



December 2003

Inside This Issue

Forum Addresses Wide Range of Sustainability Developments	1	EPA Announces Initiatives in Education for Sustainability	9
UK Publishes Vision for Energy System in 2020	2	Geothermal Market Acceleration in East Africa	9
US BCSD Creates Value Through Action	3	UNESCO Resolution Supports Earth Charter	11
Designing a Sustainable Future: Greening the Engineering Curriculum	5	Upcoming Meetings on Sustainability	11
The Impact of Invasive, Non-Native Species	6	Call for Green Chemistry and Engineering Papers	11
WFEO Creates New Committee on Capacity Building	7	Status of the Federal Environmental Indicator Project	12
FORUM FEEDBACK	8		

Forum Addresses Wide Range of Sustainability Developments

At the October 21, 2003 meeting of the Engineers Forum on Sustainability, participants heard and discussed a wide range of presentations on various aspects of sustainability. Topics included the EPA Initiatives in Engineering and Science Education; “Creating Value through Action”- a program of the U.S. Business Council on Sustainable Development; “The Impact of Invasive Non-Native Species” a part of the Heinz Center’s Study, “The State of the Nation’s Ecosystems;” Sustainability at Smith College’s Picker Engineering Program; and an Update on the Earth Charter. Many of these presentations are summarized in this issue of the Newsletter.

Also featured in this issue are articles on the United Kingdom’s vision for its energy system in 2020, the new Committee on

Capacity Building of the World Federation of Engineering Organizations (WFEO), and a new Newsletter column, FORUM FEEDBACK, which describes sustainability planning at the Port Authority of New York and New Jersey.

The next meeting of the Engineers Forum on Sustainability is scheduled for Friday, January 23, 2004 in the Lecture Room of the National Academy of Engineering in Washington, DC. The Forum will meet from 9:00 AM to Noon, and the Engineers International Roundtable will meet in the same room from 1:00 PM to 4:00 PM. Please mark your calendar for these two events. Detailed agendas will be e-mailed to you prior to the meetings.

– Al Grant – Forum Chair

UK Publishes Vision for Energy System in 2020

(Ed. Note: This feature article is drawn from an Energy White Paper, "Our Energy Future- Creating a Low Carbon Economy," presented to the British Parliament by the Department for Trade and Industry, in February, 2003).

In his message to the Parliament, Prime Minister Tony Blair stated "This white paper is a milestone in energy policy. It is based on the four pillars of the environment, energy reliability, affordable energy for the poorest, and competitive markets for our businesses, industry and households. It sets out a strategy for the long term, to give industry the confidence to invest to help us deliver our goals- a truly sustainable energy policy."

The energy system in 2020

We envisage the energy system in 2020 being much more diverse than today. At its heart will be a much greater mix of energy, especially electricity sources and technologies, affecting both the means of supply and the control and management of demand. For example:

- Much of our energy will be imported, either from or through a single European market embracing more than 25 countries.
 - The backbone of the electricity system will still be a market-based grid, balancing the supply of large power stations. But some of those large power stations will be offshore marine plants, including wave, tidal and windfarms. Generally smaller onshore windfarms will also be generating. The market will need to be able to handle intermittent generation by using backup capacity when weather conditions reduce or cut off these sources.
 - There will be much more local generation, in part from medium to small local/community power plant, fuelled by locally grown biomass, from locally generated waste, from local wind sources, or possibly from local wave and tidal generators. These will feed local distributed networks, which can sell excess capacity into the grid. Plant will also generate heat for local use.
 - There will be much more micro-generation, for example from CHP plant, fuel cells in buildings or photovoltaics.
- This will also generate excess capacity from time to time, which will be sold back into the local distributed network.
- Energy efficiency improvements will reduce demand overall, despite new demand for electricity, for example as homes move to digital television and as computers further penetrate the domestic market. Air conditioning may become more widespread.
 - New homes will be designed to need very little energy and will perhaps even achieve zero carbon emissions. The existing building stock will increasingly adopt energy efficiency measures. Many buildings will have the capacity at least to reduce their demand on the grid, for example by using solar heating systems to provide some of their water heating needs, if not to generate electricity to sell back into the local network.
 - Gas will form a large part of the energy mix as the savings from more efficient boiler technologies are offset by demand for gas for CHP (which in turn displaces electricity demand).
 - Coal fired generation will either play a smaller part than today in the energy mix or be linked to CO2 capture and storage (if that proves technically, environmentally and economically feasible).
 - The existing fleet of nuclear power stations will almost all have reached the end of their working lives. If new nuclear power plant is needed to help meet the UK's carbon aims, this will be subject to later decision.
 - Fuel cells will be playing a greater part in the economy, initially in static form in industry or as a means of storing energy, for example to back up intermittent renewables, but increasingly in transport. The hydrogen will be generated primarily by non-carbon electricity.
 - In transport, hybrid (internal combustion/electric) vehicles will be commonplace in the car and light goods sectors, delivering significant efficiency

savings. There will be substantial and increasing use of low carbon biofuels. Hydrogen will be increasingly fueling the public service vehicle fleet (for example buses) and utility vehicles. It could also be breaking into the car market.

