Environment

Centre County polluters: The next generation

by Lucy Green

The 2010 federal deadline for remediating the Susquehanna River basin has left Pennsylvania residents, the state government and environmentalists with a very big mess to clean up—a mess they didn't make.

The bad news is that acid mine drainage and coal waste left by long-gone companies aren't the last of Pennsylvania's industrial pollution problems—nor are they the least.

In 2006, more than 101 million pounds of toxic chemicals were released in Pennsylvania, according to the Environmental Protection Agency's most recently available Toxics Release Inventory (TRI), which lists the amounts of toxic chemicals that companies handle, store and release.

Centre County companies released 1.1 million pounds of those chemicals, which include ammonia, lead and hydrochloric acid. The vast majority of them, deemed hazardous by the EPA, were discharged into the air either through point sources, like stacks, or fugitive emissions that escaped into the air during the industrial process.

Donna Herron, a spokeswoman for the EPA, emphasized that the TRI is not a list of violators.

"For the most part [companies are] permitted to do what they're doing," Herron said. "I'm not saying people shouldn't be concerned about it, but just because it's going in the air doesn't mean it's going in the air illegally."

She said the self-reporting is meant to inform the public.

"The whole purpose of [the TRI] is that people in the community know what's happening in their community and in an emergency so planners can prepare for any possible crisis," Herron explained.

The picture the TRI paints is an incomplete one, though, because only companies in certain industries (like manufacturing and coal mining) that produce specified amounts of particular chemicals (about 650 of them) have to report their toxic releases to the EPA.

There is state-level reporting as well. Pennsylvania's Department of Environmental Protection (DEP) requires companies to report releases of a number of pollutants not covered by the TRI in annual Air Information Management (AIM) reports.

On its online Environment, Facility, Application, Compliance Tracking System (E-FACTS) database, the DEP says Centre County emissions in 2007 included about 8.6 million pounds of sulfur oxides, about 2.8 million pounds of nitrogen oxides and about 1.9 million pounds of carbon monoxide, to name a few.

E-FACTS does not list the detrimental effects of these chemicals or the concentrations at which they become harmful, and the EPA's Web site provides only slightly more clarity.

The Web site states that sulfur dioxide, a type of sulfur oxide, can cause temporary breathing difficulty and respiratory illness. It also accelerates the deterioration of buildings, statues and monuments, and bonds with nitrogen oxides to form acid rain.

Nitrogen oxides can trigger serious respiratory problems by combining with volatile organic compounds to form ground level ozone. Nitrogen oxides also react with ammonia and moisture to create nitric acid, which can damage lung tissue, aggravate existing heart disease and worsen bronchitis and emphysema.

Like nitrogen oxides, carbon monoxide can form ground level ozone. The EPA says even low levels of carbon monoxide pose a serious threat to those who suffer from heart disease by causing chest pain, a reduced ability to exercise, and other cardiovascular effects. Even healthy people can be seriously harmed or even killed by higher levels of carbon monoxide, which can lead to vision problems, inability to work, and reduced manual dexterity.

While this information gives some insight into ways that emissions can affect human health, it does little to elucidate the amount of pollutants Centre County residents are actually being exposed to or to reveal any health problems caused by those chemicals.

Even with the TRI and the state emission reports, it is hard to piece together a coherent picture of the condition of industrial pollution in Centre County.

Known health effects of toxic chemicals

	Particle Pollution	Carbon Monoxide	Nitrogen Oxides	Sulfur Dioxide	Lead	Ozone
Formation of Ozone		●	●			
Decreased lung function	●		●	●		●
Aggrivated athsma	●			●		●
Development of respiratory illness	●			●		●
Damage to lung tissue			●			●
Irregular heartbeat	●					
Nonfatal heart attacks	●					
Chest pain		●				
Aggrivated existing heart disease				●		
Damage to cardiovascular system					●	
Reduced ability to exercise		●	●			
Reduced vision		●				
Reduced ability to work or learn		●			●	
Reduced manual dexterity		●				
Reduced IQ					●	
Damage to nervous system					●	
Impared kidney function					●	
Damage to reproductive system					●	
Damage to immune system					●	
Biological mutations			●			
Premature death	●	●	●	●		

Source: EPA's Health Effects Information for Six Common Air Pollutants

The data compiled by both the federal government and the state is reported by the companies that produce the pollution, but Bob Hawley, the environmental program manager at the DEP's Bureau of Water Quality Management, said the reports are generally reliable.

