ONE

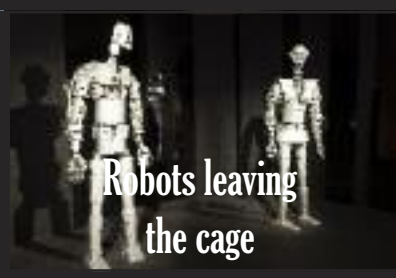
Only Natural Energy

Back in the coal old days

The mineralization of CO2 alternative

Are you a big foot?

Talking CO2: how CCS has refined its pitch



Robots leaving the cage

YEAR III - NUMBER 1 - JANUARY-MARCH 2017

NATIONAL CHILDREN'S SCIENCE CONGRESS

A programme of

National Council for Science & Technology Communication (NCSTC)

Department of Science & Technology, Government of India

District Level (All Districts) September

State Level (All States-KVS & JNVS) November

National Level 27-31 December

NATIONAL CHILDREN'S SCIENCE CONGRESS (NCSC)

An ideal and innovative programme for children to Inspire, Empower and Expand for their Mind and World.

Focal Theme for 2016 & 2017

SCIENCE, TECHNOLOGY & INNOVATION FOR SUSTAINABLE DEVELOPMENT

www.dst.gov.in

www.gujcost.gujarat.gov.in

ONE
Only Natural Energy

Year III - Number 1
JANUARY-MARCH 2017

Editor:
Gianni Serra

Editorial team:
Eusebio Loria
Toby Lockwood
Jez Abbott
Alice Masili
Lenore Hitchler

Contributors:
Esther Ngumbi
Arnie Gundersen

Thanks this issue:
Ipsnews.net
Truth-out

Cover Photo:
U.S. President Doanld Trump

Publisher:
Sotacarbo Ltd
CO2 Technology Centre Sulcis
Grande Miniera di Serbariu 09013
Carbonia (Italy)

Reg. Nr: 2/2014 Cagliari Ordinary Court

Only Natural Energy [ONE] is a digital magazine published every three months.
www.onlynaturalenergy.com
info@onlynaturalenergy.com

Back in the coal old days

President Trump wants to bring back coal mining to restore jobs, but this will never happen: "The coal industry is not coming back, for reasons that have nothing to do with climate: natural gas is now far cheaper."

By JEZ ABBOTT

ONE

Here's what's on Donald Trump's climate change "hit list", according to the respected current affairs magazine Newsweek.

He will "gut" the Paris climate deal, "scrap" the clean-power plan and throw his formidable and now mighty weight behind the coal industry, reckoned the American publication shortly after Trump won the presidential election last November.

Going by his campaign promises, the Trump era is shaping up as an "open season for the fossil fuel industry", according to the magazine's post-election news analysis. Meanwhile Trump promised to "cancel" the international climate change accord in his first 100 days of office.
The 45th president of the United States has called climate change a "Chinese hoax" and while it's difficult to know which of his many promises Trump will follow through, climate scientists warn his threats will create lasting damage to global climate, sea levels, biodiversity and food availability.

Trump vowed to repeal his country's Environmental Protection Agency regulations to limit carbon dioxide emissions from power plants, seen by many as the biggest domestic accomplishment of the Obama administration on climate. In fact Trump promised to scrap every new rule imposed by his predecessor that harms coal.

Then Trump pulled together a cabinet seen by many as a gang of global-warming deniers who scoff at the idea of human-caused climate change. What we are seeing, according to Jeremy Symons, a specialist in climate politics for the New York-based campaigning group the Environmental Defense Fund, is "an unprecedented amount of influence from the fossil fuel industry in Trump's cabinet".
But what is missing from his cabinet, insists Symons, "is the balance one would expect to bring the other side to the equation and it really leaves us wondering: who is looking out for us? Clearly the oil companies are well attended, but who's looking out for us?"

And who will look out for America? For Donald Trump's opposition to the fight against global warming could leave the US alone and mired in the past as countries from Europe and the Middle East to many parts of Asia pursue an energy revolution focusing on renewables and green energy.

Donald Trump has called climate change a "Chinese hoax". Climate scientists warn his threats will create lasting damage to global climate, sea levels, biodiversity and food availability

Photo Credit: African Solar Designs

So if and while Trump fulfils his promise to cancel the Paris deal and stimulate coal production, other leaders including those from across the European Union, China and Saudi Arabia, are pledging to redouble their uptake of renewable energy at the expense of fossil fuels. Trump's stance also flies in the face of envoys from almost 200 other countries who used late November's COP22 meeting in Marrakech, Morocco, to reaffirm efforts to clean up the world's energy supply and limit climate change. Although Trump talks the talk, can he walk the walk?

Professor Bob Lowe, a director of the University College London (UCL) Energy Institute in London, says a possible outcome of the Trump presidency on the Paris agreement may be that the US "reneges" on environmental policy, putting a "large question" mark over whether the world will be able to deliver on its global temperature targets.

"The situation will not begin to clarify until well into 2017. All that can be said now is that we have entered a period of significant uncertainty. We have already had decades of delay since the Rio Earth Summit of 1992 – the one thing the world cannot afford with respect to climate change is further delay."

However, according to corporate institution Bloomberg, Trump won't be able to reverse a drop in the cost of wind and solar power, which is tipping the economics away from the most polluting fuels. In short, Trump is isolated, reckons Alden Meyer of US advocacy group the Union of Concerned Scientists. "Not one single country has said if Trump pulls the US out of Paris, they will join him in leaving. Not one."

Just how out of step Trump is was summed up at COP22 by European Union climate commissioner Miguel Arias Canete: "The world is on the brink of an energy revolution. We will change the way we produce and consume energy. When you take office, you have to see what the global trends are. If you go against the global trend, you make a mistake."

Benjamin Santer, a climate researcher at the National Academy of Sciences, adds: "We don't have the luxury of remaining silent because decisions about whether the US is in or outside of the Paris climate agreement may affect all of us — they literally affect the kind of world we're going to leave behind for future generations,"

But it's not just climate scientists and activists who are against Trump's plans, so too are simple economics, says Steven Cohen, director of Columbia University's Earth Institute. Trump wants to bring back coal mining to restore jobs, but this will never happen: "The coal industry is not coming back, for reasons that have nothing to do with climate: natural gas is now far cheaper."

Trump's election sent shock waves, but a few weeks on, a new resolve seems to have emerged. The international desire to tackle climate remains strong, according to Lord Nick Stern, a world-leading climate economist at the London School of Economics, who told the UK's ITV news channel he was reserving judgement on the Trump administration.

Lord Stern also said that, whether or not Trump thinks climate change is an important issue, investing in clean technology could be a way for the new president to create the new manufacturing jobs that the new president promised to middle America.

Climate action in the US will continue, even if the federal government does not push it forward or tries to obstruct it. Major cities, states, companies across the country are already reducing their carbon footprint and investing in new technology for a cleaner environment, he says.

Liz Gallagher from climate group E3G agrees: "How the world acts in the next few, critical, years will determine whether or not we avoid dangerous climate change by the end of this century. With the election of Donald Trump, that task has become a little harder - but climate scientists, enlightened politicians and businesses seem to be determined to stay on the right path."

Photo Credit: Jack Corn (National Archives and Records Administration, College Park),


WORLD WATER DAY
WATERWORKS

Are you a Big Foot?

