

NEWS in Science and Technology



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The following is an Executive Summary of the Academy's quarterly Bulletin (Vol. 18,1) that includes topics and issues in science and technology deemed by the Academy to be both timely and relevant to Connecticut's interests. Each item is briefly summarized from press releases and reports of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. Hyperlinks are included to the original online source, where more detailed information is available.

NOTE: Online versions of this newsletter and the Bulletin are available on the Academy website at www.ctcase.org.

FEATURE ARTICLE: ENERGY

➤ Powering the Future: Fuel Cell Technologies

Fuel cell technologies are poised to play an increasingly critical role in meeting the world's growing demand for clean, reliable power. CT Academy completes study of Fuel Cell Systems for CT Department of Economic and Community Development and CT Economic Resource Center.

- Study describes fuel cell technologies, identifies current and examines future applications, including development status and time frames.
 - Fuel cells use hydrogen and oxygen to produce electricity through electrochemical reactions.
 - Application possibilities range from spacecraft to automobiles and large stationary power generation systems to small electronic devices.
 - Market penetration, depending on applications, expected to be one to seven years.
- Advantages: potential to create more reliable power, with lower levels of undesirable emissions and noise and higher overall efficiency compared to traditional systems.
- Development challenges: lowering manufacturing costs; improving long-term reliability; infrastructure development for some types; and increasing market penetration.
- By 2004, first significant commercial market likely to be large capacity stationary power (exceeding 100kW).
- Focus on CT companies & research centers - on cutting edge and leaders of fuel cell research:
 - UTC Fuel Cells considered a world leader.
 - Fuel Cell Energy world's largest manufacturer of molten carbonate fuel cells.
 - Proton Energy Systems leader in development and production of medium sized hydrogen generating systems.
 - GenCell becoming known for innovative approaches to fuel cell design, manufacture and system reliability.
 - Global Fuel Cell Center, UConn, focuses on research, development, commercialization, and educating "students of all ages."

[See www.ctcase.org/bulletin/fuelcells.html for an expanded version of this article]

ENVIRONMENT

➤ Climate Change Plan Falls Short

National Research Council report provides evaluation and conclusions regarding draft strategic plan developed by Climate Change Science Program (CCSP is a federal program formed to facilitate research in climate change across 13 federal agencies). The Committee responsible for the report was chaired by Academy member Thomas E. Graedel, professor of industrial ecology at Yale's School of Forestry and Environmental Studies.

- The Committee's report indicates the draft strategic plan:
 - Includes important initiatives, which provide a "solid foundation for future research," but lacks a "clear guiding vision."
 - Requires significant revision to meet needs of decision-makers responsible for dealing with effects of climate change on federal, state, and local levels.
 - The Committee's conclusions indicate:
 - Past climate change science focused on how climate is changing and affecting other natural systems and that future science must also focus on applied research that can directly support decision-making.
 - Research is needed to improve understanding of possible impacts of climate change on ecosystems and human society, plus options for responding to and reducing these effects.
 - President's fiscal year 2004 budget leaves funding for CCSP relatively unchanged, despite new initiatives.
- [See www.nap.edu/books/0309088658/html]

➤ Too Much Oil in the Sea

National Research Council report focuses on oil released into ocean waters.

- Components of oil pollution of ocean waters include:
 - Most of the 29 million gallons of oil that annually pollutes the North American ocean waters attributed to human activity – from land-based runoff, polluted rivers, jet skis, and airplanes that jettison fuel over water.
 - Only 10% of oil spills come from tanker and pipeline spills, and oil-drilling process.
 - Runoff from cars, trucks a greater problem in coastal areas.

ENVIRONMENT (cont.)

- Oil in wastewater or improperly disposed of oil also finds its way into ocean waters.
- Two-stroke engines manufactured before 1998 discharge significant amounts of unburned fuel.
- Bigger ships may release oil from engines.
- Environmental devastation caused by an oil spill of the magnitude of the Exxon Valdez found to last much longer than previously thought.
- Growing evidence that toxic compounds found in oil can adversely affect marine species even at low concentrations.
- Report recommends:
 - Major research effort by federal government to learn how ocean ecosystem is affected by chronic releases from land-based sources or boat engines.
 - Urges federal and state agencies collaborate on developing new system for documenting sources of runoff.
 - US EPA continue efforts to phase out two-stroke engines.

[See www.nap.edu/books/0309084385/html/]

HIGH TECHNOLOGY

➤ The Promise of Nanotechnology

Nanotechnology is the science of manipulating matter at the atomic, molecular, and macromolecular levels, allowing creation of materials, devices, and systems with new properties and functions.

- Nanotechnology expected to have dramatic impact on fields such as computing, telecommunications, and medicine.
- National Research Council report finds:
 - National Nanotechnology Initiative must increase support of long-term research and promote more multi-disciplinary efforts.
 - “New breed of scientist” must emerge – well-grounded in specific discipline but able to work across many fields.
 - Federal leaders need to develop broad strategic plan.
 - Independent advisory board from industry and academia should be established.

[See www.nap.edu/books/0309084547/html/]

TRANSPORTATION

➤ Easing Rules on Big Rigs

Transportation Research Board report finds that federal government should authorize states to permit trucks that exceed present federal size limits to operate on interstate highways.

- Recommendations include:
 - Allow operation of tractor-trailers with six axles and weights up to 90,000 pounds, up from today's standard of five axles and 80,000 pounds.
 - Monitor impacts on safety and road-maintenance costs.
 - Have Congress charter new organization to oversee implementation of federal truck-size regulations and evaluate their results, carry out pilot studies and research to determine impact of trucks on highways and recommend new rules based on its findings.
 - Pilot studies and permit program to help provide incentives for industry and states to develop safety innovations.

[See www.nap.edu/books/030907701X/html/]

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