

6-1966

## Workmen's Compensation for Radiation Injuries in Tennessee

E. Blythe Stason

Follow this and additional works at: <https://scholarship.law.vanderbilt.edu/vlr>



Part of the [Torts Commons](#), and the [Workers' Compensation Law Commons](#)

---

### Recommended Citation

E. Blythe Stason, Workmen's Compensation for Radiation Injuries in Tennessee, 19 *Vanderbilt Law Review* 571 (1966)

Available at: <https://scholarship.law.vanderbilt.edu/vlr/vol19/iss3/1>

This Article is brought to you for free and open access by Scholarship@Vanderbilt Law. It has been accepted for inclusion in Vanderbilt Law Review by an authorized editor of Scholarship@Vanderbilt Law. For more information, please contact [mark.j.williams@vanderbilt.edu](mailto:mark.j.williams@vanderbilt.edu).

## Workmen's Compensation for Radiation Injuries in Tennessee

*E. Blythe Stason\**

*Noting the increasing degree of state-controlled nuclear activity permitted under the Atomic Energy Act, Professor Stason here discusses the protection afforded radiation-injured employees under the Tennessee Workmen's Compensation Act. He relates the various types of radiation injuries to the applicable sections of the statute, and concludes that the Compensation Act falls far short of the standards recommended for the nuclear society of tomorrow.*

### I. INTRODUCTION

The last two decades have witnessed a remarkable evolution in the introduction of large scale nuclear activity into the American civilian scene. Starting from a top secret, exclusively military activity in World War II, progressing to cautious federal civilian control under the Atomic Energy Act of 1946,<sup>1</sup> advancing to an equally cautious allowance of some private participation under tight federal controls under the revised act of 1954,<sup>2</sup> then to affirmative encouragement of private participation by the adoption in 1957 of section 170, the 500,000,000 dollar indemnity act,<sup>3</sup> and, finally in 1959, by the enactment of section 274 authorizing the Atomic Energy Commission to transfer important regulatory functions to the states,<sup>4</sup> this new form of energy has undergone a unique legal transmutation in a short span of twenty years, with a velocity of evolution that has few, if any, parallels in legislative history. In this article, after sketching certain features of this development and noting that, with all its promised

---

\*Professor of Law, Vanderbilt University.

1. Atomic Energy Act, 60 Stat. 755 (1946), 42 U.S.C. § 2011 (1964).

2. 68 Stat. 919 (1954), 42 U.S.C. §§ 2011-2394 (1964).

3. 71 Stat. 576 (1957), 42 U.S.C. § 2210 (1964) indemnifying private users against damage claims from radiation accidents.

4. 73 Stat. 688 (1959), 42 U.S.C. § 2021 (1964) authorizing the AEC to transfer regulatory powers to cooperating states.

blessings, radioactivity carries possibilities of harm to persons and property, we shall examine the workmen's compensation phase of the increasing involvement of state governments in the nuclear regulatory process under the newly enacted section 274. Special attention will be given to problems of concern to the lawyers and legislators who are called upon to take account of injuries to employees in industry. They are the persons who will be obliged to bridge the gap between science and the law in this significant frontier of technology. Moreover, we shall devote specific attention to the Tennessee Workmen's Compensation Act, which we shall find quite inadequate to do justice to employees who are victims of over-exposure to radiation.

We lay to one side, so far as this article is concerned, the impact of the atom on general tort liability in Tennessee. Such important aspects of the total subject as strict liability, nuisance actions, third-party liability, and joint and several liability we reserve for another occasion. Hopefully radiation will be so well regulated that the injuries to outsiders will be few and far between. We also lay to one side possible injuries in Tennessee resulting from the extensive operations of the federal government in the nuclear field. Such injuries receive special handling either by federal agencies (*e.g.*, the Bureau of Employees Compensation), or by agreed agency settlements, or through proceedings under the Tort Claims Act.<sup>5</sup> Finally we lay to one side the special problems connected with safety of large scale atomic production and the utilization facilities and employee injuries therein. Although the Workmen's Compensation Law may become involved in accidents in such facilities, the area is wisely retained under the jurisdiction of the Atomic Energy Commission. The principal problems being transferred by the Commission to the states, under section 274, are those resulting from nuclear by-product and source materials. As to "special nuclear materials," such as those that might be involved in reactor accidents, section 274 specifically provides that the Commission, in transferring regulatory authority to the states, shall do so only with respect to "special nuclear materials in quantities not sufficient to form a critical mass." In other words, quantities in excess of the critical mass (for example, amounts sufficiently sizeable to operate a reactor) remain under Atomic Energy Commission control. Hence, even though they may sometimes involve workmen's compensation under state laws, they are beyond our present concern.

In short we are concerned in this article only with radiation injuries

---

5. The Atomic Energy Commission has had an extraordinarily good safety record. For a statistical report, see 1965 AEC ANN. REP. ON MAJOR ACTIVITIES IN THE ATOM. ENER. PROGRAMS 55-68 [hereinafter cited as 1965 AEC REP.].

to employees covered by the Tennessee Workmen's Compensation Act, and our concern for these injuries is limited to those transferred to state authority by section 274 of the Atomic Energy Act.

## II. FEDERAL REGULATION OF RADIATION

A little background will be helpful in orienting our consideration of Tennessee's workmen's compensation problems in the radiation field. Three categories of nuclear materials are available for use in private activities: (1) by-product materials, generally characterized as reactor-produced isotopes, (2) source materials, consisting of uranium or thorium in any natural physical or chemical form, and (3) special nuclear materials, which means plutonium, uranium 233, or uranium enriched in the isotopes U233 or U235.<sup>6</sup> About 90 per cent of all private materials licenses are in the first category; that is, they confer upon private persons the right to use by-product materials.

The Atomic Energy Act, as adopted by Congress in 1946 and revised in 1954, placed responsibility upon the Atomic Energy Commission to protect the public from harm that might be caused by these radioactive materials. Although it was realized by all concerned that, in general, it is the responsibility of the states to guard public safety, health and general welfare, yet in the unusual field of nuclear energy, the problems were new, the technology was complex and unfamiliar except to the few who had been connected with federal activities, and the federal government had physical control of practically all nuclear materials and facilities. As a consequence, federal authorities had a near monopoly of the knowledge necessary to deal with safety problems; and Congress very properly laid upon the Atomic Energy Commission the responsibility for taking all

---

6. These terms are defined in section 11 of the Atomic Energy Act in the following manner:

### Section 11. Definitions—

- (e) The term "by-product material" means any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material. . . .
- (x) The term "source material" means (1) uranium, thorium or any other material which is determined by the Commission pursuant to the provisions of Section 61 to be source material; or (2) ores containing one or more of the foregoing materials, in such concentrations as the Commission may by regulation determine from time to time.
- (y) The term "special nuclear material" means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission, pursuant to the provisions of Section 51, determines to be special nuclear material, but does not include source material; or (2) any material artificially enriched by any of the foregoing, but does not include source material. . . .

