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INDUSTRY VIEWS ON THE USE OF POLYCHLORINATED BIPHENYLS IN TRANSFORMERS AND CAPACITORS

JUNE 1976

OFFICE OF TOXIC SUBSTANCES
U.S. ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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Prepared by the

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PREFACE

In January 1976, EPA Administrator Russell Train met with manufacturers and users of PCB products. As a result of those two meetings, three industry task forces were formed and the findings of the task forces were presented to the Administrator at a meeting in May 1976.

This report is a compilation of the statements made by industry leaders at the three meetings.

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Richard Rollins
Vice-President, Jard Company
Representing the Electronic Industries Association

January 14, 1976

PCB's IN CAPACITOR APPLICATIONS

Mr. Train, Ladies and Gentlemen:

On behalf of the Electronic Industries Association and the manufacturers of PCB-filled AC capacitors, I appreciate this opportunity to present our views on PCB capacitors and possible alternatives for PCB's.

The manufacturers have almost exclusively used PCB's in capacitors for the fluorescent and mercury vapor lighting, air-conditioners, television sets and power factor correction applications since World War II.

This capacitor is thus near you a high percentage of the time. Manufacturers are very cognizant of their responsibilities in providing a capacitor that will operate satisfactorily in these applications, providing a long life and high reliability at a reasonable cost. With these requirements in a competitive marketplace, the consequence is that these components must constantly be reevaluated to increase life, increase reliability, decrease size and decrease cost. We, as manufacturers, see these pressures for improvements every day.

Why, therefore, hasn't the U.S. capacitor industry developed suitable alternatives to PCB's in 40 years? One of the answers lies in the nonflammability of the PCB material. Because of applications, such as lighting, where personnel and equipment safety are paramount, capacitors must be manufactured such that they not only fail infrequently, but also fail safely. In an application such as the World Trade Center in New York where 250,000 fluorescent lights are installed, it is obvious that high reliability and a nonflammable capacitor characteristic are mandatory. A capacitor which fails violently and contains a flammable fluid could create a serious problem, especially in densely populated buildings, giving visions of a "towering inferno". The Consumer Products Safety Commission, as an example, have shown considerable concern over television set fires and have requested Underwriters Laboratories to develop standards for safety for television receivers.

A second reason lies in the reliability of the product as it is known today. Presently the capacitors our companies manufacture have a survival rate per year greater than 99.9988%. The requirements that more than 95% of our capacitors must survive after 13 years of normal application conditions must also be met.

The test time and amount of product tested necessary to guarantee the above reliability is mind-boggling to say the least. Many thousands of units and millions of unit hours at or referred to application conditions are required to satisfy our statisticians that any change in product will perform to these present day standards.

Even with the large amount of previous testing and history on the PCB containing capacitor, there have been instances which, despite all controls in existence, caused consumer concern due to extreme failure rates (greater than 10%). The first occurred in 1957, when a variation in the quality of PCB fluid, as synthesized, produced a highly unstable capacitor. Standard analytical tests in use at the time could not detect the quality difference. The result was a large number of capacitors failing in a very short period of application life. The consequence was the requirement, by the customer, that the capacitor manufacturer not only provide compensation for the cost of the capacitor but the cost of the equipment which contained the capacitor plus the labor charge for replacing the equipment in installation. The total replacement cost to the manufacturer thus became 100 times the original price of the capacitor.

A second instance of numerous failures occurred six years later involving this time the capacitors from most manufacturers. In this circumstance, reduced-size capacitors were tested and approved by industry-accepted accelerated life testing and the new sizes were shipped to customers. Approximately one year later, up to 15% of these capacitors began failing in some applications. A subsequent modification in the accelerated life testing, based upon the findings in field failure analyses, now provides proper screening which eliminates the chance of this problem recurring.

The AC capacitor industry is therefore very sensitive to the possible effects of changes and insists upon very extensive screening before releasing new designs or using new materials.

As previously mentioned, alternates have been considered ever since the introduction of PCB's. Now the substitutes must not only be a satisfactory dielectric fluid providing acceptable life, reliability, and safe failure modes, but, in addition they must not cause environmental problems.

Our experiences with PCB's have demonstrated that some material will escape into the environment through processing, etc. Therefore, alternate fluids must be evaluated on this basis. The effects on man and his environment must be evaluated before the product is introduced.

It would be a very serious error to inadequately evaluate and prematurely replace capacitor grade PCB's with a fluid which eventually becomes a greater threat to man and/or his environment.

Non-PCB alternatives are now being offered or suggested, some are new and some have been available for many years. The industry's position on these is as follows:

1. Mineral Oil is a flammable fluid, which was replaced by PCB's in the 1930's. Capacitors using it are 50 to 100% larger, much less reliable and much less safe than those using PCB's. The substitution of mineral oil would necessitate redesign of equipment to utilize the larger capacitors, would require an increase in the capacitor manufacturing facilities and would result in increased use of basic materials which are presently in short supply.

2. Modified synthetic hydrocarbon oils have been developed which, while flammable, would allow capacitors to approximate today's sizes. Samples have been distributed for testing, but the material is not commercially available.

3. Phthalate Ester, also a flammable fluid with biodegradability problems, it should be noted, has been used in certain restricted applications where conditions of limited temperature requirements exist. The unknown factors of reliability and safety in the broad consumer use areas such as lighting now prevent its use. Evaluations, however, are continuing.

4. Substituted Aromatic Compounds are possible candidates and one has been proposed that has less fire resistance than PCB's, and is suggested to be a good dielectric fluid, but only for high voltage power factor correction applications. This to our estimation represents only 17% of the PCB usage in closed systems, and leaves completely unanswered any alternative(s) for the remaining 83% of the applications. Although some material has been produced, the fluid has not been made commercially available. When samples become available, the time-consuming testing can begin. It has been estimated that approximately three years are required for final commercial use after initial testing of a change in capacitor fluids.

Also, proposed for limited applications is the use of a plastic film replacing the kraft paper dielectric in the AC capacitors. Although evaluations for small industrial capacitors with this material have been underway for more than two years, the reliability of the product is only 1/20th of the present capacitor in most applications. Significant additional testing is required to determine the cause of the poor reliability.

In summary, there are no commercially available fluids which today can be considered a totally acceptable substitute for PCB's in the broad range of AC capacitors. Nor, in fact, are there substitute dielectric systems which would satisfy the requirements of reliability and safety in most applications.

Finally, our industry believes we should work together with the EPA to promote mutual understanding and to attempt a cooperative effort for solving our mutual problem with polychlorinated biphenyls.

Herbert M. Appleton
Vice-President, McGraw Edison Company

January 14, 1976

Thank you, Mr. Train, for your invitation to meet with you to discuss polychlorinated biphenyls.

