The Burning Issues with Biomass

by Mike Ewall, March, 2000

Green energy to bring us wind mills AND incinerators

While the new green energy marketplace is bringing a 10 megawatt wind farm to southwest Pennsylvania, it has also targeted poor, minority communities in the state of Delaware with a 22.5 megawatt construction and demolition waste incinerator.[1]

A few years ago, if a corporation wanted to build a construction and demolition wood waste incinerator in your community, they would come in and tell everyone that you'd be getting a "co-generation plant to burn clean wood chips." Now that there is a green energy marketplace developing due to electric utility deregulation, these same incinerator pushers are now coming into communities promoting themselves as "green energy biomass co-generation power plants" that would "take pollution out of the air."[2]

Philpower Corporation, the proponents of this 720 ton per day incinerator, says that their new company is "specializing in environmentally-friendly power" and that they're doing this "in response to a growing need for green power." The company plans to build 3-5 more of these incinerators "between Baltimore and New York." Philpower Corporation already has a 10 year power purchase agreement with electric utilities who are connected to a variety of green energy marketing corporations.

This is only the beginning. There are proposals in many other states to burn all sorts of things in order to provide "green" power.

The term "biomass" has been used to include all sorts of combustion schemes, such as:

- **Incineration of wastes, including...**
  - **Municipal Solid Waste (Garbage)**
  - **Sewage sludge**
  - **Tires**
  - **Wood waste (construction/demolition, urban tree trimmings, paper and lumber mills wastes, etc.)**
  - **Agriculture crop wastes (often laden with toxic pesticides)**
  - **Animal factory wastes (corporate hog factory wastes, dairy factory wastes, chicken feces & bodies, etc.)**
- **Burning of "energy crops" (tree or crop farms)**
- **Cutting down trees from forests to burn in industrial wood burners**
- **Digesters (Anaerobically composted animal factory waste, sewage sludge…)**
- **Combustion of contaminated landfill gases**

Everywhere you check, there are different definitions of "biomass." One definition of biomass is provided by the National Renewable Energy Laboratory[3]:

> "Biomass: Organic matter available on a renewable basis. Biomass includes forest and mill residues, agricultural crops and wastes, wood and wood wastes, animal wastes, livestock operation residues, aquatic plants, fast-growing trees and plants, and municipal and industrial wastes."

In general, **biomass can include anything that is not a fossil fuel that can be argued to be organic**. Tires and sewage sludge are rarely, but sometimes, included as biomass fuels. Sometimes (particularly in federal legislation) certain types are specifically excluded, such as old growth timber, garbage, and treated wood. Sometimes landfill gas and "biogas" digesters are considered to be in separate categories from biomass.

"Alternative" vs. "Renewable" vs. "Clean & Green"

All of the above terms are often used interchangeably, but can mean different things. Just the term "renewable" can mean different things in states, federal energy bills and programs, and certification programs like Green-e.

"Alternative" is generally used to mean "not fossil fuels and not nuclear." This leaves the door open for all sorts of incineration to be considered "alternative energy."

"Clean" and "green" are rarely, if ever, defined. They are terms of general environmental benefit and have no generally accepted meaning.[4]

"Renewable" is the term that is used in state and federal legislation, in government energy programs and in the Green-e certification program. Almost universally, definitions of renewables include "biomass" as well as landfill gas. Therefore, renewability does not usually mean clean or green. It's only used to describe whether an energy source is replenishable and replenished on some reasonably short time scale.[5]

In the Green-e program, renewables are not consistently defined based on their renewability. Hydroelectric power, while technically renewable in all forms, has been considered renewable for the Green-e program only if the dam is under 30 megawatts in capacity. These definitions are in the process of being replaced with "low-impact hydro" criteria which would remove the size criteria, but which would disqualify *new* hydro from being considered renewable. [6, 7] This is being done to recognize that green energy should not be promoting new dams, because dams can cause significant ecological harms. Such a concept has not been used in considering what types of biomass to approve.

Green-e leaders have stated repeatedly that they're not trying to be pure and clean, but to seek "incremental improvement" over such sources as coal and nuclear power (they see incineration as an improvement). The position of Green-e on biomass has been to include every form of biomass that they don't specifically exclude. This process leaves the door open to all sorts of polluting technologies that they have not found specific reason to exclude.

Renewables aren't necessarily cleaner than non-renewables. Since biomass incinerators are allowed to be considered renewable, they are given an advantage over cleaner (but still not that clean) fuels like natural gas[8], which is a non-renewable fossil fuel.

Biomass = combustion = pollution

All biomass combustion technologies put pollution in the air in order to make "green energy." Most of the biomass wastes/fuels contain chlorine or other halogens and would create dioxins and furans when burned. **Anything that creates pollution in the course of producing electricity shouldn't be considered green, clean or renewable.** Wind and solar, even though they have some environmental impacts in their construction (like the toxics used to make solar panels), don't have to keep polluting in order to make electricity.

Anything that has environmentally-damaging emissions that can be measured per kilowatt is not deserving of the various advantages granted to renewable energy sources.

Policies designed for renewable energies will end up supporting incineration.

There are five main advantages available to technologies that are labeled "renewable" energy: tax credits, subsidies, research, Renewable Portfolio Standards, and preferential pricing afforded to "green power."

President Clinton signed an Executive Order in August 1999 to triple biomass energy use over the next ten years.[9] There are over 20 bills in both the U.S. House and Senate which would provide some sort of advantage to biomass burning. Most of these involve research programs or tax credits for renewable energy (including biomass). A couple of these have already passed.[10] Renewable Portfolio Standards (RPS) are a wonderful way of boosting the market for renewables, as long as there is a clean definition of renewables. However, if a deregulation bill contains RPS and includes biomass as a renewable, they can effectively boost the market for incinerators as well. Such bills exist in a few state-level deregulation bills and a couple federal bills (including a bill sponsored by the Ratepayers for Affordable Green Energy (RAGE) campaign[11]).

