LIABILITY INSURANCE FOR THE NUCLEAR ENERGY HAZARD

BY

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The process of thinking about liability insurance on nuclear energy exposures is helped considerably by bearing in mind that fundamentally most of this insurance is only an extension of lines that have been written by the companies for many years. The largest part consists of premises-operations and products liability exposures from the general liability line. The transportation of nuclear material brings in automobile, railroad, aircraft and marine exposures. It is also worth remembering that at this point in time the lighter and numerically common risks are still insured by the individual companies under normal liability insurance contracts. Only the more severe hazards are included mandatorially in the nuclear liability insurance pools in the United States and it seems likely that a similar pattern will appear abroad.

Nevertheless, there are five factors involved which have led to the development of a bewildering set of policy forms, rating procedures and mechanics. The first of these is a potential catastrophe hazard which is without parallel in past experience. Among other things, this makes rating difficult, but more importantly it is the source of the second factor. This is the very real need and demand for much higher limits of liability than have been written in the past and a system of government indemnity on top of those limits. Along with government indemnity comes factor three, which is the meshing of a liability policy with a federal law establishing the form and amount of financial responsibility required of the operator of a nuclear facility and protecting him with indemnity if he meets these requirements.

Factor four is the possible slow emergence of claims. Casualty insurance has encountered this problem before, and notably in the form of compensation for dust diseases and loss of hearing. However, it has not seen it in the degree to which it could exist following radiation injuries. This slow emergence can occur in an individual in the form of an ordinary disease of life such as leukemia, or it could even be a genetic case the results of which only manifest themselves in a later generation.

The last factor and the one least susceptible to intelligent assessment is the unreasoning concern of many persons about the possibility of radiation injuries. The public is not as concerned as it should be about the fact that 40,000 or so people are killed each year by the automobile, but let it be known that a bomb test in Nevada has caused a measurable but probably harmless increase in the background radiation in other parts of the United States and we find headlines in the newspapers.

It is these problems and the seemingly endless ramifications growing

from them that the insurance industry has been struggling with, and at this point it is desirable to insert a brief chronological summary of events.

The Atomic Energy Act of 1954 opened the field of peaceful uses of nuclear energy to private industry. Shortly thereafter the top underwriters of liability insurance companies received tangible evidence of what was coming, and it took the form of serious inquiries about limits ranging anywhere from fifty to one hundred million dollars. At that time a five million dollar limit was a big deal, and a ten million dollar limit a major operation. It is a safe guess to say that the ultimate liability market here and abroad for any risk was twenty million dollars or less.

If this new need was to be met drastic steps would have to be taken. The first of these was the formation of the so-called Insurance Study Group, whose members were leaders of the property and liability insurance industries appointed by the Atomic Energy Commission. The study group visited a number of government installations and was briefed by the AEC on all information available at the time. It was they who concluded that the only solution was the formation of pools, and they did the work that brought these pools into being.

The constitutions of the liability pools were adopted in the spring of 1956. The stock pool is the Nuclear Energy Liability Insurance Association (NELIA), and the mutual pool is the Mutual Atomic Energy Reinsurance Pool (MAERP). The mutual pool is a combined property and liability pool, so it has a liability underwriting group that goes by the name Mutual Atomic Energy Liability Underwriters (MAELU) and this is the name you will usually see.

Late in 1956 the stock and mutual pools working closely together made their first filings of policy forms and rating procedures with the states for an effective date of February 1, 1957. The first risk was bound by NELIA in March, 1957.

The Joint Committee on Atomic Energy of the 84th and 85th Congresses held hearings on various proposals for indemnity bills in 1956 and 1957. In September, 1957 the Price-Anderson Bill was passed as Public Law 256 of the 85th Congress. In 1958, the Price-Anderson Law was amended to extend its application to the "Nuclear Ship Savannah" which is expected to be completed in 1960. Another 1958 amendment of interest to insurers affected non-profit educational institutions operating nuclear facilities.

In December, 1957 a first revision of the policy form for nuclear facilities was filed with and approved by the states. At this writing a second revision of this facility policy, an original supplier's and transporter's policy and a first revision of the nuclear exclusions for regular liability policies are about to be filed.

The Liability Pools

As has been said before, the stock and mutual nuclear liability insurance pools were formed in the spring of 1956. The stock pool,

NELIA, presently has 141 members and an underwriting capacity per risk of $46,500,000. The mutual pool, MAERP, has 105 members and a liability underwriting capacity of $13,500,000. Both of these pools have slightly more capacity than the above figures, which are the amounts they offer to put at risk. The excess balance is held in reserve for two reasons. One of these is that they wanted to come up with the round total figure of $60,000,000 which had been referred to many times both in congressional hearings and in discussions with industry. More importantly, they wanted to have a reasonable amount as a cushion so that the total capacity of the pools could fluctuate without the need for corresponding adjustments in the limits on policies of those customers who bought total pool capacity.

NELIA's domestic capacity was assembled by the relatively simple expedient of writing to every stock company that was listed in "Best's Insurance Reports" as writing miscellaneous liability insurance in one or more states, and inviting all companies to join the pool. The only criterion used was to ask that any company which subscribed come in for a commitment of at least $25,000 per risk.

I am not familiar with the exact method used by MAERP to assemble its membership, but I assume that it was similiar to that followed by NELIA.

There is an ancient and unhappy history of pools formed by American casualty insurers to absorb optionally risks which the individual members were unwilling to carry for their own account. Such pools lost money and both NELIA and MAERP are set up on the premise that it would have been impossible to accumulate large capacity if the placing of risks in them were optional. Consequently, these pools are the exclusive agencies of their members in the United States for writing nuclear energy liability insurance on risks that are defined as "nuclear facilities." The types of exposures that constitute nuclear facilities are explored in some detail in the section of this paper devoted to the nuclear exclusion endorsement for regular liability policies. It is enough to say here that in general these are the risks with the more severe hazards. Risks that are not nuclear facilities are mostly retained in the individual companies' accounts. However, contrary to their position on nuclear facilities, NELIA and MAELU stand ready to quote on these latter cases on an optional basis where the risk is unable to assemble the limits it desires in normal markets or where the carrying company is disturbed about the particluar exposure and wishes to be relieved of it.

Unlike the United States property insurance pools and some foreign liability pools, NELIA and MAELU insure only the nuclear energy hazard, leaving normal liabilities in the hands of the regular carriers. This has the dual virtue of meshing with government indemnity under the Price-Anderson Law and creating a minimum disturbance in the business.

In order for the liability pools to realize their full potential, the companies joining them have accepted exclusions in their reinsurance

treaties which correspond with the exclusions they have been attaching to their regular liability policies since March 1, 1958. This served to relieve the reinsurance markets of the world of the danger of doubling up on nuclear losses and permitted NELIA and MAERP to turn to these same markets for reinsurance of their own. Large additional capacity was obtained in this way and this is included in the figures mentioned above for total writing capacity of the pools. The exact distribution of capacity between primary writers and reinsurers changes slightly each year, but on the average approximately 70% of the capacity comes from primary writers' subscriptions and 30% from reinsurers' subscriptions.

So far as writings in the United States are concerned, the operations of NELIA and of MAELU are closely integrated. Each pool reinsures every risk written by the other one and the distribution is currently 77.5% to NELIA and 22.5% to MAELU. They employ identical policy forms, rates and rating procedures which have been jointly adopted by the National Bureau of Casualty Underwriters and the Mutual Insurance Rating Bureau. The pools make joint inspections of risks and have a joint claim committee which is developing procedures to be followed to handle claims in the event of a catastrophe. Similar cooperation exists in the accounting, statistical and payroll audit fields.

It should be pointed out here that the actual staffs of these liability pools are very small. Field work needed for inspection, claim and payroll audit is performed by personnel of pool company members on a reimbursement basis. Development work on forms, rating procedures, claim and inspection practices and accounting has been done by company committees without reimbursement and by the staffs of the National and Mutual Bureaus.

To date all the risks insured by NELIA and MAELU are land based exposures in the United States. However, both contemplate entering the marine and foreign fields.

In writing marine it is likely that the pools will act in concert in the same manner that they do in this country, and a joint quotation is outstanding on the "N. S. Savannah" to carry her through her trial runs in 1960.

In foreign operations the pools will operate independently rather than in concert. NELIA is presently considering requests from the Canadian, Belgian and Swedish pools for reinsurance. In the field of foreign product liability coverage for American manufacturers NELIA will probably issue its own policies on an indemnity basis.

In both the marine and foreign fields the pools will not only be operating on unfamiliar ground, but will also be without foreign reinsurance. Therefore, the total commitments will necessarily be a good deal less than the capacity offered in the United States.

While countless hours of labor have been devoted to the nuclear liability insurance program, the business itself is still in its infancy. For example, the gross premium writings of NELIA in 1959 will be

more than $500,000 but show no prospect of reaching a figure as high as $1,000,000. In 1960 some of the large power reactors now under construction are expected to begin operation. In that event gross premium writings might reach the vicinity of $2,000,000. What the gross will be after 1960 is largely dependent on the ability of the nuclear industry to make itself competitive with more conventional methods of operation. It is possible that nuclear liability insurance may in due course become a sizable operation.