By LENORE M. HITCHLER

ONE

You do not have to be a mythological creature to produce a huge carbon footprint. Carbon footprints are determined by how much of the greenhouse gas carbon dioxide (CO2) is emitted by a specific activity or the use of a particular item. Carbon dioxide is one of the main greenhouse gases which contribute to global climate change. Many modern manufacturing operations and personal individual lifestyles contribute to global CO2 emissions. Among them are the production and use of clothing which produces an enormous carbon footprint. It is important to be apprised of relevant facts and statistics in order to understand the effects of the apparel industry on climate change. This knowledge will help you to make informed decisions about your wardrobe.

According to the US Energy Information Administration, the textile industry is the fifth largest producer of carbon dioxide in the United States. Textiles are materials made from fiber, yarn or fabric. The use of textiles is responsible for about one ton of the 19.8 tons of total emissions produced by each American in 2006. When writing about clothing, some sources use the term textiles for clothing and some use the word clothing. Americans currently buy more clothing than they did in the past, adding to their carbon footprint. In 2011 the average American purchased 68 new articles of clothing.

The vast amount of textiles purchased by Americans originate from countries all over the globe, and this contributes to global climate change. Textiles account for ten percent of the world's total carbon dioxide impact. Annual global textile production in 2008 was estimated at 60 billion kilograms (over 66 million US tons), and one trillion kilowatt hours (kWh) of electricity were used. This was the equivalent of burning 132 metric tons of coal.

The carbon footprint of textiles includes the amount of energy used in the total life cycle of the fabric. All stages in the life cycle of fabric involve transportation to the next phase of the cycle.

A vast amount of clothing is manufactured from cotton. Even though less energy is used in the production of cotton than in polyester, it nevertheless uses massive amounts of energy. Cotton production contributes between 0.3 and 1% of the total annual global greenhouse gases. In the US, 7,600 BTUs of energy are used to produce one pound of cotton.

Cotton farming uses quite a bit of energy, especially with the use of fertilizers. Petroleum is one of the ingredients in nitrogen fertilizers, and ten percent of the world's fertilizers is used on the cotton crop. In the US, one third of a pound of fertilizer is used to produce each t-shirt. The production of one kilogram (kg) of nitrogen for fertilizer requires the energy equivalent of from 1.4 to 1.8 liters of diesel fuel. This does not include the natural gas that is used. Making one ton of fertilizer uses around 33,000 cubic feet of natural gas. Two thirds of natural gas comes from fracking. Methane leaks occur during the process of fracking and also when it is transported through pipelines.

According to the Environmental Protection Agency, methane has twenty one times the global warming potential of CO2. Producing one ton of nitrogen fertilizer emits nearly seven tons of CO2 equivalent greenhouse gases. Fertilizers applied to the soil emit nitrogen dioxide (NO2), and NO2 has 300 times the effect of CO2 as a greenhouse gas.

Petroleum is also an ingredient of pesticides. 25% of the world's insecticides are used on the cotton crop.

One-third of a pound of pesticides is used for each t-shirt. Cotton grown with fertilizers and pesticides produce 5.89 kg CO2 per ton of fiber while organic cotton produces 2.35 kg CO2 per ton. The use of polyester produces 9.52 kg CO2 per ton of fiber.

There are many more phases in cotton farming that produce CO2. Irrigation uses a lot of energy and thus contributes greatly to global climate change. The World Wildlife Fund states that 73% of global cotton harvest comes from irrigated land. Before cotton seeds are planted, the soil is frequently tilled to remove weeds and prepare the soil, and this process also results in CO2 emissions. Before the crop is harvested, defoliants are often applied to the crop. The seeds within the harvested cotton bolls are removed, which uses electricity, and thus produces CO2. The cotton is then baled before it is sent on to the next phase of the process. The manufacturing of polyester fabric also consumes a great deal of energy. Nearly 70 million barrels of oil are used globally each year to make polyester. Synthetic fibers are manufactured with high temperatures, using even more electricity. Spandex, Lycra, and Pleather contain petroleum products. Nylon manufacturing creates NO2.

The electrical energy used for each meter of cloth produced averages 0.45-0.55 kWh. Manufacturing stages include the spinning of yarn, bleaching and dyeing, and the weaving and knitting of yarn into material. Approximately 15% of the total fabric is wasted when the various pieces are cut out of the fabric. Still more operations such as the sewing together of the parts of the clothing and removing excess dye also contribute to global climate change. Millions of tons of unused fabric at Chinese factories go to waste each year when dyed the wrong color. The many finishing stages of clothing, including making the fabric stain and wrinkle resistant, also consume electricity.

The packaging and delivery phase of distribution also uses vast amounts of energy. Plastic packaging is derived from petroleum, and energy is used both to manufacture and transport the plastic. Likewise, paper bags and cardboard involve energy usage in their manufacturing and transportation. A shipping box equal to 0.25 pounds of cardboard produces 0.2 pounds of CO2. In 2002, the Timberland company found that the apparel and footwear shipped by ocean freight from Asia to the US produced 17,000 tons of CO2. Even the shape and routes of delivery vehicles effects the amount of CO2 produced.

The use phase of apparel occurs when clothes are actually worn and is a very important contribution to one's carbon footprint. Lifestyle decisions can raise or lower our carbon footprint. For example, ties, business jackets, long sleeves, and polyester make consumers feel warmer and therefore increase the use of air conditioning. In Japan, a program called Cool Biz was introduced and it included changes in business attire.

The Cool Biz program decreased greenhouse emissions by around two million tons in 2010 along with reduced emissions of 7.92 million tons in the previous five years. Fast fashion is a major component of the apparel industry. Crops used to make fabric, animal fibers, and synthetic fabrics may be produced in one country. Then the fabric or partially sewn articles of clothing are transported repeatedly to different countries in the various phases of production usually depending on where the cheapest labor is found. Clothes are manufactured quickly and designed to have a short life. Many fast fashion garments are worn less than five times and are frequently kept for only 35 days. These garments produce over 400% more carbon emissions per item per year than those worn 50 times and kept for a full year.

Washing and drying clothes add a large amount of CO2 to the atmosphere. Machine washing and drying lead to 75 to 80% of a t-shirt's carbon footprint One load of washing uses 40 gallons of water. Energy is used in pumping that water to the residence and within the home. Almost 90% of the energy consumed by a washing machine is due to heating the water. Washing clothes at 30 degrees Celsius will have a carbon footprint of 0.6 kilograms compared to a carbon footprint of 3.3 kilograms if clothes are washed at 60 degrees Celsius. Twenty nine billion loads of laundry

Photo Credit: Tony Hisgett

Washing and drying clothes add a large amount of CO2 to the atmosphere.

Machine washing & drying=75 to 80% of a t-shirt's carbon footprint.

One load of washing uses 40 gallons of water.

Energy is used in pumping that water to the residence and within the home. Almost 90% of the energy consumed by a washing machine is used to heat the water.

Washing clothes at 30 degrees Celsius leads to a carbon footprint of 0.6 kilograms compared to a carbon footprint of 3.3 kilograms if clothes are washed at 60 degrees Celsius at 60 degrees

29 billion loads of laundry are washed each year in the US.

Manufacture and delivery of appliances raise the total carbon footprint of each wash.

Manufacture and transport of detergents, bleach, and fabric softeners use a great deal of energy.

Transporting detergent in the US produces 422 million pounds of CO2.

The average American family's carbon footprint for the detergent that they use is about 600 pounds of CO2 each year.

Cotton farming uses a great deal of energy.

Petroleum is a major ingredient in nitrogen fertilizers.

Ten percent of world's fertilizers are used on cotton crop.

US uses 1/3 pound of fertilizer used to produce each t-shirt.

Production of one kilogram (kg) of nitrogen for fertilizer requires equivalent of 1.4-1.8 liters of diesel fuel.

Production of one ton of fertilizer uses approximately 33,000 cubic feet of natural gas.