When the private Green-e private certification program approves a technology as renewable, a marketer can get away with charging more for their energy product because it will have the added value of looking green. So far, nearly all forms of biomass have been approved by Green-e. Promoters want biomass included because it makes it easy to start marketing without having to spend much money to develop new, clean renewables.

Displacement is used to justify most of the things that can't stand on their own merits.

Some biomass promoters try to claim that they're improving the environment. Philpower, for example, said that they would be "taking pollution out of the air." No known technology produces electricity by sucking pollutants out of the air. The only pollution reduction that can result from electric generation is if a dirtier technology could be displaced by the capacity that a new and cleaner facility is producing.

There are several problems with trying to make the displacement argument.

Who gets the credit for displacement? If a coal plant closes, how do you prove which generator provided the energy to replace it?

Displacement may not be effected anywhere near the customers whose environment is supposedly being improved. Increased generating capacity in one grid could really be offsetting electric generation in a neighboring grid, several states away.

Displacement may not be occurring. With energy demand increasing yearly,[12] new generating facilities may simply serve the additional demand, without replacing anything. Putting any "renewable" facility online doesn't imply that it exceeds the yearly increase enough to displace anything.

Biomass competes with wind, solar, hydroelectric and geothermal for the renewables market. Wind is becoming one of the cheapest energy sources (altogether) and is about 10 times cheaper than solar. Biomass is the cheapest Green-e renewable except for where there are good wind sites. We are likely to see many more biomass burners because they can be built in many more places than good wind sites can be found. Since there is already a market for incinerators (based

on the economics of the waste industry), biomass competes most directly with wind, the cleanest and most promising power source.

Since there is already a well-developed incineration industry, biomass is likely to utilize most of the legislative benefits. Eliminating biomass from renewables definitions means that wind (the cleanest option, and one of the cheapest) would get better funding.

Proponents of biomass and natural gas have both argued that their technologies are a transitional step to cleaner technologies like wind and solar. However, increasing reliance on combustion technologies does not really pave the way for wind. No energy companies have established these technologies with a timetable for replacing them with clean renewables.

All biomass technologies except for landfill gas burners involve trucking fuel/waste to and from a centralized machine over the life of the operation. These burners are capital intensive machines, amortized over 10-20 year cycles, that by resultant economic demands, require a certain tonnage per day to maintain the required return on investment.

Waste Incineration

Waste incineration is the worst category of biomass. Providing increased waste disposal capacity worsens the waste problem by lowering the costs associated with waste generation. It also destroys resources (some of which are best recycled or composted), and turns them into toxic ash and toxic air emissions. The wastes which cannot be reused, recycled or composted cleanly ought to be landfilled rather than incinerated.

What makes waste dangerous is not its volume, but its toxicity. People don't usually die from waste physically falling on them, but exposure to the toxic constituents of wastes can cause all sorts of health and environmental problems. When wastes are incinerated, their toxic constituents are liberated into breathable air emissions. Toxic hazards associated with the wastes increase as heavy metals are released and halogenated chemicals (chlorine, fluorine, bromine…) are converted to highly toxic organic forms like dioxins and furans. Waste incineration is the largest known source of dioxin (the most toxic chemical ever studied). The ash that is left then has a higher surface area and is more dangerous in a landfill, where the toxic constituents can leach out more readily than if left unburned. In recent years, incinerator ash has been promoted for such applications as ingredients in cement, fill for reclaiming mines, fertilizer, industrial tile and road base. These are even more dangerous options than landfilling, as they bring the contamination closer to where they might harm people.

In seeking to create a market for alternative energy, Green-e wants to include as many forms of biomass as possible in their certification program. This leads them to view incineration-for-energy as the solution to all waste problems.

Municipal Solid Waste (Garbage)

Green-e lists "solid waste" in their definition of biomass wastes[13] although no marketers have yet sought to get garbage incineration certified as Green-e. While garbage incineration has been banned for Green-e sales to the Mid-Atlantic states (PA, NJ, DE, MD), it's still an option elsewhere. Even though garbage incineration cannot be certified as Green-e for sale to Mid-Atlantic states, it's possible that garbage incinerators in these states can be sold to other states as Green-e in the future, unless activists manage to pressure Green-e into excluding garbage incineration nationwide. Representatives from the solid waste industry have sought to get Green-e to allow garbage incineration to be certified. Nationwide, garbage incineration comprises 28% of existing biopower capacity. In the extended Mid-Atlantic area (Virginia to New York), garbage

incineration makes up 66% of existing biopower capacity.[14] Energy marketers have a lot to lose if garbage incineration is not considered renewable.

Sewage Sludge

There is no such thing as clean sewage sludge. Sewage sludge is a combination of human waste, household chemicals, stormwater run-off (including leaked automotive fluids), and commercial and industrial wastes.[15] Corporations are permitted to dump toxic chemicals[16] and even radioactive materials[17] down the drain to be "treated" at sewage treatment plants which aren't designed to treat toxic chemicals. Household chemicals can be fairly toxic. Every bottle of shampoo, conditioner, antibacterial (pesticide) soap[18] and other household chemicals like liquid plumber and bleach ends up down the drain. High school and college chemistry and art classes also contribute to the toxic muck that is sewage sludge. Excreted pharmaceuticals get flushed down toilets, leading to a growing global problem of pharmaceutical pollution in waterways.[19] Even the fluoride acids which are added to water and the lead which fluoride helps leach out of pipes[20] ends up back down the drain and in the sludge.