Having said that the liability pools are currently incurring heavy expense without producing very much premium, one more thing should be added. That is, that they have had no losses at all. Two minor incidents have been reported to NELIA. They are in the nature of losses of small quantities of relatively low hazard nuclear materials. To date no claims have resulted from these incidents.

The Involvement with Government Indemnity

What are the chances of the occurrence of a major reactor loss? If such a loss did occur, what would it cost? It is clear that no one knows the answers to these questions. No actuary has ever overindulged enough to have a nightmare including an equation with so many unknowns and variables as there are here.

At the request of the Congressional Joint Committee on Atomic Energy, the Atomic Energy Commission took a stab at it and in March, 1957 published a report entitled "Theoretical Possibilities and Consequences of Major Accidents in Large Nuclear Power Plants." This report was largely prepared by the staff of the Brookhaven National Laboratory and usually goes by the name of "Brookhaven Report." I have looked it over from time to time and admit freely to not understanding the bulk of it. However, anyone can get an inkling from the letter that Acting Chairman Vance, of the Atomic Energy Commission, wrote to Congressman Durham when he transmitted the report to the Joint Committee. On the subject of the likelihood of any single large reactor having a serious loss in a given year, he says in effect that some experts consider the subject too vague and uncertain to reduce to numbers. Others while sharing this doubt mentioned figures from one in one hundred thousand to one in one billion.

Assuming that the accident did happen, the range of expected injury is equally wide. For injury to persons it goes from a minimum of no one killed or injured up to a maximum of 3,400 killed and 43,000 injured. Similarly, theoretical property damage could run from about $500,000 to $7,000,000,000. Mind you, this range of estimates is not for a relatively small excursion, but rather for the complete meltdown of a big reactor.

The above is by way of indicating that the full theoretical potential of the nuclear energy hazard is not something that liability insurers can presently cope with. Recognizing this, the industry has never opposed the principle of government indemnity over the level of available insurance, but has limited itself to resisting the intervention

of the government in the area that private enterprise is best equipped to serve. That area, of course, is the initial sixty million of loss, and it can be expected to comprehend the great majority of nuclear exposures.

It is plain enough that if insurers are not in a position to assume the entire hazard, neither are the various segments of industry which have entered the atomic field able to put their own assets at risk for the exposure in excess of that which can be insured. If the development of peaceful uses of atomic energy is to go forward, then some sort of government subsidy or protection is implicit.

The Price-Anderson Law went through several draft versions before it became effective in September, 1957. It is not profitable here to trace the legislative history and it is enough to give a brief summary of the law as enacted.

The Price-Anderson Law is Public Law 85-256, effective September 2, 1957. The shortest statement I can make of it is that it does four principal things:

1. It deals only with the nuclear energy hazard and calls that the "radioactive, toxic, explosive or other hazardous properties of source, special nuclear, or by-product material."
2. It provides that certain licensees of the Atomic Energy Commission must meet a requirement of "financial protection" which is defined as "the ability to respond in damages for public liability and to meet the costs of investigating and defending claims and settling suits for such damages."
3. Once a licensee has provided financial protection, the Atomic Energy Commission is required to agree to indemnify the licensee and others against liability in excess of financial protection up to $500,000,000.
4. Because the potential cost of a major nuclear loss is unknown, the law goes on to cut off the legal liability of "persons indemnified" at a maximum of $500,000,000 plus required financial protection. It provides for court procedures to apportion these funds amongst claimants if the total loss should be in excess of this amount.

In addition to the above fundamentals, the Price-Anderson Law contains other points of interest, and sometimes concern, to insurers. These are:

1. A "person indemnified" is defined as "the person with whom an indemnity agreement is executed and any other person who may be liable for public liability." This means that an insurance policy which is to meet the requirement of "financial protection" must contain an omnibus definition of insured which protects not only the licensee and his designers, contractors, and suppliers of all kinds, but also any other person who may by chance become liable for a nuclear incident. The commonly used ex-

ample of this last is the proprietor of an airplane which sets off a nuclear incident by happening to crash on a reactor.

2. The term "public liability" is defined in part as "any legal liability arising out of or resulting from a nuclear incident, except claims under state or federal Workmen's Compensation Acts of employees of persons indemnified who are employed at the site of and in connection with the activity where the nuclear incident occurs, and except for claims arising out of an act of war." Most of this is routine enough when lined up with the announced principle of indemnifying anyone who may be liable. But note that one brand new concept has been brought in; that is, that the only workmen's compensation liabilities that have been excluded from the term "public liability" are those for employees at the site. Consequently, employees of a "person indemnified" who are away from the site come under the government indemnity and must be insured in some way in any policy meeting the requirements of financial protection. The background here is that a person indemnified may have entirely unrelated operations within easy range of a nuclear incident emanating from the installation. If public liability did not include this exposure, neither the person indemnified nor his insurers would have any recourse against the indemnity.

Having taken the plunge with respect to off-site workmen's compensation liabilties, Congress then went on to include in public liability damage to property belonging to a person indemnified which is away from the site. There is a proviso here that this property must also be covered under the terms of financial protection in order for the indemnity to apply.

The prime example of a beneficiary of these provisions is the university which sets a reactor down in the middle of its campus. In such a case most of the university employees and property near the reactor would have no connection with it and would be covered both by financial protection and by indemnity. It would be easy to cite a long list of other examples affecting not only the operators of reactors, but suppliers as well.

A part of this definition of "public liability" has come in for intensive study by all parties concerned. A careful reading of the language itself seems to extend government indemnity to suppliers and the like for liability that they may have for damage to the site itself. On the other hand, a review of the legislative history does not indicate that Congress intended to apply the indemnity to on-site property damage under any circumstances. It is possible that the solution to this may consist of the Atomic Energy Commission going to the 86th Congress and asking for clarification of the law.

These new concepts that a person indemnified may be liable to himself for his own off-site workmen's compensation and prop-

erty exposures first came as somewhat of a shock to liability insurers. However, they have gradually assimilated them and at this time do not quarrel with them. NELIA and MAELU facility policy forms cover these exposures in the same way that government indemnity does.

3. In Section 170A, the law specifies in general terms which licensees must meet financial protection in order to be licensed and thereby at the same time establishes those which are entitled to government indemnity. The only licensees the law deals with on a mandatory basis are those who operate reactors, critical assemblies, chemical separation plants and gaseous diffusion plants. The last two categories do not exist yet in private industry, so that for practical purposes the law is talking about reactors and critical assemblies. Other licensees may be made subject to financial protection and indemnity at the option of the Atomic Energy Commission. Up to the present time the Commission has restricted itself to the mandatory cases and has not brought in any of the optional categories.

4. Section 170B is of more concern to the insurance industry than any other part of the law. This is the section which sets forth the criteria for establishing the amount of financial protection to be provided by any installation. It starts out by saying that this shall be the amount of liability insurance available from private sources. Then, near the close of this section, it says that the big power reactors (i.e. those with a capacity of 100,000 electrical kilowatts or more) must always provide this maximum amount. In between, it allows wide discretion to the Atomic Energy Commission by using these words ". . . the Commission may establish a lesser amount on the basis of criteria set forth in writing, which it may revise from time to time, taking into consideration such factors as the following:

   (1) the cost and terms of private insurance
   (2) the type, size and location of the licensed activity and other factors pertaining to the hazard
   (3) the nature and purpose of the licensed activity: . . ."

Admittedly, as soon as the Price-Anderson Law became effective, the Atomic Energy Commission had to move fast in order to bring existing operators under the indemnity. To their credit, they published temporary regulations on financial protection within eight days, and in order to accomplish this they used a formula for amount of financial protection which consisted of a straight line and a minimum.

By rule of thumb, an electrical kilowatt is about equivalent to four thermal kilowatts. Because the efficiency of installations varies, and because some of them are not used to produce electricity, it is easier to work with thermal kilowatts. Therefore,

the Commission said that a reactor of 400,000 thermal kilowatts capacity must carry the announced maximum liability insurance capacity of $60,000,000. They then divided 400,000 into $60,000,000 and obtained a figure of $150 financial protection per kilowatt. On this straight line they imposed a minimum amount of financial protection of $250,000.

Bearing in mind that the bulk of reactors now in operation in private hands are critical assemblies or research reactors with power levels below 1,000 thermal killowatts, the insurance industry found itself sitting with a capacity of $60,000,000 and the prospect that most of its immediate customers in the reactor field would need about as much insurance as many people carry on their automobile. To describe this as a blow is a restrained understatement. Had it not been for the commitment made to Congress with regard to the big reactors of the future and the liability insurance needs of concerns in the nuclear field who do not come under government indemnity, NELIA and MAELU might have accepted the fact that they were being driven out of business by administrative order and folded up then and there. At this writing, the limits carried by reactor operators are generally low, while some fuel fabricators have bought very high limits.

The Atomic Energy Commission has continued its study of the formula for amount of financial protection, looking towards the promulgation of a definitive regulation to replace the temporary regulation of September 10, 1957. The pools hope and have urged that the amounts of financial protection will be set at more realistic levels in the definitive regulation in order that private enterprise may occupy its rightful place in this program.

