



ESD 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. ESD Members are encouraged to forward materials on Environmental Engineering topics for review by the Newsletter Editorial Staff. ESD Newsletter Readers are urged to forward comments on materials that appear in its content.

The ESD Newsletter will feature presentations in **Five** Sections:

- 1. ENVIRONMENTAL TECHNOLOGIES**
- 2. ENVIRONMENTAL REGULATIONS**
- 3. EED CHAIRMAN/DIVISION NEWS**
- 4. EDITORIAL BOARD SELECTIONS**
- 5. READER COMMENTS**

It is envisioned that the ESD Newsletter will be Monthly enterprise involving ALL members of the ESD in its production. Your participation in providing and reviewing ESD Newsletter materials will be greatly appreciated.

1. ENVIRONMENTAL TECHNOLOGIES

The Future Of Nuclear Energy Is Smaller, Cheaper And Safer?

Nuclear power plants are so big, complicated and expensive to build that more are shutting down than opening up. An Oregon company, NuScale Power, wants to change that trend by building nuclear plants that are the opposite of existing ones: smaller, simpler and cheaper. NuScale Power says its plant design using small modular reactors also could work well with renewable energy, such as wind and solar, by providing backup electricity when the wind isn't blowing and the sun aren't shining. The 98 nuclear reactors operating in the US now are large because they were designed to take advantage of economies of scale. Many are at risk of closing in the next decade, largely because they can't compete with less expensive natural gas and renewable energy. Instead of one big nuclear reactor, NuScale Power will string together a series of up to 12 much smaller reactors. NuScale's design doesn't depend on pumps or generators that could fail in an emergency because it uses passive cooling. The reactors would be in a containment vessel, underground and in a huge pool of water that can absorb heat. That



means that even a reactor that fails would still be safe. (Ref. 1)

Renewable energy generation with kites and drones

Airborne Wind Energy Systems (AWES) are a new kind of technology to harvest wind energy. The expensive and heavy tower and rotor of a conventional wind turbine are here substituted by a light tether and an aircraft (flexible giant kites or large drones), respectively. In the so-called ground generation scheme, AWES use the tension force of the tether to move an electrical generator on the ground whereas, in fly generation scenarios, the electrical energy is produced by wind turbines onboard the aircraft and transmitted to the ground by a conductive tether. In both cases, AWES present low installation and material costs and operate at high altitude (over 500 meters) where winds are more intense and less intermittent. They also present a low visual impact and their easier transportation makes them suitable for producing energy in remote and difficult access areas. Within this framework, the UC3M researchers have presented a novel flight simulator for AWES in a scientific article recently published in Applied Mathematical Modeling. "The simulator can be used to study the behavior of AWES, optimize their design and find the trajectories maximizing the generation of energy," Along with the simulator, the researchers have developed a flight test bed for AWES. Two kitesurf kites have been equipped with several instruments and key information, such as the position and speed of the kite, attack, and sideslip angles, and tether tensions, have been recorded throughout many flights. The experimental data were then used to validate different software tools, such as the aforementioned simulator and an estimator of the different parameters characterizing the state of the kite at each instant. (Ref. 2)

2. ENVIRONMENTAL REGULATIONS

Public dread of nuclear power limits its use

In the ongoing effort to decarbonize U.S. energy production, there is one energy source that often attracts great controversy. Nuclear power has been a part of the American energy portfolio since the 1950s and still generates one in every five kilowatt-hours of electricity produced in the country. Still, for a number of reasons, including the association between radiation and cancer, the general public has long felt a significant dread about it. And this fear, suggest Carnegie Mellon University Department of Engineering and Public Policy Assistant Research Professor Parth Vaishnav, and Ahmed Abdulla of the University of California San Diego School of Global Policy and Strategy may cause people to want less of this zero-carbon energy source in the nation's electricity generation mix than they otherwise would. The results of their research, however, suggest that engineering efforts to make the technology safer and communicate this improvement to the public while admirable, will not by themselves persuade people to choose more nuclear power. The respondents who were shown the names of the

energy sources consistently deployed less nuclear energy than those who were only shown the risks. This occurred despite the fact that both groups had the same statistical information. This suggests that respondents' anxiety around nuclear energy caused them to shy away from its use. With these results, the team hopes to be able to quantify just how much nuclear power the American public might be willing to accept if the fear associated with it could be reduced or eliminated. While the researchers note that the study only focuses on nuclear power, the methods by which they use the survey to disentangle the root causes of public opinion are more widely generalizable to other important decarbonization technologies, such as carbon capture and sequestration. (Ref. 3)