- Nuclear fusion will be at an advanced stage of research and development.
- People generally will be much more aware of the challenge of climate change and of the part they can play in reducing carbon

emissions. Carbon content will increasingly become a commercial differentiator as the cost of carbon is reflected in prices and people choose lower carbon options.

Information on obtaining the Energy White Paper can be found at www.tso.co.uk/bookshop.

US BCSD Creates Value Through Action

At the October 31st meeting of the Engineers Forum on Sustainability, Bill Wallace, of the United States Business Council for Sustainable Development (US BCSD) briefed Forum members on the partnership efforts of an organization advancing sustainability issues through action.

A non-profit association of industry and association leaders, the US BCSD was created to develop collaborative, results-oriented projects that demonstrate the viability of sustainable development at the operational level.

Launched in 2002, the US BCSD is a partner organization of the World Business Council for Sustainable Development (WBCSD), a network of 160 international companies with members drawn from 30 countries and 20 major industrial sectors. While the WBCSD is global in reach, the US BCSD is focused on addressing issues more specific to the U.S.

The US BCSD seeks to promote sustainability by (1) demonstrating through projects that incorporating sustainable development principles into the corporation makes business sense, and (2) overcoming barriers (regulatory, structural) to sustainable development implementation. The US BCSD is focused on five project platforms:

- **BY-PRODUCT SYNERGY:** A practical application of industrial ecology in which companies work together in a given region to match feedstock needs to unwanted by-products, transforming waste to product. BPS, the council's first collaborative effort, has been successfully implemented in multiple

U.S. states, as well as in Mexico and Canada. A brief description of the process is as follows:

By-product synergy is the brainchild of Dr. Gordon Forward, Vice-Chairman of Texas Industries, Inc. (TXI), now retired. Gordon was the president and CEO of Chaparral Steel, when TXI (Chaparral Steel's owner) asked him to manage TXI's cement plant, just down the road from Chaparral Steel. Within a short time, Gordon and a team of TXI engineers realized that the steel slag Chaparral was paying to get rid of could be used as a feed material in place of limestone in the production of Portland cement. By incorporating steel slag in the cement-making process, the company realized a ten percent increase in productivity, lowered energy requirements, and reduced greenhouse gas emissions.

"It was amazing," recalls Gordon. "I'd been driving by the cement plant for 30 years on my way to work, and never imagined that such a business opportunity existed."

TXI later patented the process, called it CemStar and began marketing it around the world. Soon after this discovery, Gordon Forward began working with Andy Mangan, the director of what was then the Gulf of Mexico Business Council for Sustainable Development, on how to develop this idea.

“We thought, if two companies can get together and create a product like CemStar, what would happen if we got twenty companies from different sectors working together?”

In cooperation with the Council, and with support from the US EPA, Ford Foundation and Avina Foundation, Gordon and Andy created a process they termed “By-Product Synergy.” In this facilitated process, representatives of 10 to 20 companies from different industrial sectors in a given region come together and exchange information about their feedstock needs and by-products generated. After learning to trust one another, they begin to realize who needs what and who produces what and connect the dots. For the first project, twenty companies worked together and explored over sixty synergy possibilities. Out of these, thirteen synergies were pursued by the participating companies.

- **SUSTAINABLE ECOSYSTEMS:** The US BCSD is working with public and private sector partners to realize the environmental, economic and social benefits of converting frequently flooded agricultural lands into sustainable forests. Projects involve using public conservation funds to leverage private investment in future timber supplies. The projects also involve establishing trading markets for ecosystem services like nutrient sequestration.
- **SUPPLY/VALUE CHAIN INTEGRATION:** This project seeks to link large multi-national companies with small and medium-size enterprises to improve the sustainability of their shared supply/value chains. The council is currently evaluating projects that include: transportation, operations, maintenance and technological improvements.
- **WATER RESOURCE MANAGEMENT:** The project is defining a set of specific water projects aimed at yielding tangible water efficiency and conservation results. The projects will involve public and private participants

and seek to provide collaborative leadership on meeting water management challenges in the United States.

- **EDUCATION AND KNOWLEDGE:** Education has been addressed through outreach to universities from different geographic regions with sustainability programs that complement US BCSD project platforms. The US BCSD continuously seeks out effective ways of communicating the values of sustainable development to its members, the business community, governments and the public.

As a multi-interest forum, the US BCSD’s strength lies in its ability to stimulate companies to think about real-world sustainable development projects that offer common bridges with the sustainable development goals of government and society. It relies on the richness of the hands-on experience, information sharing and approaches of its members. Because member companies and associations come to the table with their own project needs, they create their own value. Rather than each individual company or association attempting to resolve the same issues that others are also coping with, the council provides an arena of trust and partnership so those struggling with implementation can explore, develop, test and refine their approaches – before even hitting the ground – by tapping into collective knowledge and intelligence of fellow members and partners.