In all of this the Commission's task has been lightened by the enactment of Public Law 85-744, effective Angust 23, 1958. This is an amendment to the Price-Anderson Law in which nonprofit educational institutions are excused from the obligation to meet a financial protection requirement. Instead, government indemnity comes in for all public liability in excess of $250,000 and the educational institutions are left to decide for themselves how they will deal with liability below that point. The Commission is thus relieved of the need to find a solution to the problem caused by the fact that some of these educational institutions have statutory immunity from liability. In cases where this immunity cannot be waived the institutions have no right to assume liability or to purchase liability insurance so that they cannot meet the requirements of financial protection.

The last sentence in this famous Section 170B says that "financial protection may include private insurance, private contractual indemnities, self-insurance, other proof of financial responsibility, or a combination of such measures." Thus, nu-

clear industry has a variety of choices of means of meeting financial protection. However, up to this writing no concern has elected to do this by any means other than the purchase of a policy from NELIA or MAELU.

5. The last part of the original Price-Anderson Law I will mention here is the provision in Section 170C, which makes the $500,000,000 of government indemnity apply to "each nuclear incident." As will be seen later on, NELIA and MAELU policies are all on an aggregate limit basis and none of them contain provision for automatic reinstatement of the aggregate. This approach is necessary because of the indefiniteness of the words "accident" and "incident." If either of them were to be employed as a basis for application of limits in this new field, it is safe to say that no one would be very sure where the insurance started or stopped.

   The enactment of a government indemnity law on a per incident basis which is to apply as excess over insurance policies written on an aggregate basis has resulted in some mechanical complexities in matching the two. It is the considered opinion of the pools, however, that while it would be desirable for the law to be more specific on the point, the existing language and the legislative intent permit the Commission indemnity agreements to be drawn in such a way that no gap will appear in the protection to the public and to industry.

6. The introduction to this paper referred to indemnity for the "N. S. Savannah." Perhaps a little more detail about it is justified here. Public Law 85-602, effective August 8, 1959, amended the Price-Anderson Law to make reference to the "Savannah" by name. It is reasonable to assume that provision will be made for other nuclear merchant ships at a later date. The "Savannah" is scheduled for completion early in 1960, and when she goes into operation she will carry the $500,000,000 of government indemnity with her. As in the case of a land based private reactor, the indemnity will be over and above a yet to be established amount of required "financial protection." NELIA has tentatively offered a capacity of $10,000,000 but the combined capacity of NELIA and MAELU has not been established. A notable difference in the "Savannah" indemnity, which will need to be matched in the insurance, is that it covers nuclear incidents worldwide rather than in the United States, its territories, possessions, the Canal Zone and Puerto Rico, as is the case with land based reactors.

Policy Forms

At long last I can get down to the subjects of insurance coverage and rates, which is where I have wanted to be all along. However, I was unable to satisfy myself that a discussion of either one would

make much sense in the absence of the preceding background material on the nuclear liability insurance pools and the law. Turning to coverage, it is necessary before examining the pool policies to see what had to be done to normal liability policies in the way of an exclusion in order to make the pool policies work.

Nuclear Energy Liability Exclusion Endorsement—Broad Form

On March 1, 1958, companies began attaching the broad form nuclear energy exclusion to all liability policies of business risks. A shorter endorsement consisting of the first section of the broad form endorsement was used on family automobile, comprehensive personal and related forms beginning June 1, 1958. These endorsements are most certainly used by the companies belonging to NELIA and MAERP because otherwise they would be doubling up through the pools on their commitments to nuclear risks. It is almost equally certain that the same endorsements are being used by non-pool members, because the reinsurance market faces this same doubling up problem and began inserting the exclusion in all the treaties as soon as the primary market acted. Thus, any company not employing the exclusion endorsement is likely to be operating without benefit of reinsurance.

Policies outstanding at this writing carry the original version of the exclusion endorsement. However, that is not discussed here because a clarified and somewhat liberalized revision of the exclusion is about to be filed with the states.

Because of the presently limited volume of pool coverage, a relatively small number of people have direct contact with pool policies. However, everyone in the liability insurance business who has occasion to discuss coverage is going to be exposed to the exclusion endorsement for regular liability policies. Therefore, its provisions are included here in full along with comments on their intent.

The objectives of the broad form exclusion endorsement may be broadly stated in eight points as follows:

1. To prevent overlap or doubling up in coverage between the pool contracts and normal liability insurance policies. This is necessary because of the unusual commitments of capacity made by pool members. Even if the members had been willing to face this, which they were not, the action would have been necessary to protect the reinsurance markets which would have been far more heavily exposed to double coverage.
2. For reasons similar to those in paragraph 1, it was necessary to take away any overlaps between regular liability policies and government indemnity, and between these policies and "financial protection" furnished by a reactor operator in the form of a medium such as self-insurance. Without such an exclusion it would be possible in the event of a major loss for the

insurance policies of a large number of suppliers to become involved.

3. To take away first aid and medical payments coverages in connection with losses arising out of the operation of a nuclear facility as defined. In their normal use these coverages are not dependent upon liability, and in the case of first aid there is no monetary limit on the amount of coverage. In a catastrophe situation it is conceivable that all liability policies in the area could be drawn in for very large sums of money.
4. To deny coverage in any event on:
   (a) Nuclear facilities as defined.
   (b) The possession or handling of spent fuel and high hazard waste materials.
   (c) Foreign coverage outside the United States and Canada.
   (d) Liability for damage to a nuclear facility itself arising out of a loss emanating from that facility.
5. To retain coverage in normal liability policies for exposures arising out of source material (a defined term) including the disposal of waste source material.
6. To retain coverage for the possession of and disposal of special nuclear material (another defined term) but not the processing of such material unless it is only done in very small amounts.
7. To retain coverage for the entire so-called commercial isotope hazard, including the disposal of these isotopes when they become waste.
8. To continue to give product liability insurance to suppliers in the nuclear field when the circumstances are such that they have neither picked up pool insurance, nor government indemnity, nor protection through self-insured financial protection.

There follows an examination in some detail of how the exclusion endorsement accomplishes these objectives. The endorsement is rather long and it should be pointed out that it could have been much shorter had it not been designed to leave in the regular liability policies the coverages described in Items 5 through 8 above.

The opening of the endorsement reads:

"It is agreed that the policy does not apply:

I. Under any Liability Coverage, to injury, sickness, disease, death or destruction
   (a) with respect to which an insured under the policy is also an insured under a nuclear energy liability policy issued by Nuclear Energy Liability Insurance Association, Mutual Atomic Energy Liability Underwriters or Nuclear Insurance Association of Canada, or would

be an insured under any such policy but for its termination upon exhaustion of its limit of liability; or"

This is perhaps the most important single paragraph in the exclusion. Note that it says that the policy involved does not apply if an insured has picked up insurance in NELIA, MAELU, or the Nuclear Insurance Association of Canada (NIAC). Many members of NELIA and MAELU have also become members of NIAC in the last year, so it is necessary to prevent overlap with the Canadian pool as well as with the U. S. pools.

Bear in mind that pool facility form policies carry complete omnibus insured clauses so that this exclusion paragraph is not limited to those people who have actually purchased pool insurance themselves. More often than not regular liability insureds will have picked up pool coverage indirectly through a pool policy purchased by someone else.

Sub-paragraph (b) of this section of the endorsement reads:

"(b) resulting from the hazardous properties of nuclear material and with respect to which (1) any person or organization is required to maintain financial protection pursuant to the Atomic Energy Act of 1954, or any law amendatory thereof, or (2) the insured is, or had this policy not been issued would be, entitled to indemnity from the United States of America, or any agency thereof, under any agreement entered into by the United States of America, or any agency thereof, with any person or organization."

The portion of the above language down to the number (2) deals with the situation where an operator required to provide financial protection under the Price-Anderson Law elects to do so by a means other than pool insurance, such as self-insurance. Financial protection so provided must give the same omnibus protection to suppliers and the like that pool policies give.

The last clause numbered (2) makes the exclusion operate when an insured has access to government indemnity for the same loss. This exclusion is of particular importance in connection with suppliers to contractors who operate government installations, such as the Oak Ridge National Laboratory in Tennessee or the Hanford Ordnance Works in Washington. A program is now under way to bring government installations under Price-Anderson indemnity without the use of underlying financial protection. In these situations sub-paragraph (a) is inoperative and if sub-paragraph (b) were not present the product liability insurance of all suppliers to these installations would be in force in direct competition with government indemnity and with potential exposure to maximum losses.

The language of the endorsement continues:

"II. Under any Medical Payments Coverage, or under any Sup-

plementary Payments provision relating to immediate medical or surgical relief, to expenses incurred with respect to bodily injury, sickness, disease or death resulting from the hazardous properties of nuclear material and arising out of the operation of a nuclear facility by any person or organization."

This is the exclusion for medical payments and first aid running to losses from nuclear facilities. It requires no further comment than was made under Item 3 of the objectives of the endorsement already stated.