We believe there is no question that PCB's eventually must be eliminated from all products going into the marketplace. The only question can be, "When?" No other position is defensible.

As a major manufacturer of power capacitors, McGraw-Edison Company has recognized the PCB problem. We have a modern plant and control our emissions carefully, but we can't control the ultimate destination of millions of pounds of PCB's shipped in our products, which someday will be entering the environment.

Believing this to be a major concern, four years ago we sought, with the help of Dow Chemical, to find a non-toxic, biodegradable substitute for PCB's in high voltage power capacitors. We have succeeded and are offering a diphenyl oxide formulation to the power capacitor industry. It can be substituted in present designs, using existing process equipment.

This diphenyl oxide capacitor fluid is up to 20 times less toxic, far more biodegradable and easier to dispose of than PCB's. Electrically, it is equal to or better than PCB's in our tests.

Flammability in power capacitor impregnant is not a major issue, we believe, since most units use less than three gallons. The National Electric Code allows this to be installed without a vault in a building. The flash and fire points are better than mineral oil although not as good as PCB's.

Someday there may be developed a better, cheaper, universal liquid for capacitors, transformers, ballasts, etc., but we do have an answer now for capacitors. Dow Chemical promises to have production quantities available by mid-1976 and in large quantity by the end of 1976. Manufacturers can get sample quantities now to begin their tests.

F. J. Fitzgerald
Vice-President, Monsanto Chemical Company

January 14, 1976

Good afternoon, my name is Jack Fitzgerald. I am a vice president of Monsanto Company, a member of its Corporate Administrative Committee and managing director of Monsanto Industrial Chemicals Company, an operating unit of Monsanto Company.

Since I am responsible for the operating unit which manufactures polychlorinated biphenyl dielectric fluids, John Hanley, our president, has asked me to represent him today and reaffirm to you Monsanto's commitment to continue working with the EPA and the electrical industry in finding solutions to the PCB issue.

Let me state at the outset that Monsanto agrees wholeheartedly with EPA's desire to work toward the goal of eventually eliminating all uses of PCB's.

Monsanto has already taken several steps designed to restrict the entry of PCB's into the environment.

First, Monsanto began restricting the use of PCB's solely to closed electrical systems, for which no viable alternates existed, back in 1970. It should be noted that this voluntary program was fully implemented prior to the completion of the study done on PCB's by a Federal Interagency Task Force in 1972.

Secondly, Monsanto has been working for a number of years on non-PCB replacement products. These materials, designed to replace PCB fluids in capacitors and transformers, are currently being evaluated by the major electrical manufacturers in the United States.

While the PCB issue is a tough one to handle, the difficulty does not nor will not in the future stem from any lack of cooperation on the part of Monsanto. The problems that we face, collectively, are rather rooted in the unique characteristics of PCB's and the irreplaceable role they have served in our electrical-industrial environment for the past 45 years. The challenge: Replacing them in an orderly manner without creating another hazard of equal or potentially greater consequence, while at the same time avoiding serious power and transportation disruptions.

Let me emphasize that we have no desire to remain in the PCB manufacturing business any longer than is necessary. By this I mean as soon as we are satisfied that the electrical power supply industry's needs for usable, acceptable alternate dielectric fluids have been met by whomever, Monsanto will voluntarily shut down its PCB manufacturing unit. In the interim, we will continue to work with industry and government to ensure that the restrictive measures and controls we implemented in the early 1970's remain in force and are diligently pursued.

John F. Welch
Vice-President, General Electric Company

January 14, 1976

General Electric welcomes the opportunity to participate in today's proceedings and wishes to compliment Mr. Train and the EPA for the constructive manner in which they have approached this very complex PCB issue. A cooperative effort between government and industry can avoid the delays brought about by adversary proceedings and should truly benefit the public at large.

As the leading industrial user of PCB's in the manufacture of capacitor and transformer products, we have pursued a parallel course both to reduce the PCB discharges from our manufacturing plants and to find an acceptable substitute for their use in electrical apparatus.

The public record shows that we have made excellent progress in lowering PCB discharge levels at all related manufacturing sites. Our technological developments have positioned these facilities to achieve discharge levels in the ounces-per-day range. However, progress has been more difficult in the search for a PCB substitute.

General Electric for the past 30 years has attempted to find a suitable substitute. In the early years, this effort was directed to improving the economy and performance of its electrical apparatus, but in the past several years, the emphasis has been to provide a more environmentally acceptable substitute. We have tested over a hundred fluids representing the full spectrum of chemical substances, and although there are promising leads, they all require additional long-term testing for reliability, safety and environmental compatability.

For example, in capacitors, all known potential substitutes, unlike PCB's, are flammable. This characteristic presents a significant problem to the users of capacitors: the appliance, lighting and several other consumer-related industries.

Consumer product safety is just one of the many complex issues which have to be resolved in evaluating a PCB substitute. Environmentally, as a minimum, we must be satisfied that any subsubstitute considered is a significant improvement over PCB's.

As we stated at the outset, General Electric is most willing and indeed anxious to cooperate with EPA in their goal of finding a satisfactory substitute for PCB's in electrical apparatus. However, we urge that the complexity of this issue and the potential consequences of precipitous action be thoroughly and thoughtfully considered. Industry and government have the opportunity to demonstrate, on this highly visible PCB issue, that they can work together in solving environmental questions in the best interest of the public.

D. M. Sauter
Vice President, Westinghouse Electric Company

January 14, 1976

Westinghouse very much appreciates the opportunity to make these comments at this conference. It is the hope of Westinghouse that this meeting will be devoted to the safety aspects of electrical equipment. Westinghouse recognizes that environmental effects are one of the many elements that affect human safety. The production, use and operation of electrical equipment must not increase the danger to humans.

Since the early 1970's, when scientific studies indicated that polychlorinated biphenyl mixtures presented some hazard in the environment, Westinghouse has expended considerable money and effort to reduce the amount of Aroclors 1016 and 1242 that might escape into the environment. Measures that have been employed are: sealing drains in manufacturing areas where Inerteen is used; (note - Westinghouse uses the term Inerteen for Aroclors 1016 and 1242); utilizing specially designed incineration facilities for the destruction of scrap Inerteen and special scientific landfills for the disposal of Inerteen contaminated material; instructing operating personnel and our customers regarding the need for care, and that special waste disposal is required; and reducing the number of pounds of Inerteen for each rating of transformers and capacitors. Most of these measures were implemented prior to the enactment of the Federal Water Pollution Control Act Amendments of 1972.

