It Seems to Us . . . Radio Smog

By David Sumner, K1ZZ
ARRL Executive Vice President
September 18, 2002

Editor's note: *Typically, only ARRL members get to read the "It Seems to Us ..." editorials that run each month in QST. We're posting this editorial by ARRL Executive Vice President David Sumner, K1ZZ, that appears in the October 2002 issue of QST in the hope that both ARRL members and nonmembers might appreciate it and find it informative.*

Much in the news in mid-August were reports of a major scientific study of an "Asian brown cloud" of toxic haze hovering over the most densely populated portion of that continent and threatening other parts of the world. The harmful effects of the haze on health and weather appear to be substantial: respiratory disease, drought in some areas and flooding in others, acid rain, and reductions in crop yields to name but a few. On a more encouraging note, scientists also know how to reduce the pollution and its effects: the use of cleaner energy sources and better stoves, and reduced burning to clear fields and forests.

The issue, which is really one of economics, is how to get hundreds of millions of individuals, families, and businesses to make these changes in how they live when the cost is far more immediate and tangible than the benefit. For an impoverished family, cooking its meal as cheaply as possible is a matter of survival. If cow dung is available as a "free" fuel it's a rational decision for the family to use it--but when multiplied by one hundred million, one family's tiny stove becomes an environmental calamity.

There is an obvious parallel between pollu-tion of the Earth's atmosphere and pollution of the radio spectrum. Like the atmosphere, the radio spectrum is a precious natural resource shared by all. Like pollution, radio waves respect no political boundaries. Like the smog that fouls the air in many cities, electronic smog fouls the radio spectrum as a consequence of human activity--and like toxic haze, radio smog is an economic rather than a technical issue. We know how to control it; the debate is over whether it's worth the price to do so, and who should pay.

We're used to hearing public policy debates about air and water pollution. While people may disagree on costs vs. benefits in some instances, no one can possibly dispute that, for example, the quality of life in London improved dramatically after Parliament curtailed coal-burning in 1956. If someone were to suggest today that Londoners could save money by switching back, they would not be taken seriously--to put it mildly. The same would be true if someone were to suggest that their community could save money by dumping its raw sewage into the river. Such thoughts might have been acceptable 100 years ago, but not today. We've made too much progress, at too great a cost, to go back.

Unfortunately, the same cannot be said of spectrum policy. In some ways we do indeed seem to be going backwards, or having to fight against pressures in that direction.

Many sources of radio smog are unintentional. Switch-mode power supplies are not designed to generate radio interference. Unfortunately, in some cases they are not designed not to. They could be, and if either consumers or governments insist on it they will be.

Line noise is a big problem for many amateurs and other radio users. Power lines are not supposed to emit RF energy, and if they do it's a sign something's wrong. Some power companies care, and know what to do. Others either don't know or don't care (executive bonuses being more important than overtime pay for linemen, perhaps). The FCC can make them care, and in several recent cases has done exactly that by threatening enforcement action.

Radio smog also results from putting RF where it doesn't belong. RF has this wonderful property: it wants to radiate. And it *will* radiate from any conductor you introduce it to, unless the conductor is either shielded or balanced. So, why would anyone deliberately put RF on a conductor that is neither shielded nor balanced if they didn't want it to radiate? For the same reason that the destitute Asian family uses cow dung to heat its dinner: economics.

What we're talking about here are plans to use power lines to distribute broadband digital signals to homes and offices. The wires are already there, the reasoning goes, so why not use them? Utilizing existing infrastructure in new and creative ways is good for business and good for society. Offering competitive choices to consumers lowers prices and improves service. How can anyone be opposed to that?

Here's how. A broadband signal is RF. Sent down an unshielded or imperfectly balanced line, it will radiate. Putting security concerns aside as someone else's problem, this creates a new and pervasive source of interference to radio reception. In other words, this competitive choice would transfer to all of society a cost--in the form of reduced utility of the radio spectrum--that is not imposed by other, more environmentally friendly ways of providing broadband service. Our poor Asian family may not have any choice but to pollute. We do.

Is it possible to do power line communications without causing interference to over-the-air communications? Count us among the skeptics. What may be a fine transmission line at 60 Hz looks more like an antenna at HF. And that's a matter of physics, not economics.

Writing in the Summer 1994 issue of *EPA Journal* about London's historic "pea-soup" fogs that gave rise to the term "smog" in 1905, David Urbinato said: "At the turn of the century, cries to reduce the smoke faced a tough opponent. Coal was fueling the industrial revolution. To be against coal burning was to be against progress. 'Progress' won out. Not until the 1950s, when a four-day fog in 1952 killed roughly 4000 Londoners was any real reform passed."

New sources of radio smog are no more acceptable than are new sources of the visible kind. At the turn of the new century our policymakers should--no, must--be able to distinguish real progress from cow dung.