# 對外合作組織與機構動態報導

2017/3/24

## CBRN EXPERTS FROM SCK•CEN CHOSEN TO TRAIN ANTWERP POLICE

## 比利時核能研究中心的化生輻核專家參與訓練安特衛普警力

On 9 March, the Belgian Nuclear Research Centre signed a cooperation agreement with Antwerp's mayor Bart de Wever and chief of police Serge Muyters. SCK•CEN will work hand in hand with Polish experts to train the Antwerp police in the field of chemical, biological, radioactive and nuclear (CBRN) threat and how to cope with it.

### 報告摘要(KEY INFORMATION)

1. 3 月 9 日，比利時核能研究中心，與安特衛普市市長，及警察局長簽署合作協議，將和來自波蘭的專家一同訓練該市警力在化學、生物、輻射、核能領域之應對處理。
2. 7 年前墨西哥灣深水地平線井噴是全球史無前例的油污外洩事件，其後處理過程亦開展許多知識面。由於並非所有表層油污皆能以燃燒或吸附去除，有部分會在海水中霧化散開；該項發明不僅有效吸附原油及汽油，回收後的油品還能被收集使用。
3. 為了揭開宇宙的神秘面紗，美國能源部國家阿岡實驗室的研究者運用超級電腦的一種新理論方法，預測粒子間的交互作用。這套方法比現今所用的都更加精確。
4. 自川普上任後，因其一貫質疑氣候變遷議題，京都議定書的效力飽受質疑。然若要在2050 年以前減少 50%碳排放量（已開發國家則是 80%），核電可謂勢在必行。現今，如何良好溝通、提振大眾對核電的信心，已是亟待解決的問題。
5. 可再生能源的成本的快速下降，帶動印度該領域的發展，如何維持經濟的穩定需要許多努力；如若成效良好，其模型將可作為許多發展中國家的借鏡——如何達成國家自定預期貢獻的高目標。

The SCK•CEN crisis management experts have been training police and intervention units all over the world for several years. The Antwerp local police have also called on their expertise to train 5 master trainers. Goal of this customized training funded by the European Union: to let all primary care workers of the Antwerp police intervene in case of chemical, biological, radioactive and nuclear (CBRN) incidents.

"We teach people on how to protect themselves, measure radiation and react appropriately to a chemical or radiological incident", says Carlos Rojas Palma, CBRN expert at SCK•CEN. "Our handbook on how to approach radioactive sources has become a benchmark and our exercises on the field allow us to efficiently train multidisciplinary teams".

**Cooperation with unique partners**

SCK•CEN will organise the training together with the University of Lodz (Poland) and the Industrial Chemistry Rsearch Institute (Poland). This intended cooperation has been made official on 9 March in Antwerp's town hall. Mayor Bart de Wever, chief of police Serge Muyters and SCK•CEN Deputy Director General Frank Hardeman signed the letter of intent for cooperation in the presence of a Polish delegation.

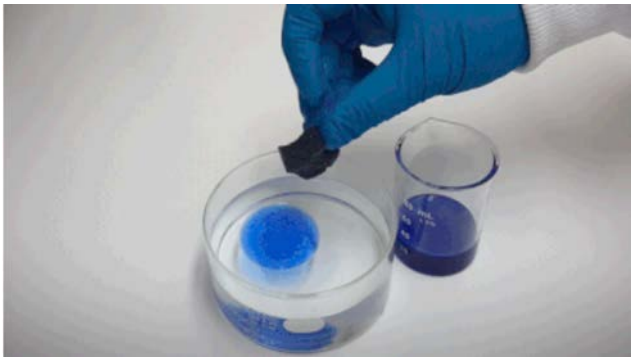
"We are extremely proud to be able to participate in this unique project in Belgium", explains Frank Hardeman. " We have the knowledge and the expertise available to train the primary care units to react more quickly and more efficiently to CBRN incidents."

## ARGONNE INVENTS REUSABLE SPONGE THAT SOAKS UP OIL, COULD REVOLUTIONIZE OIL SPILL AND DIESEL CLEANUP

## 阿岡實驗室發明之重複吸油海綿為漏油事件後續處理之革命性突破

By Louise Lerner • March 6, 2017

When the Deepwater Horizon drilling pipe blew out seven years ago, beginning the worst oil spill in U.S. history, those in charge of the recovery discovered a new wrinkle: the millions of gallons of oil bubbling from the sea floor weren't all collecting on the surface where it could be



skimmed or burned. Some of it was forming a plume and drifting through the ocean under the surface.

