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THE 4CP NEWSLETTER

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The news out of Congress could not be more discouraging. Chances of legislation to address carbon emissions are remote in a political environment so toxic that the Senate Majority Leader, Mitch McConnell (R, KY), has sent a letter to the nation's 50 state governors telling them not to comply with the Clean Power Plan, EPA's proposed rule to limit power plant emissions due to be finalized this summer.

But other countries, as well as state and local governments in the U.S., are becoming proving grounds and laboratories of innovation. In this issue we highlight some of the bold policies and programs taking place around the world that give reason for optimism.

In contrast to those stories of optimism, that we can transition to a world powered by clean energy, Dr. Bricks then provides an overview of geo-engineering. Despite the increasingly evident impacts of our giant chemistry experiment on Earth's climate and ecosystems, many exotic proposals exist for further experimentation in the name of "fixing" the problem.

ENERGY EMISSIONS GO FLAT

The International Energy Agency has reported that in 2014 CO2 emissions from the energy sector were flat, while the world economy continued to grow. China, for example, reduced its coal consumption by 2.9% helping to reduce emissions by 1% during a year of 7.4% economic growth. In the past 5 years, OECD countries reduced emissions by 4% while combined economies grew 7%.

It is routinely argued by the fossil fuel industry that fossil fuel consumption is synonymous with economic growth, and the only way for third world countries to lift people out of poverty is through growing use of fossils. While access to energy may be a key ingredient in lifting people out of poverty, this data shows that fossil fuel use and growth are not necessarily joined at the hip. Just as many developing countries are skipping land lines to go directly from no phones to cell phones, they could opt to skip dirty energy sources and go directly to renewables. **~SOURCE**

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COSTA RICA LEADING THE WAY

The Costa Rican Electricity Institute (ICE) announced on March 21st that it had generated all of its electricity from renewable sources for the first 75 days of 2015. Hydroelectric accounts for the largest portion of electric generation at 68%. Wind, solar, biomass and geothermal are also part of the energy mix. At the same time electricity rates have fallen by 12% and are predicted to fall further.

Costa Rica has a goal to become carbon-neutral by 2021; however, climate change impacts to rainfall patterns could affect hydroelectric capacity in the future. Planned development includes geothermal, wind and small-scale hydro projects. Costa Rican

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policies to preserve natural space have included paying landowners to plant trees and not to cut down old-growth forests. Forest cover has increased from 24% to 46% between 1985 and 2010. [~SOURCE](#)

FRANCE PASSES A GREEN ROOF LAW

In March, a French law was approved requiring rooftops on new buildings in commercial areas to be partially covered by either plants or solar panels. France is not a leader in solar energy, with 5+ GW of photovoltaic, or 1% of energy generation, compared to 40 GW in Germany. France gets 83% of its power from nuclear. [~SOURCE](#)

ENEL PLANS COAL PHASE OUT

Italian multinational energy company Enel recently announced that it plans to focus on becoming a carbon neutral business with investment in renewables, smart grids, efficiency and storage, while phasing out of coal. Enel has already achieved carbon reduction goals established for 2020 and aims to achieve carbon neutrality before 2050. [~SOURCE](#)

INDIA SETS AMBITIOUS RENEWABLE GOALS

In February, the Finance Minister of India announced a goal to quadruple its renewable electricity generation over the next 7 years using a mix of solar, wind, hydro and biomass. India currently has about 34 GW of installed capacity.

The targeted level of growth in renewable generation is considered extremely ambitious compared to current rates of installation; however, about a third of India's population lacks electricity, and the government wants to address that gap using renewables by 2022, the 75th anniversary of India's independence. [~SOURCE](#)

FEDERAL GOVERNMENT REDUCES ENERGY USE

The U.S. Government is one of the largest consumers of energy in the world, but consumption has been declining for the past 40 years, primarily as a result of reductions in use of jet fuel and less energy used by federal buildings and facilities. The Department of Energy Federal Energy Management Program (FEMP) has created a [website](#) where the public can view energy and water management goals and usage for the Fiscal Year ending June 2014. FEMP helps agencies to achieve their goals through energy performance contracting, training

federal employees and via technical assistance.

[~SOURCE](#)

PRESIDENT ORDERS MORE REDUCTIONS

On March 19th, President Obama signed an executive order directing federal agencies to reduce their carbon emissions by 40% below 2008 levels over 10 years. Specific directives to agencies include:

- procuring a quarter of total energy from clean sources;
- cutting energy use in buildings 2.5 percent per year;
- purchasing more plug-in hybrids for federal fleets and reducing per-mile greenhouse gas emissions by 30 percent;
- and reducing water use in federal buildings 2 percent per year.