The US BCSD believes that engaging in a broad spectrum of partnership is the path to more holistic solutions. Recently, the US BCSD launched a new category of membership, the Association Membership, designed to extend the US BCSD beyond the individual corporate members to professional associations, and their members, that have a strong interest in sustainability issues.

To find out more about US BCSD’s collaborative efforts, visit www.usbcd.org or contact William Burnidge for membership information at 512-892-6411.

Designing a Sustainable Future: Greening the Engineering Curriculum

At the October 31, 2003 meeting of the Forum, Donna M. Riley, Assistant Professor in the Picker Engineering Program of Smith College, presented the following remarks describing the program:

"Smith's engineering program will confer degrees upon its first class of engineers in May, 2004. Our entire curriculum has been designed with sustainability as a main feature, built in rather than added on. Our program's vision statement reflects this perspective:

Graduates will be confident and creative women who bridge the traditional boundaries between the sciences and the humanities as leaders in both the profession of engineering and in society as a whole. As critical thinkers and socially responsible decision-makers, they will help to engineer a sustainable future for the global community.

Sustainability is a core element in our curriculum; and we are finding ways to distribute students' education in sustainability across the core classes, and in advanced electives. Examples of the distribution follow:

Designing the future is a design-based introduction to engineering that motivates the program's interdisciplinary approach. Students read and discuss a number of papers on the role of engineering and technology in society.

Mass and Energy Balances is a required course usually taken in the first year. It focuses on the "big picture" in engineer, presenting an introduction to engineering problem solving as well as an introduction to the systems perspective in engineering analysis.

Continuum Mechanics I is the traditional course in statics. The students address considerations of sustainability, safety, costs, aesthetics, and other factors in a project where they design a bridge.

Continuum Mechanics II covers the area of fluid dynamics. The connected field laboratories address sustainability issues by including ecological considerations in engineering design.

Circuit Theory incorporates sustainability in its consideration of energy use. Students analyze home or College electric bills, discuss

energy efficiency, and engage in a case study analysis on the California energy crisis.

Engineering Thermodynamics integrates alternative energy problems into the course. Students examine the fundamentals of thermodynamics through studying traditional engines as well as human-powered machines, wind and solar energy, and fuel cells.

Stimulation and Modeling of Natural and Engineered Systems integrates sustainability in a number of ways. In learning a systems modeling approach (at a more advance level than in Mass and Energy Balances), students work through problems related to climate and energy. An introduction to neural networks is valuable in providing students with better plant optimization tools. Similarly, time series analysis is important in reliability--based design for sustainability--by using such advanced tools instead of the more traditional estimation and redundant design approach, more sustainable and more reliable systems can be built. Students examine the problem of parvovirus disinfection in drinking water as a case study; this demonstrates the need to address new problems that can arise when sustainable technologies (in this case, ozonation) are initially deployed to replace traditional ones (chlorination).

Engineering, the Environment, and Sustainability is an elective course that combines major philosophical questions (e.g. what is the responsibility of developed nations to developing nations?) with quantitative problem solving. The course is structured in three units: social balances, physical balances, and economic balances. The social balances unit includes an exercise in personal decision-making, in which students calculate their ecological footprints (land use required to sustain their lifestyle), and a risk analysis assignment, in which students compare bottled vs. tap water in their community, performing quantitative risk assessment, and addressing risk perception communication issues. The physical balances unit covers water quantity and quality, contaminant and transport modeling, and culminates in a wasteload allocation project. The economic balances unit

introduces environmental economics, (including market-based approaches), ecosystem valuation, and cost-benefit analysis.

Engineering & Global Development is an upper-level interdisciplinary elective that considers the socio-political, economic, cultural, and technical aspects of sustainable development, with a focus on appropriate technology. Students are juniors and seniors in the social sciences and engineering; they each bring expertise from their respective backgrounds and learn from each other through discussion, case studies and hands-on

projects. The first project, design and construction of a slow-sand water filter, introduces students to the challenge of working with minimal facilities and materials, as well as the need to test and troubleshoot design. The project raises ethical questions about the standards of safety locally and abroad. In the future, we may link to a project overseas, possibly through affiliation with Engineers without Borders/Frontiers."

For more information, contact Donna Riley: driley@email.smith.edu.

The Impact of Invasive, Non-Native Species

In September 2002, the Heinz Center released its landmark study, *The State of the Nation's Ecosystems: Measuring the Lands, Waters, and Living Resources of the United States*.

One thing the study revealed was that invasive non-native species affect all of our ecosystems--coasts and oceans, farmlands, forests, fresh waters, grasslands and scrublands, and urban and suburban areas. The study also revealed that, with few exceptions, data for tracking the spread of these species is sorely lacking.