Westinghouse recognized that these measures could not prevent the total elimination of Inerteen escaping into the environment. Therefore, concurrent with the above measures, we have conducted extensive evaluation programs designed to utilize those mixtures of polychlorinated biphenyls having low persistence and high biodegradability in the environment. By February 1968, Westinghouse determined that a mixture of polychlorinated biphenyls, sold by Monsanto as Aroclor 1242, would be satisfactory as Inerteen for transformers. Aroclor 1242 contains about 91% of the lower isomers (containing 4 chlorines or less) that more readily biodegrade in the environment. This material has been used by Westinghouse since that time with the understanding that over 90% of any small amounts that did enter into the environment would have relatively low persistence.

Monsanto subsequently developed a new material from Aroclor 1242 which contained more of the lower chlorinated isomers and marketed this material as Aroclor 1016. By the first quarter of 1972, this material was introduced by Westinghouse into the manufacture of all capacitors. This material contains 99% of the more biodegradable isomers (4 chlorines or less) so that less than 1% of this material that might escape into the environment might be more resistant to biodegradation.

The industry, Monsanto, our own research of the scientific literature and most kf the papers presented at the EPA Conference in Chicago have indicated that the lower chlorinated mixtures of polychlorinated biphenyls are more biodegradable and do not present the same long term toxic environmental problems as those which contain the higher chlorinated isomers. It is interesting to note in this regard, that not only have Environment Protection Agency researchers found a significant difference between the effects of Aroclor 1242 and Aroclor 1016 on rats, but also Dr. Robert W. Riseborough and Dr. Ian Nisbet concluded that there were significant differences between the various mixtures and that comments concerning the higher chlorinated mixtures should not be associated with the lower chlorinated mixtures.

Because of the long term nature of biodegradable and toxicity tests, limited data is available on Aroclor 1016 and Aroclor 1242. We hope the government is gathering test data on biodegradability, toxicity and flammability of 1016 and 1242. Otherwise, industry as it develops alternate fluids will have no sound basis for comparison.

To gather data to evaluate alternate fluids, Westinghouse after 40 years of experience, has found these steps necessary:

1. Check the fluid for possible harmful effects to the environment.

2. Check the electrical characteristics.

3. Check for safe handling.

4. Check for availability, wide use and economic feasibility.

5. Make small model capacitors and transformers and check for system compatability.

6. Perform accelerated life tests on small model capacitors and transformers.

If a fluid passes step one through six it becomes a candidate for full scale tests.

Westinghouse instituted development programs to evaluate various fluids as possible impregnants for high voltage power capacitors and transformers using these six steps over five years ago. These programs were first aimed at consideration and testing of several known existing impregnating fluids and, secondly, to seek out and test new fluids as possible impregnants. This effort has been carried out at both Research and Development Laboratory levels and plant engineering levels.

In the first phase of this program, it was determined that none of the known available capacitor impregnants were a satisfactory replacement for Aroclor 1016 either due to poor electrical performance at the high voltage stresses required, or due to poor flammability characteristics. Similar results were found when testing for substitutes for 1242 which is used in power transformers.

In the search for new fluids, a large number of raw material suppliers of chemicals and petrochemicals have been contacted. Among these have been Dupont, Dow Chemical, Dow Corning, Monsanto, Sunoco, Exxon, Pilot Chemical, Union Carbide, Nippon Oil, Prodelec, Pittsburgh Chemical and USS Chemicals. Many tests have been carried out with materials supplied by most of the above suppliers, some tests on the fluids themselves and others using the more promising fluids in both small model capacitors and in full-size capacitors units. Although none of these fluids have flammability characteristics equal to that of 1016 fluid, some have adequate electrical performance sufficient to consider them as possible replacements for Aroclor 1016 should this action become necessary. In the transformer area, no economical substitute for Aroclor 1242 could be found with adequate flammability characteristics either. The electrical characteristics of mineral oil obviously are suitable for power transformers if flammability could be ignored.

Precipitous action to replace electrical equipment would result in billions of dollars spent by utilities, industrial plants and commercial installations. While this could increase orders for electrical manufacturers it would be a disaster for customers who would have to replace equipment prematurely and rebuild their electrical systems. The Government is meeting with utilities and will learn of capacitor replacement problems. Industrial and commercial customers are the primary users of askarel power transformers. They should be included in government meetings since they will be faced with unreasonable costs for replacements also.

In conclusion, Westinghouse believes the U.S. Government and the scientific community should determine the biodegradability, toxicity and flammability of Aroclor 1016 and 1242. The tests and results for these two askarels can then serve the electrical industry as standards that should be improved upon. By putting forth scientific data and performing suitable tests on alternate fluids, the U.S. Government can assist the electrical industry in selecting alternate fluids which potentially are less dangerous to man and his environment.

Richard L. Hauser
President, Electrical Utilities Company

January 14, 1976

Mr. Train, my name is Richard Hauser. I am President of the Electrical Utilities Company in La Salle, Illinois. My company manufactures capacitors used in air conditioners, television receivers, lamp ballasts, and many other types of equipment.

As is the case with similar capacitors made by other manufacturers in the United States, they are almost all impregnated with polychlorinated biphenyl, known as Monsanto Aroclor 1016. In common with other aroclors, this material is non-flammable in the usually accepted sense.

In the pursuit of the goal of phasing out PCB's in the United States, I believe it is imperative that we take into consideration not only the adverse environmental effects we are trying to minimize, but also the safety impact of these actions.

One consideration which must be faced squarely is the matter of flammability. There are literally hundreds of millions of small industrial capacitors impregnated with non-flammable polychlorinated biphenyl (PCB's) in service today. I am not concerned about their contribution to fire hazard in these existing installations. However, an additional 50 to 75 million of these capacitors are being placed in service each year.

The materials the Electrical Utilities Company has tested may be more environmentally acceptable than PCB's, and they have other characteristics which make them reasonable candidates for use in industrial capacitors; however, they have flammability characteristics as dangerous as those of ordinary mineral oil. I am aware that there have as yet been no serious fire problems attributable to capacitors in Japan since they switched from PCB's to other impregnants. I am aware that pressure interrupting devices in some applications or electrical fuses can be used to reduce the possibility of case ruptures or fire when a capacitor fails. These safety devices, while reasonably reliable, are by no means completely effective. There also may not yet be many non-PCB capacitors in service in Japan. Failures are more likely to occur in application when the capacitors are older. Unless some other component in equipment fails first, or capacitors are removed from service for other reasons, all small industrial capacitors will eventually fail in service.

Because of the large number of capacitors being put into service, if they contain a flammable dielectric, it is my opinion that it will not be long before the first failure occurs resulting in a fire. The Electrical Utilities Company has already had a fire in our factory while experimenting with non-PCB's.