"If we find out someone's falsifying reports or consistently violating their permit limits, the fines are multiplied by huge factors," he said.

David Aldenderfer, the air quality program manager at the DEP's NorthCentral Regional Office, said the DEP monitors companies with large emissions, which ensures accurate reporting.

"There are continuous emission monitors in their stacks," Aldenderfer said. "We have a pretty good idea of what they're putting out on a monthly basis."

The state has a vested interest ensuring that such companies report such emissions accurately.

Title V of the Clean Air Act, as amended in 1990, requires companies with 10 tons per year or more of a specific hazardous air pollutant or 25 tons or more per year of a combination of hazardous air pollutants to acquire special operating permits.

According to Aldenderfer, the state administers the Title V permits and collects fees for every ton of hazardous air pollutant emitted.

"[For Pennsylvania], it's hundreds of millions of dollars every year," Aldenderfer said.

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Still, the emissions data reported by the state are often inconsistent with data reported in the EPA's Toxics Release Inventory.

For instance, the TRI reported one Centre County company's hydrochloric acid emissions as 119,938 pounds in 2006. On E-FACTS, the DEP said the same company emitted 73,540 pounds of hydrochloric acid in 2006.

Likewise, the TRI reported 73,126 pounds of lead emissions in Centre County in 2006, but E-FACTS reported zero lead emissions for the same year.

Aldenderfer said he had seen inconsistencies like that before but did not have an explanation for them.

"We don't know the TRI system very well," he said.

The TRI was established through the Emergency Planning and Community Right-to-Know Act, which Congress enacted in 1986. According to the EPA Web site, the act's primary purpose was to "inform communities and citizens of the chemical hazards in their areas."

More than two decades after the passage of that act, it is still difficult for Centre County residents to exercise that "right to know."

What is known, though not in exact numbers, is that more than a million pounds of hazardous pollutants are released into the skies above Centre County every year.

But does that mean that history is destined to repeat itself—that Centre County companies will leave today's messes for someone else to clean up tomorrow?

Definitely not, said Brian Mensinger, the Environmental Health and Safety Manager for Graymont Eastern U.S.

Graymont operates a plant in Pleasant Gap that produces lime, a material used in agriculture, steel production, waste treatment and construction materials, among other applications.

The company was responsible for nearly 14 percent of the Centre County releases listed in the 2006 TRI. According to the AIM report Graymont submitted to the state, it released 74,880 pounds of ammonia and 66,020 pounds of hydrochloric acid into the air in 2007.

Moreover, the DEP's E-FACTs for 2007 list Graymont as the largest emitter of sulfur oxides, volatile organic compounds, particulate matter, carbon monoxide and nitrogen oxides in Centre County.

Still, Mensinger said that good business sense, increasingly stringent regulations, the rising cost of energy and care for the communities in which it operates have led Graymont to treat the environment as a high priority.

The company, which is based in Canada and operates 17 lime production facilities in Canada and the United States, published its first sustainability report in 2007. The report outlined the company's goals and strategies for environmental care, waste reduction and community relations.

Mensinger said the Pleasant Gap facility has taken those goals and strategies very seriously. Over the past four years, it has shut down five old lime kilns and replaced them with two higher-efficiency kilns.

"We're the first lime kiln in North America to put a waste heat boiler on the back of a kiln," Mensinger said. "The back of the kiln is 1,100 degrees. We took that heat, and we're heating water, which will create steam, which will turn a turbine [and create energy]."

Though Mensinger said that operating the boiler has been a "learning process," the Pleasant Gap facility has reduced energy consumed per ton of lime produced by 40 percent.

Mensinger also pointed out that the semi-wet scrubber system on one of the kilns controls acid gas releases and that the permits for the two new kilns allow for the emission of 40 percent fewer toxic releases than the Title V permit for the kilns that have been shut down.