necessary measures to safeguard the public.<sup>7</sup>

Accordingly, the 1954 Atomic Energy Act established a comprehensive plan for licensing private users and regulating their activities through the supervisory authority of the Atomic Energy Commission. Part 20 of the Commission regulations covers the matter at length. It contains extensive and detailed rules governing permissible doses and levels of radiation and radioactivity, both in restricted areas and in unrestricted areas where the public might be exposed. Also covered are such matters as area surveys and monitoring, warning notices, film badges, waste disposal, and reporting requirements. These regulations were based in part upon radiation guides developed by the National Committee on Radiation Protection and the Federal Radiation Council.<sup>8</sup>

Federal regulation has been carried out with admirable results, for the nuclear industry has had a splendid safety record. In the vast governmental program with approximately 7,000 AEC employees and 126,000 AEC contractor employees conducting a 2,500,000,000 dollars per year business in an 8,000,000,000 dollar plant, the overall frequency rate of lost-time injuries during the twenty-three years of operation has been only 3.32 injuries per million man-hours of work. This compares most favorably with a general private industry rate of 8.17 injuries per million man-hours. Moreover, only about one-half of one per cent of the injuries have been due to over-exposure to radiation. During the entire period there have been only six employee deaths attributable to nuclear causes in federal operations.<sup>9</sup> There has also been one death in privately licensed operations. An employee of the United Nuclear Corporation, working in a recovery plant for enriched uranium scrap, poured a solution of enriched uranyl nitrate from a geometrically safe bottle into a process vessel of unsafe geometry. The result was a critical mass and a fatal 8000 rems exposure of the employee.<sup>10</sup> While atomic installations have proved to be safe places in which to work, it is only reasonable to assume that they will become less so as the use of radioactive materials

---

7. The Atomic Energy Act, in fact, scarcely recognized the possibility that state and local governments might possibly have an interest in this area. The only exception is found in section 271 of the act, which provides that "nothing in this act shall be construed to affect the authority or regulations of any Federal, *state* or *local* agency with respect to the generation, sale or transmission of electric power." (Emphasis added.)

8. The guides developed by the National Committee on Radiation Protection are published in handbooks issued by the Bureau of Standards. The Federal Radiation Council is an ex-officio group consisting of the Secretaries of Defense, Commerce, H.E.W. and the Chairman of the AEC. The Council reports to the President. See 1 CCH ATOM. L. ENER. REP. ¶¶ 4054, 4065.

9. See 1965 AEC REP. 55-57.

10. See 1964 AEC REP. 330.

becomes more widespread, and as confidence engendered by the fine past record induces carelessness for the future.

### III. EARLIER STATE REGULATION OF RADIATION

The states have, of course, had a long-standing concern for the health and safety of their respective populations, and it is only natural that they should take a somewhat questioning view of the seeming invasion of their domain by the federal government under the Atomic Energy Act. In general, however, the state authorities have recognized that they were better off letting the federal government grapple with the unique problems of radioactivity, and little definitive action has been taken at the state level. There have been certain exceptions, however. A few statutes have been passed prohibiting the use of fluoroscopes for shoe-fitting.<sup>11</sup> Some years ago the National Committee on Radiation Protection drafted a Model Act for State Radiation Control which provided the creation of a state authority to establish regulations and enforce compliance with state standards.<sup>12</sup> The Model Act was not enacted by any state, and it was later withdrawn. A New England Committee on Atomic Energy recommended the adoption of a Model Act for Coordinating Development and Regulatory Activities Relating to Peaceful Uses of Atomic Energy and providing for a state coordinator to deal with problems of health and safety as well as industrial and economic matters.<sup>13</sup> Several states, including Connecticut, Maine, New Hampshire and Rhode Island, adopted such statutes.<sup>14</sup> Also, several states including Alaska, Georgia, Illinois, New Jersey, North Carolina, Ohio, and Texas, have established atomic energy study or advisory commissions. The National Conference of Commissioners on Uniform State Laws has adopted a Uniform Nuclear Facilities Liability Act prescribing strict liability for injuries caused by high energy sources, but no state has adopted it as of the present time.<sup>15</sup> In short, until very recently, state activity in the regulation of nuclear affairs has been almost negligible.

It is true that the problem of pre-emption by the federal government might have been raised at any time, but this has not happened.

---

11. See, *e.g.*, TENN. CODE ANN. § 39-2214 (Supp. 1965). Other statutes have regulated the use of X-ray machines and other old-time sources of radioactivity.

12. MODEL ACT FOR STATE RADIATION CONTROL, 4 CCH ATOM. ENER. L. REP. ¶ 17031.

13. NEW ENGLAND COMMITTEE MODEL ACT, 4 CCH ATOM. ENER. L. REP. ¶¶ 17011-18.

14. These acts are reproduced at 4 CCH ATOM. ENER. L. REP. ¶¶ 17111, 17261, 17321, 17421.

15. 1961 PROCEEDINGS OF THE NATIONAL CONFERENCE 224.

The Atomic Energy Commission has wisely refrained from mentioning the possibility of pre-emption. It has concentrated instead upon attempts to bring about conformity between state and federal regulations relative to protection of health and safety. Now the problem of pre-emption is largely shelved in view of more recent developments under a new departure in the federal law, the addition of section 274 to the Atomic Energy Act.

In general, it may also be said that those persons interested in participation at the state level have pursued a "wait and see" attitude, and have been willing enough to leave the matter of further development to the guidance of the more sophisticated authorities at the federal level.

#### IV. ADDITION OF SECTION 274 TO THE ATOMIC ENERGY ACT

In 1959 Congress amended the Atomic Energy Act by adding section 274,<sup>16</sup> authorizing the Commission to enter into contracts

---

16. The significant features of section 274 are:

SECTION 274—COOPERATION WITH STATES

a. It is the purpose of this section—

(1) to recognize the interests of the States in the peaceful uses of atomic energy, and to clarify the respective responsibilities under this Act of the States and the Commission with respect to the regulation of byproduct, source, and special nuclear materials;

(2) to recognize the need, and establish programs for, cooperation between the States and the Commission with respect to control of radiation hazards associated with use of such materials;

(3) to promote an orderly regulatory pattern between the Commission and State governments with respect to nuclear development and use and regulation of byproduct, source, and special nuclear materials;

(4) to establish procedures and criteria for discontinuance of certain of the Commission's regulatory responsibilities with respect to byproduct, source, and special nuclear materials, and the assumption thereof by the States;

(5) to provide for coordination of the development of radiation standards for the guidance of Federal agencies and cooperation with the States; and

(6) to recognize that, as the States improve their capabilities to regulate effectively such materials, additional legislation may be desirable.

b. Except as provided in subsection c., the Commission is authorized to enter into agreements with the Governor of any State providing for discontinuance of the regulatory authority of the Commission under chapters 6, 7, and 8, and section 161 of this Act, with respect to any one or more of the following materials within the State—

(1) byproduct materials;

(2) source materials

(3) special nuclear materials in quantities not sufficient to form a critical mass.

