ENVIRONMENTAL SYSTEMS

DIVISION NEWSLETTER

APRIL - 2019

# 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** **3. EED CHAIRMAN/DIVISION NEWS**

**2. ENVIRONMENTAL REGULATIONS** **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

## From coal to gas: How the shift can help stabilize climate change

Led by Katsumasa Tanaka, a senior climate risk researcher at the National Institute for Environmental Studies in Japan, the study examined global scenarios for transitioning from coal to gas using a novel approach that applied metrics developed for climate impact assessments to the coal-gas debate for the first time. Focusing on the world's leading power generators -- China, Germany, India, and the United States -- the study examined the impacts from a variety of direct and indirect emissions of such a shift on both shorter and longer timescales ranging from a few decades to a century. "Many previous studies were somewhat ambivalent about the climate benefits of the coal-to-gas shift," said Tanaka. "Our study makes a stronger case for the climate benefits that would result from this energy transition, because we carefully chose metrics to evaluate the climate impacts in light of recent advances in understanding metrics."
"Given the current political situation, we deliver a much-needed message to help facilitate the energy shift away from coal under the Paris Agreement," Tanaka said. "However, natural gas is

not an end goal; we regard it as a bridge fuel toward more sustainable forms of energy in the long run as we move toward decarbonization." Concerns about methane leakage from natural gas have been intensely debated, particularly in the United States given the increasing use of fracking over the past decade. Recent scientific efforts have improved understanding of the extent of methane leakage in the United States, but the potential impacts of methane leakage remain highly uncertain in the rest of the world. (Ref. 1)

### Will vehicle automation hurt the environment?

Many of today's cars are already available with connected and autonomous vehicle (CAV) technologies such as adaptive cruise control and automatic emergency braking. Testing of fully autonomous vehicles is underway in cities and states across the United States, including Arizona, Texas, and Wyoming. And 22 US states and Washington, DC, have already passed legislation to shape the rollout and impacts of these vehicles. On the threshold to the next mobility revolution, which is truly starting to gather momentum now with the rapid progress in the area of self-driving cars, old approaches are coming up against their limits. This is not the only reason, however, why the field of road transport keeps generating new questions that require new answers: smart answers that will help master increasingly complex tasks and simplify ever more complicated issues and open up new opportunities for municipal and regional authorities to actively shape the mobility world for the next generation instead of simply responding to changing conditions. (Ref. 2)

## 2. ENVIRONMENTAL REGULATIONS

### New studies highlight challenge of meeting Paris Agreement climate goals

New research highlights the "incredible challenge" of reaching the Paris Agreement without intense action and details the extreme temperatures parts of the planet will suffer if countries fail to reduce emissions. The world reached an agreement in December 2015 on curtailing greenhouse gas emissions with the goal of avoiding a 2-degree Celsius increase in average global temperature above pre-industrial levels. Ideally, the treaty's goal is to limit this increase to 1.5 degrees Celsius. The United States delivered notice to the United Nations in August 2018 of the country's intention to withdraw from the Paris Agreement, joining Syria as one of only two countries in the world not party to the treaty.

Two new studies published in the AGU journals Geophysical Research Letters and Earth's Future now show some of the goals set forth in the agreement might be difficult to reach without much sacrifice. The new research shows future climate extremes depend on the policy decisions made by major emitters, and that even if major emitters were to strengthen their commitments to reducing emissions, the rest of the world would have to immediately reduce their greenhouse gases to zero to achieve the Paris 2015 goal. (Ref. 3)

### Leveraging scientists' perceptions for successful interactions with policy makers

Creating new policies that deal with important issues like climate change requires input from geoscientists. Policy makers, media outlets, and the general public are interested in hearing from experts, and scientists are put under increasing amounts of pressure to effectively engage in policy decisions. "Over the years, scientists have received a lot of criticism about how they engage in policy discussions," says co-author Scott Kalafatis, assistant professor at Dickinson College. "But I've worked with a lot of scientists who were remarkably dedicated and skilled at engaging in the policy process." Yet, despite these efforts, Kalafatis says it's still unclear how scientists see themselves in those interactions, and some are unsure of how they might best leverage their strengths into policy decisions.