When it comes to the emission of particulate matter, or fugitive dust, Mensinger said that the information on DEP's E-FACTS database—that Graymont emitted a total of more than 150 million pounds of suspended particulate matter in Centre County in 2007—is "very erroneous."

Graymont's AIM report for 2007 states it emitted 118 tons (or 236,000 pounds) of particulate matter less than 10 microns in length, and 94.34 tons (or 188,680 pounds) of particulate matter less than 2.5 microns in length.

The EPA Web site says that exposure to particulate pollution has been linked to aggravated asthma, development of chronic bronchitis, irregular heartbeat and non-fatal heart attacks. It has also been shown to make lakes and streams acidic, deplete the soil of nutrients and damage forests and crops.

Mensinger said that Graymont has taken measures to avoid the release of fugitive particles, which include putting dust collectors on the back of kilns and on transfer equipment.

"We do a daily visual inspection [for fugitive dust]—plus we have cameras around the facility," Mensinger said.

Not only does Graymont work to prevent

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Measuring the true costs of nuclear power

by the Peace and Social Action Committee of Friends Meeting

COMMENTARY

Is research and development (R&D) of nuclear power cheap? No! For the last 60 years, nuclear power R&D costs amounted to more than $70 billion. The lion's share of tax subsidies goes to nuclear power R&D—about $14 billion. To encourage even more nuclear power R&D, the Price-Anderson Nuclear Indemnity Act was signed into law in 1957; the latest revision of this was enacted and extended through 2025. The subsidy of this Act is as high as $100 billion. It is an incentive for R&D investors to engage in nuclear research as such investors are often unwilling to take the risk without some limitation on their liability.

The Nuclear Regulatory Commission licensees and the Department of Energy (DOE) contractors are bound by the Price-Anderson Nuclear Indemnity Act to cover personal injuries, property damages, and cost of claims and settling suits for damages caused by radiological or nuclear incidents. It also includes compensation for any problem resulting from a nuclear fuel accident to and from a covered facility.

How does the Price-Anderson Act work? Following the Three Mile Island accident, for example, many lawsuits were filed in the state and federal courts in Pennsylvania claiming property damages and personal injuries. Even though no personal health damage claims were accepted at the time of the accident, in the years that followed, payments to a variety of claims amounted to a staggering $70 million.

The nuclear power energy research and development industries claim that nuclear power is cheap. Cheap for whom? Certainly not for the taxpayers who have, through our federal government, paid out billions of dollars for nuclear power R&D since 2001. A single type of reactor design costs millions. There are subsidies for new nuclear energy plants amounting to millions of dollars that have become obscure to taxpayers.

It appears that the nuclear power industry cannot compete economically on its own in spite of earlier claims that nuclear energy is really too cheap to even think of metering. This, however, has proven to be "wishful thinking." The tax breaks and subsidies for the nuclear industry have been enormous.

> What happens when a nuclear power plant needs to be decommissioned?

Since 2001, the nuclear industry has received more than $92 million. Research and development for a single design can cost up to $1 billion. New start-up nuclear plants will receive billions of taxpayer dollars in subsidies—for example, billions of dollars for "risk insurance" and shutdown subsidies, to name two. Recall that John McCain said he would see to it that at least 40 new nuclear plants would be built if he became president.

Currently, the $50 billion allocated for building new nuclear power plants has been struck from the Obama Stimulus Plan. Although this enormous amount of money has not yet been allocated for building new nuclear energy plants this does not guarantee that they will not be built in the future. The jury is still out on that decision.

Amory Lovins, a world-renowned, widely-published and respected physicist, has gone on record saying that nuclear power plants are too costly to build. The aforementioned billions of dollars clearly attest to this fact. Lovins states that electricity produced from new light water (ordinary water) reactors will cost twice as much as from new wind farms. In addition, water is used as a cooling agent in all nuclear reactors. The use of so much water poses yet another threat to the worldwide dwindling water supply.

