# Earth Sciences

## Natural gas: For better or for worse?

With concern growing over the global warming threat, many public policy experts say countries in the near future must obtain more energy from natural gas and less from oil and coal. Natural gas seems a better source because it produces less carbon dioxide during combustion than does coal or oil, and carbon dioxide is the principal greenhouse gas humans are adding to the atmosphere. But a new study suggests natural gas may not deserve its environmentally clean reputation.

Dean E. Abrahamson, a public affairs professor at the University of Minnesota at Minneapolis-St. Paul, reports that a significant amount of natural gas leaks into the atmosphere during transportation. Natural gas, composed mostly of methane, exerts a strong greenhouse effect both directly and indirectly, and can heat the atmosphere 30 to 70 times more than carbon dioxide, Abrahamson says. He calculates that natural gas would contribute more greenhouse warming than oil if more than 1 or 2 percent of the gas leaked into the atmosphere during transmission through pipelines and distribution. He conducted his study for the Oil Heat Task Force, an industry trade association, which released it Aug. 2.

The new report raises the question of how much gas actually leaks into the air. Abrahamson's study doesn't address that. But he does report figures showing that interstate gas pipelines "lose" about 0.5 percent of the gas and that 2 to 3 percent is "lost and unaccounted for" when companies distribute the gas.

The Oil Heat Task Force uses these figures to conclude that heating oil causes less global warming than gas. But the "lost and unaccounted for" category is just an accounting term that includes theft, meter error and other factors, and it does not represent the actual amount leaking into the atmosphere, according to the American Gas Association, a gas trade group. In a survey, the association found that 0.43 percent of the total gas escapes into the air during transmission and distribution.

According to Nicholas A. Sundt of the congressional Office of Technology Assessment, these numbers are only estimates and the actual figures remain unknown. The Environmental Protection Agency has commissioned a study to quantify the actual leakage for the United States, but the difficult study may take two to three years to complete, Sundt says.

If Abrahamson is correct in concluding that a small amount of natural-gas venting could tip the environmental balance in favor of oil, policymakers will face some difficult choices, especially outside the United States, where experts presume leakage poses a bigger problem, Sundt says.

## Plants: Definitely for the better

While human activities may be warming Earth, the rest of life exerts a strong cooling influence on the planet. Trying to quantify that effect, a new study suggests the world was a whopping 30°C or 45°C warmer before life evolved, report David W. Schwartzman of Howard University in Washington, D.C., and Tyler Volk of New York University in the Aug. 10 NATURE.

They concentrated their examination on how life affects the chemical weathering of rocks – a process that pulls carbon dioxide from the air and thereby keeps Earth's surface cool. Schwartzman and Volk contend that researchers have failed to consider the many ways in which higher plants, algae and fungi increase weathering rates, in particular by preventing soil erosion. The new work shows that such life forms might speed weathering by perhaps 1,000 times.

Before life arose, Earth may have been devoid of most soil, the researchers propose. Their calculations indicate the earliest life helped make the planet more hospitable for later forms – a suggestion reminiscent of the controversial Gaia hypothesis, which holds that life regulates conditions on Earth.

# Environment

*Janet Raloff reports from Toronto at the annual meeting of the American Institute of Biological Sciences*

## Climate change: Boon to western trees?

Cold, dry forests in the mountainous West would probably weather significant climate warming far better than nearby trout streams and irrigated crops, suggests Steven W. Running of the University of Montana in Missoula. Scientists expect such warming to occur if atmospheric carbon dioxide levels are allowed to double during the next century (SN: 4/8/89, p.216).

Running and his colleagues have developed, and are now refining, a regional-scale ecosystem model to compute daily changes in the water and carbon dynamics of an actual forest. "We're basically simulating a static snapshot of what we imagine the Montana forest landscape might be a century from now," he says. They predicate their latest snapshots of the 1,200-square-kilometer study site on several basic predictions from large-scale climate models: that with a global doubling of atmospheric carbon dioxide, air in this region will warm by 4°C and precipitation increase by 10 percent. The researchers also factored in important accommodations plants would make—an increase in photosynthesis and a reduced flow of gases through pores on leaves – which together should improve their water-use efficiency. But what really makes the model innovative, Running says, is its accounting for how such changes might alter a forest's leaf cover – where evapotranspiration (water loss) and photosynthesis occur.

Running's model indicates that if carbon dioxide doubles over the next century, western mountain snowpacks – which water lower-elevation areas as they melt—will most likely thaw 60 to 80 days earlier in the spring than they do now. "We're talking about cutting in half the period of snowpack," Running says. Early-thawing snowpacks will not only melt sooner but also parcel out less water. A longer, warmer growing season and improved water-use efficiency should spur tree growth 20 to 30 percent, he found. But warmer temperatures will also boost evaporation throughout the ecosystem, more than offsetting the precipitation increase. With less water and bigger trees to consume what there is, lower-elevation users of mountain runoff may go thirsty, Running says.

## Combustible grass winning the West

Summer parches much of the Great Basin, a region centered in Nevada and extending out in all directions. Until about 1930, however, wildfires rarely hit the area – largely because the native ecosystems featured such low-ignition plants as sagebrush, bunch grass, pinyon pines and junipers. Now, the rapid advance of *Bromus tectorum,* a weedy Eurasian grass inadvertently introduced to the United States about a century ago, is igniting concern about the future of the West's sagebrush steppe and pinyon/juniper woodlands.

*Bromus,* also known as cheat grass or bronco grass, dries up in the arid West around late May. From then until the November rains, it remains highly combustible. "It's like gasoline almost," says plant ecologist Dwight Billings of Duke University in Durham, N.C. Almost anything – from lightning to the errant dropped match – can set it off. When *Bromus* burns, often 30,000 acres at a time, most of its seeds survive to sow the charred expanses. Its native competitors don't recover nearly as well. Already, *Bromus* covers almost half the Great Basin, Billings' surveys show. And where fires have been severe, at best only 3 to 5 percent of the native plants remain.

A poor forage and shelter for the birds and animals that once called the Great Basin home, the invading *Bromus* is "destroying these two big biomes – the bunch grass/sagebrush ecosystem and the pinyon/juniper woodlands," Billings told SCIENCE NEWS. And the really bad news: Billings says work by a Duke colleague indicates *Bromus* will have an even better selective advantage under conditions expected with a greenhouse warming.