Electric car switch on for health benefits

Writing in the International Journal of Electric and Hybrid Vehicles, Mitchell House and David Wright of the University of Ottawa, Canada, suggest that the migration from polluting vehicles that burn fossil fuels to electric vehicles, ideally using electricity generated sustainably could significantly reduce the incidence of cardiopulmonary illness due to air pollution. This would lead not only to less employee absence from work through illness but also lead to broad improvements in quality and length of life. The team's paper compares the financial costs of building electric vehicle charging infrastructure using empirical data with health costs to see if there is a net benefit. They have found that in the majority of plausible scenarios of balanced growth, when the number of vehicles rises and so does the number of charging stations, there is a positive net benefit to society. "Since health benefits accrue to governments, businesses, and individuals, these results justify the use of government incentives for charging station deployment and this paper quantifies the impact of different levels of incentive," the team concludes. The team explains that the Electric Vehicles Initiative (EVI) (an organization supported by 16 governments) has a target of 20 million electric vehicles by the year 2020. This was based on a national growth rate of 75% per year defined in 2016. At that time, EV sales amounted to more than half a million (550000) worldwide in 2015, which represented a growth of 70% in 2014. Electric vehicle sales have continued to grow, with 2017 and 2018 experiencing 61% and 64% year-over-year growth respectively. (Ref. 4)

3. ESD CHAIRMAN/DIVISION NEWS

ESD Officers 2019/2020

The new ESD Officers for 2019/2020 are:

- Chair – Ryan Neil
- Vice Chair – Karen Vallar
- Secretary/Treasurer – Scott Walthour



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Environmental Education Support Program

The Education Support Committee received many fine proposals this year and after much debate and discussion decided to recommend five projects for an award which were then approved by the Executive Committee. The 5 winning projects are:

- "WasteLess: Classroom-Based Research Labs to Increase Materials and Energy Stewardship Literacy on Campus", Hamline University; Hennepin Energy Recovery Center
- "Using Unmanned Aerial Vehicles to Monitor Water Quality", George Mason HS
- "Into the Field-Enhancing K-12 Summer Camps through Exploration", Hope College
- "Comparative Analysis of Indoor Air Quality Parameters of Classrooms in Far Eastern University Technology and FIT building", FEU Institute of Technology
- "Open-access Online Model for Predicting and Visualizing Pollutants Fate in the Environment", U. of Alberta, CA

Congratulations to the winners and to all of the submitters on excellent proposals.

ASME Power Conference: Environmental Panel

ESD will hold an Environmental Panel discussion at the ASME Power Conference in the Snowbird Resort, Salt Lake City, Utah during the week of July 15th. Like before, the Panel will take questions from the moderator and the audience on current environmental issues impacting the power industry and the general public. All Power Conference attendees are welcome to attend.

Regulatory Engineering Forum

ESD will hold a first of its kind Regulatory Engineering Forum in Washington DC on Oct 3 and 4. This is by invitation only. The Forum will bring together individuals representing the various groups (regulated community, regulatory agencies, professional Society's, and others) to discuss a variety of topics including the application of sound engineering in promulgating regulations.



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ICEM 2021

Plans are continuing for the next International Conference on Environmental Remediation and Radioactive Waste Management (ICEM). The Conference, a continuation of the original ICEM, is now planned for Oct 2021 in Germany; the final date and place should be known shortly. If you are interested in participating (Technical Committee member, Track Chair, Session Chair, panelist, speaker or presenter) please let either Arnie Feldman, jjdsenv@att.net, or Bob Stakenboroghs, bob@evisive.com, know. For more information please contact either Arnie or Bob.

ESD Operating Plan

The ESD Executive Committee has been working on a new Operating Plan for the Division. The new Plan will incorporate much of the old EED By-Laws and new material required by ASME under the current operating system. The revision gave the Executive Committee time to reevaluate who ESD is and what we should be doing.

Among the major outcomes is a new Vision and Mission Statement for ESD. These are:

Vision

To be ASME's resource for Environmental knowledge.

Mission

To educate, convene and collaborate with society and the Engineering Profession to advance Environmental safety and health.

The new/revised Operating Procedures should be finalized in June. To receive a copy, please email Arnie Feldman at jjdsenv@att.net, or Ryan Neil at ryanneil84@hotmail.com.

ASME Advanced Clean Energy Summit (ACES)

ASME Advanced Clean Energy Summit (ACES) is a new global forum for energy industry professionals and innovators focused on clean energy solutions and prepared by ASME's nine energy divisions, including the Environmental Systems Division. During this inaugural event new and existing technologies will be presented and discussed to determine how these technologies will work in harmony to create a balanced global energy portfolio. Please join us in Denver, CO on September 16-17, 2019 for this unique event.

Parting Comments from Arnie Feldman outgoing ESD Chair

It has been my pleasure and reward to serve you as ESD Chair for the past 4 years. There have been a lot of changes both within ASME and ESD (our new name for one) during this time;



hopefully for the best. For the Division, I have seen a new Vision and Mission statement, the reactivation of ICEM, the new Power Conference Panels, the involvement both at the Exec Committee and member level of new people, the new upcoming Regulatory Engineering Forum, our new Linked-In and Facebook pages, the Environmental Education Support Program among other items.

I am not cutting my ties with ESD but will remain a member of the Exec Committee as Past Chair, Chair ICEM and the Regulatory Engineering Forum, and will be Chairing the new ESD Student and Early Career Competition Committee.