Burning the toxic stew of sewage sludge provides a convenient way to make these toxic chemicals breathable. There is **nothing** green about sludge incineration. The national Green-e website lists "sewage and solid waste" as biomass.[21] The Mid-Atlantic Green-e Advisory Committee recommended excluding the sale of energy from sewage sludge incineration as renewable within their region[22], yet it would still be an option for the rest of the country.

Tires

[See our new page on Tire-Derived Fuel for more detailed information.]

Tires contain many toxic constituents which make burning them quite hazardous. Halogens in tires cause very hazardous emissions when burned such as dioxins, furans, PCBs, and chlorobenzenes. Toxic metals such as mercury, lead, arsenic and chromium are also released when burning tires.[23] Many other hazardous air pollutants are released from burning tires. Studies have shown tire burning to be dirtier than coal.[24] While not widely promoted as biomass, tire burning *has* been considered in some federal biomass energy research programs.[25] The Mid-Atlantic Green-e Advisory Committee recommended excluding the sale of energy from tire incineration as renewable within their region,[26] yet it would still be an option for the rest of the country.

Wood waste (construction/demolition, urban tree trimmings, paper and lumber mills wastes, etc.)

Wood waste is a very broad category. It includes - but is not limited to - wood pallets, construction / demolition wood waste, land clearing and right-of-way tree trimmings, Christmas trees, tree and shrub trimmings, paper and lumber mill waste, and wood products industry wastes.

Wood from sources like tree trimming can be contaminated with pesticides which may add toxic inputs to a burner. Wood waste is not the same as wood cut fresh from a forest. Wood waste can come contaminated with wood preservatives, binders, paints, glues, plastic laminating materials or other non-wood materials. It can also mean particleboard, flakeboard, plywood, fiberboard and manufactured wood which may have plastic laminates, chlorinated adhesives, or phenol and urea formaldehyde resins. Other products which have been allowed to be burned in industrial wood burners include pelletized wood pulp from mills which may use chlorine bleach. Wood pallets have been discussed as biomass fuels. It is unreasonable to expect that the metals staples and nails are removed before incineration in industrial wood burners.

Painted wood may include lead or mercury (particularly in demolition debris). Mercury has been used as a fungicide in paint. Treated woods are usually coated with either creosote, copper chromium arsenate, or pentachlorophenol.[27] Pentachlorophenol is a chlorinated compound which will form dioxins and furans when burned. Burning wood treated with copper chromium arsenate (CCA) will release arsenic and chromium VI. Since copper serves as a catalyst in dioxin formation,[28] any small bit of CCA-treated wood will greatly escalate dioxin emissions from industrial wood burners. Some wood burners that are permitted to be taking "clean" wood wastes have been allowed to accept a certain percentage of chlorinated wastes, since wood waste suppliers are unable to completely isolate all vinyl-coated material.[29] In construction/demolition wastes, there is likelihood of PVC (polyvinylchloride) contamination from many sources common in building materials. For example, all household electrical wire sold in the U.S. is coated with PVC plastic. Since this wire is made of copper, it's an extremely dangerous mixture to have burned, since the copper will catalyze increased dioxin formation out of the PVC.

Industrial wood burners are not usually outfitted with advanced pollution controls. Some are equipped only with electrostatic precipitators (ESPs), which are known to boost dioxin emissions by retaining the exhaust gases in the temperature range where dioxins are formed.[30] In addition to dioxins, furans and toxic metals, industrial wood burners also emit formaldehyde, phenols, benzene, napthalene (present in creosote), and chlorine, not to mention NOx, SOx, VOCs, and particulate matter.

Waste wood that is truly clean ought to be reused or made into paper, but not burned. Industrial wood burners, even if they start off burning a relatively "clean" supply of wood wastes, often end up seeking to burn more hazardous types of waste. In some cases, wood waste facilities have sought to burn wood tar waste.[31] In other cases, state agencies have allowed industrial wood burners to dispose of their oily water by spraying it on their wood fuel.[32] Some states actively encourage industrial wood burners to burn waste tires.[33, 34] It has been argued by some corporations that they need to co-fire tires in order to become "leaner and meaner" in the deregulated electric market.[35] Many industrial wood burners are already permitted to burn tires, treated wood waste, black liquor solids and/or paper sludges.

Many paper or lumber mills, fiberboard plants and other industries that process wood, paper or pulp have incinerators for waste that is created primarily or entirely on-site. In some cases, these incinerators produce excess electricity that is sold to the grid.

In lumber mills, the fuel is mostly sawdust and wood scraps. These wood wastes could be recycled or composted, instead of being burned for electricity which produces large amounts of particulate matter as well as NOx and SO2.

In paper mills, chlorine compounds are used as bleaching agents. Some paper companies burn their black liquor (pulping liquid that they cook wood chips in). This liquor is chlorinated and produces dioxins and furans when burned. The Champion International paper mill in Pigeon, Tennessee invented a bleach filtrate recycling process which is used to get more energy and heat recovery from their boilers. According to Champion's figures, their process leads to a 42% increase in chloride concentration from fired black liquor. This dirtier process is now being used by other paper corporations.

Fiberboard plants use formaldehyde (a hazardous air pollutant) and other toxic glues such as isocyanate. Although soy-based adhesives are available as alternatives, fiberboard corporations have been reluctant to switch to them. The toxic constituents of these glued and otherwise treated wood products make them unsafe to burn. Particle board and other processed wood products can come contaminated with chlorinated plastics that are burned since they're not easily removed.

Wood waste incineration is one of the primary types of biomass that is being accepted as renewable in the Green-e program. The Mid-Atlantic Green-e Advisory Committee recommended including the sale of energy from incinerating wood wastes that are supposedly not treated, painted, stained or contaminated with vinyl or nails. However, the burden of proof for enforcement of these limitations is left up to the communities who must live near these wood waste incinerators, as Green-e has no means to enforce site-specific restrictions they create.[36]

Agriculture wastes

Agriculture wastes include, but are not limited to, orchard tree crops, vineyard, grain, legumes, sugar, and other crop byproducts or residues as well as nuts, shells, hulls, and other food processing wastes.

