ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

01 AUGUST 2020

The ESD Newsletter is a monthly newsletter involving ALL members of ESD. Members are encouraged to forward materials, authored papers on Environmental and Environmental Systems topics, and comments on newsletter topics or current events to the Editor. Your participation is greatly appreciated.

The ESD newsletter features **Five** Sections:
(Please use the **blue** links below to navigate within newsletter)

1. ESD DIVISION NEWS

ESD Technical Representative to Waste Information Exchange Planning Committee – Volunteer Opportunity

The Environmental Systems Division (ESD), in conjunction with the ASME Materials and Energy Recovery Division, the ASME Research Committee on Energy, Environment and Waste, and the Air and Waste Management Association (A&WMA) are planning a Waste Information Exchange (WIE) in the Washington, DC area in 2021. The WIE will be based on the [Air] Information Exchange held annually in North Carolina. The main presenters will be EPA personnel.

ESD is looking for a volunteer to be the ESD Technical Representative to the Planning Committee. The individual should be familiar with the RCRA/HSWA regulatory program (including guidance and compliance/enforcement issues) on both solid and hazardous waste. Contacts in the Office of Resource Conservation and Recovery (ORCR) in DC would be a plus. Most of the work will be by telephone or electronic mail.

Submit a letter or email of interest to Arnie Feldman at jjdsenv@att.net or Ryan Neil, ESD Chair, at ryanneil84@hotmail.com **Back to Newsletter's Page 1**

Dixy Lee Ray Award Committee – Volunteer Opportunity

The Dixy Lee Ray Award Committee is looking for a volunteer to serve as a committee member. The Dixy Lee Ray Award is a prestigious ASME level award honoring those that have made a major impact in the environmental protection field. See https://www.asme.org/about-asme/honors-awards/achievement-awards/dixy-lee-ray-award for additional details.

Committee members' primary responsibility is to review nominations and select the annual Dixy Lee Ray Award winner. Committee members also help promote and publicize the award to their colleagues and friends. The committee normally meets thru conference calls and email. Nominations are due to the committee by February 15 each year so most of the discussion and teleconference meetings occur February, March and April. All committee members must be ASME members. The term of service is 5 years.

Submit a letter or email of interest to Ryan Neil, ESD Chair, at ryanneil84@hotmail.com.

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ICEM 2021 Call for Abstracts

ASME, the Nuclear Engineering and the Environmental Systems Divisions, are pleased to announce the Call for Abstracts for the International Conference on Radioactive Waste Management and Environmental Remediation (ICEM). The Conference is set for October 10-13, 2021 in Stuttgart, Germany. ICEM promotes a broad global exchange of information on technologies, operations, management approaches, economics, and public policies in the critical areas of environmental remediation and radioactive waste management. The conference provides a unique opportunity to foster cooperation among specialists from countries with mature environmental management programs and those from countries with emerging programs.

The program Tracks below are shown below. The associated Topics for each Track can be seen on the ICEM website (https://event.asme.org/ICEM/Program).

Abstracts are due January 18, 2021. Abstracts should be submitted on-line via the website at https://icem.secure-platform.com/a/organizations/main/home. For additional information on submitting abstracts, please contact ASME at toolboxhelp@asme.org.

For additional general information on ICEM or to volunteer to support (e.g., Session Chair) please contact either Arnie Feldman (jjdsenv@att.net) or Bob Stakenboroghs (bob@advclean-energy.com). **Back to Newsletter's Page 1**

2. ENVIRONMENTAL TECHNOLOGIES

Green Data Centers – Scaling environmental sustainability

Regardless of industry, environmental sustainability has become an undeniable business imperative. Global warming from carbon emissions, increasing sea levels and images of pollution are increasing public and shareholder pressure on corporations to take an active role in finding solutions and be accountable by setting goals and publicly documenting results. In the IT industry, reducing electrical power generation from fossil fuels is priority #1, followed closely by water conservation and waste management. Multi-tenant data centers are one of the largest per capita consumers of electric power. Based on current estimates, data centers in the U.S. alone will consume approximately 73 thousand megawatts (MW) in 2020.