During the duration of such an agreement it is recognized that the State shall have authority to regulate the materials covered by the agreement for the protection of the public health and safety from radiation hazards.

c. No agreement entered into pursuant to subsection b. shall provide for discontinuance of any authority and the Commission shall retain authority and responsibility with respect to regulation of—

with those states that had properly prepared themselves for the responsibility by setting up compatible state regulatory systems under competent radiological health services. Pursuant to these contracts the regulatory authority over radiation hazards which are connected with specified radioactive materials (*i.e.*, "source materials," "by-product materials," and small quantities of "special nuclear materials") is currently being transferred to the states.

Upwards of thirty states have now adopted enabling legislation authorizing their respective chief executives to enter into agreements with the Atomic Energy Commission. As of January 1, 1966, contracts had actually been entered into with eleven states—Arkansas, California, Florida, Kansas, Kentucky, Mississippi, New York, North Carolina, Oregon, Tennessee, and Texas. On April 20, 1966, the Commission announced that it had entered into an agreement with the twelfth state, New Hampshire. Arrangements are pending with others. These contracts transfer important regulatory authority over radiation hazards, and a major responsibility is thereby being placed upon the several states.<sup>17</sup> In this paper we shall pay special attention to the effect of the transfer in Tennessee.

- 
- (1) the construction and operation of any production or utilization facility;
  - (2) the export from or import into the United States of byproduct, source, or special nuclear material, or of any production or utilization facility;
  - (3) the disposal into the ocean or sea of byproduct, source, or special nuclear waste materials as defined in regulations or orders of the Commission;
  - (4) the disposal of such other byproduct, source, or special nuclear material as the Commission determines by regulation or order should, because of the hazards or potential hazards thereof, not be so disposed of without a license from the Commission.

.....  
 d. The Commission shall enter into an agreement under subsection b. of this section with any State if—

(1) The Governor of that State certifies that the State has a program for the control of radiation hazards adequate to protect the public health and safety with respect to the materials within the State covered by the proposed agreement, and that the State desires to assume regulatory responsibility for such materials; and

(2) the Commission finds that the State program is compatible with the Commission's program for the regulation of such materials, and that the State program is adequate to protect the public health and safety with respect to the materials covered by the proposed agreement.

.....  
 17. See 1965 AEC REP. 326. The following table shows the agreements in effect together with dates and licenses transferred to state authority.

<i>State</i>	<i>Effective date of agreement</i>	<i>Agreement material licenses transferred from AEC</i>	<i>Total State licenses in effect on Sept. 30, 1965</i>
Kentucky	Mar. 26, 1962	104	115
Mississippi	July 1, 1962	52	163
California	Sept. 1, 1962	912	996



## V. TENNESSEE DEVELOPMENTS UNDER SECTION 274

In 1957, the Tennessee legislature took the necessary action to place itself in line for the atomic future by adopting an Atomic Energy and Nuclear Materials Act. As amended in 1961, this act authorized the Governor to enter into written agreements with the United States Atomic Energy Commission relating to the regulation of atomic by-products, source materials and special nuclear materials.<sup>18</sup> The act defines by-product, source materials and special nuclear materials in a manner compatible with the corresponding definitions in the United States Atomic Energy Act.<sup>19</sup>

Additionally, the legislature in 1959 adopted the Radiological Health Service Act. As amended in 1961 and 1964, it authorizes the Commissioner of Public Health to create within the State Department of Health a Radiological Health Service, responsible for the regulation of ionizing radiation. The act requires registration with the Service by all persons owning or possessing one or more radiation sources (with the exception of certain sources of insignificant radioactivity such as luminous timepieces and illuminators on automobile locks). It imposes upon the Commissioner of Public Health the duty "to adopt rules and regulations pertaining to the manufacture, use, receipt, possession, storage and disposal of radiation sources;" and it authorizes the Commissioner to adopt rules and regulations for the licensing of users of by-product, source materials, special nuclear materials and other radioactive materials. It authorizes inspection of premises and sources of radiation; and, finally, it makes provision for appropriate emergency orders and injunctions to restrain violations of the statutes and regulations.<sup>20</sup>

## VI. THE RADIOLOGICAL HEALTH SERVICE AND ITS REGULATIONS

The Tennessee Radiological Health Service was duly constituted by the Commissioner of Public Health and took up its task with vigor and imagination. First, it drafted the necessary rules to supple-

New York	Oct. 15, 1962	1,095	1,489
Texas	Mar. 1, 1963	573	804
Arkansas	July 1, 1963	53	179
Florida	July 1, 1964	265	408
North Carolina	Aug. 1, 1964	183	244
Kansas	Jan. 1, 1965	150	161
Oregon	July 1, 1965	126	126
Tennessee	Sept. 1, 1965	181	181
New Hampshire	May 16, 1966	65	65

18. TENN. CODE ANN. § 53-3101 to -3105 (Supp. 1965).

19. See note 6 for definitions in the federal act.

20. TENN. CODE ANN. § 53-3301 to -3313 (Supp. 1965).

ment the statutes and to provide specific guide lines to protect against radiation hazards. These were promulgated on December 7, 1964, and are now an established part of the law of Tennessee. After defining such esoteric matters as units of radiation dose and units of radioactivity, the regulations set up maximum limits of radiation dosage per person in restricted areas and of exposure to airborne radioactive materials in both restricted and unrestricted areas. In addition, special provisions are made for exposure of minors; surveys of the premises are prescribed, as is personnel monitoring; instructions are given for the posting of warnings in radioactive areas; provisions are made for waste disposal; and the all-important record-keeping and reporting requirements are established. The rules thus adopted are completely compatible with the federal rules governing radiological safety, as previously adopted by the Atomic Energy Commission.<sup>21</sup>

Other portions of the regulations deal with the use in the healing arts of X-rays and sealed radioactive sources and with radiographic operations. Finally, provision is made for licensing and registration. All of this complex technology is now written into the law of Tennessee, and it must be examined and understood by all those involved in the use of radioactive materials, including among others industrialists, agriculturists, doctors, radiation workers, laboratory technicians, and lawyers representing clients who may be unduly exposed to radiation.<sup>22</sup>

To facilitate understanding and enforcement of radiation safety standards and rules, the Radiological Health Service has undertaken a personnel training program. Encouraged and supported financially by the Atomic Energy Commission in a program under the cooperating auspices of the University of Tennessee, the staff members involved in carrying out the responsibilities under the Atomic Energy Commission contract have received instruction through a year-long series of lectures and laboratory exercises in such diverse subjects as principles of radiological safety, effect of radiation on human tissues, detection of radiation with ionization chambers and various types of counters, radiation decay, autoradiography, genetic effects of radiation, disposal of radioactive wastes, emergency handling of radioactive materials, and many other pertinent subjects.

