in Hawaii, astronomers discovered that small, dim stars known as red dwarfs may be three times more prevalent than previously thought (*Nature*, Dec. 1 online). Until now, astronomers hadn't been able to detect red dwarfs in galaxies other than our own and its nearest neighbors. Through this research, **Yale University** astronomer **Pieter von Dokkum** and his team detected the faint signature of red dwarfs in eight massive, relatively nearby galaxies, located between 50 and 300 million light years away. They discovered that the red dwarfs —only 10 to 20% as massive as our sun—were much more bountiful than expected.

CI ANNOUNCES FIRST PRE-SEED FUNDS. In February, **Connecticut Innovations Inc. (CI)** announced $1 million in funding for seven technology startups in the first awards from the quasi-public technology investment arm's pre-seed fund. The firms are:

- **AlloStem Therapeutics LLC** (Farmington)
- **Alphachromics Inc.** (Farmington)
- **CMDBioscience LLC** (Orange)
- **eGen LLC** (Groton)
- **Floop Inc.** (New Haven)
- **HDB Newco Inc.** (New Haven)
- **Shizzlr Inc.** (New Haven)

The firms had to find matching funds from private investors to collect their pre-seed stakes from CI. CI's pre-seed fund totals $4 million and provides loans up to $150,000 for startup and early-stage technology companies. The fund was first launched five months ago.

Transportation

METRO TAXI EXPANDING DISABILITY SERVICES. New Haven-based **Metro Taxi** is partnering with Hartford's **Yellow Cab Company** to increase its wheelchair-accessible cab fleet from one to 140 natural gas-fueled cars. The enhanced taxis will cost no more than Metro Taxi's existing 161 vehicles. Metro Taxi CEO and President **Bill Scalzi** said that one wheelchair taxi serving 30 towns is not enough. While the purchase of the natural-gas vehicles was approved by the US Department of Energy, hearings for approval from the **Connecticut Department of Transportation** were ongoing through March. "We think a fleet of vehicles is required in order to make a program available for all those with mobility disabilities truly viable," Scalzi said.

GREEN DRIVING. The **Connecticut Department of Motor Vehicles** (DMV) is promoting environmentally friendly driving. New Canaan teenager **Katherine Schultz**, who championed the cause along with her father **Bob Schultz**, worked with the DMV to create videos demonstrating environmentally friendly driving. The videos and information are available on the DMV website (www.ct.gov/dmv) and will be distributed in the state driver's manual.

EIGHT M8S START SERVICE. The first eight of **Metro-North's** new Kawasaki M8 rail cars went into service on March 2, indicating that the cars passed 4,000 miles of problem-free testing. The next cars to go in service will need to pass only 1,000 miles of testing. The state has committed to buy 380 of the M8s.

— Compiled and edited by Ann G. Bertini, Assistant Director for Programs, Connecticut Academy of Science and Engineering

Bridgeport's Discovery Museum Seeks to "Engage, Excite, Educate"

A summer program participant checks out the museum's resident research submarine. [Photo: Discovery Museum]

The Discovery Museum opened in Bridgeport in 1961 as the multi-faceted Museum of Art, Science and Industry. Today, the museum has refined its mission and evolved into a vital regional science center whose mission is to "engage, excite and educate" visitors in the exploration of science, technology and ideas. Specialties include physical science, ocean and environmental science, space science and astronomy, with an emphasis on hands-on learning for students in Grades 3–8.

The Discovery Museum's 20,000 square foot facility includes both permanent and traveling interactive exhibit galleries, a 124-seat planetarium, a Challenger Learning Center, an 80-seat auditorium, as well as five multi-purpose classrooms where more than 70 hands-on science programs are offered for schools and groups on both an in-house and outreach basis. Programs support the CT Science Education Framework. Nearly 40,000 children participate in the museum's science programs, outreach activities and summer programs each year. According to Director of Education Alan Winick, "We specialize in making science accessible to everyone, mining the natural curiosity of our young visitors, and rekindling that natural curiosity in our adult visitors."

Recently, the museum worked with the Bridgeport Public Schools, the City of Bridgeport, and Sacred Heart University to establish the Discovery Interdistrict Magnet School, a public science magnet school built on Discovery Museum grounds. This state-of-the-art science school, which opened its doors in January 2011, will serve approximately 500 students in Grades Pre-K through 8 from both Bridgeport and surrounding suburban communities. Truly a landmark effort, Discovery Magnet represents a unique partnership among a public school, a university and an informal science education institution.

From the National Academies *(from page 1)*

bles, and whole grains, and lower the amount of saturated fat, trans fat, and sodium in meals provided to more than 32 million schoolchildren who participate in these meal programs. The changes largely mirror recommendations made by the Institute of Medicine in a 2009 report, *School Meals: Building Blocks for Healthy Children*. The USDA will accept public comments on the proposed changes through April 13. Secretary of Agriculture Tom Vilsack says he hopes schools will begin to initiate these changes in the fall of 2011.

http://national-academies.org/headlines/20110118.html

◆ Lower Fluoride Levels in Drinking Water Proposed

The US Department of Health and Human Services (HHS) announced a federal proposal to reduce the recommended level of fluoride in drinking water to prevent a discoloration and pitting of the teeth known as dental fluorosis. HHS is proposing that the recommended level of fluoride in drinking water can be set at the lowest end of the current optimal range to prevent tooth decay, and the federal Environmental Protection Agency (EPA) is initiating review of the maximum amount of fluoride allowed in drinking water.