If our industry agrees to phase out PCB's, EPA should agree to help us coordinate the introduction of non-PCB's with those organizations and agencies that will be concerned with flammable capacitor dielectrics. Underwriters Laboratory, the Consumer Product Safety Commission, and insurance companies using the National Electric Code will be some of the organizations concerned.

Also, my company has no wish to jeopardize its own survival, as well as peoples' lives and property, by producing a product which is not as safe as capacitors are today. If we are forced to use flammable dielectrics, some type of government sponsored indemnification for potential damages could greatly aid users of non-PCB capacitors and reduce the risk to capacitor manufacturers potential damages pose.

I hope that in our mutual search for reasonable alternatives to PCB's you will take these suggestions into account.

John P. DeLong
Director, Power System Operations, TVA

January 22, 1976

TVA POWER SYSTEM

USE AND CONTROL OF POLYCHLORINATED BIPHENYLS (PCB's) ASKAREL

There are two uses of askarel on the TVA system in quantities of any significance. This is in transformers and capacitors. We have slightly over 700 gallons of askarel in storage among 10 storerooms. In addition there are thousands of small capacitors and relays, but each of these has only an ounce or less of askarel. We also have a few hundred motors which contain starting capacitors with just a few ounces in each.

Transformers filled with askarel do not burn or sustain fire under conditions of internal electrical arcing. Various Federal, state, and local conditions require use of askarel in transformers for use in locations where electrical fires present the greatest potential danger to life and property.

We have approximately 1,350 transformers filled with askarel that are installed in hydro, steam, and nuclear generating plants for indoors, vaults, or special applications where fire protection is important. The total quantity of askarel used in these transformers is about 850,000 gallons. These transformers, depending upon the rating, each contain some 50 to 1,000 gallons of askarel. Out of all the askarel-filled transformers at the plants the only failures in the last 20 years have been the small high-voltage precipitator transformers. We have experienced over the last few years two or three of these failing a year. Each of these holds 50 to 100 gallons of askarel. In the past these transformers were repaired in an area of our central service shop where, if a spill had occurred, the askarel would not have entered a floor drain but would have drained into a catch sump area. For future repairs this is being discontinued. The transformers and associated filtering equipment will be repaired and handled inside a steel curbed pan with a volume that will hold the full amount of askarel that the transformers contain. This will result in a completely sealed system and eliminate the danger of spillage. The soiled rags and solids will be collected in a sealed tank and held for future disposal.

Capacitors are used on the electrical transmission and distribution system as devices to control voltage and by correcting power factors reduce system transmission and distribution losses. We have approximately 82,000 capacitors totaling 5,595,000 kvar's in use on the TVA system. These capacitors vary in size from 15 kvar for the older ones up to 200 kvar for the new ones. The new ones are not much larger physically than the old style, so the whole group would average 2 to 2 1/2 gallons of askarel per capacitor. This will give a total of 160 to 200 thousand gallons in all capacitors.

Approximately 2/3 of the capacitors are installed in TVA substations mounted on steel structures, over graveled area, and inside a security fence. The other approximately 1/3 are located on TVA power distributor systems usually in clusters of 3 to 12 capacitors mounted on a pole structure primarily in rural areas. Our major disposal problem has been with the failed or retired capacitors. On an average, 250 fail each year and another 50 are retired due to obsolescence. Since each capacitor is protected by an individual fuse, seldom does a failure result in a ruptured case and loss of askarel. From the above totals, you can see that we would have a total of approximately 1,050,000 gallons of askarel in use on the TVA system.

In the early 1970's TVA considered storing failed capacitors and solid material containing askarel until a standard disposal procedure was approved by the Federal government. However, it was felt that the storage and shipment of failed and obsolete capacitors (approximately 300 per year) would be a hardship and, therefore, the American National Standard Institute "Guidelines for Handling and Disposal of Capacitor and Transformer Grade Askarels Containing Polychlorinated Biphenyls" were adopted. These guidelines state that failed capacitors should be disposed of only in dry landfilled sites which met all applicable state standards. All waste liquid askarel should be disposed of by incinerator at a suitable facility. TVA has plans to send all waste askarel to the Monsanto Chemical Company for disposal when sufficient quantities are available. Until then it is being stored in glass-lined tanks. All solid waste which had been saturated with askarel was disposed of in a dry landfill that met state requirements.

In late 1975 TVA reviewed its guidelines for disposing of failed units and PCB's because of problems incurred with storage, collection, and transportation to the various sites. It was desirable to develop a standardized method of handling failed or obsolete units within TVA and to effect the final disposition of these units. It was felt that landfilling was probably not acceptable as a permanent solution. A decision was thereby reached to cease the practice of disposing of defective capacitors in dry landfilled areas. The decision was made to return all defective capacitors to a storage warehouse where they will be held until an appropriate method of disposal is determined. Units which might leak during transit are to be drained into a suitable closed and sealed container. Drained units are to be protected from rainwater to prevent leaking askarel into the environment. These returned units are being accumulated and stored until an environmentally satisfactory method of disposal is found or developed. No units are presently being discarded in landfills.

TVA's Solid Waste Management Staff, of the Division of Environmental Planning, is working on an environmentally and economically satisfactory method of disposing of these PCB materials. This staff is investigating in cooperation with EPA and others the adequacy of Chem-Dyne Corporation's incinerator recently placed in service in Ohio. This incinerator can operate at 2,200 degrees Fahrenheit with a residence time of 3 1/2 seconds which is sufficient temperature and residence time to destroy PCB's. The corporation has expressed an interest in testing this method of disposal of capacitors and solid waste material soaked with askarel. If this method of disposal is environmentally satisfactory, TVA will probably develop plans to ship accumulated askarel materials to the Ohio facility.

The Division of Environmental Planning is also coordinating within TVA the following actions:

1. Inventory of transformers containing askarels; review of procedures for collection, storage, and disposal or reuse of small amounts of waste liquid askarel, transformer components contaminated with askarels, and solid waste materials soaked with askarel.

2. Development of a contingency plan based upon the existing Spill Prevention, Control and Countermeasure Plan for transporting transformers filled with askarel to and from the service shops.

3. Development of engineering design plans for containment of askarels to avoid the escape or discharge of PCB's into water courses as part of the ongoing work related to the National Pollutant Discharge Elimination System permit program activity.

4. Review of procedures for storing obsolete capacitors and containers of askarel to avoid escape or accidental discharge of PCB's into the environment.

5. Issuance through TVA's Hazard Control Compliance Staff of a hazard awareness bulletin for the purpose of protecting employees' health and safety. TVA's Industrial Hygiene Branch and Safety Engineering Staff will inspect the work places periodically to ensure that the control measures identified in the bulletin are implemented.