---

21. 10 C.F.R. § 20.1 to -150.30 (1963).

22. Copies of the rules may be obtained from the Tennessee Radiological Health Service. They are available in a pamphlet entitled *Policies and Procedures for the Control of Ionizing Radiation* published in 1965 by the Tennessee Department of Health.

## VII. THE AEC—TENNESSEE CONTRACT

Finally, in September, 1965, the stage having been set by the adoption of state statutes and regulations satisfactory to the Atomic Energy Commission, the Commission and the Governor of Tennessee signed an agreement transferring regulatory authority to the state to the extent authorized by section 274 of the Federal Atomic Energy Act. As already noted, this act authorized the transfer of regulation of by-product materials, source materials and special nuclear materials "in quantities not sufficient to create a critical mass." Retained by the Atomic Energy Commission, both by express statutory provision and by explicit reservation in the contract, is authority over (1) the construction and operation of production or utilization facilities, as defined in the Atomic Energy Act, but including principally those operations involving large quantities of fissionable materials, (2) the export of radioactive materials from the United States, (3) the disposal of such materials into the ocean or sea, and (4) the disposal thereof in other places where hazards are found by the Commission to be present. In other words, jurisdiction is retained by the Commission over the more dangerously radioactive materials and operations.

Also transferred to Tennessee was jurisdiction over the 181 materials licenses in effect on the date of the contract—licenses that had previously been issued by the Atomic Energy Commission. Thus, Tennessee's program for regulation of radiation was launched. The state created a sizeable and novel code of laws and undertook a new venture in a significant field where science and the law combine to deal with a new phase of the economy. As we shall observe, the impact upon the Tennessee Workmen's Compensation Law will be considerable.

## VIII. NATURE OF RADIATION INJURIES

We are now in a position to ask ourselves what the course of events sketched in the preceding pages means to the law, the legal system and the lawyer in Tennessee. We can state without exaggeration that the fissioning atom, and particularly the self-sustaining fission of nuclear reactors, makes a vast store of atomic energy available and brings to the economy a new form of wealth of major proportions. Conceived in laboratories in this country and abroad, born in a billion dollar military gamble in World War II and nurtured cautiously through infancy in the post-war years as a new member of the industrial family, the atom is now entering maturity, and is rapidly finding a place both in fact and in law in the mainstream of the

world's affairs. What unique legal problems will be encountered as the infant matures? For a really close and careful look we should proceed state by state, for there are certain differences in existing state compensation laws. However, the general patterns of legislation do not vary significantly in the several states and the actual statutory language is frequently identical. We shall in fact use the Tennessee law as the principal source of reference, recognizing that the problems encountered in Tennessee will also be met under the laws of most other states although in varying degrees. It is a fact, however, that the Tennessee Workmen's Compensation law is probably less satisfactory than those of many other states and therefore it is especially appropriate for study. We therefore concentrate on Tennessee.

The problems divide themselves into two parts: first, the protection of employees in establishments handling radioactive materials, and second, protection of the remainder of the public. As we have previously indicated, this latter portion of the subject is laid aside for future treatment. We confine our attention to the system of workmen's compensation legislation in Tennessee under which employees' radiation injuries, if and when they occur, will be compensated. We have already ventured the thought that the present Workmen's Compensation Act is ill-adapted to the radiation injuries that are likely to occur. As we examine the specific provisions of the act, we shall conclude that it needs some substantial amendments, if not complete revision. In 1958, the Bureau of Standards of the United States Department of Labor prepared a chart setting up fourteen points under the state compensation laws that are of special concern to workers exposed to radiation hazards. New York, California and Washington met the recommended standards under ten of the fourteen points. Tennessee was the only state that failed to meet every one of the standards, although a recent amendment of the occupational disease section has improved Tennessee's score slightly.<sup>23</sup>

At the outset we should realize that we are dealing with a source of possible injury that is in its infancy. As a hazard it is not one of enormous dimensions at the present time. Recent surveys of workmen's compensation cases in the United States have revealed that only about 125 state radiation claims have been filed in the last five years. To these should be added nearly an equal number of

---

23. The Bureau of Standards table is reprinted as Appendix B in I JOHNSON, *STUDIES IN WORKMEN'S COMPENSATION AND RADIATION INJURY—A REPORT ON FEDERAL-STATE COOPERATION IN IMPROVEMENT OF WORKMEN'S COMPENSATION LEGISLATION* (1965) [hereinafter cited as JOHNSON REPORT]. The author is Professor of Economics at the University of Wisconsin. The book was published under the joint sponsorship of the Dep't of Labor and the AEC.

federal claims handled by the United States Bureau of Employees' Compensation. Many of the claims have arisen from the use of the familiar X-ray machines, and not the more modern radioactive isotopes.<sup>24</sup> Only about fifty of the claims have been based on allegations of so-called delayed injuries, which, as we shall see, are the more serious types. So at the moment we are not confronted with the massive problem faced by Chief Justice Winslow, writing the opinion upholding the Wisconsin Compensation Act of 1911, when he noted that the act was designed to deal with an "army of injured and dying, with constantly swelling ranks marching with halting step and dimming eyes to the great hereafter."<sup>25</sup> There is no such crisis in nuclear activities.

However, as has already been noted, when the use of radioactive materials grows more and more widespread in laboratories, in industry, in agriculture, and in medicine—and when isotopes are used as tracers, for radiography, for measuring the uptake of fertilizers, for sterilizing foods and drugs, for medical diagnosis, and for deep cobalt therapy—we may expect the number of personnel overexposures to increase, and the claims of employees on account of radiation injuries to multiply.

More specifically, the workers who will risk exposure to radiation will include the following: (1) Those engaged in such diverse activities as mining and processing uranium ores, enriching natural uranium for fuel purposes, fabricating fuels and other radioactive materials, making use of fuels in reactors, transporting radioactive materials and using radioisotopes in medical diagnosis and therapy. (2) Those applying high level irradiation in the treatment of cancerous lesions, the same for the sterilization of drugs and foods, in the manufacture of various industrial products and in the use of radiographic equipment. (3) Those using low level sources in thickness gauges, as tracers, in agriculture (for example, to measure the uptake of fertilizers), and in laboratories, research institutes and clinics, not to mention the familiar X-ray machines. (4) And those engaged in the uses of radium and radon, working with the operation of particle accelerators, working with high energy radar, and many other uses some of which have not yet even been conceived. The number of workers involved is great and growing, and even with the greatest care the overexposure claims will multiply.