Crop wastes ought to be tilled back into the soil to promote soil health, tilth, fertility, and nurturing of the organisms remaining within the soil. In the cases where this is impractical, crop residues ought to be composted or recycled into paper products, not destroyed in incinerators. Pesticides applied to crops may form dioxins when burned. Out of concern for soil health, the Mid-Atlantic Green-e Advisory Committee recommended against the use of herbaceous crop residue for a biomass fuel at the request of the Pennsylvania Sierra Club.[37]

Animal factory wastes -- [See our section on poultry waste incineration for more details]

Green-e considers direct incineration of animal wastes to fall under the category of agricultural wastes. The Mid-Atlantic Green-e Advisory Committee has recommended inclusion of *all* animal waste incineration. While this could include corporate hog factory wastes, dairy factory wastes, beef feedlot wastes, and more, the only actual proposal for "green energy" animal waste incinerators so far has been for chicken and turkey "litter" (feces, bodies, etc.). Pennsylvania-based Sun Combustion, Inc. has been peddling incinerators for hog waste, egg and dairy waste and poultry litter, but has not been seeking to make electricity.

Fibrowatt Ltd., a British corporation, has been seeking to build chicken and turkey waste incinerators in Maryland and Minnesota, respectively. Fibrowatt is 20% owned by Foster Wheeler, the incineration giant. They have hired Carl Strickler as their lobbyist. Strickler served as the Vice-President of Reading Energy when they got kicked out of Morrisville, Pennsylvania for trying to build a construction & demolition wood waste incinerator in 1997. Strickler has shown up at a Mid-Atlantic Green-e biomass meeting on December 7th, 1999 and has been allowed to participate even though environmental justice activists were kicked out of that meeting. The recommendations of the Mid-Atlantic Green-e biomass committee were adopted on February 25th, 2000 when the Mid-Atlantic Green-e Advisory Committee approved all animal waste incineration as renewable, over the objections of several environmental groups.

Fibrowatt helped Delaware's Senator Roth extend a renewable energy tax credit (which usually benefits only wind power) to poultry waste burners in a 1999 Tax Relief Bill.[38] This 1.7 cent per kilowatt-hour subsidy will help make it affordable to import wood chips to allow the poultry waste to burn effectively.[39]

Based on Fibrowatt's emissions numbers, the evidence shows that poultry waste burning is roughly as polluting as coal (or higher than coal in some cases) for many pollutants, including NOx, SO2, carbon monoxide, particulate matter, hydrochloric acid, antimony, manganese, and mercury.[40, 41] We're supposed to believe that these emissions don't matter because the greenhouse gases and other pollutants are already in the environment and are being "recycled" as they move from chickens to smokestacks to chicken feed to chickens again.[42]

The Delmarva (Delaware/Maryland/Virginia) Peninsula, which lies between the Chesapeake Bay and the Atlantic Ocean, is overrun with chicken factory farms. There is far more chicken waste produced than can be used by local farmers as fertilizer, leading to excessive nutrient runoff into the Chesapeake Bay. Pelletization is a cleaner alternative, which can allow the waste to be dried and shipped to other parts of the country where fertilizer is in high demand. However, Perdue's plans for a centralized, large-scale pelletization plant in Maryland have been opposed by local residents due to odor and truck traffic concerns.[43] As long as there is an unsustainable level of chicken production in the Delmarva, small-scale pelletization should be used to handle excess waste. Incineration should not be accepted by the environmental community as an out for an unsustainable industry. Delaware and Maryland environmental groups have been strongly opposed to burning chicken waste.[44, 45]

Rather than consider it a waste product, Minnesota farmers are willing to pay for poultry manure as fertilizer. In Minnesota, organic farmers are concerned that Fibrowatt's proposed turkey waste incinerator will drive up the price of poultry manure by burning nearly half of the state's supply. Both the Minnesota Farmers Union and New Ag America have issued resolutions against public subsidies for the incineration of poultry manure. In Minnesota, subsidies exist for supporting renewable energy, including biomass, though poultry manure does not qualify as biomass.[46] Fibrowatt has 8 registered lobbyists in Minnesota who have been seeking to change that definition so that the company would be eligible for state subsidies worth $140 million in addition to the $55 million they'd get from the federal subsidy that was made law in 1999.[47]

Burning of "energy crops"

Energy crops involve planting some sort of tree or crop, cutting them, burning them for green energy, then replanting, etc. Quick-growing crops such as willow, alfalfa, sorghum, poplar, switchgrass or other crops or trees would be farmed in "dedicated" monocrop plantations.

To mitigate the greenhouse pollutants that this would put out, the facility would replant the trees or crop and consider it renewable. According to the National Renewable Energy Laboratory, "[b]urning new biomass contributes no new carbon dioxide to the atmosphere because if we replant harvested biomass, carbon dioxide is returned to the cycle of new growth."[48] Even congress has not stated that biomass use is a solution for global warming. They state in the National Sustainable Fuels and Chemicals Act of 1999 that biomass provides "near-zero net greenhouse gas emissions."[49] No combustion technologies do anything to mitigate greenhouse gas emissions. Energy crop projects only move greenhouse gases around.