W. B. Behnke
Executive Vice President, Commonwealth Edison Company

January 22, 1976

MANAGEMENT OF PCB's ON UTILITY PROPERTIES

Because of their non-flammable and extremely stable chemical characteristics, PCB liquids such as Askarel have been used in capacitors and certain indoor transformers on utility systems for many years. Until the late 1960's, even though these fluids were regarded as safe industrial chemicals, the need for following good housekeeping practices in handling Askarel has long been apparent to the utilities. Aside from environmental concerns, it is essential that such insulating materials be protected from contamination by water, dirt, or other liquids. The environmental concerns with PCB's identified in the late 1960's added further emphasis to the importance of careful handling of PCB liquids. These concerns called for the control of Askarel to a much greater extent than of other insulating liquids, and led the American National Standards Institute to issue Standard C-107, guidelines for handling and disposing of transformer grade Askarels. Commonwealth Edison participated in drafting this standard and we are complying with its requirements. We recognize that, in the light of EPA's more recent concerns, more must be done. The following are the good housekeeping principles we feel are most important.

Inventories of PCB liquids must be closely controlled. Equipment containing PCB's should be inspected for leaks upon receipt and again when permanently installed. Small quantities of Askarel are needed each year to make up for losses and replace contaminated liquid.[1] Askarel is shipped in sealed five-gallon cans which are clearly labeled to identify their contents, and should be inspected for leakage upon receipt. Storage of these cans should minimize the risk of accidental puncture and avoid the possibility of any environmental contamination through sewers or seepage. Used Askarel should be accumulated and safely stored pending disposal. Askarel should be only used for approved purposes and unused quantities returned to stock. Accountability records should be maintained.

[1]At Commonwealth Edison, we have about 1.0 million gallons of Askarel in use. Last year we purchased 2,100 gallons for make up and returned 2,000 gallons to Monsanto for disposal. The returned portion consisted of contaminated fluids plus drainage from junk capacitors. Some additional fluid in Askarel-saturated materials was also returned. Actual losses to the environment, while difficult to quantify, were very small.

Handling procedures in the shop as well as the field should avoid release of PCB liquids to the environment. It is important to avoid any possibility of introducing PCB's into regular insulating oil handling systems and oil-filled equipment. For example, hoses and pumps used for regular transformer oil should not be used to handle Askarel. When filling or draining Askarel from electrical apparatus, steps should be taken to keep accidental spills from entering floor drains or seeping into the ground. Used Askarel and Askarel-contaminated materials such as rags, solvents, and sweeping compounds, should be collected and stored in sealed containers pending shipment to approved disposal facilities.

Disposal of Askarel and Askarel-saturated materials requires special attention. Commonwealth Edison's practice is to seal them in steel drums and return them to the manufacturer for high-temperature incineration. Disposal of Askarel-insulated apparatus also imposes special problems. It is virtually impossible to completely decontaminate the insulation in Askarel-filled transformers and capacitors. Therefore, it is necessary to dispose of them in a manner which will prevent the release of Askarel to the environment. Ordinary salvage practices are not sufficient. There are several companies qualified to handle the disposal of Askarel-contaminated capacitors and transformers.

There is no way to eliminate the risk of accidental Askarel spills. They can occur as a result of handling accidents or equipment failures. In order to minimize the environmental impact of such mishaps, it is important that utilities have spill control plans. These plans should provide for prompt recovery of any Askarel released to the environment and the safe disposal of all contaminated materials.

Finally, utility procedures should provide for control of Askarel-contaminated clothing. At Commonwealth Edison, workers who handle Askarel are instructed to wear face shields, gloves, and plasticized coveralls. The use of non-absorbant disposable clothing eliminates the problem of Askarel contamination from laundry water. Solvent is provided in which workers can rinse their hands.

The ANSI C-107 drafting group is now reviewing the Standard in response to EPA's concerns and expects to make appropriate revisions in the near future. EPA has identified the need to tighten the requirements concerning handling and cleaning of workers' clothing, disposal of laundry water, and requirements for solid waste disposal. We believe there are practical solutions to these concerns which can be incorporated into the Standard.

We are hopeful that within the next few years environmentally acceptable non-flammable substitutes for PCB fluids will be developed and used in all newly-manufactured equipment. Unfortunately, the flammable characteristics of those identified so far are inferior to Askarel. Even when a substitute is found, a large amount of

Askarel-filled equipment will still be in service. Replacement of this equipment is not economically feasible or environmentally desirable. It will be difficult, if not impossible, to flush enough PCB from existing transformers to avoid contamination of a substitute insulating material. Since capacitors are in sealed cans, there is no practical way to change the insulating fluid. Obviously, the handling and disposal of so much equipment on an accelerated schedule will greatly increase the risk of accidental spills, and the cost would be prohibitive. Therefore, the only practical approach is to limit the use of Askarel to existing facilities and those new installations where substitutes are unavailable. Or at the same time, maintain procedures for the control of Askarels to be upgraded wherever feasible in order to minimize future release of PCB's to the environment.

It is important for utility management to understand the problems associated with the use of Askarel and develop procedures for dealing with it. It is equally important that these procedures be properly implemented. Personnel training is an essential element in proper implementation, but indication of top management concern and insistence that Askarel control procedures be followed is equally important. I believe that the presence of top utility management at this meeting is strong evidence of their recognition of the problems and their commitment to solving them. We are convinced that good PCB housekeeping procedures will assure that the utilities can continue to use PCB insulating liquids in transformers and capacitors without adverse impact on the environment.

R. E. Uptegraff
Transformer Manufacturers Task Force/
National Electrical Manufacturers Association

May 13, 1976

PROBLEMS ASSOCIATED WITH THE BAN ON THE USE OF PCB's (ASKARELS) IN TRANSFORMERS

In attempting to analyze the extremely complex problems that would result from a ban on the use of PCB's in transformers, it is logical to first consider the various sectors that would be affected:

1. Manufacturers of new transformers;

2. Transformer service and repair companies;

3. Architects and construction consultants;

4. Buyers, such as contractors, industrials, governmental agencies, utilities, etc.;

5. Users, such as apartment owners, commercial building owners, hospital administrators, shopping center owners, etc.;

6. Regulatory agencies, such as the Environmental Protection Agency, Department of Transportation, U.S. Coast Guard, Underwriters Laboratories, National Electrical Code, etc.;

7. Insurance companies, as regards fire hazards and general insurability of locations where substitute liquids may be used; and

*8. The courts, as regard litigation for settlement of claims.

