

Episode 56EB May 8, 2023. The “Chasing Carbon Zero with iron air batteries ” and “Apartment-Building-wide Heat Humps in Brooklyn” issue.

Residents Against Wood Smoke Emission Particulates (see RAWSEPresidents.wordpress.com and Scroll Down for PDFs of articles with U R L's to search on. On RAWSEPresidents.wordpress.com are links to 30 minute Youtube videos, and podcasts on Spotify, podcasts.google.com, Amazon Music Prime (free for Prime subscribers), Cast Box, and Pocket Cast (Pocket Cast is only free on the phone App. The phone App works on Apple phones).

United States

RAWSEP View: The most direct way to slash carbon emissions is to stop practices that emit carbon, such as residential wood burning. Residential wood burning, and biomass burning as sources of carbon were not mentioned in this documentary.

<https://www.pbs.org/wgbh/nova/video/chasing-carbon-zero/>

Chasing Carbon Zero, PBS Documentary on Nova, Public Broadcasting System (PBS)

April 26, 2023

The U.S. recently set an ambitious climate change goal: zero carbon emissions by 2050. And to achieve that, slash emissions in half by 2030. Is it possible? And what kind of technology would it take? Meet scientists and engineers who are convinced we can achieve carbon zero in time to avoid the biggest impacts of climate change. (Premiered April 26, 2023)

RAWSEP View; Three new technologies are among many described in this documentary. One technology is Enhanced Geothermal Systems (or E G S). Another is a Rust Battery (also known as an Iron Air Battery) for energy storage when there are gaps in solar and wind energy generation, because of weather variations or other reasons. A third is Heat Pumps deployed for apartment buildings. The documentary also criticizes natural gas used for cooking, instead of using cleaner electric convection ranges and ovens.

1)For E G S: The idea: drill two deep wells into hot rock. If the rock is not naturally permeable, fracture it in between to create an artificial reservoir and then pump water into the cracks. It returns to the surface hot enough to generate electricity.

2) For the Iron Air Battery: The battery contains an iron metal anode and an air-breathing cathode. They sit in an electrolyte solution, a permeable separator between them. When the iron is exposed to the oxygen in air, it triggers a chemical process called oxidation. We call this rust. That oxidation process releases electrons that are separated and sent to the grid electricity when demand exceeds renewable production. When there is excess power from wind or solar, the process is reversed: electrons flow in, releasing the oxygen, causing the iron to “un-rust.” We put in electricity. We provide electrons to that iron electrode and turn it back into iron metal. That’s why we refer to the iron air battery as the rusting and un-rusting of iron, carried out in a very intentional and deliberate way.

3) Heat Pumps for Apartment Buildings. Heat pumps work not by creating heat, but by moving it from one place to another. Inside, there’s a fluid, called refrigerant, that boils at 40-degrees-below-zero Fahrenheit. As long as it is warmer than minus 40 outside, the refrigerant picks up heat from air as it becomes a gas. It flows into an electric compressor, where it is put under pressure, adding more warmth to the gas. The warm gas flows into the room unit. As it heats the space, the gas itself condenses back into a liquid. Now, the liquid travels back out, flowing through a valve that lowers the pressure and thus the temperature. And the cycle starts all over again. So, in the winter, it can pump heat inside.

Chasing Carbon Zero PBS Airdate: April 26, 2023 Excerpts edited by RAWSEP for brevity and clarity and relationship to Residents Against Wood Smoke Emission Particulates.

1) Enhanced Geothermal Systems. Geothermal is the residual heat left over from the formation of the planet and from the decay of radioactive particles deep below the Earth’s surface. At a geothermal electric power plant, they drill down far enough to reach very hot water, a source of steam to generate power. Another well injects the water back into the ground. Historically, geothermal power has only been practical in seismically active places, where fault lines allow lots of hot water to rise relatively close to the surface. Elsewhere, adequate heat is found at much greater depth. So that’s going down 10,000 feet? Researchers are developing something called “enhanced geothermal systems,” or E.G.S. The idea: drill two deep wells into hot rock. If the rock is not naturally permeable, fracture it in between to create an artificial reservoir and then pump water into the cracks. It returns to the surface hot enough to generate electricity.