This logic behind the "carbon cycle" global warming argument could almost be used by a coal plant if they could plant enough trees to offset their greenhouse gas emissions. The main difference would be that a biomass facility would plant in the same place they cut. Shell Oil and Monsanto have actually teamed up to create genetically-modified, quick growing "terminator" trees that the oil industry could plant to offset their greenhouse gas emissions.[50, 51]

The U.S. government and private industry have also been researching genetically modified crops, but for biomass energy purposes. A November 1995 article on the genetic engineering of poplar trees stated, "[i]n addition to wood and fiber uses, the [U.S. Department of Energy] and [the Electric Power Research Institute] are interested in the potential for genetic engineering to increase the economic efficiency and reduce environmental impacts of woody energy crops, necessary to make them more competitive with fossil fuels."[52]

In the Mid-Atlantic region, Green-e rejected the suggestion that energy crops comply with organic standards, so that pesticides and herbicides, sewage sludge and genetically modified organisms would not be used in their green energy products.[53] Environmental activists managed to get the regional Green-e body to recommend that genetically modified organisms be excluded in the Mid-

Atlantic states. It was not clear whether this ban would apply to the fuel crop alone or also to cover crops or components of an integrated pest management (IPM) system.[54] Any use of genetically modified organisms might still be certifiable in the rest of the country. Energy crop proponents argue that they need to use chemical herbicides in the first year in order to establish a tree crop so that weeds don't choke out saplings. Having rejected the organic certification standard, there is no protection to ensure that chemical inputs are not used for the duration of the production of an energy crop. There is also nothing preventing the use of sewage sludge or other hazardous wastes as fertilizers on energy crops. These toxic inputs would increase the hazards of incinerating the plants exposed to them.

Hybrid poplar plantations are being widely proposed for bioremediation projects at municipal and industrial waste operations. Trees would be planted at contaminated sites to uptake toxins from the soil and water. When the trees are removed, the toxins go with them. What then happens to the trees is less clear. If these trees are candidates for biomass burners, their emissions would be enormously more toxic than forest or "energy crop" trees. Read more about the merging of the phytoremediation and biomass energy crop industries here: Burning Toxic Plants for Green Energy: The Merging of the Phytoremediation and Biomass Energy Crop Industries

Since energy crops are unlikely to be planted on lands being used for food crops, marginal lands which may not have been farmed will be targeted. These lands tend to be more sensitive, have weaker soil and more erosion problems. Some (particularly willow) are likely to be planted near streams since they need a lot of water. Wetlands and floodplains may be at risk. Water and fertilizer use as well as the use of fossil-fuel-dependent farming machinery make the sustainability and green-ness of these projects questionable.

The large-scale use of biomass resources has the potential to generate incentives for undesirable land use and land management practices. Production of dedicated biomass crops could at some point compete for agricultural land (or increase harvesting pressures on forest land).[55]

When the proposed plantation landmass or prices to plantation sharecroppers proves inadequate, this leads to whole tree chipping (tops and all), incursions into remaining native forests, expansions of plantation lands, increased clearcutting on lands otherwise selectively cut, creates markets for all junk trees, and encourages in-woods chipping which can ultimately lead to stump harvests to try to meet the demands of the burner. Biomass energy production will encourage clearcutting, conversion of native forests to biomass farms, and promote nutrient draining short rotation biomass production on Conservation Reserve Program lands (CRP). CRP lands are the focus of energy crop research and most often are lands that should never have been cleared or are lands that have suffered excessive abuse in the recent past. These lands are best suited for recovery to native plant communities, rather that be put into increased demands of intensive biomass harvests. There is no documentation of the sustainability of repeated biomass removals on most soil types. To the contrary, most documentation points to nutrient losses, soil depletion and decreased productivity in one or two generations.[56]

The Mid-Atlantic Green-e Advisory Committee *ignored* recommendations to: encourage the use of crops with long rotation periods between tillage; discourage large monocultures; encourage strip cropping & age class variation; encourage use of cover crops; encourage diversity of varieties planted on a given site; favor crops requiring the least chemical inputs (biocides & synthetic fertilizers); require, if applicable, harvest after leaf fall; limit sites to existing agricultural land; and require no-entry riparian buffers.[57]

Cutting down trees from forests to burn in industrial wood burners

Trees may be renewable, but forests are not. Biomass burning can be devastating to forests. The major use of wood in the U.S. is not lumber or paper, but energy.[58] Putting forest growth into a

boiler denies its use for paper or lumber. An acre sustaining electric power is not available for other wood products.[59]

Logging slash left to decompose on site is *not* wasted wood. It provides an excellent source of carbon and nutrients for forest soil, badly needed after the extraction of large quantities of biomass in the form of logs. Tree tops in particular are very rich in nutrients. If logging slash is used for green energy, it may give rise to the "vacuum cleaner" effect. Instead of going into a site and hauling out logs, timber operators would be encouraged to "vacuum" up and remove *all* woody material. Chipping trees for electric power generation is a terrible, low value waste of a resource that should be treated as precious. Forest land is far more valuable unused than it is if used for wood chips.

The logging industry and their friends in the mainstream environmental community claim that that logging forests for biomass enhances forest health. This has been used to justify industrial wood burners like the McNeil Generating Station in Burlington, Vermont - a plant which has been contributing to asthma problems in the neighboring community. Logging contributes to increased flooding, habitat destruction and loss of native species.

The Green-e program in New England has allowed "sustainably logged" wood to be obtained from forest sources, while the Mid-Atlantic region has recommended that virgin wood sources have been excluded, so as to not encourage the start-up of an industry to burn virgin wood (such an industry already exists in New England).

Digesters (Animal factory waste, sewage sludge...) -- [See our new section on anaerobic digesters for more details]

Anaerobic digesters are containers that decompose wet organic material without the use of oxygen. This process produces methane which can then be burned as fuel. Animal wastes and sewage sludge are the primary wastes which are being looked at for digestion, but essentially any wet organic material such as food processing waste could be digested.