The proposal is based in part on EPA assessments that were prompted by a 2006 National Research Council report, which recommended that EPA reconsider its fluoride standards to take into account health effects such as dental fluorosis and consider all sources, including toothpaste and mouthwash, of fluoride exposure. These actions will maximize the health benefits of water fluoridation, an important tool in the prevention of tooth decay while reducing the possibility of children receiving too much fluoride.

http://www.hhs.gov/news/press/2011pres/01/20110107a.html

◆ Computer Games and Simulations Offer New Potential for Science Education

At a time when scientific and technological competence is vital to the nation's future, the weak performance of US students in science reflects the uneven quality of current science education. Many experts have called for a new approach to science education, based on recent and ongoing research on teaching and learning. In this approach, simulations and games could play a significant role by addressing many goals and mechanisms for learning science: the motivation to learn science, conceptual understanding, science process skills, understanding of the nature of science, scientific discourse and argumentation, and identification with science and science learning.

To explore this potential, a new book from the National Academies Press, entitled *Learning Science: Computer Games, Simulations, and Education,* reviews the available research on learning science through interaction with digital simulations and games. It considers the potential of digital games and simulations to contribute to learning science in schools, in informal out-of-school settings, and everyday life. The book also identifies the areas in which more research and research-based development is needed to fully capitalize on this potential. *Learning Science* will guide academic researchers; developers, publishers, and entrepreneurs from the digital simulation and gaming community; and education practitioners and policy makers toward the formation of research and development partnerships that will facilitate rich intellectual collaboration.

http://www.nap.edu/catalog.php?record_id=13078

◆ Shorter US Lifespans Tied to Past Smoking, Obesity

The nation's history of heavy smoking is a major reason why lifespans in the United States fall short of those in many other high-income nations, and evidence suggests that current obesity levels also play a substantial part, says a new report from the National Research Council.

Over the last 25 years, life expectancy at age 50 in the United States has risen, but at a slower pace than in many other high-income countries, a difference particularly notable given that the United States spends more on health care than any other nation. Because of a lag of two to three decades between smoking and its peak effects on mortality, one can predict how smoking will affect life expectancy over the next 20 to 30 years. On this basis, life expectancy for US men is likely to improve relatively rapidly in coming decades because of reductions in smoking in the last 20 years, the report says. For US women, whose smoking behavior peaked later than men's, declines in mortality are apt to remain slow for the next decade.

http://www.nap.edu/catalog.php?record_id=13089

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Nuclear Power *(from page 2)*

Located on a hill above the plant site is the Independent Spent Fuel Storage Installation (ISFSI), which is roughly the size of a football field. It consists of 43 dry storage casks mounted on a 100 x 200 foot, 3-foot thick concrete pad, surrounded by a high fence with a buffer zone of 300 meters outside of the fence, making for about a 100-125 acre land area. (See http://www.connyankee.com for details.) Forty of the casks contain almost all of the fuel assemblies used over the entire 28-year life of the plant. Three of the 43 casks contain reactor vessel parts.

Each cask is a vertical concrete cylinder (with a reinforced 21-inch wall), about 12-13 feet in diameter and about 20 feet high. Each contains a cylindrical steel canister with 3.5-inch thick walls, loaded with used fuel assemblies. The steel canister exterior is ringed with circumferential fins which dissipate, by natural convection, heat generated by the spent fuel. Air flows into the concrete casks at bottom openings and exits at screened openings at the top. Each cask weighs 126 tons and costs about $1M. They are licensed for a 20-year storage time, but could go up to 40-60 years (or longer). One possible future scenario would be that the appropriate federal agency might take possession of the ISFSI – and just leave the casks in place, considering the cost of moving them to a "permanent" storage site if one is ever chosen. The cost of maintaining the CY ISFSI is about $3M/year.

Dominion, the Virginia-based energy company that owns Millstone, hosted a visit of the committee to this 2,024 MWe nuclear plant last November. With Units 2 and 3 in operation, the plant that supplies about half of the state's electricity has 1,100 full-time employees (plus a security force) in Waterford.

In the future, if another 1,000 MWe unit were added to Units 2 and 3, based on current prices, it might cost $5-6B. Under Connecticut's old, regulated electric utility system, it might have been possible to finance such a huge investment, the way Units 2 and 3 were financed. With our currently deregulated system, it can be difficult for a private power provider to get such major funding (if indeed their long-term business plan supports such a commitment).

"Connecticut is one of only six states where nuclear power is the primary means of electrical generation."

This question of financing affordability for a large nuclear power plant is one factor that has led to the recent study and development of small modular reactors (SMRs) by such companies as Westinghouse and Babcock & Wilcox. These will be smaller, standardized modular nuclear power plants in the 100-300 MWe range. The advantages offered by the SMR concept include lowered unit costs in the $0.5-1B range, a standardized design, and the ability to more easily add future modules at the same site.

The CASE Nuclear Power Study Committee is investigating the pros and cons of SMRs to see if they make sense for Connecticut. At the federal level, the Nuclear Regulatory Commission is studying the licensing framework for SMRs. In addition, US Secretary of Energy Steven Chu established the Blue Ribbon Commission on America's Nuclear Future in January 2010, at the direction of President Obama. The Commission is reviewing policies for managing the nuclear fuel cycle and is expected to issue recommendations within 24 months. ***—Lee Langston is Professor Emeritus of Mechanical Engineering at the University of Connecticut and Chair of the CASE Nuclear Power Study Committee.***