Overexposure of workers to radiation may arise in at least two

---

24. See O'TOOLE, *THE INCIDENCE, NATURE AND ADJUDICATION OF WORKMEN'S COMPENSATION CLAIMS INVOLVING RADIATION EXPOSURES AND DELAYED INJURY* (1965). The work is published as II U.S. DEPT. OF LABOR & AEC, *WORKMEN'S COMPENSATION AND RADIATION INJURY* (1965). This is a companion of the JOHNSON REPORT.

25. *Borgnis v. Falk Co.*, 147 Wis. 327, 133 N.W. 209 (1911).

ways: first, from the "accident," the unforeseen, unpredicted, and fortuitous incident that releases radioactivity into the environment where employees are working. Examples include such unfortunate occurrences as the accidental assembling of a critical mass of fissionable material, the accidental removal of a cobalt 60 source from its shield, or the spilling of a powdered plutonium compound. Second, there is the constant low level exposure of certain employees who are obliged to work in environments that cannot be kept wholly free from radiation because of the nature of the processes in which they are engaged. An example might be the inevitable leakage around facilities using nuclear fuels or other high level sources.<sup>26</sup>

In considering the adequacy of coverage for radiation overexposures in the present provisions of the Workmen's Compensation Act, we must keep in mind the kinds of injuries that may result from overexposure to radiation. For the most part, they will bear little resemblance to the typical traumatic injuries resulting from accidents in industry for which the compensation acts were first designed—broken bones, lost limbs, and sudden death from falls or crushing blows. Rather they will bear a somewhat greater resemblance to the typical occupational diseases compensable under the act—silicosis, lead poisoning, bursitis, etc.—but even here there are important differences.

According to current theories, atomic radiations (chiefly alpha and beta particles, gamma rays and neutrons) cause damage to humans by ionization and destruction of the functioning of body cells. The body has developed no instinctive defense to radiation, as it has to heat and cold. Moreover, severe damage to tissues can, and often does, take place without the victim knowing that he has been overexposed. In severe cases of overexposure some erythema, or reddening of the skin, or "burn" may be immediately observable and depilation may occur at an early date. But all types of excessive exposure seem to have one factor in common. Whether or not there is any initial manifestation, there is almost invariably a long delay (perhaps as long as ten to twenty years) between the time of exposure and the manifestation of the final and most serious effects.

The specific long range effects of ionization in humans may include one or more of the following: cancer, leukemia, leukopenia, cataract, bone necrosis, genetic damage, sterility, fetal damage, anxiety reactions, emphysema, dermatitis, shortened life span, or death. Much depends upon the type of radiation, for certain kinds are more penetrating than others. Alpha particles have little penetrating power and cause little damage unless ingested; neutrons, on the other hand,

---

26. See STASON, ESTEP & PIERCE, *ATOMS AND THE LAW* 686-705 (1959) for a history of radiation accidents.

are hard to stop. The effects are complex. Exposure of the whole body is more serious than exposure of certain less sensitive parts, such as the hands and feet. Internal radiation, such as might result from ingesting radioactive material, is especially damaging because of possible proximity to vital organs. The reproductive organs are unusually sensitive. Young persons are more sensitive than their elders. Also, there is a cumulative effect; and even though a small dose for a short time produces no observable injury, a continuation even at low levels of intensity for a long period may.<sup>27</sup>

To the extent possible the regulations of the Tennessee Radiological Health Service take account of these variant matters. They establish ceilings on the amount of permissible radiation exposure in a given time for various parts of the body and for different ages. For the whole body the prescribed maximum is not over  $1\frac{1}{4}$  rems per calendar quarter;<sup>28</sup> for the hands and forearms, feet and ankles,  $18\frac{3}{4}$  rems per quarter; for the skin of the whole body,  $7\frac{1}{2}$  rems per quarter. Taking account of the cumulative effect as well as the age factor, the regulations provide that the total accumulated (whole body or equivalent) dosage shall not exceed 5 (N-18) rems, where N is the age of the exposed employee. Under this formula a person less than 18 years of age cannot be subjected to any radiation exposure whatsoever; a 28-year-old person could not exceed a total of 50 rems; at 38 it could be 100 rems; at 48, 150 rems, and so on.<sup>29</sup> For the purpose of perspective a dose to the whole body of about 400 rems at one time would probably be lethal to at least half the population; however, no one really knows the precise lethal dosage. Special note should be taken of the fact that the foregoing regulations establish a ceiling on total exposure for any individual employee. Hence, an employee who has accumulated the maximum total prescribed for his age can no longer be permitted work in a place where further irradiation is likely, or even possible. Thus, in the nuclear age we encounter an unusual form of industrial disability, namely incapacity because of "overload" of radiation to engage in further activity in a radiation environment. This involves the Workmen's Compensation Act, in regard to medical benefits, rehabilitation and "second injury" funds as hereinafter discussed.

With the foregoing background in mind we are now in a position

---

27. See *id.* at 3-44 for full discussion of radiation and its many effects on man.

28. "The rem (roentgen-equivalent-man) is a measure of the dose of any radiation to body tissue in terms of its estimated biological effects relative to a dose of one roentgen of X-rays. The relation of the rem to other dose units depends upon the kind of radiation involved." For further elaboration, see TENN. RADIOLOGICAL HEALTH SERV. RULE 1.5.

29. *Id.* Rule 2.101.

to examine the effectiveness of the Tennessee Workmen's Compensation Act in dealing with overexposed employees.<sup>30</sup>

## IX. THE WORKMEN'S COMPENSATION LAW OF TENNESSEE

### A. Employers and Employees Covered

First, we should note that the Tennessee Workmen's Compensation Law, which has been on the statute books since 1919, is a so-called elective law; that is, employers and employees who wish to do so may elect not to come under it.<sup>31</sup> However, any employer who so elects is deprived of certain valuable legal defenses, *i.e.*, contributory negligence, assumption of risk, and the fellow-servant doctrine.<sup>32</sup> This deprivation provides a strong motivation for not electing exemption.

The elective scheme was designed two generations ago to counteract the fear that a comprehensive compulsory workmen's compensation law would be held unconstitutional by the courts—a matter in some doubt in the early history of compensation legislation in this country. In fact the first New York Workmen's Compensation Act of 1910, which was passed with compulsory coverage of certain "hazardous employments," was held unconstitutional in 1911 by the New York Court of Appeals on the ground that imposition upon the employer of liability without fault was taking of property without due process of law under both state and federal constitutions.<sup>33</sup> The elective laws were intended to avoid this constitutional difficulty. New York subsequently amended its constitution, and eventually the United States Supreme Court upheld both the compulsory and the elective types of workmen's compensation law but only so far as the federal constitution is concerned.<sup>34</sup> In the meantime, however, the elective plan had been adopted widely in about two-thirds of the states, including Tennessee.<sup>35</sup>

---

30. The AEC is currently engaged in working cooperatively with the several states to help bring about a reconsideration and revision of their respective laws to meet the needs of radiation workers. To that end, the Commission in December 1965 distributed to the states a 13 page document entitled *Analysis of Recommended Standards for Workmen's Compensation for Radiation Injury* [hereinafter cited as *AEC Recommended Standards*]. Also distributed in March, 1966, was another document entitled *A Draft of a Proposed Employer-State-Federal Records and Report System for Radiation Workers* to which reference will hereinafter be made. There is much ferment taking place and the time for action seems close at hand.