2/3 natural gas is produced by fracking.

Methane leaks occur both during the process of fracking and also when it is transported through pipelines.

According to the Environmental Protection Agency, methane has 21times the global warming potential of CO2

One ton of nitrogen fertilizer emits nearly 7 tons of CO2 equivalent greenhouse gases.

Fertilizers emit nitrogen dioxide (NO2) which has 300 times the effect of CO2 as a greenhouse gas.

are washed each year in the US. The manufacture and delivery of appliances also raise the total carbon footprint of each wash. A lot of energy is used to manufacture and transport detergents, bleach, and fabric softeners. Transporting detergent in the US produces 422 million pounds of CO2.

The average American family's carbon footprint for the detergent that they use is about 600 pounds of CO2 each year. Clothes dryers use a tremendous amount of energy and thus make a sizable contribution to climate change. A load of clothing in the dryer uses five times more energy than washing. The Environmental Protection Agency found that dryers emit 32 million metric tons of CO2 each year. Consumers frequently use fabric softeners and dryer sheets which consume energy and contribute to global climate change in their manufacture, transportation, and disposal.

Most dryer sheets are made from a non woven polyester material, and that polyester comes from petroleum which must be extracted and transported to the factory that produces the dryer sheets. The brand Kleen Test, by itself manufactures a billion dryer sheets per year, and that is only one company. The final step of the carbon footprint occurs during waste removal and processing. However, by extending the average lifespan of an item of clothing by as little as three months, we can reduce the carbon footprint by 5 to

Waste removal and processing is the final step of the carbon footprint of clothing.

By extending the average lifespan of an item of clothing by 3 months, we can reduce the carbon footprint by 5 to 10%.

Americans recycle or donate only 15% of their used clothing.

Studies find 90% of clothing is thrown away long before the end of its useful life.

Recycling one kg of used apparel will help to reduce up to 3.6 kilograms of CO2 emissions.

According to the EPA, in 2013 Americans sent 14.3 million tons of clothing to landfills.

Textiles sent to landfills require years to decompose, and during the process methane will be released.

10%. Americans recycle or donate only 15% of their used clothing. Studies show that 90% of clothing is thrown away long before the end of its useful life. Recycling one kilogram of used apparel will help to reduce up to 3.6 kilograms of CO2 emissions. According to the EPA, in 2013 Americans sent 14.3 million tons of clothing to landfills. Textiles that are sent to landfills require years to decompose, and during the process methane will be released.

Thus, our purchase and use of clothing significantly adds to our carbon footprint. However, there are things that individual consumers can do to lower their individual carbon footprint. Purchase only items that you really need and will wear for a longer period of time. And be sure to use cloth bags to bring your purchases home. Wash clothes at cooler temperatures and hang them up to dry. Never throw out unwanted clothing. Discarded clothing should be given away or donated to charities. ONE

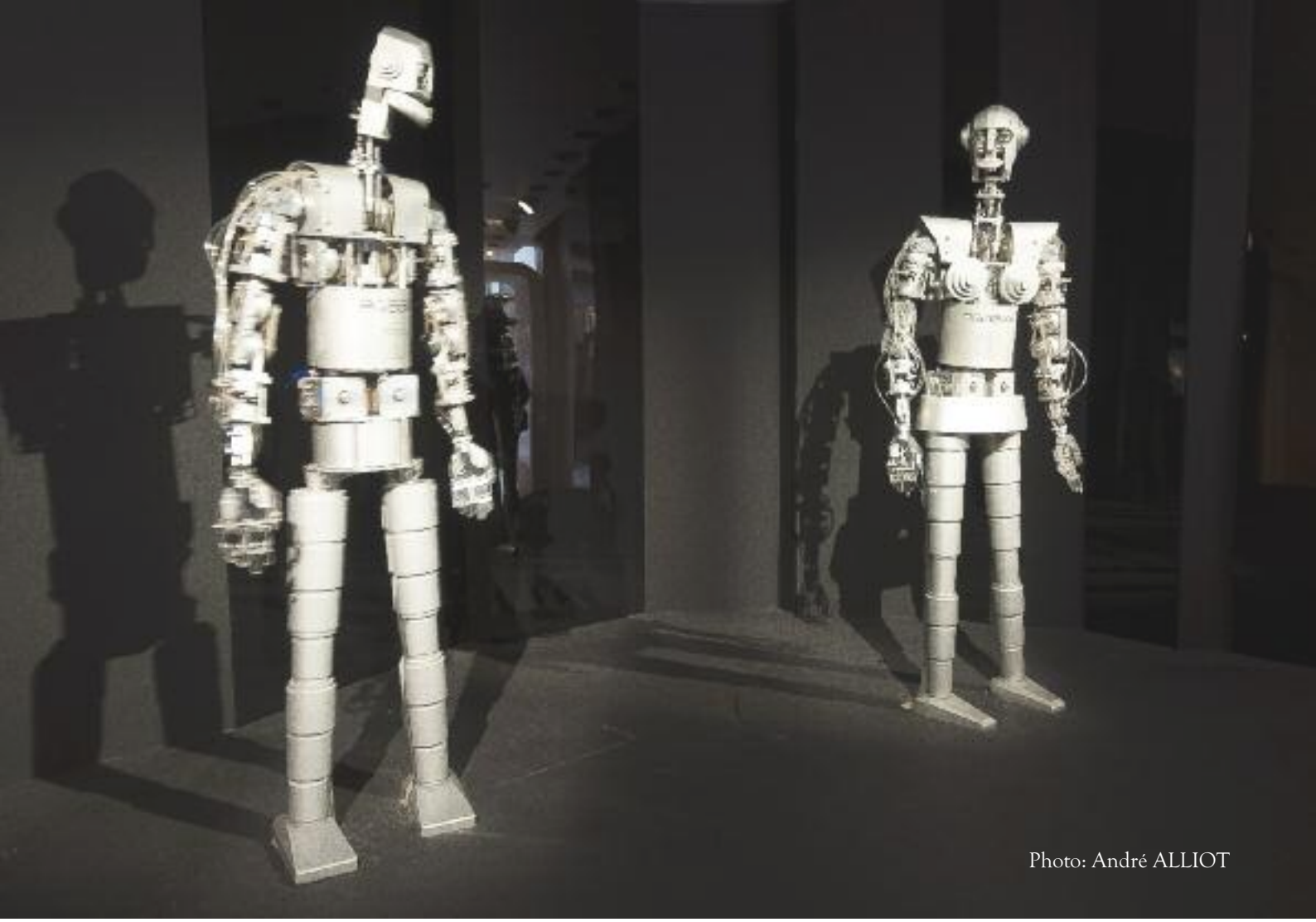


Photo: André ALLIOT

Robots leaving the cage

By EUSEBIO LORIA

ONE

Robots. Not a Blade Runner or super-evolved apes– they weren't movies, they were documentaries from the future. Humanity could face the apocalyptic scenario where robots real turn on humans.

"Robots are leaving the cage now in industrial production," told a EurActiv event held on September 2016 Staudenmayer, Dirk Staudenmayer, head of unit for contract law at the European Commission's justice department.

When we talk about robots, we must have in mind not only movies such as 'Star Wars' or 'Terminator'. It exists already in an incredible range of applications, from medical diagnostics to assembly lines of car companies. What is new is that digitisation allows us to connect machines, and that smart robots will interact also with humans. This represent a huge opportunity in terms of efficiency and competitiveness for European companies.

In that regard, robots are at the centre of Industry 4.0. Consequently, the recent discussion about an EU robot law is not science-fiction but indeed highly relevant for the future of European industry. It is positive to see this debate taking place at a European level in a very early stage, since we need a political framework for the EU in a couple of years.