The 2002 report marked the end of the first phase of this long-term project. The Center has now launched the second phase by convening a Non-Native Species Task Group to review the non-native species indicators in the 2002 report and to recommend refinements or modifications. This task group--made up of experts in marine, freshwater, forest, urban, farmland, and grassland ecosystems--hopes to identify common approaches to reporting on the spread of non-native species across these very different systems. The group's first meeting highlighted a key distinction--between reporting on the actual spread of invasive species themselves, and reporting on the effects of the invaders. Reporting on the effects such as fouling of intake pipes by zebra mussels and the coverage of sandy coastal bottoms by masses of algae is important, but the group agrees that measures that describe the relentless expansion of these species are more practical in the near term and are thus a higher priority in collecting new data.

In 1990-91, 100 European starlings were released in Central Park in New York City. Today, one hundred and ten years later, there

are some 200 million starlings in North America, in every U.S. state and in every Canadian province, in cities, suburbs, rural areas, and farms. Along with two other non-native species, pigeons and English sparrows, starlings are by far the most common birds in American's cities. In many places, they have displaced native species, including woodpeckers, purple martins, orioles, and the Eastern Bluebird, and they pose risks to health, cost, and esthetics.

Non-native species are also called nonindigenous, exotic, alien or introduced; those that spread aggressively are called invasive. They may act as predators or parasites of native species, cause diseases, compete for food or habitat, and alter essential habitat. They may also threaten human health and economic well being.

In the United States alone, invasive non-native species cost federal, state, and local government, business, farmers, and the public more than \$125 billion each year. Fire ants, zebra mussels, kudzu, Scotch broom, Japanese beetles, Norway rats, nutria, brown tree snakes, crabgrass, Dutch elm disease, West Nile virus--all these and more annoy, disturb, damage, and even destroy our native species, endanger our health, and undermine our economy.

Many of the species that are causing trouble now were introduced deliberately, often as a solution to problems that now seem smaller than the ones their introduction has created.

Both kudzu and multiflora rose were widely distributed by the Soil Conservation Service beginning in the 1930's for erosion control. Today kudzu, a native of Asia (which was originally introduced as an ornamental at

the Centennial Exposition in 1876 and later promotes as a forage crop), smothers native forest trees and shrubs and destroys habitat for native birds and animals throughout the Southeastern states. A multiflora rose, which has also been widely planted in highway medians as a crash barrier, is rampant in pastures and other unplowed fields in the East and Midwest, sometimes making grazing impossible.

One of the most destructive and best known of these misguided imports is the gypsy moth. An optimistic entrepreneur brought gypsy moths to Boston in 1869 in the hope of establishing a silk industry in this country; several moths escaped, and now their descendants defoliate an average of nearly 3 million acres of forest each year.

Other invaders arrive unexpectedly, as stowaways on planes, ships, trucks, and cars. And because it is easier and faster to transport people and goods now, it is also easier for non-native species to reach our lands and waters. The zebra mussel is just one example among all too many.

First seen in Lake St. Clair near Detroit in 188, probably having hitchhiked from Europe in a transatlantic freighter's ballast water, the

zebra mussel, a native of Russia, is now found in all the Great Lakes and all the major river systems of eastern North America. In fact, by 1989, only a year after their discovery, there were so many of them in Lake Erie that they blocked Monroe, Michigan's water -intake pipeline, cutting off the city's water supply for three days. Zebra mussels are invading inland lakes throughout the northeastern and central states, and they have been sighted in Virginia and as far west as California. They are in the headwaters of the Susquehanna River, headed for the Chesapeake Bay and its fertile fishing grounds. They are still spreading. They have damaged power plants and dams, closed water treatment plants, fouled boat engines and piers, spoiled beaches, displaced some native species, and altered the habitat for others. The U.S. Fish and Wildlife Service estimates that zebra mussels will cost the U.S. and Canadian water users in the Great Lakes region alone some \$5 billion over the next ten years.

For more information about the State of the Nation's Ecosystems project, see <http://www.heinzctr.org/ecosystems>.

WFEO Creates New Committee on Capacity Building

The World Federation of Engineering Organizations (WFEO) held its 2003 General Assembly in Tunis, Tunisia, October 13-17. Among the notable actions of the assembly was the establishment of a new WFEO Standing Committee led by the United States. Called the Capacity Building Standing Committee, this new activity will complement the "WFEO/UNESCO Engineering for a Better World Proposal" and will focus on implementation of projects. USA proponents have received expressions of interest by a funding agency. Tony Marjoram of UNESCO stated that the Capacity Building Committee represents an opportunity to advance cooperation between engineers and scientists, an interest of UNESCO Director General Matura.

In other activities and actions of interest, the WFEO Standing Committee on Information and Communication and the Council of the Order of Engineers in Tunisia also organized the World Congress on the

Digital Divide. A featured speaker was Don Roberts, President of ComTech. His presentation, "Beyond the Internet," highlighted his proposal, a multi-year program for enhanced communications among engineers. The Congress was officially recognized as a contribution to the preparation of the World Summit on the Information Society.