31. TENN. CODE ANN. §§ 50-903, -904 (1956).

32. TENN. CODE ANN. § 50-911 (1956).

33. *Ives v. South Buffalo Ry.*, 201 N.Y. 271, 94 N.E. 431 (1911).

34. *New York Central R.R. v. White*, 243 U.S. 188 (1917), upholding a compulsory law, and *Hawkins v. Bleakley*, 243 U.S. 210 (1917), upholding the elective type.

35. For discussion see 1 LARSON, WORKMEN'S COMPENSATION §§ 5.20, 5.30, 67.10 (1965) [hereinafter cited as LARSON].



In view of the present state of the judicial decisions on the subject, the Atomic Energy Commission, in conjunction with the Department of Labor, is urging that consideration be given to making all workmen's compensation laws compulsory, at least so far as they apply to employees in areas where radioactivity may be encountered.<sup>36</sup> Although the extent of rejections under the elective plans is not great, the non-electing employer being the exception, there is today no good reason for keeping the way open to individual rejections of the almost universally approved provisions of the compensation laws.<sup>37</sup>

### B. *Exclusion of Small Employments*

Second, we should note that Tennessee's Compensation Act does not cover small establishments, that is, those with but few employees. Section 50-906 of the Tennessee Code provides:

The Workmen's Compensation Law shall not apply: . . . (d) In cases where less than five (5) persons are regularly employed; provided, however, that in such cases the employer may accept the provisions of this law by filing written notice thereof with the said division of Workmen's Compensation at least thirty (30) days before the happening of any accident or death, and may at any time withdraw the acceptance by giving like notice of withdrawal.

One may question the desirability of this provision as applied to radiation workers, many of whom will be working in small research-type laboratories, in medical clinics, or in other activities which may not need to employ five or more persons. Employment in the nuclear industry is not, in general, on as massive a scale as in the steel or motor industries. Small laboratories, clinics, and production facilities are the nature of the business. Yet the injuries will be just as serious as those in larger employments, and there can be no real justification for the exclusion. The five-employee limitation calls for reconsideration. Doubtless, exemptions should be provided for domestic employees, and perhaps for casual workers; but otherwise the size of the establishment should have no bearing upon the desirability of workmen's compensation coverage.<sup>38</sup>

### C. *Injuries Covered*

We now need to consider the injuries covered by the Tennessee Workmen's Compensation Act. Two kinds of injuries are compensated—accidental injuries and occupational diseases. Clearly the act

---

36. *AEC Recommended Standards*; see also AEC Release No. H-65, Dec. 6, 1965, 1 CCH ATOM. ENER. L. REP. ¶ 10237; 13 NUCLEAR INDUSTRY 25.

37. For a discussion of the election provisions, see Sabel, *The Uncompensated Industrial Injury*, 36 MICH. L. REV. 935 (1938).

38. This, too, is recommended by the AEC. See *AEC Recommended Standards* at 3.

does not cover all possible injuries of employees. So far as radiation injuries are concerned, the significant sections of the Act are:

50-902. Definitions.—(d) ‘Injury’ and ‘personal injury,’ shall mean any injury by accident arising out of and in the course of the employment and shall include certain occupational diseases arising out of and in the course of employment which cause either disablement or death of the employee resulting from the occupational diseases named in Section 50-1101.

50-1101. ‘Occupational diseases’ defined.—The following diseases only shall be deemed to be occupational diseases within the meaning of the Workmen’s Compensation Law:”

[There is a listing of nine specific diseases, not pertinent to radiation injuries, followed by]

10. Beryllium and heavy metal poisoning and diseases or conditions caused by exposure to ionizing radiation from sources inside or outside the body. Heavy metals as used in this paragraph shall include all elements (or compounds thereof) with atomic numbers of 80 or above.

The key limiting words are “accident arising out of and in the course of employment,” “occupational diseases,” and “disablement or death.” As we shall see, not every radiation injury will be compensated under these provisions.

Obviously, the statute covers cases of “accidental injury,” that is, those that arise from identifiable, unforeseen, unexpected, fortuitous and damaging occurrences. Certain radiation injuries may result from such unfortunate incidents.<sup>39</sup> Also, the act covers specified “occupational diseases” if they result in “disablement or death.” These are the insidious affairs that develop slowly. Disablement includes partial disablement.<sup>40</sup> Thus provisions of the Tennessee act clearly cover a very large number of employees’ injuries, including many radiation injuries. Yet there is an important vacuum at one point. Partial disablement is interpreted to mean reduction in earning power, and this leaves uncompensated many radiation cases. The test, established by section 50-1007 of the Tennessee Code for determining if an injured worker with “partial disablement” is entitled to compensation is whether there has been a decrease in his capacity to earn wages in any line of work available to him which he is reasonably able to perform.<sup>41</sup> Absent total or partial “disablement,” as thus defined, the act does not compensate. For example, genetic injuries arising

39. For the meaning of “accident” in Tennessee, see *Shaw Co. v. Musgrave*, 189 Tenn. 1, 222 S.W.2d 22 (1949), which tells us that an “accident” is not necessarily a *single* occurrence, but may result from a series of events. Accordingly, the line of demarcation between accidental injury and occupational disease is far from clear cut. As we shall see, this fact has special significance in relation to radiation injuries.

40. That disablement by occupational disease includes partial disablement, see TENN. CODE ANN. §§ 50-1007 (Supp. 1965), 50-1105 (1956).

41. See *Standard Sur. & Cas. Co. v. Sloan*, 180 Tenn. 220, 173 S.W.2d 436 (1943).

from working in a high radiation area are not compensable. "Wage-loss" does not result in such cases; hence, disablement cannot be proved. Similar reasoning prevents the act's coverage of other very real injuries from over-exposure to radiation, *e.g.*, fetal damage, sterility, or shortened life span (unless life is shortened sufficiently for it to be called "death"). The act may not protect even a cancer victim, at least not until the onset of the terminal illness.

It is true that the wage-loss measure of compensation has certain advantages. It facilitates workmen's compensation administration by providing a ready formula for computation of awards, and it is generally approved by well-recognized authorities.<sup>42</sup> But it does not provide relief in certain radiation cases. Amendatory legislation is needed so that all radiation injuries will be covered.