Now, scientists at the U.S. Department of Energy's (DOE) Argonne National Laboratory have invented a new foam, called Oleo Sponge, that addresses this problem. The material not only easily absorbs oil from water, but is also reusable and can pull dispersed oil from the entire water column—not just the surface.

"The Oleo Sponge offers a set of possibilities that, as far as we know, are unprecedented," said co-inventor Seth Darling, a scientist with Argonne's Center for Nanoscale Materials and a fellow of the University of Chicago's Institute for Molecular Engineering.

We already have a library of molecules that can grab oil, but the problem is how to get them into a useful structure and bind them there permanently.

The scientists started out with common polyurethane foam, used in everything from furniture cushions to home insulation. This foam has lots of nooks and crannies, like an English muffin, which could provide ample surface area to grab oil; but they needed to give the foam a new surface chemistry in order to firmly attach the oil-loving molecules.

Previously, Darling and fellow Argonne chemist Jeff Elam had developed a technique called sequential infiltration synthesis, or SIS, which can be used to infuse hard metal oxide atoms within complicated nanostructures.

After some trial and error, they found a way to adapt the technique to grow an extremely thin layer of metal oxide "primer" near the foam's interior surfaces. This serves as the perfect glue for attaching the oil-loving molecules, which are deposited in a second step; they hold onto the metal oxide layer with one end and reach out to grab oil molecules with the other.

The result is Oleo Sponge, a block of foam that easily adsorbs oil from the water. The material, which looks a bit like an outdoor seat cushion, can be wrung out to be reused—and the oil itself recovered

At tests at a giant seawater tank in New Jersey called Ohmsett, the National Oil Spill Response Research & Renewable Energy Test Facility, the Oleo Sponge successfully collected diesel and crude oil from both below and on the water surface.

"The material is extremely sturdy. We've run dozens to hundreds of tests, wringing it out each time, and we have yet to see it break down at all," Darling said.

Oleo Sponge could potentially also be used routinely to clean harbors and ports, where diesel and oil tend to accumulate from ship traffic, said John Harvey, a business

development executive with Argonne's Technology Development and Commercialization division.

Elam, Darling and the rest of the team are continuing to develop the technology.

"The technique offers enormous flexibility, and can be adapted to other types of cleanup besides oil in seawater. You could attach a different molecule to grab any specific substance you need," Elam said.

The team is actively looking to commercialize the material, Harvey said; those interested in licensing the technology or collaborating with the laboratory on further development may contact partners@anl.gov.

Argonne scientists Anil Mane, Joseph Libera and postdoctoral researcher Edward Barry also contributed to the development of the Oleo Sponge. Preliminary results were published in a study in the Journal of Materials Chemistry A, titled "Advanced oil sorbents using sequential infiltration synthesis."

The research was funded by the U.S. Coast Guard and the Bureau of Safety and Environmental Enforcement. The team used resources of the Center for Nanoscale Materials, a DOE Office of Science User Facility, in the development of the material.

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## HIGH-PRECISION CALCULATIONS ON SUPERCOMPUTERS HELP REVEAL THE PHYSICS OF THE UNIVERSE

## 運用超級電腦的高精準度計算法讓科學家更接近宇宙物理學

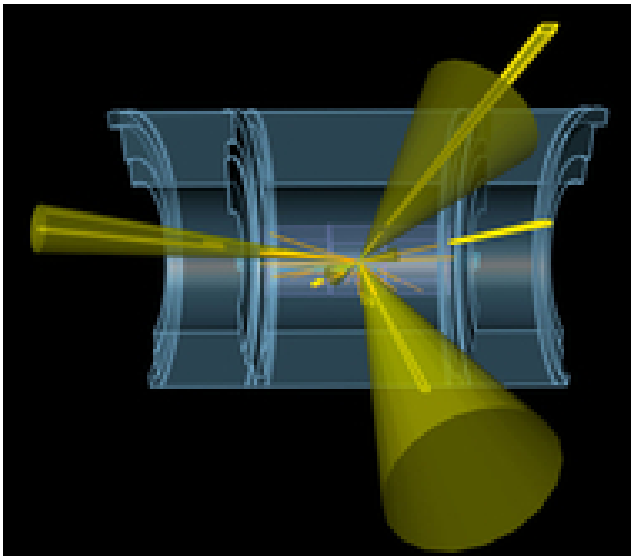
By Joan Koka • March 9, 2017

Eighth grade girls learned about the exciting possibilities in science and engineering at the annual Introduce a Girl to Engineering Day Thursday, Feb. 23, 2017, at the U.S. Department of Energy's Argonne National Laboratory.