At its Annual Meeting on October 13 in Tunis, ComTech approved Puerto Rico's proposal to host its next four-year term as Secretariat for the Committee. WFEO President Jose Medem, who attended the ComTech meeting, congratulated Don Roberts, ComTech President; Michael Sanio, Deputy to the ComTech President; and Jane Alspach for their stewardship of ComTech. He also offered his support to the US-proposed Capacity Building Standing Committee.

In early November, Puerto Rico's leadership team for ComTech's new Secretariat met in Washington with Delon Hampton, Mike

Sanio, and Jane Alspach to finalize the Secretariat transfer.

FORUM FEEDBACK

(Ed. Note: The Forum seeks feedback from Newsletter recipients on sustainability activities of interest. We plan to publish selected responses from time to time.)

During the past few years, The Port Authority of New York and New Jersey, along with other public agencies in the region, has made several key commitments regarding the integration of high performance (sustainable) design within the agency's capital program and for the sustainable development at the WTC site.

The Port Authority's commitment to sustainable design began in 2000 when we had completed a design for a new administration building at Teterboro Airport. This pilot project was a comprehensive "green" design effort performed with in-house staff and consultants. Different energy conservation and daylight modeling strategies were employed in the analysis. This project demonstrated the potential benefits of sustainable design through the use of natural light in the building's interior, better indoor air quality, and cost savings through reduced energy consumption.

The incorporation of sustainable development is both a unique and a timely challenge for the Port Authority. It is a unique challenge to develop and incorporate sustainability within our agency because of the variety of transportation, infrastructure and tenant businesses that are operated within our facilities. Additionally, New York State Executive Order 111, which went into effect in June 2001, has mandated higher standards for energy reduction, air quality management for both construction and building occupancy, and project commissioning for New York State agencies.

To meet these challenges, we are currently developing sustainable design guidelines that can effectively address the complex mixture of project types, regulations and tenants that exist within our agency. A multidisciplinary task force has been created to generate a "tailored" guideline that will meet Executive Order 111 and will enable the Port Authority to apply for LEEDS project certification, if desired. Once the guideline is approved within the department, it will be "rolled-out" within the agency through projects funded within our capital program.

The timing is also right to take advantage of sustainable development on a much larger scale than has been previously realized to date in our country. We are meeting this challenge through the development of sustainable design guidelines for the Permanent PATH Terminal and through the creation of additional guidelines being prepared by the Studio Daniel Libeskind team for the new master plan for the WTC site. We decided to develop separate guidelines for the PATH terminal in order to expedite the design process for the transportation program.

Sustainable design principles have also been incorporated into a new office building currently under construction by Silverstein Properties for the 7 WTC sites. Skidmore Owings & Merrill, the project architects, are seeking LEEDS certification for the project. The project is part of the "Core & Shell" pilot program for LEEDS. - Francis J. Lombardi, P.E. - Chief Engineer, The Port Authority of New York and New Jersey

EPA Announces Initiatives in Education for Sustainability

The U.S. Environmental Protection Agency (EPA) and its partners announce the 1st Annual Designs for Sustainability: a National Student Design Competition.

Designs for Sustainability is an intercollegiate design competition among interdisciplinary student teams (undergraduate and/or graduate) that will research, develop, and design solutions to the technical challenges of sustainability.

This competition is open exclusively to colleges, universities and other post-secondary educational institutions. The faculty advisor(s) for each team will be responsible for correspondence between the team and EPA. Interdisciplinary teams are strongly encouraged including representatives from multiple engineering departments and/or departments of chemistry, architecture, industrial design, economics, policy, social sciences, etc. Teams are also strongly encouraged to develop partnerships within your educational institution and with industry and/or the NGO communities for guidance, research and development, contributions, and implementation.

EPA and its partners offer this competition to respond to the technical needs of the developed and developing world in moving towards the goal of sustainability. At this time,

partnerships for this competition include other Federal Agencies (National Science Foundation and US Agency for International Development), non-governmental organizations (NGOs) (American Chemical Society, American Institute of Chemical Engineers, American Society of Civil Engineers, American Society of Engineering Education, American Society of Mechanical Engineers, Engineers Forum for Sustainability, Engineers without Borders, Global Environment and Technology Foundation, Industrial Design Society of America, Institute for Electrical and Electronics Engineers, Massachusetts Toxics Use Reduction Institute, National Council for Science and the Environment, United States Business Council for Sustainable Development, United States Green Buildings Council, World Resources Institute), and industry (DaimlerChrysler, Dell, Herman Miller, Hewlett Packard). EPA will continue to create partnerships with additional interested parties as the competition progresses.

Applications are due March, 15, 2004. For additional information go to <http://es.epa.gov/ncer/p3/>.