But how to consider robots from a legal point of

view is a difficult issue for policymakers. And the answer will have implications for the robot-manufacturing industry and insurance companies covering potential damage caused by robots and workers operating alongside machines on factory.

As robots play a more important role in the EU, moving from manufacturing to healthcare, Europeans are becoming more suspicious of the technology. According to a poll, which was carried out in all EU member states in November and December 2014, two-thirds of those surveyed (64%) have a positive view of robots, down from 70% in 2012, except in Hungary (49%), Cyprus (46%) and Greece (45%). Danes and Swedes (both at 84%) have the most positive view of robots' role in society, followed by the Dutch (77%) and the Poles (75%). 20% of EU citizens are considering purchasing a robot for their home in the future, particularly in he Nordic countries and Central Europe, but respondents in Eastern and Southern Europe are more hesitant. More than one-third (36%) believe that their current job could be at least partially done by a robot in the future. In four countries (Bulgaria, Poland, Croatia and Hugary) at least half of the respondents thought that their current jobs could be done at least partially by robots. At the other end of the scale, less than a quarter of those surveyed in the Netherlands (24%), Denmark (22%) and Luxembourg (20%) take this view.

The truth is that robots are invading our daily life progressing faster than ever. The most urgent issue to be addressed is to regulate artificial intelligence. Given that it is so difficult to define robots, we have to look at the different applications of robotics, to try to find pragmatic solutions to the problems that may arise. From a legal perspective, liability is the most urgent topic and the application of existing principles if a robot damage to a person.

"If an accident happens, who is liable? Is it the producer, is it the seller, is it the car owner, is it the structure that sends the data to the car or is it the software?"

An option could be that robots come with compulsory insurance, like with cars. Another issues are data protection and privacy issues. Robots cannot work without data and they are connected. Most sophisticated robots could be held partially or entirely responsible for their acts, giving them the status of electronic persons.

One of the scenarios could be to give robots an e-personality. This is a very controversial issue. The robotic community doesn't agree this solution. An European agency for robotics could monitor and prevent. The agency could be a partner for industry and it could help to build consumers' trust. There is competition between countries in this field. It could be preferable to interact with a European robot that meets safety and security standards that we can define now, preventing robots from third countries with lower standards from accessing the European market.

US experts are also proposing a national agency for robots. There are common issues and challenges related to robotics even if the applications are different. The agency would not only include engineers, but also ethics experts and sociologists, because the agency will be about the interaction with humans. Legal clarification on liability – who is responsible in case of damage – was "very important" for the EU's Digital Single Market initiative and the Internet of Things where objects are connected to each other and share information automatically.

Robots will change the way we work. Some jobs will disappear. The question is how many new jobs will be created by the industrial revolution. Experts are divided. Half of them believe many jobs will be destroyed, the other half argue that many jobs will be created. If jobs are lost, we will have to reflect on how to organise our society, how we finance the social security systems. Nowadays, the main source of tax revenues comes from labour. A 'robot tax' certainly isn't a good idea, neither today nor in the future.

We could do that but we cannot prevent other rese-

arch in certain area of robotics in non-EU countries. We can try to regulate the EU, but we need to discuss it with the US, China, Japan or Korea, because this is a global phenomenon. That is also one of the reasons for setting up an agency, as it could be the body to discuss norms with the international community.

Mady Delvaux, a socialist and Member of European Parliament, is writing an own initiative report on the stiff rise of advanced robotics and artificial intelligence, she warns, "My main concern is that humans are not dominated by robots, but that robots serve the humans." Mady is calling for a European agency for robotics to monitor developments such as the creation of artificial beings and cyborgs.But there is still much work to be done. ONE

More than 1.5 million industrial robots are spread in various manufacturing facilities around the world.

IEA CLEAN COAL CENTRE

SOTACARBO
SUSTAINABLE ENERGY RESEARCH CENTRE

The eighth international conference on Clean Coal Technologies

CCT 2017
8-12 May
Cagliari

For its 8th edition, CCT2017 returns to Cagliari on the beautiful Italian island of Sardinia. In the 14 years since its inception, the CCT series has established itself as a leading forum for showcasing state-of-the-art coal research, with the previous event assembling 200 delegates from 30 different countries. A comprehensive scope and a diverse mix of industry, academic, and government representatives make this event an ideal opportunity for networking within the international coal community.

CCT2017 will be held in the congress centre of Cagliari's exclusive T Hotel, where three days of technical sessions and keynotes will cover the research, demonstration, and deployment of clean coal technologies and related areas including:

- High efficiency, low emissions plant
- Developments in carbon capture
- SOx, NOx, mercury, and particulate controls
- Low rank coal utilisation
- Highly flexible power plant
- Gasification, IGCC and IGFC
- Coal-bed methane
- Underground coal gasification
- High-temperature materials
- Advanced power cycles
- Coal to chemicals
- Efficiency upgrading technologies
- Fluidised bed combustion
- Biomass cofiring and co-gasification
- Coal beneficiation and blending
- Policy and financing
- Social acceptance

Successful conference papers will be published in a special issue of the journal *Fuel*.

Abstracts should be submitted before 15 December 2016 – please visit the event website to submit your abstract or sign up for updates.

WWW.CCT2017.ORG

Talking CO2: how carbon capture and storage has refined its pitch

By TOBY LOCKWOOD

ONE

In most countries today, a minority of people have ever heard of carbon capture and storage, and still fewer have much knowledge of how this seemingly outlandish idea of stashing our CO2 emissions underground might actually work.

Yet from 2008 to 2010, so-called 'CCS' was thrust into the limelight in the Netherlands and parts of Germany as large sections of the public came out passionately against the use of the technology in their regions, fearing dangerous CO2 leaks, contamination of farm land, or even earthquakes. Backed by some environmental groups such as Greenpeace, local activist groups were formed, petitions signed and large protests held.

In Germany, CCS opponents employed strikingly effective imagery of timebombs and gas masks, and drew analogies with the equally emotive issue of nuclear waste disposal. With unfavourable media coverage also growing, CCS rapidly became a toxic political issue, and politicians were quick to distance themselves from the technology in the run up to local and national elections. The end result was effective moratoriums on onshore storage of CO2 in both countries, and a resounding victory for citizen activism.

The fossil fuel and energy companies behind these early CCS projects in Europe were poorly prepared for such a response, as the technology was not at first regarded as particularly controversial. Underground storage of other industrial gases is relatively common, and as a climate mitigation technology CCS also had the backing of many environmental groups and respected research institutes.

Considering most of the technology involved in the process as straightforward and risk free, the project developers saw little need for much consultation with local communities beyond the bare minimum required by permitting law. As we now know, the state of public opinion on CCS was in fact much more fragile. New technologies are always subject to greater scrutiny than well-established ones, and the novelty of CCS at the time was highlighted by the fact that EU member states were then still in the process of implementing various regulations to govern the new projects.

Probably most importantly, the idea of storing CO2 emissions within the earth is fundamentally unappealing, and is often instinctively viewed as a quick and unsustainable fix for fossil fuel companies to continue 'business as usual' rather than properly addressing the problem by stopping CO2 emissions altogether.

While many of the initial concerns about CCS were driven by fears of damaging or dangerous local effects of a CO2 leak, this somewhat uncertain status as a 'proper' climate change mitigation strategy has undoubtedly contributed more to mobilising opposition, and has led to the involvement of some influen-

Local communities need to feel that they are being listened to and can have some impact on the process

Photo credit: ccs-protest.de

tial environmental groups who see it as an unwelcome distraction from the development of alternative climate solutions.