What happens when a nuclear power plant needs to be decommissioned—that is, when it is no longer operable? All nuclear plants have a lifetime expectancy of only about 40 to 60 years. Sixty years is the maximum time that a nuclear power plant has to be finished with the process of closing once a plant has been decommissioned. How is a nuclear power plant decommissioned? It involves dismantling the plant and ensuring its safe storage, the problem of which is still unresolved at this writing. Plant owners are required to put aside at least $300 billion when the plant is still operating to pay for decommissioning. But what if the plant has to be decommissioned before its expected time or the federal government discovers that at the time of decommissioning the plant does not have the required funds to shut down the plant? Once more, taxpayers pay the price.

Yucca Mountain's repository is not expected to open until 2020. Even that date is questionable as design problems and budgetary constraints due to many "outside factors" have forced nuclear storage at Yucca Mountain to skyrocket to more than $96 billion. The Department of Energy contracted with utilities to begin taking away nuclear waste in 1998. However, that did not happen and as a result of the DOE breaking its contract, nuclear waste is piling up. Thus the cost is not only in dollars but also in human health, as the nuclear waste is not being disposed of in a safe manner. The liability expenses are continuing to rise to more than $11 billion.

Early in this decade a report, updated in September 2008, on the cost of funding nuclear activities, was prepared for Congress. Readers are encouraged to read the full report titled "Congressional Research Service (CRS) Report for Congress, Nuclear Energy Policy"—especially Table 3, DOE Funding for Nuclear Activities—(budget authority in millions of current dollars) on page 24 of this document. As J. Cook said in his *Nuclear Follies* article, "The failure of the U.S. nuclear power program ranks as the largest managerial disaster in business history."

The real and hidden costs of nuclear power should give one serious pause. It is time to be reasonable and embrace the research and development of renewables.

Sassy ruddy ducks signal the start of spring

by Alice L. Fuller

BIRD WATCH

If any bird can strut while swimming, this little ruddy duck can and carries the feat off magnificently. Handsome in nuptial plumage with its sprigtail fanned out and held erect, this diminutive duck creates a memorable picture on any lake or pond that is included in its spring pilgrimage.

A small flotilla of ruddy ducks in the spring is an impressive sight. They have provided a treat for many a bird watcher visiting local lakes in recent days. Of chunky or stubby demeanor, the ruddy duck is one of our smallest native ducks, and is unique in the waterfowl clan. It belongs to its own sub-family of ducks known as the masked and stiff-tailed ducks. Instead of going through an eclipse plumage in late summer as most other ducks do, the ruddy has distinct winter and summer outfits. The oldsquaw is the only other species of duck that has the same molting pattern.

By middle or late April, male ruddy ducks arriving in central Pennsylvania are completely decked out in their splendid breeding garb. The drake's body is a rich chestnut red. The head has white cheeks topped with a black cap and accented by an azure-blue bill. In fall and winter, the dapper ruddy resembles his lady, with grayish body, dark cap and white cheeks. However the lady's cheeks are tinged with gray and bisected by a dark line.

If the cocky ruddy is in a courting mood and a female is about, he may put on a show which, if it doesn't impress his lady friend, will certainly captivate any human observer lucky enough to be on the scene. Often if the birds are resting, the tail is down in the fashion of other diving species of ducks. The male showing off, however, will hold his saucy tail straight up or even over his back. He may stretch his short neck out as far as it will go or clap his blue bill against his chest. With great fervor he may puff out his rusty chest, stand up and scoot over the water's surface. Some naturalists have described this display as resembling a miniature turkey gobbler when executing this performance.

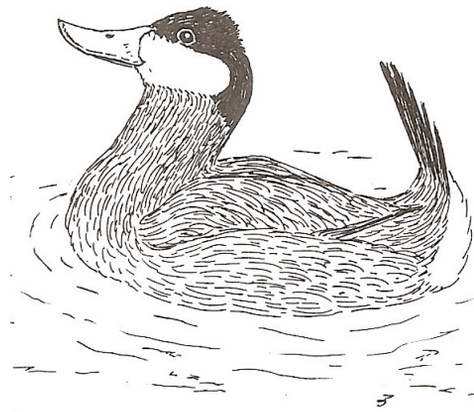
During his long spring travels, the little ruddy would seem to have plenty of time to woo and win a mate. This species nests primarily in prairie country around the potholes of the Dakotas and in Manitoba and Saskatchewan. Part of the ruddy population winters on the Pacific coast and part heads east to the Atlantic coast, with many remaining on the Chesapeake Bay.