Serving on various ASME Committees and Boards has been (and continues to be) most fulfilling and rewarding for me. It has kept me busy and my mind sharp (our younger members challenge my technical skills on an on-going basis). I urge my fellow engineers to get involved.

Arnie Feldman, ASME Life Member

4. EDITORIAL BOARD SELECTIONS

Is China Placing A Global Bet On Coal?

China, known as the world's biggest polluter, has been taking dramatic steps to clean up and fight climate change. China's overseas ventures include hundreds of electric power plants that burn coal, which is a significant emitter of the carbon scientifically, linked to climate change. China is building or planning more than 300 coal plants in places as widely spread as Turkey, Vietnam, Indonesia, Bangladesh, Egypt, and the Philippines. While closing old plants, China's leaders have limited the building of new ones. The government has promoted wind and solar energy — it has produced so many solar panels that it has reduced prices for them worldwide, which analysts contend has contributed to the spread of solar energy in the United States. China has made more than \$244 billion in energy investments abroad since 2000, much of it in recent years, according to a Boston University database. The bulk is in oil and gas, but more than \$50 billion has gone toward coal. A report in January found that more than one-quarter of coal plants under development outside China have some commitment or offer of funds from Chinese financial institutions. (Ref. 5)

Developing Safe and Secure Autonomous Vehicles across Industries

Autonomous systems can only be released to the public after developers have demonstrated their ability to achieve adequately high levels of safety. Today's hands-off autonomous systems are largely built with deep learning algorithms that can be trained to make the right decision for

nearly every situation. These systems, however, lack the detailed requirements, architecture, and validation that are already being used today in the development of safety-critical systems, such as the control systems of commercial airliners. Road and air testing is clearly an essential part of the development process, but the billions of miles of testing that will be necessary to validate the safety of autonomous driving systems and software are clearly impractical. These challenges can be addressed with a comprehensive and open autonomous vehicle simulation platform that integrates physics, electronics, embedded systems, and software to accurately simulate complete autonomous driving systems in a fraction of the time and cost required for physical testing. (Ref. 6)

Engineered bacteria could be missing link in energy storage

One of the big issues with sustainable energy systems is how to store electricity that's generated from wind, solar and waves. At present, no existing technology provides large-scale storage and energy retrieval for sustainable energy at a low financial and environmental cost. Engineered electro active microbes could be part of the solution. These microbes are capable of borrowing an electron from solar or wind electricity and using the energy to break apart carbon dioxide molecules from the air. The microbes can then take the carbon atoms to make biofuels, such as isobutanol or propanol that could be burned in a generator or added to gasoline, for example. Adding electrically engineered (synthetic or non-biological) elements could make this approach even more productive and efficient than microbes alone. At the same time, having many options also creates too many engineering choices. The study supplies information to determine the best design based on needs. Natural photosynthesis already offers an example for storing solar energy at a huge scale and turning it into biofuels in a closed carbon loop. It captures about six times as much solar energy in a year as all civilization uses over the same time. But, photosynthesis is really inefficient at harvesting sunlight, absorbing less than one percent of the energy that hits photosynthesizing cells. (Ref. 7)

Wearable cooling and heating patch could serve as a personal thermostat and save energy

Engineers at the University of California San Diego have developed a wearable patch that could provide personalized cooling and heating at home, work, or on the go. The soft, stretchy patch cools or warms a user's skin to a comfortable temperature and keeps it there as the ambient temperature changes. It is powered by a flexible, stretchable battery pack and can be embedded in clothing. Researchers say wearing it could help save energy on air conditioning and heating. The device, which is at the proof-of-concept stage, could also save energy. "If wearing this device can make you feel comfortable within a wider temperature range, you won't need to turn down the thermostat as much in the summer or crank up the heat as much in the winter. There are a variety of personal cooling and heating devices on the market, but they are not the most convenient to wear or carry around. Some use a fan, and some need to



be soaked or filled with a fluid such as water. (Ref. 8)

A step for a promising new battery to store clean energy

Researchers have built a more efficient, more reliable potassium-oxygen battery, a step toward a potential solution for energy storage on the nation's power grid and longer-lasting batteries in cell phones and laptops. In a study published Friday in the journal Batteries and Supercaps, researchers from The Ohio State University detailed their findings centering on the construction of the battery's cathode, which stores the energy produced by a chemical reaction in a metal-oxygen or metal-air battery. The finding, the researchers say, could make renewable energy sources like solar and wind more viable options for the power grid through cheaper, more efficient energy storage. Renewable energy sources don't emit carbon dioxide, so they don't contribute to global warming -- but they provide energy only when the sun is shining or the wind is blowing. In order for them to be reliable sources of power for a region's energy grid, there needs to be a way to store excess energy gathered from sunshine and wind. Companies, scientists and governments around the world are working on storage solutions, ranging from lithium-ion batteries -- bigger versions of those in many electric vehicles -- to giant batteries the size of a big-box store made using the metal vanadium. (Ref. 9)

5. ESD NEWSLETTER READER COMMENTS

- Expecting the reader comments and views on the newsletter.

ESD NEWSLETTER EDITORIAL BOARD

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