2) Rust Batteries. How best to give electricity some shelf life? Batteries. The challenge is making them big enough and cheap enough to work at scale. Researchers are working to eliminate some of the gaps in energy availability when the weather isn't right for solar or wind. What you see are gaps of several days. We're now able to tackle those 100-hour intervals. Just a few years ago this was considered impossible. For the past 30 years, researchers have focused on lithium ion battery technology, which are perfect for laptops, phones, and cars, but they are not well-suited for multiday storage on the grid. To compete with a natural gas power plant, a hundred-hour battery pack must cost no more than \$20 per kilowatt hour. If we take a lithium ion battery pack, the cost of that pack today is about \$200 per kilowatt hour. In order to do multiday storage, we have to have batteries that cost about 1/10 or less than that of today's lithium ion battery packs. Researchers found a novel way to harness the energy released when air interacts with iron. It's the power of rust. That's right, rust. It's called an iron air battery. Iron air batteries were first studied back in the '60s. At that time, no one saw a practical application for a very cheap, very heavy battery. The grid may be the problem this solution was waiting for. Air is still free, and iron is one of the most widely produced, lowest cost materials in the world. So, the iron air battery is the lowest cost rechargeable battery chemistry that we know of today. The battery contains an iron metal anode and an air-breathing cathode. They sit in an electrolyte solution, a permeable separator between them. When the iron is exposed to the oxygen in air, it triggers a chemical process called oxidation. We call this rust. That oxidation process releases electrons that are separated and sent to the grid electricity when demand exceeds renewable production. When there is excess power from wind or solar, the process is reversed: electrons flow in, releasing the oxygen, causing the iron to "un-rust." We put in electricity. We provide electrons to that iron electrode and turn it back into iron metal. That's why we refer to the iron air battery as the rusting and un-rusting of iron, carried out in a very intentional and deliberate way. Form Energy's iron air batteries are working just fine in the lab, but they haven't been tried on the grid, yet. We need to scale up the manufacturing of this and really build the next generation of larger systems and deploy them. And that really brings us to utility-scale systems. They plan on building their rust batteries in the rust belt, where the infrastructure and transportation network are already tailor-made for it. The first plant will be built beside the Ohio River in Weirton, West Virginia, seven-hundred-fifty good-paying jobs promised in a place of broken promises. Form Energy would like to create real manufacturing jobs in parts of the country that have seen a great loss of jobs from, you know, traditional industries and may not have seen themselves as part of this green revolution. So, the road to zero will pass through an old steel town in the heart of coal country. Now there's some "irony." Batteries are just one storage idea.

3) Heat pumps for Apartment Buildings. A building owner in Brooklyn, New York, says that we built an infrastructure based on oil and gas, burning things. That's what we're used to. But it doesn't have to be that way. An owner of an early-20th-century building in Crown Heights, Brooklyn says that when it was built, they burned coal in a boiler to stay warm. Now there's a heat pump, for each of the 14 units. Heat pumps work not by creating heat, but by moving it from one place to another. Inside, there's a fluid, called refrigerant, that boils at 40-degrees-below-zero Fahrenheit. As long as it is warmer than minus 40 outside, the refrigerant picks up heat from air as it becomes a gas. It flows into an electric compressor, where it is put under pressure, adding more warmth to the gas. The warm gas flows into the room unit. As it heats the space, the gas itself condenses back into a liquid. Now, the liquid travels back out, flowing through a valve that lowers the pressure and thus the temperature. And the cycle starts all over again. So, in the winter, it can pump heat inside. And in summer? The process is reversed to pump heat outside, cooling the room. In Lincoln's building, each unit has its own wireless thermostat. The apartment heat pump system is easy enough for his son to operate. But heat pumps are not cheap. And for us to reach net zero, nearly every building will need to make the transition. So, how can this technology become accessible to everyone? That is precisely the goal for this Brooklyn apartment owner. He is the C.E.O. of a startup called BlocPower which wants to turn buildings into Teslas. Founded in 2014, BlocPower is making it more affordable for landlords to make the switch. The company has spearheaded 2,000 conversions so far. We focus on buildings because we don't need any more innovation. You're going to save money, because the payment that you make to us over 15 years is going to be less than what you would pay to the oil company or to the gas company as an alternative. The arithmetic relies on incentives from the government and assumptions that the cost of heat pump manufacturing and installation will decline. There isn't going to be a green revolution in America without working class and poor people, so there must be a financial solution that includes them. In New York City, buildings account for around 70 percent of greenhouse gas emissions, if you include electricity. The city is aiming for carbon neutrality by 2050. And there are several laws designed to make that happen. One eliminates the burning of fossil fuels in all new buildings by 2027, but there is an important asterisk: the city's commercial kitchens are exempt.