Although other CCS projects around this time were seeing little opposition or even active support in other countries such as the USA, Australia, and Spain, these negative experiences in the Netherlands and Germany would fundamentally change the approach the emerging CCS industry took towards public communications.

Most projects since have made use of dedicated 'outreach' teams with trained communication specialists, and sought above all to develop more trusting relationships with local authorities and members of the public from as early on as possible. As large fossil fuel and energy companies are not generally perceived as acting in the best interests of either the environment or the public, this can be challenging, and the help of more trusted organisations such as research institutes and NGOs can be hugely important in winning support.

Above all, local communities need to feel that they are being listened to and can have some impact on the process, so feedback is carefully collected and taken into account wherever possible. In the place of formal presentations to large groups of people, the industry has moved towards more informal 'exhibit style' meetings and house visits which allow one-to-one communication and prevent a few vocal

A danger that the perceived unpopularity of CCS in the region is acting as a convenient political excuse to halt its development

opponents from swaying a crowd. Companies have also tried to emphasise potential benefits for the community as much as explaining the risks, including employment opportunities, local investment, and international prestige.

While many of these ideas may seem like common sense, and are not new for other, more controversial industries like chemical plants and nuclear power, the CCS industry has faced some unique challenges in developing its communication strategy.

Most people encounter the technology for the first time when a project is planned near their community, so communicators need to start with the basics. This usually includes presenting the evidence for man-made climate change, and making the case for why CCS needs to be part of a solution, often with reference to the country's current energy supply and how the technology can complement other measures such as renewable energy and improving energy efficiency.

The nature and properties of CO2 also needs to be discussed, as some people tend to mistakenly identify it as a toxic or even explosive gas. Public understanding of how CO2 is actually stored is limited, with ideas of large underground caverns of the gas, not far below the surface, helping stoke fears that it could easily escape. In reality, CO2 is soaked into the pores of rocks several kilometres down, and prevented from surfacing by layers of impermeable rock above. Using real samples of these rocks and to-scale diagrams of the depth of the storage location have proved essential in getting across the key idea that a CO2 leak is extremely unlikely.

As the developer stung by the mass public opposition in the Netherlands, oil company Shell have arguably done more than many to develop a comprehensive communications strategy for their more recent CCS projects.

Although eventually cancelled by the UK government, the company's plans at Peterhead power plant in Scotland won widespread local support, and involved working closely with local schools and businesses, as well as an eye-catching nation-wide advertising campaign.

A similar approach was used for the successful Quest project in Alberta, Canada, which began operating in 2015, where the team would even show up at local cafes to talk informally about the plans over a coffee. While some of these more successful projects might be considered less controversial proposals than those which met with serious opposition, often involving putting the CO2 offshore, this is not always the case.

Even in Europe, plans for a new coal power plant with CCS in Spain eventually met with approval following the concerted communications efforts of a local research institute, despite the project ultimately being abandoned due to lack of funds.

Today, there is growing confidence within the CCS industry that projects can win local acceptance if enough care is taken, although there is also an understanding that the social context of some locations may not be suitable. However, with CCS going from strength to strength in North America, but still failing to take off in Europe, the memory of the Dutch and German experiences are proving difficult to banish entirely.

A relative absence of economic drivers and lack of infrastructure for the technology in Europe is the main reason for this contrast in fortunes, but there is a danger that the perceived unpopularity of CCS in the region is acting as a convenient political excuse to halt its development.

CCS is yet to find an equal place alongside renewable energy in the public and political debate around reducing CO2 emissions, despite organisations like International Panel on Climate Change and the International Energy Agency agreeing that it must form part of the solution, and it is clear that the battle for public opinion is far from won. The next frontier for CCS communication must go beyond local concerns and seek to make the case for technology at a national and international level. ONE

2017 Energy & Sustainability Conference

Leadership for Virginia's Energy Future

Wednesday, May 24, 2017
Greater Richmond Convention Center

VA CHAMBER FOUNDATION

Looking for alternatives: CO2 mineralization

By ALICE MASILI
ONE

The reduction of carbon dioxide emissions into the atmosphere is one of the great goals of our century. The constraints on emissions set by the Kyoto Protocol have prompted the technical and scientific world to search for new and more efficient technologies to tackle climate change.

The capture and storage or fixing CO2 (CCS) methods represent a viable way, according to the International Energy Agency (IEA), to reduce by one-sixth the amount of CO2 injected into the atmosphere by 2050. The mineralization of CO2 is acquiring great importance as an unconventional CCS method.

The mineralization of CO2 is an alternative to conventional geological storage through the reaction with matrices containing alkaline-earth metals to form carbonates, with the reduction of a sixth of the amount CO2 injected into the

atmosphere by 2050 (IEA 2013).

The mineralization of CO2 is simply a transformation that occurs naturally over millions of years, through an acid-base reaction in the solid phase as rocks. Researchers have found a way to accelerate this natural aging process of the rocks in order to allow the permanent storage of CO2 in the form of thermodynamically stable calcium and magnesium carbonates.
The most important step is to select suitable minerals containing calcium and magnesium, which are appropriate for the carbonation processes.

This method can be in situ or ex situ. In the first case, mineralization takes place when the injected CO2 hits the alkaline part of the rock in the formation of interest to form solid carbonates. In the ex situ process, the reaction occurs on the surface, inside of a reactor or as a stage of an industrial process.

Recently the use of industrial waste as sources of calcium and magnesium ions has been developed at a pilot scale. In this type of process CO2 emissions, from the exhaust gas of power stations or from cement manufacturing processes, are chemically combined with water and saline solution to form solid mineral carbonates and bicarbonates.

Calera Company and Skyonic Corporation are involved in the development of mineralization technology using industrial emissions. Other ex situ mineralization processes which are currently being developed include that of Integrated Carbon Sequestration (ICS), the Mineral Carbonation International (MCI) and Alcoa.

•Calera Company built a continuous pilot-scale plant in Moss Landing, California that uses fly ashes as an alkaline source to produce on average 5 t/day of cement, aggregates and other related building materials.

•Skyonic Corporation which developed SkyMine & Technology, a process for transforming CO2, acid gases and other heavy metals and pollutants into marketable pro-

Photo: San Antonio Express-News

ducts, such as sodium bicarbonate, hydrochloric acid, and bleach. The first SkyMine plant has operated since October 2014 in San Antonio, Texas near the Capitol Aggregates cement plant. The plant will reduce carbon dioxide emissions by 15 percent - 83,000 tons of CO2 per year.

•ICS invented and patented a separation process to convert carbon dioxide into ammonium bicarbonate and, after a reaction with silicates, into carbonate and silica. ICS collaborates with important organizations such as the Australian CSIRO (Commonwealth for Industrial Research and Development Organization). Together they performed several experimental to study the effects of temperature and pressure, supported by simulation studies.
•The Australian company MCI aims to transform CO2 in stable carbonates and silicates for the production of construction materials such as cement, gypsum and other valuable industrial products. It built a pilot plant at the University of Newcastle near Sydney, Australia, to scale up and test the commercial potential of mineral carbonation technology.

•Alcoa has developed a process to use the "red mud", a waste product generated in the industrial production of alumina, to sequester 70,000 tonnes of CO2 per year from the refinery of Kwinana, Western Australia. It is equivalent to 30 tons of "red mud" per tons of CO2.

Currently several large-scale projects study the carbonation of CO2 in situ.

The Carbfix project site is located near the Hellisheiði geothermal power plant

•The Carbfix project (www.carbfix.com) is a collaboration between the Earth Institute at Columbia University, Reykjavik Energy, Icelandic University, and the Centre National de la Recherche (CNRS) in France, with the purpose of mimicking the natural CO2 storage process observed in basaltic rocks on a large scale.