To economically sell electricity, digesters must be placed on large operations. About half of the 36 animal waste digesters in the U.S. that sell electricity are on Confined Animal Feeding Operations (CAFOs).[60] In other cases, animal waste could be trucked in from a number of farms to centralized digesters (such as one for chicken waste being fought in West Virginia). It is unclear how digester use will affect the waste disposal costs and economics of CAFO operations.

The Mid-Atlantic Green-e Advisory Committee meeting, after discussing digesters in the context of animal factory wastes, voted to recommend in favor of digestion of ANY materials. This could mean that sewage sludge, food wastes and anything else that is digestible can become Green-e certified.

Unaddressed is the matter of whether the heavy metals, toxic chemicals, and sometimes even radioactive contaminants present in sewage sludge migrate into the gas formed in a digester.

Combustion of contaminated landfill gases

"Landfill gas" is not the same thing as "natural gas" or "methane." Landfill gas is roughly 50% methane. The remainder of landfill gas is mostly carbon dioxide with "trace amounts" (usually under 1%) of contaminants known as "non-methane organic compounds" or NMOCs.[61] There are sometimes over 100 of these toxic contaminants, including such chemicals as benzene, toluene, chloroform, vinyl chloride, carbon tetrachloride, and 1,1,1 trichloroethane. Since almost half of these contaminants are halogenated, dioxins and furans will be formed when these gases are burned.[62]

In order to greenwash landfill gas utilization projects, some proponents have urged their colleagues to describe landfill gas as "natural" gas and to describe the burning of it as "like recycling."[63] The landfill gas industry, aided by EPA's Landfill Methane Outreach Program, is pushing for passage of House Bill 3466, which would extend renewable energy tax credits to landfill gas burners.[64]

It's a very different thing to ask "what is the best way to manage landfill gas?" than to ask "how should we produce green, renewable energy?" If you ask about the best way to manage landfill gas, the answer is along the lines of "before you do anything with it, filter out the toxic contaminants and treat them with a non-burn technology." If the question is how to produce clean, renewable energy, the answer is more like "use technologies such as wind and solar that don't create pollution in the process of making energy."

Landfill gas burners were the first combustion technology endorsed as a renewable energy source by Green-e. So far, landfill gas is the most widely used new renewable in Green-e products. For a more detailed look at landfill gas, see the Primer on Landfill Gas as "Green" Energy.

Co-firing:

Take almost any of the above biomass wastes/fuels and mix them with any other fuel (coal, natural gas, oil, or "biomass") and you have co-firing. Green energy marketers have proposed piping landfill gas to natural gas boilers in order to be able to sell the landfill gas portion of the energy. Other existing or proposed co-firing projects involve burning any of the following with coal or wood waste (though not as green energy… yet): liquor solids, wood waste, natural gas, fuel oil, paper sludge, medical waste and/or tires. The "renewable" part of a co-firing project would be allowed to be sold as Green-e certified power if they approve co-firing. Co-firing with coal could allow coal plants to reduce emissions of criteria air pollutants (though their toxic emission would likely increase, depending on the co-firing material), allowing them to avoid having to shut down or install badly needed air pollution controls. To date, concerns over how co-firing might be used to extend the life of coal burning power plants have kept the Green Power Board from approving co-firing.

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FOOTNOTES:

Note: Links to external websites listed below are often followed by a "local copy." These links are provided in the event that the content on the external websites is changed, moved or otherwise unavailable.

1. After getting kicked out of four poor, minority communities in northern Delaware state in 1999, Philpower Corporation is currently (3/2000) seeking to locate in a white suburb in the same county, and is facing stiff opposition.
2. Philpower Corporation Public Meeting/Hearing in Delaware, June 23rd, 1999.
3. Bioenergy Glossary provided by the National Renewable Energy Laboratory. http://rredc.nrel.gov/biomass/states/bio_glossary/glossary.html

4. National Association of Attorneys General "Environmental Marketing Guidelines for Electricity" Preliminary Draft, May 24, 1999 http://www.penweb.org/issues/energy/naag-guidelines.html#3b
5. *Ibid*. http://www.penweb.org/issues/energy/naag-guidelines.html#4a
6. Green-e website, "Helpful Definitions" http://www.green-e.org/what/defs.html
7. Low Impact Hydropower Institute http://www.lowimpacthydro.org/
8. Natural gas includes many contaminants such as organometallic compounds and radon. Combustion releases many toxic metals including lead and mercury as well as dozens of Hazardous Air Pollutants. Natural gas lines can also be contaminated with PCBs. See http://www.penweb.org/users/palm/air.html and http://www.penweb.org/users/palm/links.html
9. Presidential Executive Order 13134, Developing and Promoting Biobased Products and Bioenergy, August 12, 1999. http://www.pub.whitehouse.gov/uri-res/I2R?urn:pdi://oma.eop.gov.us/1999/8/13/4.text.2
10. House Bill 1180 (Ticket to Work and Work Incentives Improvement Act of 1999) passed on 12/17/1999, becoming Public Law No: 106-170. This bill extends the section 45 IRS renewable energy tax credit for wind, closed-loop biomass and poultry waste to facilities placed in service by 1/1/2002. Also, House Bill 1906 (Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2000) passed on 10/22/1999, becoming Public Law No: 106-78. This bill provides research dollars for 6 energy crop projects. Senate Bill 1792 (the Tax Relief Extension Act of 1999) passed the Senate on 10/29/1999. This bill would extend the section 45 IRS renewable energy tax credit to a wide range of biomass technologies for facilities placed in service by 1/1/2001.
11. Ratepayers for Affordable Green Electricity (RAGE) is a national campaign run by Ralph Nader's Critical Mass Energy Project. They are doing some excellent work in opposing nuclear bailouts and other horrible effects of deregulation in the states. However, in reaction to many awful national deregulation bills, they have sponsored their own better version. While the better version includes Renewable Portfolio Standards (making sure that ALL utilities must have a certain amount of renewables in their mix), it allows all forms of biomass short of municipal solid waste or black liquor incineration to be included in the definition of renewables. A copy of their bill (H.R. 2645) can be found at: http://www.penweb.org/issues/energy/hr2645.html RAGE's website can be found at http://www.citizen.org/cmep/RAGE/
12. The U.S. Department of Energy expects national electricity sales to rise by 2% in 2000, and another 1.6% in 2001. http://www.eia.doe.gov/emeu/steo/pub/h1tab.html
13. Green-e website, "Helpful Definitions - Biomass" http://www.green-e.org/what/biomass.html
14. Operating Biopower Capacity (1999), by Fuel Type, World Electric Power Plants Database, Utility Data Institute / McGraw-Hill Companies, June 1999. The extended Mid-Atlantic area includes Virginia, Maryland, Delaware, New Jersey, Pennsylvania and New York.
15. "The Sludge Hits the Fan," Chapter 8 in "Toxic Sludge is Good for You - Lies, Damned Lies and the Public Relations Industry" by John Stauber and Sheldon Rampton. Available on the web at http://www.ejnet.org/sludge/
16. U.S. Environmental Protection Agency's Toxic Release Inventory (TRI) database can be used to track a small portion of the toxic chemicals dumped down the drain by industry. This database can be searched at http://www.rtk.net/triinputtransfer.html See http://www.ejnet.org/sludge/ for tips on how to use it effectively.
17. "Nuclear Regulation: Action Needed to Control Radioactive Contamination at Sewage Treatment Plants," U.S. General Accounting Office, Letter Report, 05/18/1994, GAO/RCED-94-133). http://www.ejnet.org/sludge/radioactivity/gao_radsludge.txt
18. Triclosan is a chlorophenol chemical with similar structure to dioxin. It is a pesticide that is registered with EPA as such. For more information, see