Michigan, Bay County

2 homes burn in Bay County Blaze - MLive.com MLive.com

Prieur said the cause of the fire remains under investigation, but a wood-burning stove in the garage was the possible source.

North Carolina

RAWSEP View: A natural gas generator for backup of electricity generated by wind, solar and geothermal, can be useful during a power blackout, and there are some government subsidies. Wood burning produces 450 times more particulates, PM2.5, than natural gas burning. PM2.5 is particulate matter of 2.5 micrometer size, the perfect size to infiltrate the human lung, causing a cascade of human health problems.

<https://www.nytimes.com/2023/05/06/business/energy-environment/backup-power-generators-climate-change.html>

Backup Power Generators.

New York Times

May 8, 2023.

Excerpts edited by RAWSEP for brevity and clarity and relationship to Residents Against Wood Smoke Emission Particulates.

A statistician from Chapel Hill, North Carolina, slashed her energy consumption a few years ago. She installed a geothermal system, which uses the earth's steady temperature to help heat and cool her home, replacing an aging system that came with the house. She later added 35 solar panels on her roof and two Tesla home batteries, which can provide enough power to meet most of her needs, including charging an electric Volkswagen Golf. "The neighborhood has lost power a whole lot, but I have not," the statistician said. She spent about \$52,000 on her solar panels and batteries, but \$21,600 of that cost was defrayed by rebates and tax credits. The remainder she was responsible for herself was \$30,400. Ms. Dudley estimates that her utility bills are about \$2,300 a year lower because of that investment and her geothermal system. If continued at the same rate, the system would pay for itself in 13 years. Natural gas generator companies believe that growing electricity usage and the threat of outages

Oregon, Coos Bay

[Does Coos Bay need a more restrictive smoking ordinance? | | theworldlink.com](#)

The World Newspaper

Miracle Ear - Health Notification. Miracle Ear - Health Notification. Generac. Generac. Margaritas. Margaritas. Kozy Wood. Kozy Wood.

South Dakota, Sioux Falls

[Frederick family loses home, pets and rescue animals in April fire - Argus Leader](#)

Argus Leader

... him from getting inside, and he burned his hand and ear in the process. ... features as well as a wood-burning stove and a well for water.

Vermont

RAWSEP View: New technology described in the PBS documentary "Chasing Carbon Zero" (above) renders this Vermont writer's reasons for wood burning for heat obsolete. Rust Batteries (also known as Iron Air Batteries) can be used for energy storage for up to 100 hours backup at a time, when there are gaps in solar and wind energy generation because of weather variations or other reasons. Enhanced Geothermal Systems might be usable in Vermont, which are reliable in all weather. Heat Pumps have been used successfully on a large scale in over 2,000 conversions since 2014 in Brooklyn, New York, which experiences cold winters. Heat pumps work at down to negative 40 degrees Fahrenheit. Why does a person who has a master's level in energy auditing, the author of this opinion, want Vermont to be left behind in utilizing the state of the art in clean, non-polluting home heating?

Fear of the new or profit from old, bad ways can stall progress on turning to the clean heating alternatives that are available now and getting lower and lower in cost than wood burning every day. The clean alternatives are at best wind, solar and geothermal power (Enhanced Geothermal Systems which work at lower ground temperatures) with backup of 100 hour at a time battery storage (Rust Batteries) which are also low cost, and a new electric grid extending to all rural communities so that the most low-income in Vermont can benefit and save money in the new energy economy. People in rural areas should not be left behind, and suffer ill health from exposure to the pollution of residential wood burning.