To put this in perspective, one megawatt is enough to power 700 households. A single data center can use power equivalent to a small city and requires a significant amount of water for cooling. Worldwide, its' estimated that data centers consume about 3 percent of the global electric supply and account for about 2 percent of total greenhouse gas (GHG) emissions. Data center efficiency and sustainability now transcends companies, geographies, and workloads. There is no simple solution and the challenge is being compounded as massive

digitalization of data globally is creating a parallel demand for energy. Technological advancements are difficult to forecast, but several models predict that data center energy usage could surpass more than 10% of the global electricity supply by 2030.
For all of these reasons, the creation of green, sustainable, multi-tenant data centers has become essential in both an environmental and a business sense. Green data centers are built on pillars of commitments to innovative green and renewable strategies – including green power, water reclamation, zero water cooling systems, recycling and waste management, and more. They do not contain obsolete systems (such as inactive or underused servers), and take advantage of newer, more efficient technologies. Taking cues from the hyperscalers, green data centers recognize the need to lead with modular energy efficient data center designs from the onset, adopt the latest in building technology and influence the overall supply chain for the actual sourcing of materials for these green data centers.
(Ref. 1) **Back to Newsletter's Page 1**

AI Models Help Predict Large Tropical Waves and Ocean Currents

A team of researchers has recently designed an artificial intelligence (AI) model that is capable of forecasting oceanic phenomena that stretch over hundreds of kilometers, like tropical instability waves (TIW). Tropical Instability Waves (TIW) are an oceanic event that takes place within the Pacific Ocean, near the equator. The Pacific TIW involves the motion of curved, triangular waves that move westward along the edges of the tropic pacific cold tongue – a region of the tropics notably colder than the ocean surrounding it.
The environmental factors that give rise to TIW are complex and the phenomenon is hard to forecast. Forecasting the TIW is traditionally done with complex statistical and physical models. However, a team of researchers has recently designed an AI model intended to better predict TIWs and other ocean phenomena.
According to Phys.org, the research team, headed by the Institute of Oceanology of the Chinese Academy of Sciences (IOCAS) Professor LI Xiaofeng, including members from Shanghai Ocean University and the Second Institute of Oceanology of Ministry of Natural Resources, the team made use of satellite data to design a deep learning model intended to analyze the instability waves as they move thousands of kilometers through the ocean. Even with global satellite data, the environmental factors that influence oceanic phenomena can be difficult to discern, but the goal is that AI models can decipher these variables and make predictions. (Ref. 2) **Back to Newsletter's Page 1**

3. ENVIRONMENTAL REGULATIONS

Social Cost of Carbon: Identifying a Federal Entity to Address the National Academies' Recommendations Could Strengthen Regulatory Analysis

To develop estimates of the social cost of carbon, analysts use economic models known as "integrated assessment models." With these models, according to the National Academies,

analysts define a baseline of current and future carbon dioxide emissions by projecting future economic growth, population, and technological change. Then, a small increase in carbon dioxide emissions (typically, a 1 metric ton increase) is added to the baseline emissions projections of the models. The models then translate the emissions increase into an increase in atmospheric carbon dioxide concentrations, which results in an increase in global average temperature. The models then translate the temperature change into physical impacts and monetized damages—that is, damages expressed in dollars. When assessing the costs and benefits of proposed environmental regulations, federal agencies use estimates of the "social cost of carbon"—economic damages from increases in greenhouse gas emissions. According to EPA, these gases stay in the atmosphere long enough to become "well mixed"—contributing to global damages regardless of their origin. Current national estimates are based on domestic damages and are about 7 times lower than prior estimates based on global damages. In 2017, the National Academies recommended updating the estimating methods. They recommended that the Office of Management and Budget choose a federal entity to take the lead. (Ref. 3) **Back to Newsletter's Page 1**

