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The Varieties of Possible Precautionary Approaches to Low Frequency EMFs  
Raymond Richard Neutra MD Dr.PH (Albany CA)

In 1993, the California Public Utilities Commission (CPUC) mandated that the Department of Health Services (DHS) oversee a program of research and policy analysis about power frequency EMFs (see [www.dhs.ca.gov/ehib/emf](http://www.dhs.ca.gov/ehib/emf)). In addition to projects on EMF exposures in schools and the workplace, and a study on EMFs and miscarriage, the program supported two policy analyses. They dealt respectively with possible EMF information campaigns and avoidance measures, on the power grid and in schools.

A stakeholder's advisory group oversaw the EMF Program. In overseeing the policy analysis it became clear that stakeholders operate under four different policy frameworks that lead to differences in preferred action with regard to involuntary environmental exposures. Economists and regulators adhere to a "utilitarian" framework that aims at "the most good for the most people at the least cost." Many citizens adhere to a "social justice" framework that aims at "protecting the most vulnerable regardless of cost." Others adhere to a "virtual-certainty-required" framework that requires certainty of a problem before acting on it. Still others adhere to a "non-interventionist" framework that prefers voluntary non-governmental approaches to environmental risk regardless of the degree of confidence that there is a problem.

To assist economists and regulators who frame policy in terms of costs and benefits the policy analysts asked, "how confident must one be that EMFs cause disease and how many cases of disease must be caused before one could justify implementing cheap or expensive EMF information campaigns or avoidance measures?" The results suggest that a range of expenditures, from inexpensive to expensive, could be justified from a cost-benefit perspective even without 100% confidence that EMFs cause disease. Depending on the avoidance measures taken this could increase 1999 utility rates between 0.2% to 3.5% for a decade and could cost \$4.8 to \$7.6 billion. Information campaigns would be much less expensive. Judging by other protective measures taken, economists have determined that society seems willing to pay around \$5 million per statistical death avoided. To make these investments costs beneficial, economists would require avoiding between 100 and 1,500 deaths over the 35-year useful life of the modified power lines statewide. (The DHS contractor acknowledges uncertainty in costs and the means of financing projects; thus these numbers could be higher by a factor of 2.)

School EMF interventions could cost \$40-\$50 million statewide. Therefore to make this investment cost beneficial, economists would require avoiding ten deaths among the five million students and half a million staff over the assumed 35-year useful life of the modified schools statewide.

The philosophical and economic assumptions underlying cost benefit analysis have received increasing criticism. There are ways other than cost-benefit analysis, to incorporate consideration of cost into precautionary policy analysis and these will be discussed.

For those who use a "social justice" policy framework that aims at protecting the vulnerable regardless of cost, the analyses discuss issues of interest to that perspective. For those who use a "virtual-certainty-required" framework that requires certainty of an EMF effect to take any action, the analyses and the risk evaluation (see below) provides them with the information they need to take a position. Adherents to the "non-interventionist" framework will find discussions of voluntary or informational strategies that could be taken.

Adherents to the "utilitarian," "social justice," and "virtual-certainty-required" policy frameworks will probably advocate different courses of action on the basis of these assessments and analyses. The CPUC has administrative procedures to resolve such differences with regard to power grid policy. They can use the information that the California EMF Program has gathered with regard to the power grid in any such deliberations. The state agencies and local districts concerned with educational facilities can use the policy analysis and exposure information in any policy activities that they pursue. DHS will not be making any recommendations on policy at this point in the process.