Geothermal Market Acceleration in East Africa

The restructuring of the electric power industry, growing demand for energy, increasing private sector participation in Eastern African countries and environmental concerns are creating markets for geothermal power. Many of the Rift Valley countries of Eastern Africa are dependent on large hydro power and diesel fuels as their primary energy sources. Recurrent droughts and petroleum price hikes have led to frequent power outages and utility financial problems. To mitigate these problems, E. African countries are increasingly considering geothermal energy to meet growing energy needs. Geothermal energy also presents a clean and more environmentally friendly alternative to traditional fuels. Small-scale geothermal

plants for rural electrification are a proven technology and are of great interest to African energy decision-makers.

Kenya has been using geothermal energy successfully since 1981 at greater than 98% availability. The country presently has 127 MW of geothermal power online and has a plan in place to have almost 500 MW on line by 2020. In addition, Ethiopia installed an 8.5 MW pilot geothermal plant in 2000 and is considering further geothermal development projects.

During the period 1994 – 2000, through the Idaho National Engineering and Environmental Laboratory, US DOE financed research into the potential for geothermal development in East Africa. In March 1998,

DOE sponsored an industry trip to East Africa to evaluate geothermal potential in Uganda, Ethiopia and Eritrea. A US developer completed the trip and went on to Djibouti where he negotiated and signed an MOU, carried out a US-TDA assisted feasibility study and is presently negotiating with the Government for the installation of a 30 MW geothermal power plant. The US is the world leader in the use of geothermal power generation - both from technology and installed-capacity perspectives. Based on the above, an Eastern Africa Regional Geothermal Conference took place in Nairobi, Kenya April 7-11, 2003 that included 220 representatives from 23 countries and 8 US companies. The participating U.S. companies identified a broad range of geothermal-related initiatives that they feel are commercially viable but require some assistance to "jump-start". The most significant outcome of the Conference, however, was the establishment of an Eastern African Regional Geothermal Development Program to accelerate private sector participation in geothermal development. The program will last 10 years and have a budget of \$250 million. The design of the program is being supported by the GEF, Government of Italy, German Development Bank (KfW) and US TDA. DOE is presently considering participating in the program and assisting in the coordination of other US Government agencies.

The experience gained in developing the Eastern African Geothermal Development Program can be immediately leveraged to efforts being initiated by several of the same partners in Eastern Europe, Central America and Latin America.

Potential Project Proposals

For FY 03 - Study of a Representative Sample of Small-Scale Geothermal Plants in the US and Developing Countries - Information concerning the existing 50 or so small-scale geothermal plants installed around the world is sparse. A number of U.S. companies manufacture small-scale geothermal systems. Engineering societies, in conjunction with the National Academy of Engineering could carry out a desk study and on-site

analysis of a representative sample of the existing small-scale geothermal plants installed in the US and selected developing countries and prepare a report to be used to focus US participation in the UNEP/GEF E. Africa geothermal program's efforts in this area.

For FY 04 - Rehabilitation of an Existing But Non-Operating 240 kW Geothermal Plant in Northern Zambia as a Model for the E. Africa Region - The Kapisya Pilot Geothermal Plant is located on Lake Tanganyika in northern Zambia. Fifteen shallow exploratory and production wells were drilled during the 1980's. For reasons that are not well understood, the plant was never put into operation. US Government support could be used to evaluate the plant, and negotiate an alternative arrangement with the Government of Zambia to enable a US firm to install the plant either elsewhere in Zambia or in the region where it would serve as a model to accelerate the market for US-made small-scale geothermal systems.

For FY 04 - Installation of 3-4 New Small-Scale Pilot Geothermal Plants in Eastern Africa - Follow-on US Government support is being sought to install additional small-scale geothermal plants in Djibouti, Eritrea, Tanzania, Kenya and/or Uganda (all of which expressed strong interest) and further strengthen US industry's position in this area. US firms installing a geothermal plant in Uganda can benefit from significant subsidies provided as part of a recently-initiated World Bank rural electrification program in that country.

A partnership with the US based engineering societies, the National Academy of Engineering could also provide a forum for discussion of the issues related to the use of small-scale geothermal plants in Africa, the involvement of US geothermal companies, and the donor community (USAid, GEF, KfW, USTDA). A workshop could be held in the US that would bring these parties together for a discussion of the technical, economic and management issues that must be addressed in order to significantly increase the use of small-scale geothermal plants in the E. Africa region. The NAE has been active in such activities for a number of years providing a neutral convening opportunity to all involved parties.

UNESCO Resolution Supports Earth Charter

At the October 31, 2003 Forum meeting, a briefing on the Earth Charter was provided, and copies of the Charter were distributed.

It was reported that at the 32nd General Conference of UNESCO, which took place in October 2003, a resolution was supported "recognizing the Earth Charter as an important ethical framework for sustainable development." The text of the resolution basically resolves to 1) acknowledge the Earth Charter for its ethical principles, its objectives and contents, as an expression that coincides with the vision that UNESCO has with regard to its new Medium-Term Strategy for 2002-2007; 2) affirm the intention of member states to utilize the Earth Charter as an educational instrument, particularly in the framework of the United Nations Decade of Education for Sustainable Development; and invite the UNESCO General Conference to analyze with the UNESCO Director-General how to reinforce, in a practical way, the vision and principles of the Earth Charter in UNESCO programs.