The trial site is located in Iceland, near a Hellisheiði geothermal power plant that produces 30,000 tons of CO2 per year. Between 2012 and 2013, they injected 250 tons of water with carbon dioxide and hydrogen sulfide into the ground, at a depth between 400 and 800 meters. After two years, they recorded changes in the isotopic composition of water samples, indicating a substantial start to the solidification process.

•Big Sky Carbon Sequestration Partnership (BSCSP) is a project about the storage of carbon dioxide in rocky areas of Montana, Wyoming, Idaho, South Dakota, and eastern Washington and Oregon, operated in the United States by the University of Montana.

In an effort to characterize and evaluate the potential of geological storage sites, the BSCSP is developing a small-scale project near Wallula, Washington for the characterization of geological site in order to guarantee security injection of 1,000 tons of CO2 in a basalt formation at about 1000 m depth. ONE

SARDINIA
Technology & Nature

ENEA

CO2 Technology Centre of Sulcis

SOTACARBO

To Effectively Combat Climate Change, Involve Women

Esther Ngumbi is a post-doctoral researcher at the Department of Entomology and Plant Pathology at Auburn University in Alabama. She serves as a 2015 Clinton Global University (CGI U) Mentor for Agriculture and is a 2015 New Voices Fellow at the Aspen Institute.

By ESTHER NGUMBI

Ipsnews.net

London's Waterloo Bridge over the River Thames is famously known as the "Ladies Bridge," for it was built largely by women during the height of World War II. On another continent, women fighting a different war have built an equally remarkable structure: a 3,300-meter anti-salt dyke constructed by a women's association in Senegal to reclaim land affected by rising levels of salt water.

These women are on the front-line of the fight against climate change, and their ingenuity and resolve resulted in a singular victory. The project allowed the revitalization of rice-growing activities and the re-generation of natural vegetation over 1,500 hectares, and benefiting over 5,000 people in Senegal.

Yet, women continue to be excluded from climate change solutions for agriculture. A look at United Nations report on female representations in main climate change decision bodies shows that women are a minority on every major committee of the United Nations' own top climate change decision making group. For example, women hold only 6 percent of positions in the Advisory Board of the Climate Technology Centre and Network. At the same time, women smallholder farmers have limited access to agricultural training, credit, seeds, and inputs – all of which are essential for the development and adoption of climate-smart agricultural practices.

Most affected by climate change are the world's 1.3 billion poor people, the majority of whom are subsistence farmers, women and their families. Furthermore, women make up an average of 43 percent of the global agricultural workforce and produce as much as 90 percent of the food supply in African countries, where they are also mainly responsible for providing water and fuel for their families. All this makes them exceptionally vulnerable to the effects of climate change.

Not only does women's disempowerment prevent us from understanding the true extent to which climate change is disrupting the way of life for our most at-risk communities, it also perpetuates the antiquated narrative that women are victims, rather than agents, of change.

But, as seen in Senegal, women bring novel perspectives and solutions to the fight against climate change. Furthermore, studies have found that women in leadership improve organizations' financial performance, strengthen the organizational climate, increase corporate social responsibility and reputation, leverage talent and enhance innovation and collective intelligence.

Therefore, across every level of society, women's leadership in addressing climate change must be supported.


Esther Ngumbi

While there are signs of change—including the recently announced appointment of Patricia Espinosa as Executive Secretary to the United Nations Framework Convention on Climate Change—much remains to be done, whether in the Board room or on the threshing floor.

Small-scale women farmers must beassisted with tools, technologies and other resources to effectively deal with the changing climate. These include portable modern stoves that do not require large amounts of firewood and biogas digesters that can turn waste from animals into gas for cooking. Water conservation technologies, such as micro-dams, rain storage systems, and drip irrigation technologies that grow more crop per drop are a prerequisite for dealing with more variable rainfall. Such climate-smart agriculture techniques could potentially allow small-scale women farmers to grow crops and feed their families throughout the year and avoid the "hungry season."

When women gain access to such resources and tools on a large scale, whole communities and regions can benefit. In India, for example, the Gorakhpur Environmental Action Group and the Women's Earth Alliance launched a yearlong India Women, Food Security, and Climate Change Training program. Through this program, women were trained on a wide array of conservation agricultural practices including agroforestry, conservation tillage and mixed farming. These practices strengthen resilience of the land base to extreme events, broaden sources of livelihoods, and have positive implications for climate change adaptation.

As a result of the initiative, over 5,000 women were trained and over 6,000 trees were grown. The trainees were further tasked with implementing what they had learned. Many of the 5,000 trained women launched their own small-scale agribusinesses and continued to be leaders in the fight against climate change, reaching out to more than 750,000 people.

Another example is the work of late Nobel Prize winner Prof. Wangari Maathai. Through the greenbelt movement, she empowered women to grow seedlings and plant trees to bind the soil, store rainwater, and provide food and firewood. Since its inception, the organization has planted over 51 million trees, helping to protect Kenya's forests. This program not only addresses climate change, but it also creates jobs for women while improving water and food security.

Efforts towards empowering women with tools and resources to fight climate change must be intensified and accelerated at local, national and regional levels. Echoing the words of former President of Finland Tarja Halonen: "Women are powerful agents whose knowledge skills and innovative ideas support the efforts to combat climate change." Including women in top decision-making organs on issues of climate change and empowering them on ground to take action is essential, and will surely facilitate a more stable and prosperous planet.

Originally published by Ipsnews.net September 30, 2016

WORLD
Sustainable Built Environment Conference 2017 Hong Kong

5-7 June 2017

Transforming Our Built Environment through
Innovation and Integration:
Putting Ideas into Action

TU Graz

IAT | Institut für Architekturtechnologie

Nuclear Power is not "Green Energy": it is a fount of atomic waste

By ARNIE GUNDERSEN (Truth-out.org)

Starting in 1971, I became a card-carrying member of the "nuclear priesthood." I began as a licensed nuclear reactor operator and progressed through the industry to become a senior vice president. I believed, with religious fervor, that by helping to build and operate atomic power reactors, I would be creating power that was "too cheap to meter." The historic 1973 gasoline shortages and long lines of cars queued at the pumps made it clear to me and hundreds of other nuclear engineers that nuclear power was the only solution to the "energy shortage." In the 1970s and '80s, solving this apparent energy shortage was our only mantra. At that time, there was no scientific data connecting fossil fuels to climate change.

In 1953, President Eisenhower initiated his "Atoms for Peace" program as a means to transform the atom from a scourge into a benefit for mankind and created grand illusions of at least 1,000 US atomic plants by the year 2005. However, well before the 1979 disaster at Three Mile Island, nuclear construction costs were skyrocketing and construction schedules were constantly slipping. The overzealous goal of 1,000 US atomic power reactors dwindled to about 110 finally completed reactors, while more than 120 others that had been on the drawing boards were canceled before producing a single watt of power.

By 1985, Eisenhower's dream of reclaiming the power of the atom for peaceful purposes had unraveled and had become a nightmare. Electric rates continued to skyrocket and ratepayers were left picking up the pieces from Atoms for Peace. Of the more than 230 attempts to construct atomic power reactors in the United States during the 20th century, only 99 reactors are still operating. Globally, a total of 438 atomic power reactors were still operating in 2015, according to the World Nuclear Association.