Some of the concerns of the transformer sectors are as follows:

1. The inability of certain users or owners to obtain askarel-filled transformers or some equivalent where the location or space is limited in existing buildings or buildings currently under construction.

* Not in official presentation to EPA

2. The fire hazards associated with the ill-considered use of oil-filled transformers in locations that presently call for the use of nonflammable transformers.

3. The technical or engineering problems associated with the use of oil-filled transformers in locations that presently call for the use of nonflammable transformers.

4. The fire hazard and insurability problems associated with the use of relatively untried substitute materials.

5. The technical and engineering problems that could arise in using dry type transformers as replacements for askarel-filled units.

6. The serious consequences, both technical and financial, that would result if an entire transformer system had to be changed because of inability to replace or modify any part of an existing askarel transformer system.

7. The inability of the transformer manufacturer to honor express or implied warranty on askarel-filled units in the event that no equivalent liquid is available.

8. The problems associated with retro-filling existing askarel units with replacement liquids should the PCB ban make this become a requirement. It is our opinion that large scale retro-filling with other liquids should be avoided as the environmental hazards of such a program would be greater than if the askarel-filled transformers were allowed to remain in service throughout their useful life.

9. The possibility that some substitute fluids may also present future environmental hazards. We feel that before the transformer industry adopts any replacement for askarel, some form of official sanction should come from EPA.

10. The problems, both technical and financial, associated with the cleanup of existing manufacturing, transport, and service facilities that have been handling askarels. We recommend that ANSI Standard C-107.1 "Guidelines for Handling and Disposal of Capacitor and Transformer Grade Askarels Containing PCB's" be given official sanction by EPA so that askarel users have clear guidance in dealing with the cleanup problem.

11. The severity of fines for accidental spills and discharges of PCB's into the environment, as called for in 40 CFR Part 116-119, in the event EPA finds "gross negligence". "Gross negligence" is not specifically defined and does not appear to be established in guideline rules or regulations, violation of which would imply "gross negligence".

12. The possibility of problems arising regarding the disposition of askarel-filled transformers already manufactured, both in service and in storage, when and if these were to be banned.

In analyzing all of these concerns of the various transformer sectors, there is one major and overriding key issue; and that is the timing of the implementation of a ban on the use of PCB's. A corollary key issue, associated with timing, is that effective dates be broadly communicated to all of the transformer sectors.

Adequate specific timing and communication will enable the transformer users, buyers, manufacturers, and other concerned sectors:

1. To intelligently plan an orderly withdrawal of PCB's from commerce with minimum economic impact;

2. To obtain and technically evaluate substitutes;

3. To obtain environmental qualifications on substitutes;

4. To attempt to resolve problems dealing with the National Electrical Code, Underwriters Laboratories, and other fire code writing bodies such as local municipalities;

5. To attempt to clarify general insurability of installations using substitute materials that are somewhat more flammable than askarel; and

6. To formulate policy dealing with manufacturers' liabilities under warranty.

Recognizing the importance of these timing and communication problems, we feel that real progress in solving them can only be made:

1. By there being a definite date for stopping the sale or purchase of askarels for new transformers;

2. By EPA establishing a definite, later date, for the cut-off of sale of askarels to transformer service and repair shops; and

3. By EPA broadly disseminating at the proper time, a comprehensive analysis of the PCB ban, including alternative or remedial procedures, to all architects, construction consultants, federal, state, and local governmental agencies, transformer manufacturers, service shops, utilities, fire underwriters, professional technical organizations, and others. This analysis should specifically spell out the timing on a ban, its restrictions, and its alternatives; and most importantly, there should be precise definitions of terms, such as "use", "transport", "process", "distribute in commerce", and other similar terms.

We recognize the fact that the timing aspects of the PCB ban are spelled out in the proposed "Toxic Substances Control Act, S-3149"; and we feel that we can effect an orderly withdrawal of PCB's within this time frame. In summary, it should be noted that askarel-filled transformers represent perhaps less than 5% of the dollar value of the total transformers sold; and because of this and the fact that other types of transformers will be made in lieu of askarel transformers, we do not see any undue hardship resulting from an intelligently planned and implemented total ban on the usage of PCB's.

We, as responsible members of the business community, share the concerns of everyone regarding environmental hazards; and we pledge our wholehearted support in helping solve the PCB problem.

Clifford Tuttle
Capacitor Manufacturers Task Force/
Electronic Industries Association

May 13, 1976

Mr. Train, my name is Clifford Tuttle, I am president of Aerovox Industries and I am speaking under the auspices of the the Electronic Industries Association for the manufacturers of alternating current (AC) capacitors on polychlorinated biphenyls. Perhaps it would be illuminating if I briefly outlined the market and function of an AC capacitor.

The total capacitor market in the U.S. is approximately $600 million of which the Department of Commerce reports only $500 million since some AC segments of the market do not fall under a capacitor SIC code. Of this $600 million, $450 million is direct current (DC), primarily electronic. We are only associated with the AC sector which totals approximately $150 million. This can roughly be divided into three equal parts: $50 million of large (utility type) capacitors, $50 million of lighting (small) capacitors, and $50 million of motor run and other small capacitor applications.

Frequently, people not connected with the industry try to make comparisons between the use of AC capacitors in the U.S. and the practices followed in other countries. This is not possible since the U.S. is relatively unique. In many countries, the distribution circuits are 220 volts and capacitors are applied across the incoming voltage, providing power factor correction only. In the U.S. we use a 110 volt system, but we put our capacitor in the circuit with a transformer or a motor winding to gain significantly greater efficiency and use less current. The result is that U.S. capacitors see voltages of from 300-500 volts versus the 220-250 volts typical in other countries.

As a result of these higher voltages and the resultant corona, we do not believe that the referred to "dry construction" - metallized film - will be a viable method of manufacturing AC capacitors until the 1980's and still then only for a segment of the market. Presently, this process and resultant product is simply too unreliable and much must be done to improve performance before dry designs will satisfy U.S. requirements; therefore, for the remainder of this decade, we feel paper/foil capacitors, with some type of impregnant, are the only way that we can supply the needed AC capacitors in the U.S.

Without capacitors, our fluorescent and mercury lights would require nearly twice as much electric power for the same light output. The same is true for AC motors and, in the case of most air conditioning compressors, the units would not even operate on the 110 volt line current without capacitors. The present use in the

U.S. of an AC capacitor in television is primarily for the benefit of the consumer in that the constant voltage transformer insures that the picture size will not decrease with changes in line voltages. It also significantly reduces the amount of current needed for television sets, but this is not the reason the capacitor is currently being installed in about 25% of the U.S. sets.