The next paragraph which is III is important because it lays down the conditions under which there is a flat denial of liability insurance in the policy to which it is attached regardless of the presence or absence of pool insurance or government indemnity. To be fully understood, it needs to be carefully read in conjunction with the definitions in Paragraph IV. Therefore, the entire balance of the endorsement is quoted immediately below:

"III. Under any Liability Coverage, to injury, sickness, disease, death or destruction resulting from the hazardous properties of nuclear material, if

(a) the nuclear material (1) is at any nuclear facility owned by, or operated by or on behalf of, an insured or (2) has been discharged or dispersed therefrom;

(b) the nuclear material is contained in spent fuel or waste at any time possessed, handled, used, processed, stored, transported or disposed of by or on behalf of an insured; or

(c) the injury, sickness, disease, death or destruction arises out of the furnishing by an insured of services, materials, parts or equipment in connection with the planning, construction, maintenance, operation or use of any nuclear facility, but if such facility is located within the United States of America, its territories or possessions or Canada, this exclusion (c) applies only to injury to or destruction of property at such nuclear facility.

"IV. As used in this endorsement:

'hazardous properties' include radioactive, toxic or explosive properties;

'nuclear material' means source material, special nuclear material or byproduct material;

'source material', *'special nuclear material'*, and *'byproduct material'* have the meanings given them in the Atomic Energy Act of 1954 or in any law amendatory thereof;

'spent fuel' means any fuel element or fuel component, solid

or liquid, which has been used or exposed to radiation in a nuclear reactor;

'waste' means any waste material (1) containing byproduct material and (2) resulting from the operation by any person or organization of any nuclear facility included within the definition of nuclear facility under paragraph (a) or (b) thereof;

'nuclear facility' means

(a) any nuclear reactor,

(b) any equipment or device designed or used for (1) separating the isotopes of uranium or plutonium, (2) processing or utilizing spent fuel, or (3) handling, processing or packaging waste,

(c) any equipment or device used for the processing, fabricating or alloying of special nuclear material if at any time the total amount of such material in the custody of the insured at the premises where such equipment or device is located consists of or contains more than 25 grams of plutonium or uranium 233 or any combination thereof, or more than 250 grams of uranium 235;

(d) any structure, basin, excavation, premises or place prepared or used for the storage or disposal of waste,

and includes the site on which any of the foregoing is located, all operations conducted on such site and all premises used for such operations;

'nuclear reactor' means any apparatus designed or used to sustain nuclear fission in a self-supporting chain reaction or to contain a critical mass of fissionable material;

With respect to injury to or destruction of property, the word *'injury'* or *'destruction'* includes all forms of radioactive contamination of property."

The short preamble of III contains no less than four defined terms. These are—"injury", "destruction", "hazardous properties" and "nuclear material". Unless you prefer to get lost, form the habit now of checking the definitions at every step.

Note that paragraph (a) repeats the defined term "nuclear material" and uses the defined term "nuclear facility". The definition of nuclear facility is particularly important here because sub-paragraphs (a) and (b) of this Paragraph III describe the risks which the membership of NELIA and MAELU have agreed to insure mandatorily in the pools. They will no longer write this business for their own account. Sub-paragraph (a) of III runs to the hazard of nuclear material in connection with the operation of a nuclear facility. In passing, I am not unaware that some of the language in the definitions

is not wholly clear on a first reading. I will try to unravel it as I come to it, and hope that this may help to bring home the great significance of this part of the endorsement.

The defined terms in sub-paragraph (b) of III are "nuclear material", "spent fuel" and "waste". Again, watch the definitions to see what the endorsement is talking about, and note that this paragraph operates as a complete denial on any risk having to do with spent fuel or waste as defined.

Sub-paragraphs (a) and (b) of III have the effect, courtesy of the definitions, of retaining coverage for a number of operations while denying on others. Sub-paragraph (c) works in somewhat the same way in that it starts out as a flat denial of not only the operation of nuclear facilities, but also of product liability of suppliers in the broad sense of that word. It is not until near the end that one realizes that this is the exclusion of foreign operations and of damage to a facility itself.

Later on it will be seen that the policies issued by the pools themselves have this same denial of damage to the facility and a word or two here concerning the rationale behind this particular exclusion is appropriate. This paper says little about the pools formed by the property insurers to cover nuclear installations on an all risk basis, including contamination and other nuclear hazards. Nevertheless, it is assumed that the reader knows these pools exist, and that they have underwriting capacity even larger than that of the liability pools. The liability pools were formed to protect the public. In the presence of large direct damage capacity it is a fundamental principle of NELIA and MAELU that when a supplier or other "outsider" is liable for a nuclear loss at a facility, the capacity of the liability pools must not be used up in paying for the damage to the facility. Coming back to regular liability policies which are being dealt with here, NELIA and MAELU would have been unable to assemble large capacity if they had allowed coverage for damage to the facility to remain in such policies and thereby created for the membership and the reinsurers an area of doubling up with pool commitments.

Turning now to the definitions in Paragraph IV, the answers to a number of questions should appear.

"Hazardous properties" requires no comment.

"Nuclear material" should be taken together with the definitions of *"source material"*, *"special nuclear material"* and *"byproduct material"* immediately following. It may well be asked why these definitions are disposed of so abruptly by a reference to the Atomic Energy Act of 1954. There are two reasons for this. One is that the Act definitions are rather long and in technical terms. The other is that the Atomic Energy Commission has the right to alter these definitions by regulation, and if the insurance industry had attempted to use precise definitions they would not have been sufficiently flexible. For practical purposes, it is probably sufficient to say that *"source material"* is unenriched uranium or thorium and their ores. There is a

coverage point here. You will not find any language in the endorsement that excludes the possession, processing, etc. of source material as such. This means that regular liability policies continue to cover the entire segment of industry that is concerned with the mining and refining of uranium up to the point where it goes to plants, now only operated by the government, which enrich the material in the naturally fissionable isotope uranium 235 and thereby make it "special nuclear material". This coverage in regular liability policies also reaches out to the disposal of waste source material.

A similar coverage situation exists for thorium which at present is not used as extensively by the nuclear industry as uranium, but which has considerable use elsewhere. Small percentages of thorium are often alloyed with magnesium to improve the properties of that metal, and use of these alloys plus the disposal of their wastes is covered by the regular liability policies.

"Special nuclear material" somewhat simplified is uranium enriched in the isotopes 233 or 235 and plutonium. There is a coverage point here, too, and for discussion of it see the comments below on the definition of "nuclear facility".

"Byproduct material" is broadly defined in the Atomic Energy Act and includes both those useful isotopes which are employed in research, medicine and industry and also those which are nuclear waste. The insurance industry narrows the term in order to retain the so-called commercial isotope hazard in normal liability policies. The way in which this is done is discussed under the definition of "waste".

The definition of *"spent fuel"* is reasonably clear in itself, but a few comments may be useful. New (i.e. unused) fuel elements for reactors are made in a great variety of shapes and sizes. The fissionable material in them is typically natural or enriched uranium in metallic or oxide form and clad in various ways with other metals, such as aluminum or zirconium. As nuclear materials go, these fuel elements are not very dangerous. The greatest hazard is that enough of them might be brought together to form a critical mass and start a chain reaction where one was not intended to occur. The fact that a moderator, such as water, must also be present makes this fairly difficult to do by accident provided sensible precautions are taken.

However, after a fuel element has been in a reactor and subjected to neutron bombardment for a period of time it becomes a very different animal. A portion of the uranium has broken down and formed some plutonium which is highly toxic. Also, a variety of unhappy isotopes have been created of which the most famous is strontium 90. The whole element is now highly radioactive and emits gamma rays which are comparable to X-rays. Where new elements can be transported in any reasonable container that will protect them and keep them from getting close enough together to form a critical mass, spent elements can only be transported safely in heavy lead caskets. It is the desire of the insurance industry that any risks having to do with exposures to spent elements be insured only in the liability pools.

The definition of *"waste"* must be looked at in parts. The words "means any waste material" convey the meaning that in the first place this must be material which is intended to be disposed of, and not put to useful purpose. The words "containing byproduct material" are very significant and limiting in their effect. By including them the endorsement says that "source material" or "special nuclear material" which is to be disposed of and which is not in combination with byproduct material is not "waste". The reference in (2) to a nuclear facility has the effect of saying that even though something which is disposed of contains byproduct material it is not "waste" unless it comes from a nuclear facility as defined. The significance of this is that here is the spot where the endorsement leaves coverage in regular liability policies for the disposal of so-called commercial isotopes which have outlived their usefulness.

The definition of *"nuclear facility"* must also be taken in its individual parts and, as stated earlier, is important because it describes those installations and operations to which the flat exclusion of Paragraph III (a) of the endorsement applies.

The reference to "nuclear reactor" is clear enough, particularly when taken with the fact that this term itself is defined later in the endorsement.

The reference in (b) (1) to "separating the isotopes of uranium or plutonium" is talking about a gaseous diffusion plant. No such plant yet exists in private hands.

The reference to processing spent fuel in (2) is to a chemical separation plant. Again this is an operation not yet undertaken by private industry.

The reference to utilizing spent fuel in (2) does have immediate bearing. In the comments above on "spent fuel" it was pointed out that a used fuel element is a heavy gamma emitter. Gamma radiation is used by industry in various ways and a spent fuel element is a cheaper source than, for example, irradiated cobalt or a big X-ray machine. As a result a number of laboratories have been set up to employ usefully the gamma radiation from spent elements under closely controlled conditions. Because of the extreme toxicity of the material in a spent element, any break in the metal cladding could be very dangerous. For that reason these laboratories have been classified as "nuclear facilities" while coverage for laboratories using cobalt sources or X-ray machines is left in the regular liability policies.