#### D. *Time Limitations on Notice of Injury to Employer*

Two time limitations provisions are encountered under the Tennessee act: one directing a "notice of injury" to be addressed to the employer, and the other dealing with the time for filing claims in court. These limitations cut off compensation in many situations and raise special problems with respect to radiation injuries.

Regarding the notice of accidental injury to be addressed to the employer, section 50-1001 of the Tennessee Code provides:

Every injured employee or his representative shall, immediately upon the occurrence of an injury, or as soon as is reasonable and practicable, give or cause to be given to the employer who has not actual notice, written notice of the injury, and the employee shall not be entitled to physician's fees nor to any compensation which may have accrued under the provisions of Workmen's Compensation Law from the date of the accident to the giving of such notice, unless it can be shown that the employer had actual knowledge of the accident; and no compensation shall be payable under the provisions of this law unless such written notice is given the employer within thirty (30) days after the occurrence of the accident, unless reasonable excuse for failure to give such notice is made to the

---

42. See, *e.g.*, the testimony of Harry A. Nelson, former Director of the Wisc. Dep't of Workmen's Compensation, in *Hearings on Employee Radiation Hazards and Workmen's Compensation* before a Subcommittee of the Joint Committee on Atomic Energy, 86th Cong., 1st Sess. 417 (1959) [hereinafter cited as 1959 *Hearings*]: "The more nearly we adhere to the principle of wage loss as a measure of liability, the more logical our basis, and the less difficulty we shall encounter in determining liability."

Mr. Nelson would even turn the wage loss idea around to compensate the worker who is exposed to the radiation exposure "overload" point and hence must take other work, although this would not be possible under the present Tennessee act. He says: "The employee who loses wages because of radiation exposure, even though he is not actually disabled should, in all justice, be compensated for his loss."

satisfaction of the tribunal to which the claim for compensation may be presented.

In regard to notice in case of occupational disease there is section 50-1107:

Within thirty (30) days after the first distinct manifestation of an occupational disease the employee, or someone, in his behalf, shall give written notice thereof to the employer in the same manner as is provided in the case of an accidental injury.

Consider the case of an employee in a radioactive area who is overexposed to radiation in an obviously sudden, fortuitous "accident," as distinguished from "occupational disease," but who does not actually know that he is seriously injured until the fact becomes apparent years later. This type of case will not be at all unusual. A radiation injury can be severe without producing any immediately visible serious effects. In fact, the serious but delayed effect may be the norm. When must the victim notify his employer? Has the employee suffered an accident or an occupational disease? This is a threshold question that must be answered before it can be known which section applies, 50-1001 or 50-1107.

Suppose there have been initial minor manifestations, such as superficial burns or depilation which are deemed by the employee too insignificant to warrant a claim. Yet later effects are vastly more severe; they emerge, for example, in the form of a cataract, leukemia, or cancer. What about the 30-day limitation on notice of injury for such an occurrence? To be sure, if it is treated as an "accident" there are the mitigating clauses: "as soon thereafter as is reasonable and practicable" and "unless reasonable excuse for failure to give such notice is made to the satisfaction of the tribunal." It is also true that courts are lenient. For example, in the recent case of *Brown Shoe Co. v. Reed*,<sup>43</sup> the claimant, who claimed compensation for injury to the ulnar nerve resulting from many months of repeated strain in operating a trimming tool, was permitted to recover when the evidence showed that, although months had elapsed since the first discomfort, he had reported to the employer's first-aid station (and thus had given notice of the injury) within thirty days after he realized its incapacitating effect, and had instituted suit within one year thereafter. It appears from this and other cases that the Tennessee courts will favor excuses for delayed notices. But the employee overexposed in a radiation area should not be subjected to the

---

43. 209 Tenn. 106, 350 S.W.2d 65 (1961).

litigation and anxiety that is necessitated by the uncertainties of such vaguely defined escape routes. If a better way can be found, it is unfortunate that the issue must always be hanging over the victim, often requiring litigation with the attendant expense and delay.

On the other hand, suppose the overexposure did not produce any observable physical damage when the incident took place. Can the case be saved by calling the later manifestation an "occupational disease" even though it derives from a single overexposure, thus allowing thirty days for notice after the "first distinct manifestation"? Probably the courts will adopt an interpretation that will excuse the delay, but when do we note the "first distinct manifestation" in cancer or cataract? These are insidious, slowly developing diseases, and the victims all too often ignore early symptoms although they may be "manifest" to the trained observer. Is the crucial time of "manifestation" the moment when the trained observer would notice the condition, the time when the victim begins to feel a doubt about it, or that usually-later date when a qualified physician actually makes the diagnosis? These are questions that cannot be answered under present interpretations of the Workmen's Compensation Act, but they will have to be answered in years to come, either by judicial decision or by clarifying legislation, preferably the latter. There is much to be said for legislation fixing medical diagnosis as the manifestation date for radiation workers.<sup>44</sup> Also, it would be preferable to make a single "notice of injury" provision for both accidents and occupational diseases, thus eliminating the necessity of determining which is involved in any given case. This should be accompanied by a suitable reopening provision for cases involving an initial injury which is compensated, followed by a delayed injury from the same overexposure which may prove to be much more serious.

#### *E. Time Limitations on Filing Claims and Beginning Suit*

There is another time limit of concern to radiation workers. The right to bring legal action in Tennessee for workmen's compensation is subject to a one year statute of limitations.<sup>45</sup> First we consider injuries resulting from "accidents," *i.e.*, the unexpected and fortuitous occurrences. The precise wording of section 50-1003 is as follows:

The right to compensation under the Workmen's Compensation Law shall be forever barred, unless within one (1) year after the accident resulting in injury or death occurred the notice required by § 50-1002 is

---

44. For full discussion of the judicial attitude toward the timing of the notice of injury, see 1 LARSON 568-80.

45. One year is the period in Tennessee and in fact is the usual period throughout the country, but about 13 states allow two or more years. See table in 2 LARSON 556-57.

given the employer and a claim for compensation under the provisions of this law is filed with the tribunal having jurisdiction to hear and determine the matter . . . .

The critical word in this section is the word "accident"; and it is not only critical but also it becomes ambiguous, so far as radiation cases are concerned, when it is applied to cases of "accidents" which at first seemingly result in only minor injury or perhaps none at all, but which more than a year later produce serious consequences. In such cases does the statute run from date of the *accident* or the date of *recognition of the injury*? In this connection another section of the Tennessee act, 50-1017, also becomes important. This section reads in part as follows:

The time within which the following acts shall be performed under this law shall be limited to the following periods respectively:

(1) Actions or proceedings by an injured employee to determine or recover compensation, one (1) year after the occurrence of the injury . . . .

The critical word in this section is "injury." In view of the divergent language in the two sections, 50-1003 and 50-1017, which date governs—that of the "*accident*" or the often later date of discovery of the "*injury*"? Justice and a liberal interpretation of the two conflicting provisions would indicate the latter; strict interpretation perhaps the former.