Possible implications of the action are that 1) Each country - member state - that supported the resolution is likely to start a formal project (governmental project) to implement the resolution; 2) the UNESCO secretariat has a mandate to work with the Earth Charter; 3) it may help to find partners and funding; and 4) it provides a basis for incorporating the Earth Charter within the UN Decade of Education for Sustainable Development.

For a copy of the Earth Charter, and for further information, contact Sandra Hannen, National Coordinator, Earth Charter USA, Tel: 202-778-6133, Fax: 202-778-6138; www.earthcharterusa.org.

Upcoming Meetings on Sustainability

AICHE 2004 Spring National Meeting, April 25-29, 2004 New Orleans, LA. Topical 4: Green Chemical Engineering. <http://www.aiche.org/conferences/spring/>

8th Annual Green Chemistry & Engineering Conference Green Chemistry and Engineering: The Business Imperative for Sustainability, June 28-30, 2004 Washington, DC
<http://chemistry.org/meetings/greenchem2004.html>

Sustainable Resources 2004. September 27 - October 5, 2004; pre-conference seminars (September 27-29), Conference (September 29 - October 2); post-conference seminars (October 3-5). Boulder, CO. www.sustainableresources.org

Call for Papers

Green Chemistry and Engineering: The Business Imperative for Sustainability

A call for papers has been issued for the *8th Annual Green Chemistry and Engineering Conference*, to be held June 28-30, 2004 in Washington, D.C. Abstracts must be submitted by January 30, 2004.

The 2004 conference will emphasize the business imperative for green chemistry and engineering. Sessions will address how

innovations in green chemistry and engineering have been successfully implemented and will consider what needs to be done to further the adoption of these technologies in business.

Green chemistry and engineering focus on the design, development, and implementation of chemical processes and products that reduce

or eliminate the use and generation of hazardous substances in a way that is both feasible and economically viable. The conference will present sessions on how the innovations of green chemistry and engineering have been successfully implemented as well as what needs to be done to further the adoption of these technologies in business.

The 2004 conference will feature presentations on the industrial implementation of green chemistry and engineering in the following areas:

- Green Chemistry and Engineering in Business Schools
- Small and Medium Businesses: Challenges and Opportunities
- Vertical Integration of Green Chemistry and Engineering in the Supply Chain
- From Bench Top to Commercialization: Incentives and Barriers

- Measuring the Success of Green Chemistry and Engineering in Industry
- Decision Support Tools
- Marketing Green Chemistry and Engineering (Business to Business and Consumers)
- Applications of Green Chemistry and Engineering in Manufacturing and the Federal Government

Papers may be submitted for either oral or poster presentations in any of the above areas. Case studies are encouraged. Presenters are asked to address the business benefits and challenges of the green chemistry and engineering technologies in both their abstract and presentation.

Abstracts are to be submitted electronically through the conference web site at <http://chemistry.org/meetings/greenchem2004.html>.

Status of the Federal Environmental Indicator Project

About a year ago, James Connaughton, Chairman of the White House Council on Environmental Quality initiated an interagency effort to explore the opportunities to make significant improvements in national statistical indicators on natural and environmental resources. An Interagency Working Group on Indicator Coordination was formed to develop a Framework for a National System of Indicators on Natural and Environmental Resources.

The Working Group reviewed the progress being achieved by ongoing indicator projects such as the Heinz Center Report on the State of the Nation's Ecosystems, the EPA's Draft Report on the Environment, the Forest Service's National Report on Sustainable Forests – 2003, and the work of Sustainable Resource Roundtables on rangelands, minerals and water resources. It developed a Framework that draws on these and other efforts to develop indicator systems.

The Framework includes: a Vision, a set of Guiding Principles, a list of Institutional Functions and the basic concepts for an Information Architecture. The Framework has been accepted by the Senior Officials Group formed to oversee the indicator project. It will provide the basis for preparation of a

Development Plan for a National System of Indicators by mid-2004. The elements of the Framework are summarized below.

Vision: The long-term goal is to develop the capacity to regularly report on natural and environmental resources and closely related health, social and economic factors using a comprehensive set of indicators, a National System of Indicators on Natural and Environmental Resources.

Guiding Principles: Development of the National System of indicators should be guided by the following basic principles:

- Meet the needs of a wide range of uses and users, both private and public;
- Reflect a systems and science-based approach to the selection of indicators and measurements;
- Use data from valid, consistent, science-based measurements;
- Draw upon existing inventorying and monitoring capacities to make the relevant measurements;
- Use new institutional capacities as needed for data compilation, indicator development and production and statistical reporting; and

- Employ up-to-date information technology to reduce the costs of data acquisition, processing and access.