Additional emission reduction commitments have been requested from large government contractors such as GE and IBM. [~SOURCE](#)

CORNELL PLAN TO GO CARBON NEUTRAL

In January, Cornell University released a report prepared by its Climate Action Acceleration Working Group detailing a plan for the University to become carbon neutral by 2035 – 15 years earlier than a previous goal of 2050. The university plans to use carbon fees as part of the strategy. Market prices for fossil fuels are artificially cheap because they do not cover external costs such as health impacts of pollution and environmental damage. By adding carbon charges, to utility bills for example, revenue is generated that is invested back into the emissions reduction program, but more importantly, it creates a more accurate picture of the economics of alternative sources compared to fossils. The charge would start around \$20-\$30 per ton of carbon emissions.

Utilities are not the only area that will be subject to carbon pricing. Other carbon intensive targets include university-related travel and employee commuting. A capital fundraising campaign is planned over 10 - 20 years to provide adequate funds for the climate action program.

[~SOURCE](#)

Photo courtesy climate.nasa.gov



GEO-ENGINEERING - AN OVERVIEW

The average temperature is already up 0.8 degrees Celsius and scientists tell us 80% of the identified fossil fuel reserves must stay in the ground to avoid a 2 degree centigrade increase, after which natural systems may begin to fail catastrophically. Can anything be done to counter Earth's temperature rise? There are only two control knobs: CO₂ levels turn it up or down; and reflecting more of the sun's radiation back into space (known as albedo) turns it down.

Can 'excess' CO₂ be removed from the air? Can we 'dial down' the sunlight?

The U.S. is enamored with these big, expensive, high-tech adventures. Does any of it make sense? The National Academy of Sciences (NAS) thinks not, at least not in the short term – which is when we need it.

The NAS Committee on Geo-engineering Climate just released two reports on Climate Intervention. The first is Carbon Dioxide Removal and Sequestration, and the second is Reflecting Sunlight to Cool Earth.

In addition to reporting on the current state of the two different approaches, NAS recommended a name change from 'Geo-engineering' to 'Climate Intervention.' They reason that 'Geo' refers to the whole earth, whereas global warming and climate change are surface phenomena. And 'engineering' conveys 'a greater level of precision and control' over the climate that humans do not have now, and most likely never will.

Bottom line from the NAS: there are no easy, low-

risk solutions; much more research is required; and socio-political and legal issues abound.

Most of all the reports say: DON'T QUIT MITIGATION AND ADAPTION. Mitigation, i.e. reducing emissions, is 'technologically well within our grasp... lowest risk and most efficacious path.' Our notable lack of success is socio-political, not technological. Without mitigation we are faced with ongoing, more expensive adaption, which will only get worse as emissions and climate disruption increase.

APPROACH 1: CARBON DIOXIDE REMOVAL

The Committee evaluated five methods of CO₂ removal.

1) Land Management: reforestation and afforestation (developing forest in areas that have been deforested for more than 50 years). These techniques are well established, relatively low cost, and should be a part of the solution, but are only capable of solving a portion of the problem. Reducing deforestation is much more effective than afforestation or reforestation; land use has to be balanced against food production.

2) Accelerated Weathering: speed up the natural chemical processes that turn CO₂ into solid carbonates by spreading specific minerals on the land or sea that hasten the transition. These processes normally take thousands to

hundreds of thousands of years, but the amount of minerals required to speed the processes up is beyond production possibility. This is a purely theoretical approach.

3) Ocean Iron Fertilization: introduce iron to the upper ocean to stimulate phytoplankton, which in turn absorbs carbon dioxide. A number of experiments have demonstrated that phytoplankton blooms can be stimulated by iron seeding, but have not demonstrated CO₂ sequestration or answered concerns about unintended ecological effects.

4) Bioenergy with Carbon Capture and Sequestration (BECCS): this approach uses biomass energy sources, such as wood, but must include CCS to make it carbon neutral. Pilot CCS projects must be scaled up by a factor of 1000 to make this approach realistically useful. It also requires significant land area to generate the biomass, in direct competition with crops and pasture.

5) Direct Air Capture: chemical scrubbing of the atmosphere to remove a low concentration material, in this case CO₂. This is currently a process used in places like submarines. No large scale projects have been attempted, nor have any scrubbing efforts included compression and sequestration. An interesting indirect probable consequence is that atmospheric scrubbing would eventually cause outgassing of CO₂ from the oceans back into the air.

APPROACH 2 - MODIFYING EARTH'S ALBEDO (REFLECTIVITY)

We know volcano particulates can temporarily lower temperature.

In 1784 Ben Franklin speculated that a 'perpetual fog' in Europe was due to volcanic eruptions near Iceland. We know that the Tambora eruption in 1815 caused a year without summer, with loss of crops and lives. The effects of Mt. Pinatubo in 1992 are well documented.

Can we increase reflectance by dispersing aerosols to dial down temperatures and resulting climate disruption? The short answer is yes, we do that now – unintentionally. Human aerosols currently offset ~30% of the effects of CO₂. This presents a well-known Faustian dilemma – remove human aerosols to improve human health, and the temperature and climate disruptions go up.