CEQ Issues Final Rule to Modernize NEPA Regulations

On July 15, 2020, the Council on Environmental Quality ("CEQ") announced its final rule modernizing and clarifying its procedural regulations implementing the National Environmental Policy Act ("NEPA"). The final rule, titled "Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act," is the first major revision to CEQ's NEPA regulations in over 40 years, and is the latest in a series of efforts by the Administration to streamline federal agency processes for permitting infrastructure projects. CEQ describes its efforts on this rule as intended to "facilitate more efficient, effective, and timely NEPA reviews by Federal agencies by simplifying regulatory requirements, codifying certain guidance and case law relevant to these regulations, revising the regulations to reflect current technologies and agency practices, eliminating obsolete provisions, and improving the format and readability of the regulations." To this end, the rule modifies almost all aspects of the regulations governing how federal agencies meet their environmental review obligations under NEPA. Although the ultimate practical impact of these changes is uncertain, the rule fundamentally alters the timing of, procedures for, and content of NEPA reviews, and will have important implications for parties seeking federal permits and other program approvals or authorizations.

The final rule will be effective September 14, 2020; however, the timing may be impacted by Congressional review and anticipated litigation. The revised regulations apply to all NEPA processes begun after the September 14, 2020 effective date. CEQ states that agencies also have the discretion to apply the revised regulations to ongoing activities and environmental reviews. Going forward, federal agencies must revise their agency-specific NEPA implementing regulations by September 14, 2021. In the interim, the final rule explicitly states that, where existing agency NEPA procedures are inconsistent with the new CEQ regulations as adopted; the new regulations shall apply, upon their effective date, "unless there is a clear and fundamental conflict with an applicable statute." Additionally, the rule supersedes existing CEQ guidance materials, but clarifies that CEQ will publish a separate

notice to withdraw such guidance. (Ref. 4) **Back to Newsletter's Page 1**

4. EDITORIAL BOARD SELECTIONS

Impact of Battery Raw Materials

Demand for raw materials used in the production of electric car batteries is set to soar, prompting the UN trade body, UNCTAD (United Nations Conference on Trade and Development), to call for the social and environmental impacts of the extraction of raw materials, which include human rights abuses, to be addressed urgently. UNCTAD predicts that some 23 million electric vehicles will be sold over the coming decade: the market for rechargeable car batteries, currently estimated at $7 billion, is forecast to rise to $58 billion by 2024. A new report from UNCTAD, Commodities at a Glance: Special issue on strategic battery raw materials addresses a number of impacts from the production of selected raw materials. The aim of this report is to provide information on the critical raw materials used in LIBs with respect to production, consumption, trade and prices. The report also analyses the influence of supply and demand of these battery raw materials on market prices in view of the growing role of LIBs in energy storage and electric vehicles. Furthermore, the study examines the varying stages of transformation from ores/brines into value added products and their implications for producing countries. The scope of the report will be limited to a few battery raw materials that are considered as strategic and critical: Cobalt (Co), lithium (Li), manganese (Mn) and natural graphite (C), given that these materials are essential to the production of rechargeable batteries, which are expected to have a high market growth and will play an important role in mitigating GHG emissions from the use of fossil fuels. (Ref. 5) **Back to Newsletter's Page 1**

Plants Have Hormones, Too, and Tweaking Them Could Improve Food Supply

Researchers have long studied ways to help plants resist environmental stressors such as pests and drought, both through conventional breeding and genetic modification. But many questions still remain about how, exactly, plants interact with their environment and how scientists might be able to modify those processes to help them adapt. Researchers at the Institute of Network Biology in Germany and their colleagues may have found a way to help. In early July they published a study in Nature showing that plants communicate with the environment in more complex ways than previously thought. The investigation revealed that the information-processing network, driven by hormones, in one genus of plants is carried out by more than 2,000 protein interactions, hundreds of which had not been discovered before. Unlike animals, which complete most of their development in utero, plants remain relatively flexible throughout their life. Sensory proteins detect changing environmental