Looking forward to 1980, TV sets will undoubtedly have to have capacitors since the Federal Energy Policy and Conservation Act mandates energy consumption reduction on virtually all appliances and other items that are significant users of electricity. For example, room air conditioners now use shaded pole motors on the fans; these must change to split capacitor motors in order to meet this mandated reduction. We believe that compliance with this recently passed legislation will increase by 1980 the small capacitor market in the U.S. from its present $100 million to between $150 million and $175 million in terms of today's dollar.

I just learned yesterday that the State of California is holding hearings on legislation that would immediately require the addition of capacitors on virtually every appliance.

Now that we have identified the function and market for an AC capacitor, let me bring you up to date on our progress in searching for alternate liquid impregnants to replace Aroclor 1016. At present, it appears that manufacturers of small capacitors may generally employ phthalate esters which are less efficient than PCB's. There is some concern about a segment of the applications of these products where operating temperatures are in the 85°C to 100°C range. The manufacturers of large utility type capacitors do not have unanimity in the selection of alternate materials. Some are going to phthalate esters, others hydrocarbons and a few to entirely different materials. Both types of manufacturers will probably be able to meet a 24-30 month phase-out which provides a very limited amount of time for testing and customer acceptance. The transition is going to pose a special hardship on about half of the manufacturers of small capacitors who had hoped to use a modified hydrocarbon that was being proposed by Monsanto. The availability of this fluid has been withdrawn and therefore these companies are starting today from ground zero on phthalate ester research. There are other problems associated with the transition. First, I must emphasize that in a short period of two years we have to change from a material on which we have a 40 year history to brand new untried alternates. There are many risks involved because we may be unsuccessful. Therefore, the product liability that rests upon us, as manufacturers, is most significant. Secondly, there is no doubt that the product made with alternate materials will have a somewhat poorer performance and be significantly less reliable than those made with Aroclor 1016. Also, we are still concerned about the environmental acceptability of these alternates and hope we are not trading one problem for another. Finally, and most important, all of these alternates are flammable, posing a significant safety hazard to both life and property. We do have methods of protection available, but unfortunately they are most unreliable. All the user groups with which we met are practically paranoiac about this problem.

Now I would like to address myself to EPA's directive efforts to force those of us discharging to streams to hold effluents to one part per billion. We do not believe that pretreatment has been proven technically and the cost appears to be extremely high. Further, we are having even greater difficulty in responding to EPA pressure that discharges to municipal sewers be low. Here, we apparently must treat the raw sewage before we can even start the treatment for PCB's. This is going to be very expensive and again, the end results are unknown. Frankly, we are concerned that the cost will be prohibitive to many of the capacitor manufacturers. We think, during this last 2 year phase-out period, maximum discharges of 1-3 ounces per day, per plant and 4 pounds a day for the entire industry is acceptable. By your own admission, this is an infinitesimal amount compared to the PCB's going into the environment by other means. We question the edict to go lower than 1-3 ounces per day when we know that from the date in which pretreatment could be installed we will probably use PCB's for only 6-12 months. Therefore, it appears the necessity for this significant expenditure will be removed almost immediately after it is made. We hope that EPA will understand our position on this matter.

In summary, phasing out the use of Aroclor 1016 in 24-30 months forces the manufacturers of AC capacitors to take major risks from a consumer safety and a product liability standpoint. We will be making the transition with totally insufficient experience. Let me review our major concerns:

1. The modified product would be considerably less reliable;

2. The new product will be more costly;

3. The new product will be larger;

4. We do not know the environmental impact of the alternate materials;

5. Finally, and most important, any known alternative material will be flammable and a potential hazard to people and property. We hope the U.S. Government is truly facing the potential magnitude of this problem.

As you can see, Mr. Train, we sincerely question the advisability of ceasing the use of Aroclor 1016 and changing to flammable alternatives. Perhaps, considering all aspects, controlled use of Arochlor 1016 in capacitors would be better.

Harry Onishi
Utilities Task Force

May 13, 1976

PROGRESS ON PCB CONTROL

Mr. Train, as a result of your meeting with representatives of the electric utility industry in January concerning the problem of PCB's, a Task Force has been formed under the auspices of the Edison Electric Institute to focus voluntary action of the utility industry in cooperation with EPA in controlling the handling and disposal of PCB's.

The Task Force has had several meetings with EPA representatives and we have prepared an Industry Position Statement. Copies of this statement are available and have been released to your staff. Today, I would like to briefly summarize our concerns with the phase-out of PCB's and the use of substitute fluids in electrical equipment.

Looking first at existing equipment (which are primarily transformers and power capacitors), we believe such equipment should remain in service for its useful life. Our reasons for this position are as follows:

1. Past experience has shown that transformers and capacitors are very reliable devices. During normal operation of this equipment, PCB losses to the environment have been minimal. I might mention that this finding is also supported by the Independent Study (PCB's in the United States Industrial and Environmental Distribution) conducted for EPA.

2. It is not possible to completely drain equipment of all PCB's. If we attempted to retrofill transformers, the substitute fluids would be contaminated with PCB's and the transformer would still have to be handled as PCB containing apparatus. For capacitors, the units are hermetically sealed with no provisions for adding or removing fluid.

3. Substitution of non-PCB fluids in existing equipment would create severe handling, transportation and disposal problems. For example, for disposal of PCB's, there are limited facilities for incineration, and there are a limited number of chemically secure landfill sites for disposal of non-burnable PCB wastes and equipment. Moreover, we believe undertaking such a program would significantly increase the probability of PCB releases to the environment.

4. If it were required that all PCB containing equipment be replaced in total, there would be a tremendous replacement cost, insurmountable disposal problems, and we believe such a move could also impair the quality of electric service.

For these reasons we believe existing PCB containing equipment should remain in service and that our efforts should be directed toward maintaining records of all PCB equipment and establishing procedures and methods for the containment, clean-up, handling, and disposal of PCB's in accordance with guidelines as stated in the ANSI Standard C-107. You may be interested in knowing that utilities are disposing of PCB's by incineration and in approved landfill sites. As I mentioned previously, there are at present a very limited number of chemically secure landfill sites. Geographically they are located in California, Idaho, Nevada, Texas, New York, and Illinois. Because of this limitation, in some instances, utilities are stockpiling capacitor units until suitable disposal arrangements can be made. Utilities are also in the process of developing and implementing procedures for control and proper clean-up of inadvertent PCB spills should they occur.

We expect that PCB containing equipment will be part of electric utility systems for many years into the future. Phase-out of the manufacture of PCB's would not impact existing capacitor installations because there are no make-up fluid requirements. It would require, however, that acceptable substitute capacitor fluids for replacement units be available. For existing transformers, unavailability of PCB's would be an inconvenience, but the nominal make-up fluid requirements could be provided by reclaiming askarel from transformers removed from service.