The language in (3) simply says that anyone having to do with "waste" as defined in the endorsement is operating a "nuclear facility."

Sub-paragraph (c) of this definition is dealing primarily with the fabricators of new fuel elements for reactors. It is the intention that people actually engaged in this business shall be classified as "nuclear facilities". However, unless so-called "clean cold" special nuclear ma-

terial is present in quantity, the nuclear hazard is relatively low. Therefore the definition says that unless the weights of the specified elements exceed the amounts stated, a concern working with them is not a "nuclear facility". The weights were selected as being well below the quantities required for a critical mass regardless of the degree of enrichment.

Sub-paragraph (d) of the definition requires little comment. It says simply that the place of disposal of high hazard material defined as "waste" is in itself a nuclear facility and must take pool coverage.

The definition of *"nuclear reactor"* has been mentioned before and is self-explanatory.

The definitions of *"injury"* and *"destruction"* were introduced because the reinsurers were not wholly satisfied with the terms used by the American primary insurers and desired this clarifying statement.

Nuclear Energy Liability Policy—Facility Form (2-1-57 edition, 2nd revision)

The natural step from the exclusion endorsement for regular liability policies is to the contracts used by NELIA and MAELU. There are two of these documents and both are well supplied with lengthy and complex verbiage. No effort is made here to examine all of their terms, as was done with the exclusion endorsement. This seemingly lazy approach gets support from two directions. First, any real analysis of the pool policy forms would stretch an already long paper beyond reader endurance, and second, it is by no means certain that such an analysis would serve a useful purpose. Nuclear industry receives much public attention, but, so far as actual operations go, it is still in the research and development stage. While everyone is exposed to the exclusion endorsement, only a relative few have to wrestle with the details of pool policies. It is enough to look at the major provisions and see why the drafters found them necessary.

The Facility Form is the basic contract used to insure those installations which the exclusion endorsement calls "nuclear facilities", and also the installations which are not mandatory pool risks, but which come in because they cannot find all the market they want in an individual company. This is also the policy that is broad enough to furnish the "financial protection" required of indemnified licensees by the Price-Anderson Law. For a facility operator the coverage of this policy is mostly premises-operations liability and transportation liability. For a typical supplier the primary exposures insured are product or completed operations liability and transportation liability. The word "transportation" is used because this policy does not draw the usual distinctions between automobile, rail, marine and air transport, but blankets them all.

The facility policy is issued by the primary writing members of NELIA as a group and by the 6 underwriting members of MAERP

who make up MAELU. It is never issued by one company, and the obligation assumed by each signatory company is "several", not "joint". That is, a signing member is responsible only for its percentage of the policy limit as shown in the list of participations attached to the policy. It would have been impossible to accumulate large capacity on a joint basis.

The policy only insures against bodily injury and property damage caused by the nuclear energy hazard and leaves all other liability exposures to be insured by the individual carriers in the normal way. This limitation serves several practical purposes. For the facility operator who buys it, it causes a minimum disruption of his normal insurance or self-insurance program. The presence of an omnibus clause means that a single facility policy can cover literally thousands of interests and if it were to reach into their insurance beyond the nuclear energy hazard, chaos would result. Lastly, government indemnity and the requirement of "financial protection" run only to the nuclear energy hazard so that a policy which failed to match this would be unsuitable.

The unusual concepts of Price-Anderson relating to off-site property and employee exposures of a "person liable" are incorporated in the policy by three different devices.

The property problem is met by in effect deeming the off-site property to be property of another and therefore something for which a liability would exist.

The policy cannot provide workmen's compensation insurance because some statutes do not permit this liability to be limited or subdivided. Therefore, the desired objective is reached by handing a contractual subrogation right to the regular workmen's compensation carrier as to off-site employees. The last loophole is buttoned up by deeming a self-insurer to be a workmen's compensation carrier.

Off-site employers' liability is met by direct insurance in the facility policy, and this insurance is made primary ahead of other applicable insurance. This latter is to protect Coverage B of any standard workmen's compensation policy that may be outstanding on the same employees. Incidentally, don't look for this employers' liability coverage in the insuring agreements of the facility policy because it turns up as an exception to an exclusion and as a proviso clause in the "Other Insurance" condition.

The "Definition of Insured" is the broadest ever written. With the single exception of the United States, it covers the legal responsibility of anyone in connection with the facility. Although the United States is left out of this omnibus clause the policy nevertheless gives the Government a great deal of indirect insurance. All nuclear fuel belongs to the Government, and users of it must hold the United States harmless. This contractual obligation is covered without additional charge, and in addition the policy contains a waiver of subrogation against the United States.

When handling limits in ranges up to $60,000,000 liability under-

writers feel a certain fear (equals polite term for stark terror) about any situation where the limits could double up or overlap. You will find protections against this sprinkled liberally throughout the facility policy, and the most intricate example lies in the Supplier's and Transporter's Form which is discussed later. There are two major illustrations worth recording here. Pool policies give continuous coverage and contain no expiration date. They are terminated only by cancelation or exhaustion of limit. They contain no per accident (or in nuclear language "per incident") limit, but only a policy aggregate limit which is impaired by every loss. There is no provision for automatic reinstatement, but the pools will arrange for negotiated reinstatement of the limit if investigation of a loss does not disclose an uninsurable condition.

Since the beginning of the liability business companies have insured against "accident", but they have never succeeded in precisely defining the term. Courts have tackled the job from time to time with varying results, so that situations have inevitably arisen in which insurers intended that a limit apply only once, but courts have found two or more accidents.

The term "incident" is no more susceptible to definition than "accident", and in fact some nuclear exposures can be so sneaky that they compound the difficulty. To have issued pool policies on an incident basis would have been an invitation to doubling up of limits, and the firm intention to avoid this is the prime reason for the employment of a single policy aggregate for bodily injury and property damage combined.

While on the subject of limits it should be pointed out that there is a difference in the handling of loss adjustment expense between pool policies and normal liability policies. In ratemaking allocated claim has been included with losses for many years and more recently it has been joined by unallocated claim. However, neither one was part of a policy limit until NELIA and MAELU came along and put them in. This was an unusual step, but the pools really had little choice.

Radiation injuries can be very slow in manifesting themselves and if potential genetic effects are to be considered the time could be measured in generations. If damaging but relatively mild overexposures were to take place, the whole thing could turn into an adjusters' nightmare. Records will be destroyed or difficult to unearth. Witnesses will have forgotten about events or have moved away or died. There will be conflicts of medical testimony because radiation can cause ordinary diseases of life. In short, a new body of case law may have to be created at great cost.

In this situation the pools said in effect that they would offer unprecedented capacity, but that since they were unable to command the services of a Cassandra who could tell them how this capacity should be divided between actual losses and loss adjustment expense, they would put everything in a single fund. This approach also made sense to Congress, and in the last weeks before the Price-Anderson Bill was

passed it was amended to include loss adjustment expense within the $500,000,000 of government indemnity rather than leave it as an additional cost to be paid.

The second illustration of a double limits problem appears in the coverage for transportation. If each facility policy insured the transport of nuclear material without restriction, there would be double coverage every time such material moved from one facility to another. To cure this the pools adopted an initial premise that the only policy which would cover would be the one issued to the facility that the material was moving *away from*. This did not fit all situations and various refinements were tried out. For the purpose here there doesn't seem to be much profit in tracing the history of each version so only the current one is dealt with.

The thing works this way:

1. The policy form itself is drafted for a nuclear facility such as a fuel fabricator which does not qualify for government indemnity and therefore does not furnish proof of "financial protection" to obtain its license.
2. The actual language is tricky to follow, but the effect of it is to:
   (a) Cover transportation "from" the facility insured unless the material is going "to" a facility required to furnish "financial protection".
   (b) Not cover transportation "to" the facility insured unless the material is coming "from" a facility which is owned by the United States.

   The above looks like rather narrow transportation insurance, but very broad cover is given to facilities furnishing "financial protection", and bear in mind the omnibus clause that covers everyone in sight. Thus the protection a facility operator lacks on his own policy is picked up from the policy of another.
3. When a policy is issued to a facility furnishing "financial protection" it will be endorsed to enlarge the transportation cover and thus match the way the indemnity will run. When so revised the policy will cover transport both "from" and "to" the facility with the single exception that a shipment travelling from one indemnified facility to another indemnified facility is insured only by the policy of the facility it is going "from" in order to prevent overlap.

There is little reason for pride in the clarity of these three numbered statements, and the explanation is incomplete without the following illustrations.

1. An unindemnified facility receiving a shipment from:
   (a) A government location has protection from its own policy and in some cases from the indemnity.

(b) A non-profit educational institution has protection from the indemnity in excess of $250,000 and is otherwise dependent on any insurance the educational institution elects to buy.

Note: See earlier reference to 1958 Price-Anderson amendment excusing non-profit educational institutions from "financial protection".

(c) A facility furnishing "financial protection" has protection from the policy of that facility and from the indemnity.