conditions and then use hormones to cause it to alter its behavior or physiology accordingly. Many pathways are well understood: the hormone ABA, for instance, tells plants to close their pores and conserve water during drought by directing a series of specific proteins to carry out cellular functions. The flexibility of these hormone networks is precisely what has made them so difficult to genetically modify or engineer to cope with changing climates, however. Most genetically modified crops that are on the market are made by adding a gene from bacteria to a plant's genome—allowing it to resist an herbicide or insecticide, for example. To create crops that resist environmental stressors, researchers have relied on conventional breeding techniques using the genetic diversity that exists naturally among them. They have done so to develop varieties of wheat that produce high levels of ABA, for instance. For one thing, many countries have begun banning the export of seeds that have useful properties in order to conserve them as a natural resource. New technologies, including CRISPR/Cas9 genome editing, can make genetic modification relatively straightforward. Scientists hoping to tweak plant genes must first know what they are looking for, however. Focusing on systems rather than individual genes could prove useful. To activate their defenses against insects, for example, plants might have to shut down another hormone pathway, such as growth or water conservation.
(Ref. 6)

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How to reduce plastic waste

Despite it being the 10th anniversary of Plastic Free July, the initiative nearly did not happen this year. The Plastic Free July challenge is called that for a reason: it is not easy to go without single-use plastics, even for a month. The response to COVID-19 saw a rise in single-use plastic, notably the use of disposables at cafes and restaurants responding to social distancing by offering "hands-free" takeaways in throw-away packaging, and in the need for a massive increase in single-use gloves, gowns and face masks as personal protection equipment (PPE) in the health system. Against this backdrop, it seemed 2020 might not be the right time to try to live without plastic. Even in a pandemic, we can all take small steps. Simple swaps include switching to bar soap rather than using liquid soap in plastic dispensers or avoiding plastic packaging when you buy your fruit and vegetables. Although COVID-19 has presented innumerable challenges, it has also brought some unanticipated positives. Behavioral economists have worked extensively with the Plastic Free Foundation to explore the disconnect between the eight out of 10 people who are concerned with plastic waste entering landfill or the oceans and the single-use plastic dilemma. They says overcoming the disconnect between attitude and behavior requires more than just giving people information. Instead of focusing on the problem, it is far more advantageous to focus on the intrinsic benefit. Combining this with what he terms "the small ask" makes people far more open to change.
(Ref. 7)

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Organic fungicide copper sulfate endangers humans, animals and insects

Organic farming uses pesticides just as conventional farming does. The only difference is that (with a few exceptions) the pesticides used in organic agriculture have to be derived from "natural" sources. One such example is copper sulfate, which is used in temperate climes as a fungicide. Both organic farmers use it although conventional farmers do have synthetic alternatives. How does this 'natural' pesticide compare in toxicity to synthetic or other natural chemicals commonly used by conventional farmers? Many anti-GMO activists have pointed to pesticides used in conventional agriculture, such as the herbicides glyphosate and the highly toxic organic 2,4-D, as dangerous to people, animals and the environment. For example, anti-GMO organization, The Environmental Working Group, writes this about 2,4-D: Researchers have linked 2,4-D to hypothyroidism, suppressed immune function, Parkinson's disease, cancer and other serious disorders. Farmworkers could inhale 2,4-D and get it on their skin while spraying it. The chemical could drift from sprayed fields into nearby neighborhoods. People would track it into their homes. The damage can reach beyond the farmers who live close to sprayed areas.
In 2015, the International Agency for Research on Cancer (IARC), the cancer research arm of WHO, declared the popular synthetic pesticide glyphosate "probably carcinogenic to humans." The classification served as a basis for the ruling in a recent California trial in which a jury decided that Monsanto (now owned by Bayer), which patented glyphosate under the trade name Roundup, was responsible for a groundskeeper's cancer. It should be noted that IARC had designated glyphosate as a hazard to workers but said there is no evidence that it poses a danger in food residues, which is what most activists focus on. In addition, the hazard category was not based on real-world exposures. Science regulatory organizations that measure risk, which takes into account exposure, have consistently and universally found that glyphosate poses no identifiable health danger to workers or consumers if used as recommended. Nonetheless, the IARC ruling has been taken out of context and is often used by organic activists and anti-chemical advocacy groups to argue that glyphosate (and glyphosate resistant GE crops) should be banned from use.
(Ref. 8)