Moving on to replacement and new equipment, there are numerous proposed substitute fluids; however, there are today no direct replacement fluids that have the equivalent properties of askarel. We note in pending legislation that the proposed timetable for phase-out of PCB use in electrical equipment is 2 1/2 years. We think this is overly optimistic. We believe further research, development, demonstration and evaluation are necessary to determine long term electrical characteristics and operating reliability. It is also important that we have EPA assurance that the substitute fluids are environmentally acceptable so that normal handling and disposal methods may be employed.

For transformers, we believe further testing is required to establish that substitute fluids do not constitute an undue fire risk and further, the appropriate code-making agencies must indicate they are acceptable from a fire risk standpoint. On new transformer installations, utilities are taking steps to minimize or eliminate requirements for PCB transformers by using alternative designs where practicable. However, for replacement units at existing locations, there may be no feasible alternatives. At some locations it is essential that replacement transformers have a fire-resistant insulapion. Based on the development, testing, and evaluation still remaining, we believe the phase-out of PCB use in transformers will be in the range of 5 years, rather than 2 1/2 years.

For power capacitors, it appears substitute fluids having adequate insulating properties are available; however, no adequate assessment of their operating performance or reliability has been made. Assuming these fluids are environmentally acceptable, and there are no other unforeseen difficulties, the phase-out of PCB use in capacitors could be accomplished within 3 years.

In conclusion, the utility industry is concerned that PCB's are properly controlled and we are prepared to take practical measures to ensure that PCB's from electrical equipment do not enter the environment. We are pleased that we have the opportunity of working with EPA in moving toward a voluntary solution to this difficult problem. In view of the progress on control of PCB's and the intention of utilities to conform with provisions of ANSI C-107, we believe it is unnecessary to specifically legislate the control of PCB's such as is proposed by the Nelson Amendment. We would urge that this be a significant consideration in your discussions with Congress on PCB legislation.

J. C. Weber
Monsanto Chemical Company

May 13, 1976

Good afternoon, my name is Cole Weber. I am manager of product acceptability for specialty chemicals, including polychlorinated biphenyls (PCB) dielectric fluids, manufactured by Monsanto Industrial Chemicals Company, a unit of Monsanto Company.

When Jack Fitzgerald, a Monsanto vice president and managing director of this operating unit, met with you in January, he assured you that Monsanto had no desire to remain in the PCB business any longer than necessary. He also stated that as soon as Monsanto was satisfied that the electrical power supply industry's needs for usable, acceptable alternate dielectric fluids had been met by whomever, Monsanto would voluntarily shut down its PCB manufacturing unit.

I am here today representing Monsanto to reaffirm this position and to give you a brief update on the status of development work on possible replacement products. I'll also comment on the phase-out timetable.

Based on customer feedback, the transformer industry is apparently leaning towards silicones, which are readily available, as the leading askarel (PCB) replacement candidate. We do, however, still sense some reservations on the part of our transformer customers with regard to the fire resistance of all current replacement candidates and are awaiting further clarification programs.

In the meantime, we have shelved all development work on our transformer fluid alternates because they simply did not appear to be able to compete on a cost/performance basis with other viable alternates.

In the capacitor segment, the trend is currently towards commodity type solutions which are widely available in large quantities such as phthalate esters. If this approach proves satisfactory, it will obviously preclude further consideration of specialty solutions such as Monsanto's MCS 1238-type technology which is a proprietary blend specially designed as a capacitor dielectric. Consequently, we are very close to terminating our development efforts in this area as well.

If the capacitor industry determines that commodity fluids are indeed the most expedient way to satisfy their cost/performance criteria, we believe that Monsanto may have viable candidates to assist them in this approach.

Regarding the phase-out timetable, we are already involved in the transformer fluid phase-out. Since we announced our intentions to exit the business, demand for PCB-filled transformers has declined substantially. Our transformer fluid sales in 1976 will be less than half the toal recorded in 1975.

When the capacitor makers complete their evaluation work and tell us they are satisfied that they have viable alternates in hand, we will cooperate fully in an industry-wide changeover and proceed with the orderly termination of <u>all</u> PCB production, including Aroclor 1016, the current capacitor industry standard.

Monsanto is often asked, and indeed pressed, to establish a firm exit date. We are as anxious as anyone to settle on a firm timetable so we can complete our exit plan and begin applying these considerable resources to ongoing programs. However, to unilaterally set an exit date would be inconsistent with our long-standing pledge to work with the electrical industry to replace PCB's in an orderly manner. So, to reiterate, Monsanto is fully prepared and indeed most anxious to exit this business at the earliest possible date. We will establish and begin executing a firm phase-out timetable as soon as we receive a consensus judgement that viable alternates are in hand.

Thank you.

Ronald J. Kasper
Industrial Risk Insurers

May 13, 1976

CURRENT POSITION OF THE INDUSTRIAL RISK INSURERS REGARDING THE USES OF PCB's IN ELECTRICAL SYSTEMS

It has been common practice to use askarel-insulated transformers as one of the counter measures against the fire and explosion hazards of oil-insulated transformers. Recently, however, recognition of the environmental hazards of askarels (polychlorinated biphenyls or PCB's) has become a matter of concern to many. As a result, this Association is reevaluating the suitability of askarel-insulated transformers.

As an industrial property insurer, we are interested in the development by industry and/or government agencies of substitutes for askarels that are satisfactory from a fire protection standpoint. Otherwise it may be necessary that we evaluate installations to determine if additional fire protection is needed. Oftentimes, automatic deluge waterspray systems, fire barrier walls, fire resistive vaults, or combinations thereof are recommended to protect buildings, adjacent transformers, and outdoor storage where combustible liquid-immersed units introduce exposures.

Currently, silicone oils are being considered as one substitute for askarels in transformers. Although our experience with silicone oils is limited, their use has been accepted by us on a limited case-by-case basis. Hopefully, additional research, testing, and service experience will eventually demonstrate that silicone oils as well as some other dielectrics are acceptable substitutes for askarels in transformers.

Although silicone oils have shown considerable promise for use in transformers, this does not currently appear to be the case for their use in capacitors. Other dielectrics are currently in the developmental stage and will be tested for suitability. Hopefully, researchers will soon be able to agree on a number of dielectric fluids for use in capacitors that are relatively non-combustible and equivalent electrically to the PCB's.

In summary, having recognized the adverse ecological and toxicological problems associated with PCB's and the impact of current EPA regulations, this Association urges that precautionary measures be developed to reduce the potential hazards of existing installations and utilized until such time as the availability of suitable substitutes having low orders of combustibility makes it possible to eliminate PCB's from our environment.