During the 20th century, the lights stayed on and the prediction of a dire energy shortage never materialized. Nuclear power's claims that it would be an economic nirvana "too cheap to meter" collapsed as well. Entering the 21st century, renewables began to appear more feasible, so the atomic power industry latched on to NASA's James Hansen's 1988 prognosis of the global buildup in CO2 resulting in global climate change as a new justification for existence. Armed with this new marketing ploy, nuclear power lobbyists flooded Capitol Hill looking for financing to fund the 21st century "nuclear renaissance."

Does the nuclear industry's latest claim that it is the world's salvation from increasing levels of CO2 hold up under scrutiny? No. The evidence clearly shows that building new nuclear power plants will make global warming worse.

A Growing Carbon Footprint

Before we look at the data, two concepts are im-

Photo: Julius Diller

portant to clarify. First, burning a fossil fuel like coal or oil emits CO2. The amount of CO2 emitted into the atmosphere each year is massive, measured in gigatons. A single gigaton is one thousand million tons of CO2 gas. The second concept is "ppm," or parts per million. As all this CO2 is dumped into the atmosphere, it is diluted by air. The concentration of CO2 atoms in air is measured in parts (molecules) of CO2 divided by one million air molecules, hence parts per million. In preindustrial times, normal background levels of global CO2 levels were around 280 ppm.

When the first large commercial nuclear power plant went on line, global emissions of CO2 were about 16 gigatons in 1970 and the concentration of CO2 in the air was about 320 ppm. Hansen and 350.org claim that the world's CO2 levels must stay below 350 ppm to avoid catastrophic climate change, a level that was exceeded late in the 1980s. By 2015, well after more than 438 heavily subsidized atomic power plants were constructed worldwide, global emissions from burning fossil fuels have reached 36 gigatons. The CO2 concentration in the atmosphere has already exceeded 400 ppm and is increasing by about 2 ppm yearly.

Nuclear power lobbyists and their marketing firms want us to believe that humankind's current CO2 atmospheric releases would have been much worse were it not for those 438 power plants now operating. How much worse? The World Nuclear Association industry trade group estimates that an additional 1.1 gigatons of CO2 would have been created in 2015 if natural gas plants supplied the electricity instead of those 438 nukes. Worldwide, all those nuclear power plants made only a 3 percent dent in yearly CO2 production. Put another way, each of the 438 individual nuclear plants contribute less than seven thousandths of one percent to CO2 reduction. That's hardly enough to justify claims that keeping your old local power plant running is necessary to

prevent the sea from rising.

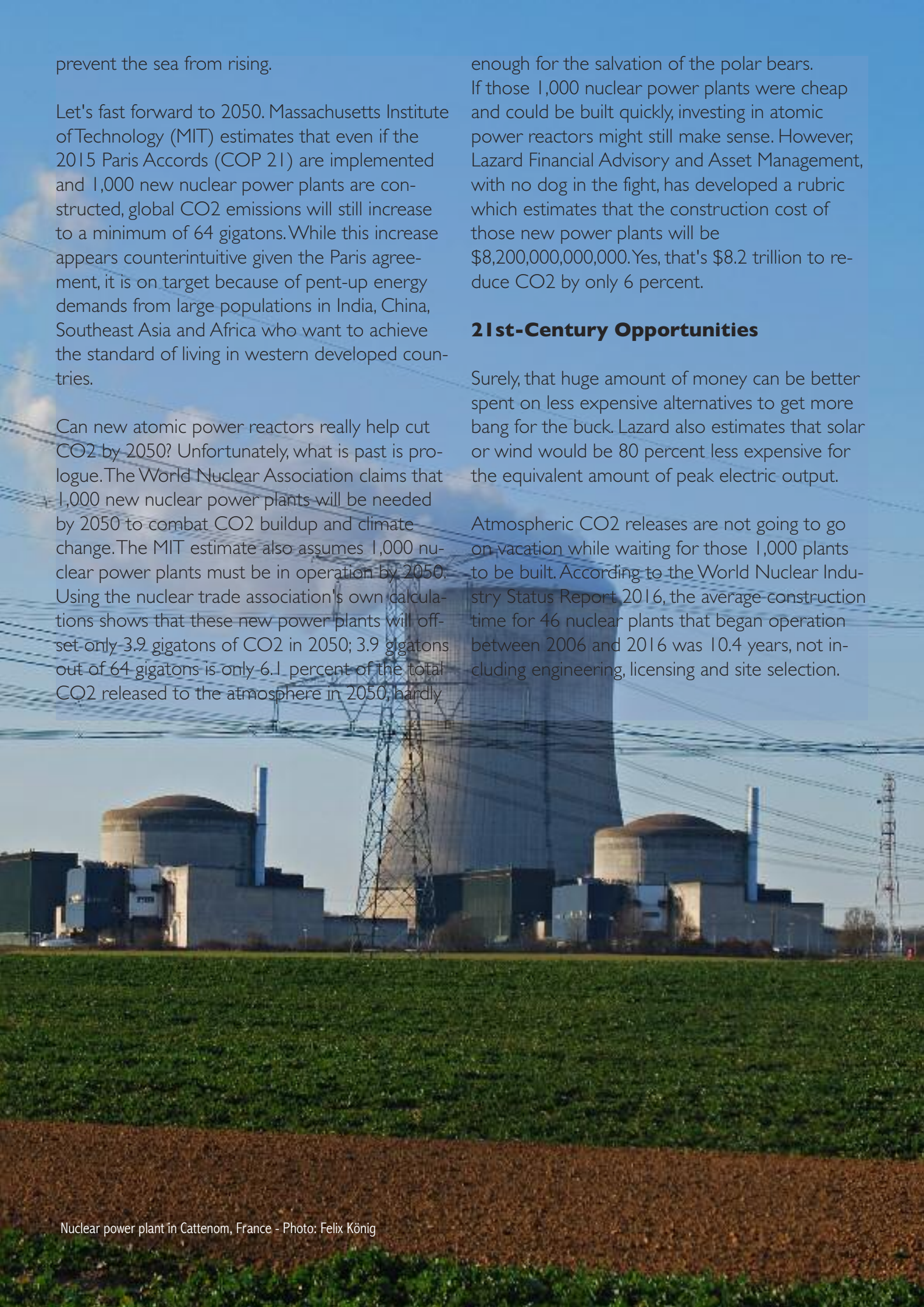
Let's fast forward to 2050. Massachusetts Institute of Technology (MIT) estimates that even if the 2015 Paris Accords (COP 21) are implemented and 1,000 new nuclear power plants are constructed, global CO2 emissions will still increase to a minimum of 64 gigatons. While this increase appears counterintuitive given the Paris agreement, it is on target because of pent-up energy demands from large populations in India, China, Southeast Asia and Africa who want to achieve the standard of living in western developed countries.

Can new atomic power reactors really help cut CO2 by 2050? Unfortunately, what is past is prologue. The World Nuclear Association claims that 1,000 new nuclear power plants will be needed by 2050 to combat CO2 buildup and climate change. The MIT estimate also assumes 1,000 nuclear power plants must be in operation by 2050. Using the nuclear trade association's own calculations shows that these new power plants will offset only 3.9 gigatons of CO2 in 2050; 3.9 gigatons out of 64 gigatons is only 6.1 percent of the total CO2 released to the atmosphere in 2050, hardly enough for the salvation of the polar bears.
If those 1,000 nuclear power plants were cheap and could be built quickly, investing in atomic power reactors might still make sense. However, Lazard Financial Advisory and Asset Management, with no dog in the fight, has developed a rubric which estimates that the construction cost of those new power plants will be $8,200,000,000,000. Yes, that's $8.2 trillion to reduce CO2 by only 6 percent.