In their new paper for Geosphere, Kalafatis and his co-author Julie Libarkin investigate how scientists in all stages of their career perceive interactions with policy makers. They discovered that there's not a one-size-fits-all approach to interactions between scientists and policy makers -- and relying on your strengths can be the most effective way to communicate. Libarkin, a professor at Michigan State University, developed a way to analyze drawings to help understand the interactions of science and policy. The authors asked a group of 61 geoscientists to draw a picture of how they imagined science migrating through society and leading to policy decision making. Within the drawings, key elements where research was provided or needed for decision making were identified and labeled. The team assigned the key elements in each drawing specific codes for use in their statistical analysis. (Ref. 4)

## 3. ESD CHAIRMAN/DIVISION NEWS

Memo from Arnold Feldman, Chair ESD

ESD ViceChair & Other Officers

July 1 starts the 2020 fiscal new-year for the Environmental Systems Division (ESD) and all other Divisions, Sections, etc. With the new-year approaching, the ESD Executive Committee will be looking for some new officers and Committee members.

The 2019 Chair, Arnie Feldman, will complete his term of office on June 30, 2019 and will be replaced by the current ViceChair Ryan Neil. This will result in an opening for a new ViceChair.

In addition, several ESD Committees have openings including Chair and ViceChair.

If you are interested in the ViceChair or a Committee position please contact Ryan Neil at ryanneil84@hotmail.com and include either your bio or resume.

Dixie Lee Ray Award (DLR)

The ESD Honors & Awards Committee decided not to make an award in 2019. The Committee (and Chair) felt that (1) there was not enough time for applicants to submit their info and (2) the number of applicants was too few to reasonably consider. Hopefully 2020 will bring additional nominees.

Environmental Education Support Program

As of the writing of this article, the Environmental Education Support Committee has not decided on whom to give grants to in 2019. Similar to the DLR, the announcement of applications was held up several months due to internal ASME IT issues. Therefore, the due date for applications was extended and the award date also extended. It is anticipated there will be a decision by late April/early May.

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.

ICEM 2020

Plans are underway for the next International Conference on Environmental Remediation and Radioactive Waste Management (ICEM). The Conference, a continuation of the original ICEM, is 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.

As part of preparing the revision, the Exec Committee met in Washington DC for a planning session with ASME staff to develop a Strategic Plan and work on finalizing the Operating Plan. Among the major outcomes is a new (draft) 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."

We would like your input on these. Please send your comments and opinions to Arnie Feldman, jjdsenv@att.net, and/or Ryan Neil, ryanneil84@hotmail.com. The Exec Committee will keep you up-to-date on both the Operating Plan and Strategic Plan.

## 4. EDITORIAL BOARD SELECTIONS

### Stopping Climate Change at 2050!

While interviewing Rep. Alexandria Ocasio-Cortez in February, about her Green New Deal, she said that her goal was bigger than just passing some new laws. The public imagination and exploring a dream, a possible future that bring global warming to a halt, and a world in which greenhouse gas emissions have ended was emphasized by her. According to this, by 2025, battery technology got cheaper and electric cars were no longer more expensive. At that point there was a massive shift to electric vehicles, because they were quieter, and cleaner, and [required] less maintenance. No oil change! Heating and cooling in homes and office buildings have gone electric, too. Gas-burning furnaces have been replaced with electric-power like heat pumps. We needed more electricity to power all this right when we were shutting down power plants that burned coal and gas. It took a massive increase in power from solar and wind farms. They now cover millions of acres in the U.S., 10 times more land than they did in 2020. Huge electrical transmission lines share electricity between North and South America. Europe is connected to vast solar installations in the Sahara desert, which means that sub-Saharan Africa also has access to cheap power. (Ref. 5)

## Scientists Develop Cheaper, Greener Plant-Based Jet Fuel

Chinese scientists have developed a new plant-based biofuel that could help the aviation industry "go green," according to research published in the journal Joule Thursday. Researchers say the magic of this biofuel, derived from cellulose, is its high-density state that is usable as either a wholesale replacement fuel or as an additive to improve the efficiency of other jet fuels. The process converts plant waste from agriculture and timber harvesting into high-density aviation fuel and ultimately may help reduce $CO_2$ emissions from airplanes and rockets.

"The aircraft using this fuel can fly farther and carry more than those using conventional jet fuel, which can decrease the $CO_2$ emissions during the taking off (or launching) and landing," study author Ni Ling of the Dalian Institute of Chemical Physics said. To produce the biofuel, Li and his team found that cellulose – a cheap, renewable and highly abundant polymer that forms the cell walls of plants – can be selectively converted using the chemical reaction hydrogenolysis. In this study scientists used wheatgrass cellulose to obtain their final product: a mixture of C12 and C18 polycycloalkanes with a low freezing point and a density about 10 percent higher than that of conventional jet fuels. (Ref. 6)

## See-Through Film Rejects 70 Percent of Incoming Solar Heat

A heat-rejecting film was developed that could be applied to a building's windows to reflect up to 70 percent of the Sun's incoming heat. The film remains highly transparent below 32 °C (89 °F). Above that temperature, the film acts as an "autonomous system" to reject heat. If every exterior-facing window in a building were covered in this film, air conditioning and energy costs could drop by 10 percent. The film is similar to transparent plastic wrap and its heat-rejecting properties come from tiny microparticles embedded within it. These microparticles are made from a type of phase-changing material that shrinks when exposed to temperatures of 85 °F or higher. In their more compact configurations, the microparticles give the normally transparent film a more translucent or frosted look.