"We were very excited to host this event and inspire young girls to become the next generation of scientists and engineers, " said

Lydia Finney, a physicist at Argonne and the Women in Science and Technology program initiator.

The day-long event was an entertaining and interactive way to introduce girls to science and engineering pursuits. Over one hundred young girls from the Chicagoland area heard from leaders at Argonne, met with a mentor, toured the laboratory's one-of-a-kind research facilities, joined seminars led by female Argonne employees and watched demonstrations of 11 experiments by Argonne scientists and engineers.



"The girls enjoyed our hands-on experiments from different areas across the laboratory – from predicting the weather to demonstrating cryogenics used at the Argonne Tandem Linac Accelerator System, or ATLAS," said Emily Zvolanek, a GIS analyst in Argonne's Environmental Science Division and six-time coordinator of the annual event.

The activities culminated in a team car-design challenge that allowed the girls to test their problem-solving skills as they prepared to race model vehicles.

The event is one of two annual day-long sessions geared toward inspiring young women to pursue science and technology and is one of dozens of educational programs hosted by Argonne each year.

Sponsorship for the event is provided by the Argonne Education Outreach Council along with Argonne's Division of Educational Programs and Women in Science and Technology program.

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# GLOBAL WARMING MEASURES AND NUCLEAR ENERGY'S ROLES

## 核能扮演因應全球暖化的角色

Tsutomu Toichi

The Denki Shimbun carried this report on November 30, 2016, and has permitted it to be reprinted here.

As Donald Trump, a skeptic of climate change, has been elected as U.S. president, concerns have grown about the effectiveness of the Paris Agreement. In order to limit the average global temperature rise from pre-industrial levels to less than 2 degrees Celsius, however, each country will have to further improve its voluntary greenhouse gas emission reduction target in the long term. This is because the world is required to cut GHG emissions by 50% by 2050, with developed countries reducing their emissions by 80%, to achieve the 2 C goal.

Japan plans to reduce GHG emissions in 2030 by 26% from 2013. Just before the Group of Seven summit in Ise-Shima last May, the government decided on a long-term target of cutting GHG emissions by 80% by 2050. The target is based on a long-term energy supply and demand outlook revised in July 2015. The revised outlook includes a target share of the electricity mix in 2030 at 22-24% for renewable energy and at 20-22% for nuclear energy. If electricity demand in 2030 remains unchanged from the present level with nuclear reactors' capacity utilization rate standing at 70%, more than 30 reactors with total capacity of 31-34 GW should be operating in the year. This will require Japan to extend the operation of more-than-40-year-old reactors, replace some reactors and build new ones. However, new risks have emerged for nuclear energy projects.

First, there are policy change risks. Full electricity market deregulation has eliminated the concept of full cost and regional monopolies. The feed-in-tariff system has been revised to lead FIT electricity to be sold through the power transmission operators to the wholesale power exchange (JEPX). If wholesale electricity prices decline substantially as seen in Germany, it will become difficult to make nuclear reactor renewal investment decisions. A plan is under consideration to require some electricity from nuclear and other baseload sources to be provided to the market to stimulate competition in the retail market. It is uncertain whether power producers could recover fixed costs including additional investment in measures to meet new safety requirements for the nuclear power plant.

Second, there are judicial risks. Kansai Electric Power Co. was forced to suspend the operation of Units 3 and 4 at its Takahama nuclear power station last March as the Otsu District Court issued a civil suit injunction on the two reactors that were authorized by the Nuclear

Regulation Authority as meeting new safety requirements, with their operation approved by relevant local governments. The Fukui District Court had cancelled its injunction on the

reactors in late 2015. Civil suits have been filed against the restart of other nuclear reactors in Japan. Nuclear and other facilities given administrative approval may not be suitable for any civil suit but should be subjected to administrative suits. The judicial risk for nuclear reactors will remain until higher courts rule on the injunction.