Ruddy ducks are fine swimmers and divers and are more likely to dive when danger threatens than attempt to fly. They behave like grebes, disappearing and then reappearing almost magically. Like most diving ducks, they are primarily vegetarians and may dive to lake bottoms for tasty vegetables or simply immerse their head in shallow water while selecting preferred morsels.

Because he is such a unique little fellow, it is not surprising that the ruddy duck has attracted a great variety of colloquial names. From a list compiled by Francis H. Kortright, I found these especially descriptive and delightful names: blatherskite, bristletail, broadbill dipper, bumblebee-buzzer, butterbowl, Johnny Bull, leather-breeches, light woodknot, paddywack, sleepy jay, stub-and-twist and water partridge.

During the first half of April, local birders have reported finding on our lakes and ponds nearly all the ducks, including the ruddy, which normally pass through in spring migration. More recent arrivals include the gadwall, blue-winged teal and shoveler. Other water-loving species have put in appearances as well: ospreys have been busy fishing on local lakes. Most bodies of water now have swallows, especially tree and barn swallows, swarming over them.

While the trees seem to have a long way to go before they burst into leafy spring canopies, songbirds are beginning to arrive in the area. A few days ago, it was a treat for me to step out in the morning and be greeted by a towhee's "drink your tea." So far only the male towhee seems to be back , and he spends much time scratching in the leaves under the forsythia and lisping "three" instead of "towhee." Catbirds and brown thrashers are also drifting back into home locations. Tiny voices of kinglets come from many an evergreen bower, and now and then a ruby-crowned kinglet sings a bar or two of its lovely song.



One hears the simple trill of the chipping sparrow coming from still-barren shade trees. Tree sparrows seem to have departed, so any chestnut-capped one is most likely to be a chippy. The sweet trill from piney woods is that of the pine warbler. It and the yellow-rumped warblers are the vanguard of warbler waves to come. Mercurial as she may be, April is still busy preparing the landscape to welcome weary travelers anxious to be home again.

Have something to say?
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Composting: A natural way to recycle foods

by Heather Simmons

Your Green House

Twenty-three percent of the solid waste produced in the United States consists of yard and food waste, according to the Environmental Protection Agency. Composting can reduce the amount of this garbage hauled away from your house by 50 to 75 percent.

Composting is the process whereby organic waste matter is broken down by microorganisms in the presence of oxygen into an environmentally friendly type of soil called humus. Humus is a dark, rich crumbling soil that is excellent for enriching garden soil as it not only increases the nutrient content of the soil but also aids in moisture retention. In addition, using compost can suppress pests and plant diseases in your yard and reduce your reliance on chemical fertilizers.

Although you can choose to compost without a bin, a compost heap will look more appealing if it is contained in a bin, and will help keep animals from hauling away your latest addition. There are many compost bins commercially available or you can build your own. A simple and easy way to build a bin is with wooden pallets. Start by placing one on the ground and then drive a metal stake into each side. You can then slide other wooden pallets over each support to form the walls of your bin.

When first starting a compost heap it is generally recommended that it not exceed 3 feet by 3 feet by 3 feet in size, and that you select a dry shady spot for your compost.

Efficient composting requires certain conditions:

—Have the proper mix of nitrogen and carbon by balancing the ratio of green elements that contain large amounts of nitrogen such as glass clippings and food scraps to brown items that contain large amounts of carbon such as dry leaves, wood chips and branches. A ratio of 25 to 30 parts carbon to one part nitrogen is best. If you have too much carbon, decomposition will slow down and if you have too much nitrogen you will end up with a smelly heap.

—Keep the pile aerated to accelerate decomposition. Turn the mixture periodically or include bulking items such as shredded newspaper.

—Ensure that the mixture remains moist although it should not be kept wet. You want to aim for the dampness of a wrung out sponge.

Composting fruit

—Make sure that large particles are chopped or shredded to give the microorganisms enough surface area. This will speed up the decomposition process significantly.