21st-Century Opportunities

Surely, that huge amount of money can be better spent on less expensive alternatives to get more bang for the buck. Lazard also estimates that solar or wind would be 80 percent less expensive for the equivalent amount of peak electric output.

Atmospheric CO2 releases are not going to go on vacation while waiting for those 1,000 plants to be built. According to the World Nuclear Industry Status Report 2016, the average construction time for 46 nuclear plants that began operation between 2006 and 2016 was 10.4 years, not including engineering, licensing and site selection.



Nuclear power plant in Cattenom, France - Photo: Felix König

Contrast that with a two-year design and construction schedule for a typical industrial-scale solar power plant. Atmospheric CO2 levels will increase by almost 70 ppm during the 35 years it will take to construct those 1,000 new nuclear power plants, an increase that they will never eliminate -- if they ever operate.

Proponents of nuclear power claim that somehow, sometime in the future, atomic power reactor construction costs will be much lower and construction delays will be a thing of the past. There is no shortage of atomic reactor power ideas, according to the nuclear industry and its lobbyists, when government subsidies are used to fulfill their pipe dreams.

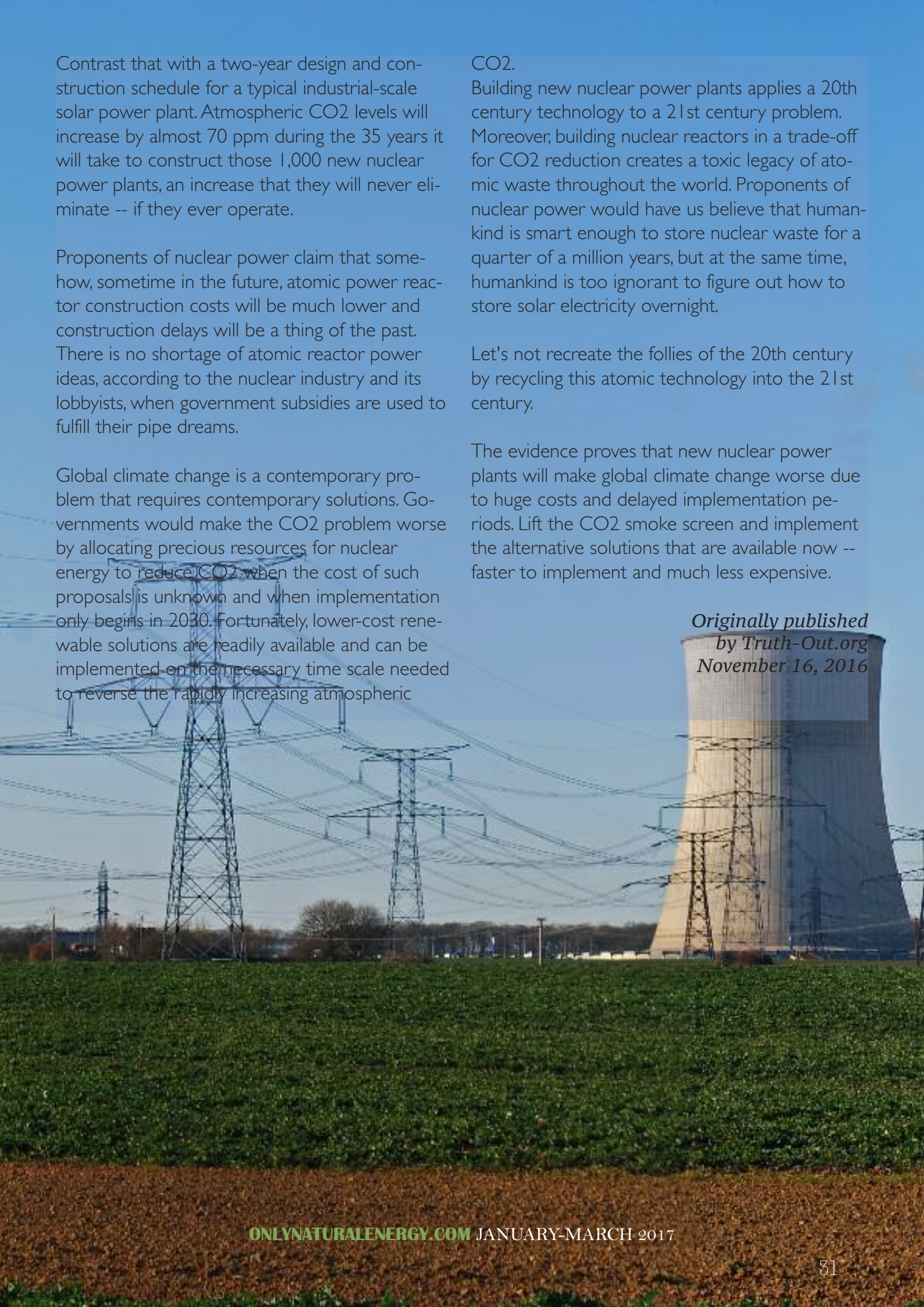
Global climate change is a contemporary problem that requires contemporary solutions. Governments would make the CO2 problem worse by allocating precious resources for nuclear energy to reduce CO2 when the cost of such proposals is unknown and when implementation only begins in 2030. Fortunately, lower-cost renewable solutions are readily available and can be implemented on the necessary time scale needed to reverse the rapidly increasing atmospheric CO2.

Building new nuclear power plants applies a 20th century technology to a 21st century problem. Moreover, building nuclear reactors in a trade-off for CO2 reduction creates a toxic legacy of atomic waste throughout the world. Proponents of nuclear power would have us believe that humankind is smart enough to store nuclear waste for a quarter of a million years, but at the same time, humankind is too ignorant to figure out how to store solar electricity overnight.

Let's not recreate the follies of the 20th century by recycling this atomic technology into the 21st century.

The evidence proves that new nuclear power plants will make global climate change worse due to huge costs and delayed implementation periods. Lift the CO2 smoke screen and implement the alternative solutions that are available now -- faster to implement and much less expensive.

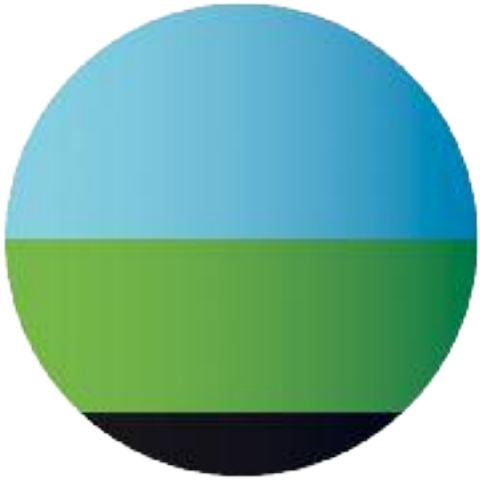
Originally published by Truth-Out.org November 16, 2016



WIELICZKA

810 steps underground. That's what it takes to reach the bottom of the wonderful Wieliczka Salt Mine, which was closed after over 900 years of operation in 1996.
Since then it has become one of Poland's greatest sources of pride. A true model of beauty and preservation. UNESCO has entered the Wieliczka Salt Mine in its World Heritage Register in 1978.
But what makes Wieliczka unique is the spirituality emaneted by the decorations made by the miners. They began carving out of salt statues and religious icons in the 13th century. After a while you forgot to be in a salt mine. When you reach the Chapel of Saint Kinga, the largest underground chapel in the world, you feel to be in a cathedral or in a 19th century royal ballroom on in both. ONE

SOTACARBO



SUSTAINABLE ENERGY
RESEARCH CENTRE

www.sotacarbo.it

www.onlynaturalenergy.com
info@onlynaturalenergy.com