The arguments for using wood heat are tired and disproven long ago. Claims are made about wood heat that are unsubstantiated, but only an opinion. Claims about failures of systems that have instead, proven scientifically that they work, are sad excuses to remain looking to the past, to a failed method of home heating and a failed method of industrial heating, wood and biomass burning, which produce 450 times the particulates as natural gas burning, and produce more particulates and CO2 than coal burning. The health of near neighbors of residential wood burners is at stake whenever someone burns wood residentially. Wood smoke is 90% PM2.5, particulate matter of 2.5 micrometer size, the perfect size to infiltrate the human lung, setting off a cascade of human health problems and early deaths. That health cost is not discussed in this opinion piece.

[Norm Etkin: The importance of wood fuels in the clean heat bill - VTDigger](#)

VTDigger

However, its traditional use as a fuel in Vermont, coupled with the advances in wood-burning systems for cordwood, pellets and chips, ...

[Opinion](#)

Norm Etkin: The importance of wood fuels in the clean heat bill

May 8, 2023.

Excerpts edited by RAWSEP for brevity and clarity and relationship to Residents Against Wood Smoke Emission Particulates.

What's missing from the public discourse around the clean heat bill is **how essential and beneficial the use of wood fuels in Vermont is.**

The bill, [S.5, also known as the Affordable Heat Act](#), is how Vermont will be seeking to eliminate our reliance on fossil fuels to heat our buildings while reducing **costs**, providing resiliency, and making sure that the needs of **lower income** Vermonters are addressed.

But why is(wood) "essential" to meeting the goals of the Act?

One key way of providing that heat is with **cold-climate heat pumps**. **During very cold temperatures, they do not perform better than standard baseboard electric heat or plug-in electric heaters.**

(There is) a **very serious problem when there is widespread adoption of cold-climate (electric) heat pumps.** Currently (backup generators) are primarily fired by **oil, natural gas, and nuclear resources.**

Peaks could be ameliorated using wood fuels.

Battery storage may help for a short outage but is useless for an extended one.

Use of wood fuels is (a) **traditional use as a fuel** in Vermont, and (this benefit) is recognized in the Affordable Heat Act.

Canada, Alberta

<https://www.nytimes.com/2023/05/08/world/canada/canada-alberta-wildfires.html>

New York Times

Wildfires Burn Nearly 1 Million Acres in Western Canada.

Light rain and cooler temperatures brought much-needed relief over the weekend to Alberta, where nearly 30,000 residents have been forced to evacuate. The Canadian province of Alberta declared a state of emergency on Saturday as more than 110 wildfires burned across it, but weather conditions were improving for firefighting efforts. Credit...Alberta

Wildfire, via Reuters

May 8, 2023.

Excerpts edited by RAWSEP for brevity and clarity and relationship to Residents Against Wood Smoke Emission Particulates.

A shift in weather conditions brought much-needed relief to firefighters in Western Canada, where around 964,000 acres have burned since wildfires started more than a week ago, destroying dozens of structures and forcing nearly 30,000 residents of Alberta to evacuate.

Canada, British Columbia

Carrie on Facebook

May 1 to May 7, 2023

bccdc.ca

[B.C. SPEAK Survey](#)

[The SPEAK Survey is now open.](#)

Where are the questions about the environmental impacts of pollution such as smoke, dust, and industrial emissions and our health? With over 100 chimneys on garages and homes in this valley we struggle to breathe any clean air all winter long. And right in the middle of our valley is an elementary school where children breathe the smoke all day long. There has been an increase in new wood stoves lately and that is causing even greater health concerns for our seniors and children. Unfortunately, this health care survey asks no questions about the environmental impacts of pollution in our area. Totally overlooking such impacts is not acceptable since air quality and safe drinking water is vital to good health. Constant exposure to wood smoke, debris from fire smoke, industrial pollution and dust pollution is a major cause of increased hospital visits. I did the survey hoping to add my comments at the end of it, but there was way to do so. Not satisfied with this survey. Prescribed burns are NOT healthy for people. It can cause very unhealthy air quality which will last for weeks after the burns. People living with respiratory diseases such as asthma, COPD, emphysema, or heart disease suffer from smoke inhalation. Chronic exposure to smoke is known to cause cancer in fire fighters, the people doing the burns and others living in the area of the burns. Other countries have turned away from controlled burns because of the poor air quality, increased hospitalizations, and the risk of “controlled” burns turning into large wildfires. Chronic exposure to irritants such as wood smoke can increase the risk for developing asthma in children. Smoke can trigger deadly asthma attacks for those living with respiratory illness. It is not acceptable to burn things in any community where people with smoke allergies, asthma, COPD, and heart conditions live. Children exposed to constant wood smoke experience more negative health conditions than those living in clean air. Don't burn anything in our communities.