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How the world's smelliest fruit could power your phone

The lithium-ion batteries in our devices degrade over time and come with a large environmental cost. Are there better ways to store and carry energy that are kinder to the planet? They are the beating heart of our modern portable technology – packets of energy that we can charge from a plug in the wall and slowly drain through the course of a day. Lithium-ion batteries have transformed our ability to store and carry energy around with us, and so, in turn, revolutionized the devices we use. First commercialized by Sony in 1991 as the company sought a solution to the limited battery life of its handheld camcorders, the power many of the gadgets we use today – from smartphones and laptops to electric toothbrushes and handheld vacuum cleaners. At the end of last year, the three scientists behind its invention won the Nobel Prize in Chemistry for enabling this technical revolution. Lithium-ion batteries work by allowing charged lithium particles (ions) to move electricity

from one end to the other, passing through a liquid electrolyte in the middle. One of the things that makes lithium-ion batteries so attractive is their "energy density" – the maximum energy a battery can hold for its volume –, which is one of the highest of any commercially available battery on the market. They can also deliver higher voltages than other battery technologies.

One innovative group is not only trying to find new ways to power our devices, but also tackle the issue of food waste at the same time. A chemical engineer at the University of Sydney, and his team, are turning waste from the world's smelliest fruit, durian, and the world's largest fruit, jackfruit, into a supercapacitor that can charge mobile phones, tablets and laptops within minutes. Supercapacitors are an alternative way of storing energy. They act like reservoirs, able to quickly charge and then discharge energy in bursts. They tend to be made out of expensive materials like graphene, but this group have turned inedible parts of durian and jackfruit into carbon aerogels – porous super-light solids – with "exceptional" natural energy storage properties. They heated, freeze-dried and then baked the inedible spongey core of each fruit in an oven at temperatures of more than 1,500C (2732F). The black, highly porous, ultralight structures they were left with could then be fashioned into electrodes of a low-cost supercapacitor. The supercapacitors can be charged in 30 seconds, and could be used to power a range of devices."To be able to charge a mobile phone in a minute is incredible,". The researchers' dream is to use these sustainable supercapacitors to store electricity from renewable energy sources for use in vehicles and houses. And that's before considering the benefits of finding a green use for durian's headline-making, stomach-turning waste, as over 70% of the fruit tends to be thrown away. In 2018, the smell temporarily grounded a plane in Indonesia, and leftover fruit prompted a mass evacuation of a University of Canberra library last year. (Ref. 9) **Back to Newsletter's Page 1**

5. ESD NEWSLETTER READER COMMENTS

None received this month.

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ESD NEWSLETTER BOARD

NEWSLETTER ARTICLE REFERENCES

1 https://www.networkworld.com/article/3569189/green-data-centers-scaling-environmental-sustainability-for-business-and-consumers-collectively.html
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5. https://unctad.org/en/PublicationsLibrary/ditccom2019d5_en.pdf
6. https://www.scientificamerican.com/article/plants-have-hormones-too-and-tweaking-them-could-improve-food-supply/

7. https://www.afr.com/policy/energy-and-climate/how-to-reduce-plastic-waste-in-the-age-of-covid-19-20200706-p559jv
8. https://geneticliteracyproject.org/2020/07/23/organic-fungicide-copper-sulfate-poses-dangers-to-humans-animals-insects-how-does-it-compare-to-conventional-pesticides/
9. https://www.bbc.com/future/article/20200724-the-battery-made-from-diamonds-that-could-last-1000-years

ABOUT NEWSLETTER

ENVIRONMENTAL ENGINEERING features the application of environmental technologies to engineering systems to attain optimal performance according to established standards. The Newsletter of the Environmental Systems Division (ESD) will attempt to highlight a variety of environmental technology applications aimed at enhancing engineering systems performances in accordance with the latest standards by presenting excerpts of and links to selected articles from a variety of websites.

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