http://www.lindachae.com/triclosan.htm or search through the dioxin list archives (particularly in 1998) at http://lists.essential.org/dioxin-l/

19. "Drugs In The Water," Rachel's Environment & Health Weekly #614, September 03, 1998. http://www.rachel.org/bulletin/bulletin.cfm?Issue_ID=501&bulletin_ID=48
20. "Study Finds Correlation Between Fluorides in Water and Lead Levels," Dartmouth News Press Release, August 31, 1999. http://www.actionpa.org/fluoride/lead.html
21. Note 13 *supra*.
22. Mid-Atlantic Green-e Advisory Committee meeting, February 25, 2000.
23. Greenpeace, "Tire incineration and Toxic Emissions: New data from the Modesto Incinerator, Westley, CA."
24. Lone Star Chapter Sierra Club, "Comments on Resolution 97-425 to Authorize Tire-Derived Fuel Use in Cement Kilns and Utility Boilers for Energy Recovery," submitted to California Integrated Management Board, October 22, 1997. The comments showed there to be increases in the following pollutants emitted from co-firing whole tires with coal vs. burning only coal: NOx, SO2, CO, particulate matter, chlorine, benzene, dioxins, PAHs, chromium VI, copper, lead, mercury, and zinc.
25. "Summary of the First Annual Biomass Resource Assessment Review Task V," August 24th, 1995. http://rredc.nrel.gov/biomass/portland.html At the end of this meeting report, they listed research priorities, in which burning tires was listed as a low research priority which didn't receive any votes, but which is "important and should not be overlooked entirely."
26. Note 22 *supra*.
27. Feldman, Jay, M.A. and Terry Shistar, Ph.D., "Poison Poles -- A Report About Their Toxic Trail and Safer Alternatives," National Coalition Against the Misuse of Pesticides, 1997. http://www.ncamp.org/poisonpoles/
28. A compilation of scientific studies on metals serving as catalysts for dioxin formation can be found here: http://www.ejnet.org/dioxin/catalysts.html
29. Karakash, John, CRSS Viking Operations Inc., letter to Richard Maxwell, PA Department of Environmental Resources Air Quality Management Division, March 22, 1993. This letter states that a wood waste supplier to the Viking wood waste incinerator in Northumberland County, Pennsylvania is "unable to completely isolate all vinyl-coated material." The PA DEP has allowed both of the main suppliers to this wood waste burner to supply wood waste with an average .04% chlorine content (16 pounds per 20 tons of waste).
30. The fact that ESPs magnify dioxin emissions has been documented in *Waste Not* issues #45, 262, 275 and 309. Excerpts from these issues and links to some of them can be found online at http://www.ejnet.org/dioxin/esp.html
31. Maxwell, Richard, PA Department of Environmental Resources, note to John Karakash, CRSS Viking Operations Inc., 9/15/1994.
32. Maxwell, Richard, PA Department of Environmental Protection, letter to Steve Henry, Viking Energy of Northumberland, "re: Oily Water Waste," 8/1/1998.
33. Illig, Richard, PA Department of Environmental Protection Residual Waste Coordinator, Internal Memorandum "re: MMI at Viking Energy of Northumberland September 26th, 1995," 10/5/1995. This memo states: "Currently, Viking is experimenting with the burning of other materials at their Michigan facility. Some of the alternate fuels considered include creosote wood and tires among other materials. The Northumberland facility is also encouraged to consider the use of wastes as alternate fuels."
34. Pennsylvania's Waste Tire Recycling Act encourages the burning of tires. See the PA Department of Environmental Protection website for details: http://www.dep.state.pa.us/dep/deputate/airwaste/wm/MRW/Tires/Tires.htm
35. Harrison, Vicki, "Supervisors: Burning issue may require expert opinion," The Daily Item, A1, August 20, 1998.
36. Note 22 *supra*.