The thermochromic material is made from poly (N-isopropylacrylamide)-2-Aminoethyl methacrylate hydrochloride microparticles. These microparticles resemble tiny, transparent, fiber-webbed spheres and are filled with water. At temperatures of 85 °F or higher, the spheres essentially squeeze out all their water and shrink into tight bundles of fibers that reflect light in a different way, turning the material translucent. When the molecular chain of each microparticle shrinks in response to heat, the particle's diameter is about 500 nanometers, which is more compatible to the infrared spectrum of solar light. A solution of the heat-shielding microparticles was applied between two sheets of 12 × 12" glass to create a film-coated window. A light was shown from a solar simulator onto the window to mimic incoming sunlight; the film turned frosty in response to the heat. When the solar irradiance transmitted through the other side of the window was measured, the film was able to reject 70 percent of

the heat produced by the lamp. (Ref. 7)

## US nuclear is dying, but it produced more electricity in 2018 than ever before

According to the US Energy Information Administration (EIA), the US nuclear fleet produced more electrical energy than ever before in 2018. Last year, it produced 807.1 terawatt-hours (TWh) of electricity, barely beating its 2010 peak of 807TWh. But the US nuclear industry has been in a well-documented decline. So what gives? The EIA says the explanation comes from a combination of scheduling serendipity and what's called "uprating," where older nuclear plants are permitted to output more power. In a post this morning, the administration wrote that we shouldn't expect this much nuclear power output from the industry again—at least not in the near future. Since the last peak in 2010, more than 5 gigawatts (GW) of nuclear capacity has been retired. Some of that was offset by a new reactor addition: another 1.2GW of capacity came online in 2016 at TVA's Watts-Barr nuclear plant when reactor 2 was completed.

Then, between 2010 and 2018, many nuclear plants completed uprates. Since many older plants were designed extremely conservatively many decades ago, modern modeling and equipment can be applied to some of these nuclear reactors to allow them to operate safely while delivering more power. The EIA estimates that 2GW of power were added to the US nuclear fleet between 2010 and 2018 through uprating alone. (Ref. 8)

## Snow's Power Potential: How to Generate Electricity from a Blizzard

Approximately 30 percent of the Earth’s surface is covered in snow. UCLA’s Maher El-Kady sees the pileup not as a nuisance, but as a source for power. El-Kady, along with Prof. Richard Kaner and fellow researchers, has designed a new device that creates electricity from falling snow. The nanogenerator – flexible like a sheet of plastic – offers new possibilities for self-powered wearables and improved solar panels. “The device can work in remote areas because it provides its own power and does not need batteries,” said senior author Richard Kaner, who holds UCLA’s Dr. Myung Ki Hong Endowed Chair in Materials Innovation. The snow-based triboelectric nanogenerator, or snow TENG, generates charge through static electricity and the exchange of electrons. Snow, by its very nature, is positively charged and readily gives up electrons. “Snow is already charged, so we thought, why not bring another material with the opposite charge and extract the charge to create electricity?” said co-author Maher El-Kady, a UCLA assistant researcher of chemistry and biochemistry. The snow TENG’s silicone — a synthetic rubber-like material that is composed of silicon atoms and oxygen atoms, combined with carbon, hydrogen and other elements — is negatively charged. When falling snow contacts the silicone surface, a charge is produced and stored. The device could be produced at low cost given “the ease of fabrication and the availability of silicone,” Kaner said. So, what’s possible with this new kind of snow tech? When snow falls, solar panels often fail to operate. The accumulation of snow reduces the amount of sunlight that reaches the solar array, limiting the panels’ power output and rendering them less effective. The new device could be integrated

into solar panels to provide a continuous power supply when it snows, said El-Kady. (Ref. 9)

## 5. ESD NEWSLETTER READER COMMENTS

- Expecting the reader comments and views on newsletter.

## ESD NEWSLETTER EDITORIAL BOARD



## NEWSLETTER ARTICLE REFERENCES

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