Items you can put in your compost pile

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the emission of fugitive dust, it recycles what it recaptures.

"Instead of disposing of it, we sell that material," Mensinger said. "In fact, we sell 100 percent of all of our waste material."

Mensinger explained that this material has been used to neutralize acid rock on I-99, treat acid drainage from mines and desulfurize flue gas that comes from power plants—all of which benefit the environment.

"Part of the reason I came to Graymont seven years ago was I thought the company was well run and it held the environment as a high priority," Mensinger said. "We're a part of the community. That comes from the CEO down."

Graymont isn't the only company that is taking steps to reduce Center County residents' exposure to toxic chemicals, according to Aaron Parker, who worked as a maintenance mechanic for Piezo Kinetics, Inc. from 2006 to 2007.

Parker said that Piezo Kinetics excels at protecting its employees and those who live in surrounding areas from the lead it uses in its manufacturing process.

Piezo Kinetics, located in Bellefonte, manufactures piezoelectric ceramic elements that are used by the aerospace and biomedical industries and in items such as sound boards, dental equipment and even fish finders.

The company's 2007 Form R report, filed with the EPA, said that the company had no on-site toxic releases, but that it used a solidification or stabilization process to capture 43,916 pounds of lead compounds and send them off-site.

According to Parker, who maintained the filtration system when he worked for the company, Piezo Kinetics uses a closed system that prevents any lead from being emitted outside of the facility.

The facility also limits employees' exposure to lead, said Parker, who added he was worried about lead contamination when he first went to work for the company but soon felt very safe.

"Any place that lead powder may have been loose, they had a recovery," Parker said. "They also blood test every employee's lead levels every three months."

Parker also described the company's treatment of wastewater. All of the water—including water from sinks and equipment cleaning—goes into a holding tank from which it is dispensed into barrels and evaporated, so that any lead compounds in the water can be recaptured.

Parker said all of the lead waste created by the manufacturing process is transferred from Piezo Kinetics to an EPA-approved disposal site.

"Steve Dynan, [the CEO of Piezo Kinetics], works really, really hard to keep everything up to standard," Parker said. "I absolutely respect and admire the company that he and his crew run."

Dynan was unavailable for comment.

Although Piezo Kinetics and Graymont have taken steps to responsibly handle toxic releases, their emissions are only a fraction of the 1.1 million pounds of hazardous chemicals that the TRI stated were released in 2006.

Of the remaining 972,495 pounds of toxic chemical releases, Cerro Metal Products Co. was responsible for 963,776 pounds of zinc, copper and lead releases.

The overwhelming majority of these were released into the air through point source emissions, although nearly 850 pounds were discharged as surface water into the Logan Branch of Spring Creek.

This year's TRI should reflect a very different story, as United Kingdom-based Bolton Metal Products bought Cerro in 2007 and announced in February of 2008 that it was shutting down the factory.

The DEP's Hawley said Bolton Metal Products hasn't left a mess behind.

"Cerro has already remediated and asked for cancellation of their permit," Hawley said. "Basically there's nothing left to discharge there. We issued them a departmental order, then turned that into a consent order, clean-up and secondary containment. They did everything we asked them to do before they went out of business."

The rapidity of Cerro's clean-up starkly contrasts with another Centre County clean-up that has been drawn out over more than two decades—that of the State College Superfund site owned by Ruetgers Organics.

The 32-acre site was used to manufacture the pesticide kepone in the late 1950s and early 1960s and the pesticide mirex in the early 1970s. Ruetgers Organics, based in Germany, bought the chemical plant from Nease Chemical Company in 1978.

Soon thereafter, leaks were discovered in the facility's waste lagoons and storage drums. Hazardous materials had leached into the groundwater and surface water, and Spring Creek was designated as a catch and release zone for fishing because of contaminated fish in 1982. (EPA officials say the fish are now safe to eat but the catch and release program remains in effect for wildlife preservation.