37. *Ibid*.
38. House Bill 1180, "The Ticket to Work and Work Incentives Improvement Act of 1999" became Public Law No. 106-170 when passed on 12/17/1999.
39. Howe, Patrick, "Chicken Manure Power Tax Break Has Senators Clucking," Chattanooga Times/Chattanooga Free Press, July 31, 1999.
40. Elliott, Brian, Energy Program Organizer, Clean Water Action Alliance, "Power Plant Air Emissions Comparison," February 23, 2000. This is a comparison of Fibrowatts' FibroThetford facility in the UK to the Serburne County, Minnesota coal-fired power plant (Sherco) operated by Northern States Power. In this comparison, NOx and mercury emissions are about the same as coal, SO2 is nearly as high as coal, particulate matter is much lower than coal, hydrochloric acid, manganese and antimony are much higher than coal.
41. Alternative Resources Incorporated, A Review of the Air Emissions from a Fibrowatt 50-MW Power Plant Fueled with Poultry Litter, Prepared for Fibrowatt, LLC, Feb, 2000. This report shows that NOx and carbon monoxide emissions from Fibrowatt's proposed turkey litter incinerator in Minnesota would be a little higher than coal plant emissions. It also shows that acid gases (sulfer dioxide and hydrogen chloride) and particulate matter (PM10) would be about the same as coal plant emissions.
42. *Ibid*. Fibrowatt makes these arguments for the global warming gases as well as for the toxic metals which they say would be "recycled" back into the environment.
43. Kellam, Aaron, "Delaware residents raise stink over plant," Newszap, 9/12/1999. http://www.newszap.com/stories/091299c.html
44. Muller, Alan, Green Delaware, Letter to Liz Robinson, Mid-Atlantic Green-e Advisory Committee "Regarding: Use of 'Green-e' to promote incineration in Delaware and elsewhere," February 24, 2000.
45. Mills, Robin, Maryland Safe Energy Coalition, statements at Mid-Atlantic Green-e Advisory Committee meeting February 24, 2000.
46. Nelson, Jessica, Institute of Local Self Reliance, "Poultry manure legislation is putting energy needs eggs in wrong basket," Pioneer Planet, 3/10/2000. http://www.pioneerplanet.com/opinion/ocl_docs/027009.htm
47. Nelson, Jessica, "Should Minnesotans Subsidize the Burning of Poultry Manure? - A Fact Sheet," Institute for Local Self-Reliance.
48. National Renewable Energy Laboratory, "Biomass - Nature's Renewable Storehouse of Solar Energy and Chemical Resources." http://www.nrel.gov/research/industrial_tech/biomass.html
49. House Bill 2827 / Senate Bill 935, the National Sustainable Fuels and Chemicals Act of 1999, would authorize $49 million/year in research money from 2000-2005 for a wide range of biomass and biobased industrial products.
50. Tickell. Oliver, and Charles Clover, "Trees that never flower herald a silent spring," Daily Telegraph, London, July 17, 1999. http://www.purefood.org/Monsanto/frankentrees.cfm
51. Reinsborough, Patrick, Rainforest Action Network, "An Afterword On The Link Between Genetically Engineered Forestry And The Great Kyoto Climate Scam" comments on Daily Telegraph article "Trees that never flower herald a silent spring" in communication titled "Why are oil companies genetically engineering trees?" http://www.earthsystems.org/list/seac-announce/1999/1507.html
52. "Genetic Engineering Of Poplars In The Pacific Northwest," National Biological Impact Assessment Newsletter, November 1995. http://www.fsl.orst.edu/tgerc/overvw.htm
53. Mid-Atlantic Biomass subcommittee meeting on 2/24/2000 passed a recommendation to require organic certification. This recommendation was dismissed by the Mid-Atlantic Green-e Advisory Committee on 2/25/2000 and environmentalists only managed to obtain an exclusion on GMOs as fuel crops.

54. These issues were raised by Arthur Clark in his comments titled "Recommendations to the Green-e Mid-Atlantic Advisory Committee on Biomass Energy Sources," submitted December 8, 1999.
55. Fieler, Jeff, Climate Policy Specialist, Natural Resources Defense Council (NRDC), Testimony before U.S. Senate Committee on Agriculture, Nutrition, and Forestry Hearing on The National Sustainable Fuels and Chemicals Act of 1999. http://www.senate.gov/~agriculture/Hearings/Hearings_1999/fie99527.htm
56. Communications with Denny Haldeman, Dogwood Alliance.
57. Note 54 *supra*.
58. J.W. Konig, Jr. and K.E. Skog. 1987. Use of Wood Energy in the United States--an Opportunity. *Biomass* 12:27-36.
59. Note 54 *supra*.
60. Phil Lusk, Resource Development Associates, Presentation on Anaerobic Digestion at Green-e Biomass Workshop, 12/1/1999. Clarified in conversation with Mr. Lusk on 3/17/2000.
61. "Growth of the Landfill Gas Industry," Chapter 10 of the "Renewable Energy Annual 1996" report by the U.S. Department of Energy's Energy Information Administration. Available online at http://www.eia.doe.gov/cneaf/solar.renewables/renewable.energy.annual/chap10.html
62. "Air Emissions from Municipal Solid Waste Landfills - Background Information for Proposed Standards and Guidelines" Document # is EPA/450/3-90/011A. March 1991, 544 pages.
63. These suggestions were made by panelists at the Environmental Protection Agency Landfill Methane Outreach Program (LMOP) Conference January 10-11th, 2000. Proceedings available online at: http://www.epa.gov/lmop/confer2000.htm
64. *Ibid*. At the January 2000 EPA LMOP conference in Washington, D.C., the conference attendees were encouraged to join the Solid Waste Association of North America's lobbying day for the landfill gas tax credit legislation.