Third, there are political risks. A politician critical of nuclear power generation won a gubernatorial election in nuclear plant-hosting Niigata Prefecture in October 2016 after a similar development in Kagoshima, another nuclear plant-hosting prefecture, in July 2016, making the restart of nuclear reactors more uncertain. Prefectural governors have no authority to decide on the operation of nuclear reactors but can exert great influences on the operation through safety agreements with nuclear plant operators. Some opposition parties are moving to make the restart of nuclear plants an issue for national elections, creating a major risk for nuclear business.

Behind these risks is people's anxiety over the safety of nuclear power generation even six years after the Fukushima Daiichi nuclear plant accident. Other contributors to the risks include media reports saying that the decommissioning of the Fukushima Daiichi nuclear power station will fail to make progress as planned earlier, boosting decommissioning and damage compensation costs. The government should not shelve these problems but seriously tackle the negative legacy of the Fukushima accident.

Nuclear power generation, though plagued with various risks, is an indispensable option to realize public interests including global warming measures, stable electricity supply and the suppression of electricity prices. The government and electric power companies must try to mitigate new risks for achieving the nuclear power generation target in the long-term outlook. They must also make every efforts to explain nuclear energy's public roles to citizens in an easy-to-understand manner to restore public confidence in nuclear energy.

## INDIA ACCELERATES THE INTRODUCTION OF RENEWABLE ENERGIES

## 印度加速引入可再生能源

New and Renewable Energy Group

New and Renewable Energy & International Cooperation Unit

As of the end of 2016, the cumulative operating capacity for renewable energy (electricity) of India surpassed 50 GW. However, introduction must be expedited to achieve the target of 175 GW by 2022, and moves for achieving the target are accelerating.

First, regarding solar PV power, the bid for one of the world's largest solar power plants (750 MW) to be constructed in Rewa District in Madhya Pradesh state in central India in

January was won with a record low price of 3.30 rupees/kWh ($0.0494/kWh), far lower than the previous domestic record of 4.34 rupees/kWh ($0.065/kWh), although the cost structure and breakdown are unknown. The cumulative solar PV capacity is still 9 GW, far below the target of 100 GW, but the fall in price will provide a great boost.

Next, regarding wind power, for which India has surpassed Spain to rank fourth

following China, the US, and Germany with a cumulative capacity of 29 GW, the Spanish company Gamesa is making active efforts. It opened its third plant in the country, a turbine blade factory, in Andhra Pradesh in January following the first turbine blade plant in Gujarat in 2012 and the nacelle factory in Tamil Nadu in 2014. Local production is essential for reducing the cost of wind power, and the company seeks to boost wind power capacity in India where it is operating.

There are moves also in grid stabilization. In January, Mitsubishi Corporation and the US independent electricity producer AES Corporation announced the joint introduction of a 10 MW battery cell in an electricity distributor in the suburbs of Delhi to run a pilot project. NEDO also plans to conduct a feasibility study based on a governmental agreement between Japan and India, aiming to establish standards and institutions for expanding battery cells in India. With the recent sharp decline in battery cell prices, hopes are rising that it will become an economical means for grid stabilization. According to a report released by The Energy and Resources Institute (TERI) in February, if the prices of renewable energies and battery cells continue to decline at the current pace, the generation cost of renewable electricity, including

the cost of battery cells and other grid stabilization technologies, will reach 5 rupees/kWh by 2027, matching that of new coal-fired thermal power plants and making them no longer necessary.

Further, the long-distance transmission project won by ABB (for completion in 2019)

will connect the central Indian state of Madhya Pradesh with Tamil Nadu in the south with an 1,800 km-long ultra-high voltage direct current (UHVDC) line having a transmission capacity of 6 GW. This will reduce transmission losses by 30-50% compared to AC transmission, and is intended to efficiently resolve the regional imbalance of wind power.

As described above, the rapid decline in the costs of renewable energies and battery cells in India is accelerating efforts to maintain grid stability while simultaneously introducing renewables in an economically rational manner. This effort, if successful, will be a model for other developing countries which have set high targets for their INDCs. Attention must be paid to the developments in India’s renewable energy-related markets.