In 1983, the site was added to the National Priorities List, which made it eligi-

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Geothermal picks up steam at Home Show

by Suzan Erem

Geothermal displays were the hot spots at the Home Show on the Penn State campus in March, in part because of a new federal tax credit that brings its costs into the range of other heating and cooling options and in part because of the promise of up to 500 percent in energy savings over fossil fuels.

The recent federal stimulus package gives geothermal system buyers a tax credit equivalent to 30 percent of the cost, replacing an earlier maximum tax credit of $2,000. It can cost $12,000 to $30,000 or more to retrofit a house with a geothermal system, according to local installation professionals.

The engineering behind such a system, which maximizes the steady 50 to 70 degrees that the Earth maintains five feet or more below the surface, can be complicated. At two seminars during the Home Show, manufacturers and dealers attempted to explain it, but moved quickly to its savings benefits.

Essentially, geothermal uses the Earth's energy—conducted in one case through a massive "closed loop" system laid in the ground that circulates a mixture of water and methanol (or other Department of Environmental Protection-approved anti-freeze fluid)—and combines it with mechanical "heat exchangers" placed inside the home, to transfer energy in the form of heating and cooling between the home and the ground nearby. Geothermal installers like to use the refrigerator analogy—cool on the inside, hot coils on the back, except backwards.

Geothermal system installer Daniel Woodring of Enviroteq explained heat extraction this way:

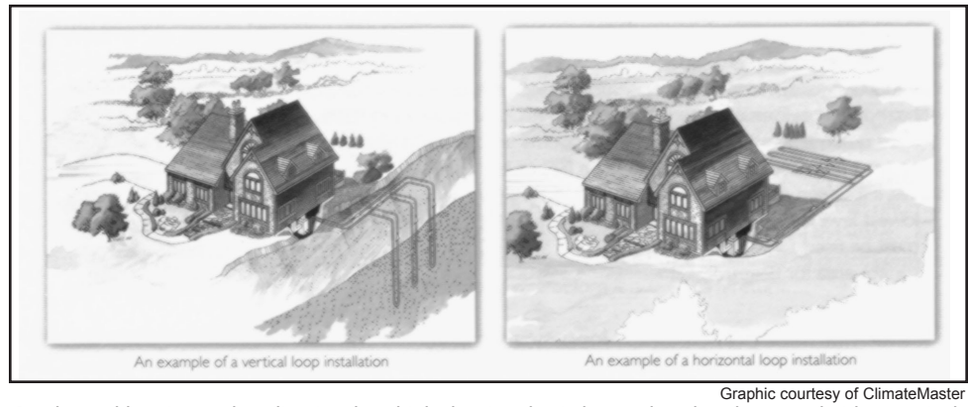
"1. All matter contains heat. 2. Cold is the absence of heat. 3. Heat always flows from higher temperature matter to lower temperature matter. 4. Heat is moved or 'extracted' from one source and delivered to another by 'heat exchangers.'"

"Basically, we pull the heat out of the water and blow it into the house in the winter time," explained Chris Sylves of Go Geo installers in Lemont. "In the summer, the water comes in cooler than the air in the house, so the heat is drawn to it, and we pull it back out to the underground where it cools off again."

The main parts of a geothermal system are a heat exchanger or pump, duct work and high-density polyethylene pipes, or loops, that are either laid horizontally, usually in new home construction and in large lots of land, or dug vertically in 200- to 300-foot-wells. A project that requires duct work and vertical wells costs more than one that doesn't, but the duct work provides the benefits of air conditioning as well as heat. Open and closed loop systems are available.

The life-span of the nontoxic loops is 100 years, according to one WaterFurnace representative, and "decades" according to printed materials.

Materials provided by the industry state that for every unit of electricity a consumer uses, the Earth provides three units of "free" energy. At the presentations in March and in additional interviews, installers commonly stated not 400 percent but 500 percent more efficiency, or one-fifth of a current average energy bill.



Graphic courtesy of ClimateMaster

Geothermal heating and cooling involves high-density plastic loops placed underground either vertically hundreds of feet deep, as in a well, illustrated on the left, or horizontally from five to 18 feet underground. The deeper the loops are, up to 18 feet, the more consistent is the temperature they remain. In a closed-loop system, the loops contain a mixture of water and anti-freeze chemicals. An open loop system, which recirculates through a pond or well, contains only water.