(d) Another unindemnified facility has protection from the policy of that facility.

2. An unindemnified facility making a shipment to:
   (a) Is the same as 1.(a).
   (b) A non-profit educational institution has protection from its own policy and from the indemnity.
   (c) Is the same as 1.(c).
   (d) Another unindemnified facility has protection from its own policy.

3. A facility furnishing "financial protection" and receiving a shipment from:
   (a) A government location has protection from its own policy and from the indemnity.
   (b) A non-profit educational institution has protection from its own policy and from the indemnity.
   (c) Another facility furnishing "financial protection" has protection from the policy of that facility and from the indemnity.
   (d) An unindemnified facility has protection from its own policy and from the indemnity.

4. A facility furnishing "financial protection" and making a shipment to:
   (a) Is the same as 3.(a).
   (b) Is the same as 3.(b).
   (c) Another facility furnishing "financial protection" has protection from its own policy and from the indemnity.
   (d) Is the same as 3.(d).

So much for transportation coverage, and so much for grants of coverage in general, except to point out that the discovery period for losses is unlimited so long as one of these continuous policies remains in effect and then runs for two years after cancellation.

The exclusions are important and there are eight of them. However, two can be disposed of on the ground that they are designed to

prevent overlap between a pool policy and a workmen's compensation policy. The six one could say are "for real" are:

A partial exclusion of contractual liability. The policy covers contractual provided it runs only to liability imposed by law on the indemnitee. The part excluded may be "bought back" on a specified contract basis.

An exclusion of the manufacture of nuclear weapons and a war risk exclusion.

An exclusion (with a minor exception on vehicles) of damage to any property at the site of the nuclear facility.

An exclusion of damage to nuclear material at the site or in the course of transportation to or from the site.

A typical property exclusion running to failure to try to preserve property after a loss and tied down to the hermaphroditic coverage the policy gives for damage to off-site property of a person liable.

There are some nineteen conditions in the policy containing thousands of words that have a bearing on the contract. While it cannot be said that they should not be studied, there is not space to examine them all here. Attention is called to two of them.

Read Condition 3. "Limit of Liability" to find the language that brings loss adjustment expense into the policy limit. Note also that it subjects the policy to a single aggregate limit for its entire term and terminates the policy when the limit is exhausted.

Condition 4. "Limitation of Liability; Common Occurrence" is a special case because it bears on the familiar problem of duplication of limits. There are two general types of situations where the pools foresee the possibility of two or more facility policies becoming hopelessly entangled with each other.

One of these is where a single transport agency such as a freight train is carrying loads from several facilities at the same time. If a loss should take place there might be no way to identify which load started the trouble and all of the facility policies could be held to cover. Condition 4. says that when this happens the liability is the sum of the limits of the applicable policies. However, it goes on to impose an additional limitation to the effect that the total commitment on the loss shall not exceed pool capacity in any event (i.e. $46,500,000 for NELIA and $13,500,000 for MAELU).

An example of the other set of conditions with similar potential would be where contaminants were discharged over a period of time by several facilities into the same stream or watershed. If the contamination were identified many miles downstream, the source of the excess probably could not be traced. In that event Condition 4. again applies and the policy limits are added together, subject to an overall limit of pool capacity.

Nuclear Energy Liability Policy—Supplier's and Transporter's Form Edition—5-1-57

This form is also issued by NELIA and MAELU and is an outgrowth of the Facility Form just discussed. Shortly after the pools commenced operation it became apparent that there was going to be a demand for this kind of a policy. Some builders of reactors and both major and minor suppliers of nuclear equipment have a good deal more assets at risk than do certain of their customers. In the case of reactors and critical assemblies these suppliers have little to fear. They have access through the omnibus clause on the facility policy to the pool insurance purchased by the reactor operator and when the limits of that policy are exhausted they also have access to government indemnity. However, when they are supplying materials or services to risks such as fuel fabricators which do not come under government indemnity, they become dependent on the limits purchased by the facility operator. Since some suppliers normally carry liability insurance limits in the range of ten to twenty million dollars, and a facility operator, if he so wishes, may buy a limit as low as $250,000, the suppliers came to the pools and said that they wanted a means of keeping their own liability insurance limits at their customary levels. The Supplier's and Transporter's Form is designed to do this.

In many respects it follows the language of the Facility Form, but it also has some important differences. It is only these differences that need to be covered here.

Where the definition of insured in the Facility Form includes the complete omnibus clause previously described, this policy is a typical single interest contract. "Single Interest" is a loose term because in addition to the named insured the policy also covers such people as executive officers, employees, directors or stockholders, while acting within the scope of their duties as such. Further, it can be extended by endorsement to pick up other interests reasonably related to the named insured, provided, they are specifically named. At the same time it is impossible for the pools to go so far as to insure additional interests in such broad terminology as for example "subsidiaries and affiliates." This kind of language could sweep in a tremendous variety of concerns and there would be no means of knowing the extent to which all of these were involved in the nuclear industry or the number of supplier's and transporter's policies that might be covering a particular concern.

The pools consider facility insurance policies as primary insurance. That is where they intend to provide coverage in the first instance, and consequently every supplier's and transporter's policy is drawn as excess insurance over and above coverage available on any applicable facility policy.

Under the facility policy some space was devoted to discussion of

the peculiar provisions which treat as liability insurance all injuries to off-site employees and damage to off-site property of a "person liable." These provisions were inserted in order to match in with Price-Anderson indemnity and if such indemnity is present no supplier needs this type of coverage. Therefore, the Supplier's and Transporter's Form contains none of it.

In the exclusions section there are a number of departures from the Facility Form. The more important of these are:

It will be recalled that the contractual coverage of the Facility Form is very broad. Actually, if one sets aside the subject of hold harmless agreements in favor of the United States, this does not involve a great deal in the way of assumption of additional liability. With the omnibus insured clause the whole world is on the policy, anyway. When the supplier's and transporter's policy reverted to single interest coverage as described contractual assumptions became very important. If unlimited contractual had been left in the policy any supplier could of his own generosity turn his supplier's and transporter's policy into a pretty good facsimile of a facility policy for every one of his customers.

Therefore, the only contractual that is given automatically in the supplier's and transporter's policy is that which the insured would get on a typical comprehensive general liability policy. The pools are willing to insure other assumptions of liability, but only on an individual agreement or type of agreement basis and for an additional charge.

There is language in some of these exclusions which bears directly on coverage of suppliers to nuclear ships like the "N. S. Savannah," or even the Navy's submarines. It is not discussed here because this paper must have some limitations, and its eyes are closed to the marine and foreign problems.

Unlike the facility policy, the supplier's policy contains an exclusion of losses in the area of government indemnity. The pools assume that the average supplier buys this contract in order to remove any uncertainty about the purchase of insurance by his customers. If conditions are such that a loss comes under the indemnity, this uncertainty is taken care of. However, private insurance has an enviable record over the years of prompt and efficient action and it may be taken as a compliment that people place a value on this. This exclusion is removable for a price so that the supplier's policy can be made to perform regardless of the presence or absence of indemnity and a number of suppliers have elected to buy it this way.

There is a removable exclusion of disposal of nuclear wastes. The pools are willing to insure this type of operation, but they are a little nervous about it and they wish to know definitely each time they take on such a risk.

Lastly, there is an exclusion of any loss for which any form of the "financial protection" required by the Price-Anderson Law is available. This is designed primarily to take care of the situation where a

facility operator elects to self-insure his "financial protection." The omnibus provision of self-insured "financial protection" must be just as broad as that of insured "financial protection" and it is not intended that the supplier's and transporter's policy take precedence over self-insured "financial protection."

Our old friend double limits or cumulation of limits is very prominent in the Supplier's and Transporter's Form. If suppliers buy the volume of this insurance which they are showing a tendency to do, it will be possible for a number of policies to become involved in a single loss at a single facility. In the absence of protective language the pool memberships could find themselves committed far beyond their intended maximum participations. The problem is dealt with in Condition 4 of the policy, "Limitation of Liability; Multiple Policies." The adopted language is not particularly long, but it is probably fair to say that before this final form emerged more man hours were devoted to this subject than to any other single part of the nuclear liability insurance program.

Every word of this condition drips with sweat, and it has earned the right to be quoted in full. It reads:

"Limitation of Liability; Multiple Policies. With respect to any occurrence or series of occurrences for which insurance is afforded under this policy and for which insurance (a) is afforded to any person or organization whether or not an insured under this policy, under any other nuclear energy liability policy issued by the companies, or (b) would be afforded under any other such policy but for its termination upon exhaustion of its limit of liability:

(1) the total aggregate liability of the companies under all Nuclear Energy Liability Policies (Supplier's and Transporter's Form), including this policy, affording insurance for such occurrence or series of occurrences shall be the sum of the limits of liability of all such policies, the limit of liability of each such policy being as determined by Condition 3 thereof, but in no event shall such total aggregate liability of the companies be greater than the amount by which $46,500,000 exceeds the sum of the limits of liability stated in the declarations of all Nuclear Energy Liability Policies (Facility Form) issued by the companies and affording insurance for such occurrence or series of occurrences, provided each such Nuclear Energy Liability Policy (Facility Form) issued by the companies shall, solely for the purpose of computing the total aggregate liability of the companies, be deemed to be in effect notwithstanding it has terminated upon exhaustion of its limit of liability; and

(2) if in the performance of the companies' obligations with respect to such occurrence or series of occurrences and in payment for expenses incurred in connection with such obligations the total of the payments made by the companies under any

Nuclear Energy Liability Policy or Policies (Supplier's and Transporter's Form) shall exhaust such total aggregate liability of the companies, all liability and obligations of the companies under this policy with respect to such occurrence or series of occurrences shall thereupon terminate and shall be conclusively presumed to have been discharged, whether or not any of such payments have been charged against this policy.