What about intentionally? What could possibly go

wrong? The NAS says a lot. Besides just lowering the temperature, there are other significant consequences to consider: quantities and distribution of released materials; regional changes in precipitation and temperature distributions; atmospheric and oceanic circulation patterns; stratospheric temperature, chemistry and dynamics (potential ozone depletion); and changed sunlight characteristics impacting plant and animal life.

Aerosols must be continually released, because gravity causes particulates to settle out in a few days to a year or two, just as volcanic effects only last for short periods.

In addition, we cannot reduce sunlight alone; we must also continue with CO₂ emissions reduction. If we continue generating CO₂, increasing amounts of aerosols would have to be added each year, and ocean acidification would continue to increase, further jeopardizing all ocean ecological systems.

The NAS also points out that we do not have the observational and measuring infrastructure to monitor such a process. They also raise serious socio-political and legal issues; e.g., if we change the albedo, and some regions gets a redistribution of precipitation causing floods, who is responsible for the damage?

Other unrealistic possibilities have been suggested, such as an array of satellite reflectors. Do the math. Earth has a diameter of 8000 miles. Could we really create and maintain an array appropriate to that size?

~SOURCE

RESTRUCTURING THE UTILITY BUSINESS MODEL

The state of New York has set a goal to reduce GHG emissions 80% below 1990 levels by 2050. It is already the 9th ranked state for installed solar.

The business model for electric utilities has always been one of continual growth, with strong incentives built in to sell more power and build more power plants. A challenge for the clean energy economy is to create a business model with incentives to support local distributed sources, such as excess rooftop solar generation during the day, while continuing to provide reliable power during periods when renewable sources are insufficient.

New York is leading the way in creating a new utility business model. In 2007 it changed incentives from the amount of power sold, to the number

of customers served. This helped remove the motivation many U.S. utilities have to actively fight against rooftop solar and energy efficiency efforts, but it did not remove the incentive to keep building new power plants. More recent changes have established a rate structure where revenue is based on how efficiently the utility distributes power. A structure that rewards utilities for effectively moving power regardless of source, aligns utilities' interests with the state's climate goals. Many consider this a potential model for other states to follow. ~SOURCE

FIRST U.S. OFFSHORE WIND FARM COMPLETES FINANCING

Deepwater Wind has recently completed financing on the Block Island Wind Farm, the first U.S. offshore wind project with 5 turbines already under construction that will provide 30 megawatts of power and is expected to come online in late 2016 ~SOURCE

FORT COLLINS PLANS CARBON NEUTRALITY

Fort Collins, Colorado has adopted a plan to reduce greenhouse gas emissions 80% by 2030 and 100% by 2050. This ambitious plan was developed through combined efforts over several years by local government, businesses, Colorado State University, the municipal utility and environmental groups, with facilitation and support from the Rocky Mountain Institute. ~SOURCE

CARBON NEGATIVE DATA CENTER

Data centers use huge amounts of energy and there are more than 3 million of them around the world. A new one being built in Sweden called EcoDataCenter, says it will be the first carbon negative data center – generating more energy in the course of a year than it uses. The first of three buildings is planned for completion in early 2016. The local grid supplying electricity to EcoDataCenter operates on renewable-only sources. The cold climate in the area will enable cooling via an

open air system. Green roofs and other techniques contribute to the carbon calculation.

A number of companies with large data center footprints such as Google and Microsoft are also working to lower their footprints, with some already claiming to be carbon neutral.

~SOURCE

EVENTS OF NOTE

4CP SPEAKER SERIES MEETINGS:

Our usual room at the West Chester Borough Building is not available for some of the months in 2015. Please watch your email for meeting announcement details.

May 13 2015 Speaker Series – Join us in a private room at Barnaby's, 15 S. High Street, West Chester.

Risky Business: The Corporate Response to Climate Change will be presented by David R. Ross, Associate Professor of Economics, Bryn Mawr College. No manager concerned with the long-term viability of a major corporation can afford to be a climate-change denier. This talk will consider some of the major channels by which senior management is being compelled to consider the consequences of, and necessity for, reducing carbon emissions.

June 2015 Speaker Series – Dean Carlson from Wyebrook Farms and Wes Bruckno, Chester County's Sustainability Coordinator will present a program on sustainable animal farming and land use in Chester County.

Apr 2015 Speaker Series (Recap):

An Evening with Judy Wicks – 4CP teamed up with West Chester University for a presentation by Judy Wicks on Local Living Economies and Responsible Business. A book signing of Judy's award winning book, *Good Morning, Beautiful Business*, followed the presentation.



Mar 2015 Speaker Series (Recap): John Nagle, a nuclear energy consultant, gave an overview of the current state of nuclear power technology as well as some of the post Fukushima changes in emergency preparedness. A lot of questions were asked both during and after the presentation. 4CP is following up with Mr. Nagle for additional information.