There are currently almost a dozen local mechanical contractors offering geothermal installation that are members of the Builders Association of Central Pennsylvania.

One industry source for more information is the Geothermal Heat Pump Consortium at www.geoexchange.org. To find local geothermal dealers go to www.centralpabuilders.com.

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include cardboard rolls, paper, coffee grounds (these are particularly good), cotton and wool rags, eggshells, fireplace ashes (however use only a little as they are alkaline and affect the pH of the pile), teabags, shredded newspaper, hay, straw, leaves, grass clippings, houseplants, nut shells, sawdust, fruits and veggies, wood chips and yard trimmings (as long as they have not been chemically treated).

Items that should not be included in your heap include any dairy products, meat scraps or bones, or any fats, grease or lard, as they tend to attract pests and rodents. Avoid plant material that is diseased, colored paper, coal ash, black walnut tree leaves or twigs, as these can be harmful to plants. Pet waste should not be included as it may contain harmful pathogens.

In warm weather, soft refuse will decay much faster than in winter. If you want to continue the composting process through the winter you can keep it in a black bin in direct sunlight. Hay bales also work. If you live in a cold climate (like central Pennsylvania) you might have to let your compost heap rest for the winter, but you can also use an indoor compost heap for the winter months. It can take anywhere from three months to a year for your compost to be ready. When finished it should be less than half the volume you started with, but it will be much denser, and you should not be able to recognize any of the starting ingredients. It will also be dark, crumbly and have an earthy odor. If the compost is still lumpy or appears stringy it is not ready for use.

Your finished compost should not be used as potting soil for your household plants but can now be used on your lawn and garden. Mulching is an easy way of applying it, and you will be on your way to an eco-friendly garden!

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ble for federal clean-up money, known as the Superfund.

Since that time, Ruetgers, which was declared a Potentially Responsible Party, has been implementing clean-up measures, including excavating and removing contaminated material from lagoons and excavating surface soil. The EPA held a hearing in March to determine the next steps for the site and proposed a combination of soil cover, asphalt and seeding, according to a *Centre Daily Times* report.

David Frantz, the controller for Ruetgers, said the site is currently in a maintenance phase that involves extracting hazardous vapors from the soil and pumping up and cleaning ground water.

"We're expecting the ground water treatment to go on quite a few more years," Frantz said. "The levels of contaminants are going down, but it's not a linear thing—we've got probably five to 10 more years."

Frantz pointed out that most of the environmental damage had been done when Ruetgers bought the facility, but the company has been accountable for the clean-up.

"I think the company [has] stood by what people said was our responsibility, and I think that's a good thing," Frantz said.

Today's industrial polluters certainly seem to be taking more responsibility than their predecessors, but just because they aren't getting a free ticket to pollute doesn't mean they're not getting a ticket at all.

According to David Aldenderfer, the federal and state governments have taken a technology-based approach to air pollution prevention since the 1990 amendment to the Clean Air Act.

"The EPA was asked to list the most hazardous air pollutants," Aldenderfer said. "Then they had to look at all the sources of all those pollutants and to decide where to take out the biggest chunk of emissions."

This has resulted in National Emissions Standards for particular industries, which are required to apply the "maximum achievable control technology."

Aldenderfer said what's "achievable" is determined by scientists, economists and other experts that the EPA hires to decide how much a company can be expected to invest in removing each ton of pollutants.

The state awards construction and operating permits, which allow the release of toxic and hazardous chemicals on the basis of these standards, Aldenderfer said.

When it comes to the emission of specific pollutants—such as carbon monoxide or lead—there are no statewide ceilings.

"There's no uniform standard for any industry or across the board," Aldenderfer said.

Herron said the same is true of the EPA.

"We don't have a total amount that people are allowed to have," Herron said. "Each permit is specifically created for each company; and to make things even more complicated, it's not just one permit. There are air permits, water permits, hazardous materials permits, tons of different kinds of permits."

Still, in this renewed era of environmental awareness, some companies are working hard to reduce their emissions.

Graymont's Brian Messinger knows why: "Because it's essential to doing business these days."