The provisions of this condition shall not operate to increase the limit of the companies' liability under this policy."

If you take the preamble first and strip it of all the nuances in the language it may be said to read: "If two or more policies issued by the same pool insure the same loss the following conditions apply." (Courts take notice. You are not entitled to this stripping operation.) Using this simplified approach and with the same admonition to the courts, the paragraph numbered one may be said to do three things:

(a) The available limits of all supplier's and transporter's policies applicable to the loss are added together.

(b) The total limit produced in (a) may not exceed the amount by which total pool capacity exceeds the sum of the limits in all applicable facility policies issued by the same pool.

(c) For this purpose of figuring limits any applicable facility policy issued by the same pool is deemed to have its original limit still in effect, regardless of whether or not that limit has actually been depleted or exhausted by this or prior losses.

The substance of all this is that neither pool intends to commit itself for more than its total capacity at any one facility regardless of the policies it may have outstanding and applying to that facility.

Examination of the paragraph numbered (2) shows that it does just one thing. Baldly and undiplomatically stated, it can be paraphrased to say, "The mere presence of a supplier's and transporter's policy in your hands is in no sense an unconditional guarantee that you have any insurance." In the event of an actual loss of major proportions, the pools will have no way of knowing which interests claimants will elect to bring their actions against. Therefore, it is impossible for them to make an advance proration of coverage between all policyholders. A conceivable sequence of claims might run like this. The facility operator is the most likely candidate, particularly if so-called strict liability is held to apply. Claimants turn to him until his policy limit is exhausted. The major facility designer or constructor might be next in line, so that a supplier's and transporter's policy held by him would come under fire. Depending upon the fact situation involved a variety of other interests could be attacked and somewhere along the line total pool capacity would be exhausted. All this could happen in such a way that some supplier's and transporter's policies would not pay a single dollar of loss. If subsequent claims were brought against the holders of these policies

they just wouldn't have any insurance. At first blush this result may appear inequitable. At the same time it is submitted that in practice it would be impossible to draft a contract in any other manner and still meet the vital requirement that the signatory companies shall not be committed for more than their total capacity at any single facility.

The above brings to a close the subject of coverage offered by NELIA and MAELU. Admittedly, the analysis of the Supplier's and Transporter's Form is, if anything, sketchier than that of the Facility Form. However, an understanding of the points that have been touched on will go a long way toward bringing this new kind of insurance into focus.

Pricing Systems—Ratemaking

No one has contended that the rating of the nuclear energy liability hazard in the present state of the art is not largely a matter of "flying by the seat of your pants." Over the years it has not been uncommon for liability ratemakers to face unusual situations, but it is doubtful if there have been many before where a concrete answer is as elusive as it is here.

All existing experience is on government installations and it is very good indeed. The few losses that have occurred in the United States have usually been instances of accidental criticality, most commonly resulting from operations that are not yet carried on by private industry. A small number of people and some government property have been involved, but no member of the public has ever been injured by radiation or contamination from a major installation. We know about losses in Great Britain and Canada that have been more expensive than anything that has occurred here. In the case of the Windscale loss in England the public was involved in that milk production from cows who ate grass contaminated with radioactive iodine was condemned and the milk disposed of in the ocean. The dollar cost of this has not been published. We are told that something fairly serious happened in a critical assembly at Vinca in Yugoslavia, but that is all we know about it. Whether similar losses can take place in the United States remains to be seen, but experts in reactor safety seem inclined to the belief that somewhere, somehow, we will eventually have an incident.

How do you rate this? The pool committees did some exploration of property insurance where there are existing examples of very high insurable values with small likelihood of loss. Two of these would be the collection of large suspension bridges around New York City and the major ocean liners. It cannot be claimed that anything conclusive was drawn from these analogies.

The pools also gave thought to the well founded principle that an underwriter must get some premium for placing large amounts of assets at risk regardless of the remoteness of the hazard. For this purpose comparisons were made to existing charges for upper layers

in the excess insurance market and to the charges which banks make for stand-by loans. In a stand-by loan the money is not actually furnished to the borrower, but a promise is given that when the time comes that the borrower needs the money it will be loaned to him at the going rates for commercial loans. The pools were told that rates for stand-by loans ranged from an absolute prime figure of one-quarter of one percent up to a more common figure of one-half of one percent. In terms of dollars related to sixty million, these rates produce annual charges ranging from $150,000 to $300,000. For comparison, the pools have quoted annual rates for sixty million limits on nuclear facilities ranging from $30,500 a year to $364,000.

When the pools were first formed, all discussion of rating revolved around prices for reactors. Economic power reactors are the prime objective of the nuclear industry and both industry and Congress pressed the insurance carriers for quotations on them. Following the preliminaries described above, the pools then worked out a procedure based on rating a reactor which does not exist and then relating the prices for all other reactors to it. There is a formula involved here, but at this stage it is impossible to refine it enough to produce actual prices in all cases. Therefore, the complete details of it have not been published. However, the elements that go into the formula are public information. A value is established for each reactor and five factors are taken into consideration in setting up each of these values. These factors are:

Type of Reactor. There are various kinds of reactors, such as swimming pools, boiling water, pressurized water, liquid metal cooled, gas cooled, etc. Insurers believe there is a variation in hazard amongst these types.

Use of the Reactor. Reactors are used for various purposes, such as research, materials testing, production of radioactive isotopes and power. There is probably more hazard connected with a reactor which is started up and shut down frequently than with one which is started and then operated more or less continuously. Also, it is likely that there are proportionately more members of the public around research and test reactors than there are around power reactors. For example, the operation of a research reactor in a university is frequently observed by students.

The Power Level of the Reactor. Power level is a pretty fair measure of the amount of damage a reactor could do if it should let go. Since all reactors are not used to produce power this power level is measured in thermal kilowatts, rather than electrical kilowatts.

Location of the Reactor. It is obvious enough that a major reactor incident in the middle of a large desert would not cause the same injury to persons and property that would result from the same failure of a reactor located in or near a population center. Factors now in use are a good deal more refined than this example and it is reason-

able to expect that even greater refinements will come with increased knowledge and experience.

The Containment of the Reactor. Every reactor in the licensee program of the Atomic Energy Commission is supposed to be designed in such a way that it will contain what is called the "maximum credible incident." In other words, if there is a serious loss in the reactor it is hoped that there would still not be any release of contamination to surrounding areas. The pictures you see of the power reactors that are now being constructed in various parts of the country always show a dome-like structure as part of the plan. This is the outer reactor shell, or containment, which is intended to withstand any incident that might occur within the reactor. If underwriters find containment is either not present or inadequate in their opinion, this will naturally have an affect on the price quoted.

All of the above is used in establishing the price for the first million of limit. Procedures have been set up so that once that is done the rules take over and the rest of the prices are produced automatically. For additional millions on reactors, and for limits below one million, there are standard gradations as follows:

	1st Million		Base
Next	4	"	50% of base each
"	5	"	20 " " "
"	10	"	10 " " "
"	20	"	5 " " "
"	20	"	2.5 " " "

Limits below one million:

750,000	90% of base
500,000	75 " "
250,000	50 " "

The pools have minimum prices per million of insurance so that regardless of the base price they never charge less than $1,000 per million on power reactors and $500 per million on research and test reactors regardless of the layer of limits involved.

For test and research reactors there is a special loading of 50% of the base price which applies only to the first million or fraction thereof. This loading is to recognize the fact that there is a greater likelihood of members of the public being near these reactors or working around them than there would be in the case of power reactors.

The lowest reactor price the pools have quoted is $1,500 for the first million dollars of limit on very small research reactors. On such a reactor the price for all additional millions would be $500 each, because of the 50% loading on the first million. The highest price

so far quoted is for a large power reactor, which probably will not go into operation until 1961. That price is $56,000 for the first million with the standard gradation applying. This produces the previously mentioned total figure of $364,000 per year for sixty million of coverage.

Critical assemblies are sometimes referred to as zero power reactors. Usually they consist of a tank-like installation which is used for research and testing of fuel assemblies. The fuel is placed in the critical assembly and a moderator introduced to bring it just to the point of criticality. The reaction is never intentionally carried beyond this point and the hazard of these installations is relatively low. They are rated on the reactor schedule, but the price for the first million is always $2,000. Therefore, the next four million would be at a rate of $1,000 each and all subsequent millions at a rate of $500 each. Sixty million costs $33,500.