fm4.orf.at

[A Burning Issue Turns Toxic](#)

[Burning wood to heat homes creates hundreds times more dangerous fine particulate pollution than gas central heating. An uncomfortable truth.](#)

Canada, Northwest Territories

[Wildfire near Fort Smith, N.W.T., almost contained, says territory - Yahoo News Canada](#)

Yahoo News Canada

He said crews are also intentionally burning wood, grass and other fuel ... though smoke and fire will be visible from the town and the highway.

[Fire crews making progress on wildfire near Fort Smith - NNSL Media](#)

NNSL Media

... burning wood, grass and other fuel to ensure the fire doesn't grow. ... Smoke and flames were visible within town limits, but the town was ..

Canada, British Columbia, Kamloops

[Wildfire crews to train Wednesday south of Kamloops; BCWS says smoke will be visible - Castanet](#)

Castanet

The exercise will consist of burning 15 piles of wood debris close to Stake Lake, about 15 kilometres south of the city on Highway 5.

Australia

<https://www.theburningissue.org/?fbclid=IwAR17meSvar9mbw8bnl8jdDDIUJIMKNwv4mNoE8MexXfI5-lmVAQKmhgWXg0>

The Burning Issue dot org

[1. Burning is based on latest science - WRONG](#)

The 2,000 sq km per annum 'indicative target' for prescribed burns is based on a 2009 study which concluded that this would reduce the...

[2. Bush must be burnt to protect us - WRONG](#)

After burning, or other disturbances such as logging, the forest responds with dense understory growth, increasing the 'fuel load' and...

[3. Burns are cool fires - WRONG](#)

The over 75% of prescribed burns are done by dropping flammable materials (incendiaries) from the air every 100 - 200 m over large areas....

[4. Burns don't harm wildlife - WRONG](#)

WARNING: GRAPHIC IMAGERY BELOW Many animals can't escape the large areas being burnt rapidly, particularly when the fires are lit from...

[5. Burns are like Indigenous practices - WRONG](#)

Traditional burning was nuanced, small scale, selective and seasonal and protected key natural assets. This was 'right way burning' which...

[6. Burns are done carefully to protect sensitive areas - WRONG](#)

While the prescribed burning program was designed not to burn high value environmental assets (such as wetlands, streams, granite rocks...

[7. Burns are a natural part of the ecosystem - WRONG](#)

Burns are done at much higher frequency and in different seasons to the natural fire cycle. The south-west of Australia evolved with...

[8. Burning is the only way to protect people and property - WRONG](#)

Existing technology developed in Australia is proven to detect all fires within 10 minutes of ignition, even fires the size of a small...

[9. Smoke from burning is necessary to save lives - WRONG](#)

Since 2000, it is estimated that at least 20 people have died from poor air quality due to manmade burns, with hundreds of emergency...

[10. Burns are done to reduce 'fuel load' - WRONG](#)

United Kingdom

U K, Yorkshire, Sheffield

[Sheffield house fire live as blaze covers neighbourhood in smoke - YorkshireLive](#)

Yorkshire Live

The blaze is occurring on Blackstock Road, near Lees Hall Wood, today (May 7) before 9.30am, according to a report online.

Asia China

[Chinese Medical Journal Review Warns of Air Pollution Health Hazards | Mirage News](#)

Mirage News

A key air pollutant linked to health risks is ambient fine particulate matter (PM2.5), which consists of minute particles, sized less than or ...

PM2.5 and Health Effects (wood smoke is 90% PM2.5)

[Worried About Your Local Air Quality? Track It With These Apps | PCMag](#)

PCMag

Load up your location and tap Air Quality to check it out. To track personal exposure to anything beyond PM 2.5, you need to pay for the premium ...