Institutional Functions: Institutional arrangements need to be developed to perform the following functions:

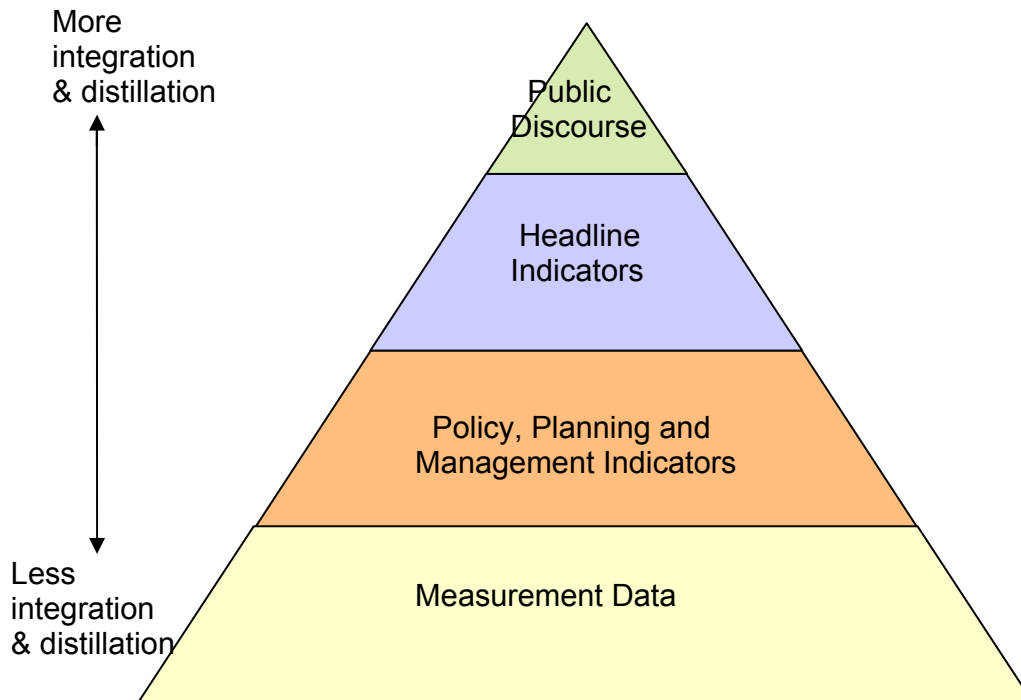
- Guidance and coordination of system development and implementation,
- Measurement and data acquisition (inventorying and monitoring) for the indicators,
- Data compilation and statistical reporting,
- Research, and
- Policy-related analysis and interpretation.

Information Architecture: The Information Pyramid, shown below, reflects the fact that people tend to focus on the particular kinds of information that they find meaningful and valuable, at the level of detail they find worthwhile to access and assimilate.

The Information Pyramid will be used to focus the design of the National System on the various kinds of information that “target users” desire at each level or tier of the pyramid. More detailed “floor plans” will be developed to organize the categories of indicators included in each tier.

The capstone at the top of the pyramid shows that stories told in public discourse come from the distillation and integration of large amounts of underlying information, represented by the three lower tiers of the pyramid. Informed public discourse may be regarded as the capstone of a successful indicator system. This capstone then, provides an important basis for the decision-making process and policy development that stems from evaluation and interpretation of the indicator information.

Information Pyramid



Three tiers of statistical indicators and data support the capstone, with each tier reflecting the major uses or “markets” for indicator information that a system must be designed to satisfy. For example, a relatively small set of Headline Indicators should be designed to address the needs of policymakers, public, media, stakeholders, and community leaders.

A larger set of more detailed Policy, Planning and Management Indicators could provide consistent, reliable measures of conditions to inform policy development, planning, management, and performance measurement. The market for this kind of information would be professional users such as Federal agency officials, state/federal/local

natural and environmental resource managers, and landowners. The third tier contains the Data needed to produce the Headline and Policy indicators. Highly detailed data are also often used for research.

Next Steps: Over the next 6 months, the CEQ Interagency Working Group will prepare a National Indicator System Development Plan that will:

- Review options and recommend institutional arrangements within the Federal government and with its partners to provide the capacity and ensure collaboration needed to produce and publish indicator information.
- Review options and recommend an “Information Architecture” to guide the selection and development of indicators

and the organization of data and indicators for effective access and use.

- Recommend processes for the coordination and integration of ongoing Federal indicator development projects and related inventorying and monitoring programs.

The Working Group will also continue its outreach efforts in order to identify and draw upon non-Federal interests and capabilities regarding indicators on natural and environmental resources.

- Theodore Heintz - White House Council on Environmental Quality

For more information on this newsletter please contact:
Darlene Schuster, AIChE
3 Park Avenue
New York, NY 10016
Phone: 410-458-5870
E-mail: darls@aiche.org

For more information on the three societies sponsoring this newsletter please visit their web sites:
ASCE: <http://www.asce.org>
American Society of Civil Engineers
ASEE: <http://www.asee.org>
American Society for
Engineering Education
AIChE: <http://www.aiche.org>
American Institute of Chemical Engineers