One thing the development of the reactor schedule did was to set the flat charge as the pattern for the premium base for nuclear liability insurance. Casualty insurance also uses a variety of other premium bases such as units, payroll, sales, area, etc. which automatically do part of the job of measuring variations in exposure. In the nuclear field the background information is so thin that no way could be found of easing the ratemaking job by incorporating one of these variable premium bases. Thus hazards are measured for each risk on the best available information and a price per million of limit quoted. In the absence of significant interim changes the quotations are refigured annually.

Fuel fabrication operations have a rating schedule of their own. It is a simplified outgrowth of the reactor rating system, which takes into account the location and the amount and kind of special nuclear material used. Prices for the first million range from $1,000 to $5,000 unless the risk is working with plutonium or the 233 isotope of uranium, in which event the prices would be higher. The price for the second million is a varying percentage of the first million price, depending on the presence or absence of powder metallurgy in the operation and all millions above the second are charged for at the rate of $500 each.

Some rather complicated procedures have been used in the rating of supplier's and transporter's policies, and it is perhaps enough to say that many of them have a relationship to either the reactor or fuel fabrication rating systems. It is interesting to note that the concept of charging for prior sales which was in vogue in product liability insurance some years ago has been revived here for some of the major supplier exposures.

Where two or more installations defined as nuclear facilities are found at the same location, they are insured under a single facility policy and share the limits of that policy. In recognition of this, there is a system of discounting the rates for all facilities in excess of one.

There is another discount that applies when a facility is shut down for an extended period of time.

Breakdown of the Premium Dollar

The distribution of the premium dollar is rather simple. 10% is assigned to long term catastrophe reserves and profit. Another 10% is assigned to company expenses and is broken down into 5% for administration plus any claim expense which is not identifiable, and 5% for inspection. Note that the inspection figure is higher than the normal general liability loading of 3.5%. This is because inspections of nuclear energy installations have to be made by specially trained personnel and the number of qualified people is limited. Both the cost of their time and the travel expense incurred are considerably above normal.

Taxes are included at the standard liability figure of 3%.

Acquisition expense is graded by size of risk and the loadings are as follows:

1st	10,000	of	premium	10%
next	15,000	"	"	5
"	75,000	"	"	3
Excess over	100,000	"	"	1

The balance of the premium which ranges from 67% to about 75%, depending on risk size, is held by the pools in special funds for the payment of losses and loss expense. This same loss fund is subject to the application of the long term Industry Credit Rating Plan which is discussed immediately below.

Industry Credit Rating Plan

The great need in the nuclear energy liability insurance pools is to have a means of accumulating reserves against a major catastrophe. If unexpended loss dollars were to be subject to normal income tax, a big bite would be taken out of them and it would be necessary to charge very high premiums in order to salvage any material net amounts for reserves. Therefore, at an early stage pool representatives met several times with the Internal Revenue people. A plan was developed whereby unused loss dollars could be held for ten years in the reserve for retrospective returns to policyholders. This plan works as follows:

As mentioned before, dollars from the loss and loss expense portion of the premium which are not actually paid out are placed in special funds by NELIA and MAELU. These funds are accumulated for the first ten years of operation without any other action being taken.

In the eleventh year of operation a process of gradual return of unexpended funds to policyholders will begin. The method of this return may be stated as follows:

1. From the ten years accumulation of loss dollars deduct actual

incurred losses and loss expense. The balance is the total returnable premium.

2. Determine the accumulated earned premium for the full ten year period.
3. Determine the ratio of earned premium in the first year of operation to the ten year earned premium.
4. Apply the ratio obtained in 3. to the total returnable premium obtained in 1. to obtain the actual dollars returnable to policyholders who contributed to the earned premium in the first year of operation.
5. Distribute the dollars obtained in 4. to policyholders in the first year of operation in proportion that the earned premium of each policyholder bears to the total earned for that year.

There are three things about the plan that are probably obvious enough. First, it is an industry plan and not a risk plan. If a return becomes available for a given year, it is paid both to policyholders who have had losses and those who have not. Second, this is an all credit plan with no provision for additional payments if experience is unfavorable. Third, if the special loss funds of the pools show negative balances after the tenth or any subsequent year, there is no money to give back and no further distribution will be made until such time as the funds again show positive balances.

The plan has been accepted by the Internal Revenue because the money in it can never become the property of the pool memberships. If it is not used to pay losses and loss expense, it ultimately finds its way back to the policyholders.

An exhibit is attached and is marked "Appendix 1". This has been lifted gratefully and with permission from a memorandum written by Harry Williams and Frank Hope of the Hartford Accident and Indemnity Company. Note that it not only illustrates 15 years of pool operation, but it also shows the ultimate "run-off" of the plan if for any reason the pools were to discontinue operation.

The column headings of the exhibit are largely self-explanatory, but a few comments may be useful.

The word "provisional" in Columns (2) and (3) has a specific meaning. It refers to the premiums originally charged by the pools from year to year. The actual or final premiums are considered to be those which apply after ten years have elapsed and any available returns have been made.

Note that the cumulative premiums in Column (3) revolve on a ten year basis. For example, at the end of the eleventh year the provisional premium for the first year is dropped and that for the eleventh year added.

The "returnable premium cumulative" in Column (8) does not re-

volve, but goes on forever. The positive or negative amounts in Column (7) respectively increase or reduce it, and the amounts in Column (9) reduce it ultimately to zero.

The basic charge ratio of .30 in Column (5) is an assumed average of the expense and catastrophe portions of the premium described earlier in this paper.

While the operation of the Industry Credit Rating Plan as between the pools and their customers is relatively simple, the internal pool accounting is quite the opposite. So far there have been minor changes in company participations for each year of operation and there is no reason to believe that these fluctuations will cease in the future. This could produce some neat problems if incurred losses exceeded the fund balances and assessments became necessary. Another problem to be solved is the one involved in making certain that this rating plan should not operate as an incentive for a company to retire from a pool following the emergence of a heavy loss.

A plan of accounting exists which the writer believes will meet every contingency. No description is offered here because the pools have not adopted it yet.

In closing, it is worth pointing out that while the Industry Credit Rating Plan was conceived as a solution to a tax problem, a secondary benefit has flowed from it. There has been some conversation by people outside the insurance business to the effect that some of the prices quoted by the pools look high. The pools feel strongly that these criticisms are unfair in view of the potential risks involved, but the whole subject is so intangible that it comes down to dealing with conflicting opinions with few concrete facts for either side to point to. The rating plan has the virtue of providing an automatic correction if, after a period of time, it is proven that current rate quotations are too conservative.

APPENDIX 1

(1) Year	(2) Provisional Premium (Annual)	(3) Provisional Premium 10 Year Cumulative	(4) Incurred Loss and Loss Expense	(5) Basic Charge .30 × (2)	(6) Formula Premium (4) + (5)	(7) Premium Available for Future Losses or Return (2) — (6)	(8) Returnable Premium Cumulative	(9) Return Premium (In Year Assigned)
1	$ 1,000,000	$ 1,000,000	$ 100,000	$ 300,000	$ 400,000	$ 600,000	$ 600,000	$ 440,000
2	2,000,000	3,000,000	5,200,000	600,000	5,800,000	— 3,800,000	— 3,200,000	938,560
3	2,000,000	5,000,000	200,000	600,000	800,000	1,200,000	— 2,000,000	None
4	3,000,000	8,000,000	300,000	900,000	1,200,000	1,800,000	— 200,000	129,322
5	3,000,000	11,000,000	300,000	900,000	1,200,000	1,800,000	1,600,000	319,064
6	3,000,000	14,000,000	300,000	900,000	1,200,000	1,800,000	3,400,000	479,249
7	4,000,000	18,000,000	400,000	1,200,000	1,600,000	2,400,000	5,800,000	641,124
8	4,000,000	22,000,000	400,000	1,200,000	1,600,000	2,400,000	8,200,000	644,026
9	5,000,000	27,000,000	500,000	1,500,000	2,000,000	3,000,000	11,200,000	802,038
10	5,000,000	32,000,000	500,000	1,500,000	2,000,000	3,000,000	14,200,000	802,705
							— 440,000	
11	5,000,000	36,000,000	500,000	1,500,000	2,000,000	3,000,000	16,760,000	800,782
							— 938,560	
12	5,000,000	39,000,000	20,500,000	1,500,000	22,000,000	—17,000,000	— 1,178,560	800,782
							— —	
13	5,000,000	42,000,000	500,000	1,500,000	2,000,000	3,000,000	1,821,440	799,982
							— 129,322	
14	5,000,000	44,000,000	500,000	1,500,000	2,000,000	3,000,000	4,692,118	801,183
							— 319,064	
15	5,000,000	46,000,000	500,000	1,500,000	2,000,000	3,000,000	7,373,054	801,183
							— 479,249	
16		43,000,000					6,893,805	
							— 641,124	
17		39,000,000					6,252,681	
							— 644,026	
18		35,000,000					5,608,655	
							— 802,038	
19		30,000,000					4,806,617	
							— 802,705	
20		25,000,000					4,003,912	
							— 800,782	
21		20,000,000					3,203,130	
							— 800,782	
22		15,000,000					2,402,348	
							— 799,982	
23		10,000,000					1,602,366	
							— 801,183	
24		5,000,000					801,183	
							— 801,183	
25		0					—	
	$57,000,000		$30,700,000	$17,100,000	$47,800,000	$ 9,200,000		$9,200,000