In a very recent decision, *Imperial Shirt Corp. v. Jenkins*,<sup>46</sup> handed down on January 5, 1966, the Tennessee Supreme Court took the liberal view and concluded that the date of "injury" controlled the running of the statute. It was a herniated disk case that started with a seemingly insignificant "slip or pop" in the back as the employee was tilting a heavy box. He reported to the plant nurse, who sent him to a local hospital where he was given two or three heat treatments. He then continued his regular work for approximately two years. Thereafter, he became disabled by back pain and eventually submitted to an operation to repair the ruptured disk. He filed a claim within a year from the diagnosis that resulted in the operation, but this was three years after the "accident." When did the one year statute start to run? The court decided that the statute did not begin to run until the date of "injury," or what the court calls "the time of commencability of loss rather than the time of the accident." This is a liberal view consistent with practice in many other states.<sup>47</sup>

Notwithstanding this recent opinion, the Tennessee Supreme Court decisions leave a considerable measure of uncertainty on the point.

---

46. 399 S.W.2d 757 (Tenn. 1966).

47. See 2 LARSON 261.

Importance is seemingly attached to the apparent triviality of the initial consequences of the accident, that is, the extent of manifestation of disablement at the outset. Much seems to depend upon the court's view as to whether or not the employee should have realized the seriousness of his injury at the outset, in which case the statute runs from the "accident"; or alternatively, whether the employee was justified in regarding it as trivial without the likelihood of severe aftermath, in which case the date of injury governs. This involves a court decision on a question of fact with vague and unsatisfactory distinctions, and the result has been a long series of Tennessee Supreme Court decisions, sometimes hard to reconcile with each other.<sup>48</sup> Since most radiation overexposures from accidental releases of radioactivity are likely to involve the delayed type of injury, either with or without immediate manifestations and the full extent of the injury is usually not known at the outset, although in fact the damaging ionization of the body cells takes place immediately upon overexposure, it seems clear that the ambiguity should be resolved by amendatory legislation. Such legislation should take account of the vagaries of radiation injuries and peg the date of actual "injury" in all cases as the date on which the statute begins to run, with appropriate reopening provisions if an immediate injury is compensated and then is followed years later by delayed effects.

There is yet another section of the Workmen's Compensation Act limiting the filing of claims, namely section 50-1108 which covers occupational diseases as distinguished from accidents. It reads:

---

48. The seeming difficulty of applying the two limitation provisions, *i.e.*, sections 50-1003 and 50-1017, and determining when the statutes of limitations on filing of claims begins to run is well illustrated by the following cases. *Wilson v. Vestal Lumber & Mfg. Co.*, 214 Tenn. 157, 378 S.W.2d 780 (1964), statute runs from date of "accident" when plaintiff suffered a blow on the head and knew he had some "disability" at that time, although later results were much more serious than at first anticipated; *J. E. Greene & Co. v. Bennett*, 207 Tenn. 653, 341 S.W.2d 751 (1960), statute does not run until the date of "injury," this case involving the later onset of blindness in one eye, although at the time of the "accident" the victim's eyes were "irritated" by dry cement thrown up from the occurrence; *Travelers Ins. Co. v. Jackson*, 206 Tenn. 272, 332 S.W.2d 674 (1960), statute runs from the date of accident, when an initially minor back strain developed fourteen months later into a ruptured disk; *Pittman v. City Stores Inc.*, 204 Tenn. 650, 325 S.W.2d 249 (1959), statute runs from date of accident when plaintiff, a saleslady, struck her head on a shelf with no apparent latent effect, but manifested really serious injuries three years later; *Bradford v. Dixie Mercantizing Co.*, 199 Tenn. 170, 285 S.W.2d 136 (1955), statute runs from the date of accident in a backstrain case which did not prevent plaintiff from doing heavy work without loss of time, but three years later emerged as a disabling ruptured disk; *Ogle v. Tennessee Eastman Corp.*, 185 Tenn. 527, 206 S.W.2d 909 (1947), statute does not run until the subsequent date of the injury to victim's eyes which were initially merely inflamed by gas fumes from accident, but blindness developed two years later. See comments in 20 TENN. L. REV. 398 (1948); 21 TENN. L. REV. 210 (1950).

The right to compensation for occupational disease shall be forever barred unless suit therefore is commenced within one (1) year after the beginning of the incapacity for work resulting from an occupational disease, and if death results from the occupational disease, unless a suit therefor be commenced within one (1) year thereafter; provided, however, that if upon the date of the death of the employee the employee's claim has become barred, the claim of his dependents shall likewise be barred, and in such case the claim shall be barred whether or not the employer gives the notice required by subsection (2) of § 50-1017.

The troublesome words in this section are "the beginning of incapacity for work." When does incapacity result from occupational disease as that term is used in Section 50-1108? If the employee has been subjected to more or less prolonged exposure to radiation (most of the time below the maximum permissible whole body dosage of 5 times his age minus 18) and later in life he develops a cataract, how soon must his claim be presented in court if he wishes to claim as the victim of an "occupational disease"? When does the moment of "incapacity for work" arrive? Is it the moment the employee discovers the earliest symptoms of opacity, even though the condition is not yet disabling and he has not yet related it to the overexposure? Is it the time of diagnosis by a doctor (at which time the patient's mental state may materially affect his subsequent usefulness)? Is it the later time when impairment precludes further activity requiring acute eyesight such as that for which he was employed? Or is it a still later time when the infirmity precludes even a reduced level of gainful activity? The Tennessee Supreme Court has not yet had occasion to deal extensively with this problem, and the ambiguity remains unsolved.

It has been suggested that a positive and reliable time for the beginning of the running of the statute would be the time of initial medical diagnosis. This is a precisely pinpointed moment. The results are usually recorded and are readily provable in court. If an occasional employee delays too long in reporting to the medical office, no great harm will be done. Doubtless a statutory amendment will be needed to cover the problem of the one year limitation on claims. Moreover, it seems not unreasonable to conclude that a single statute of limitations should be employed for both accidents and occupational diseases. In no case should the statute begin to run until there is a medical diagnosis both of the victim's condition and his incapacity for work, and re-opening provisions should be made to deal with successive injuries from the same overexposure.

The United States Atomic Energy Commission has given consideration to the matter of the running of the statute of limitations against the filing of the claims and has decided to recommend that the statutes



should be amended to provide that three events should concur before the time period begins to run: (1) knowledge by the employee that he is actually injured, not just overexposed, (2) knowledge by the employee of possible relationship between the injury and his employment, and (3) disability.<sup>49</sup>

In any event it is abundantly clear that statutory revision is needed with respect to workmen's compensation statutes of limitation.

#### F. *Proof of Causation*

Possibly the most difficult legal task confronting the employee injured by radiation will be that of proving causation, that is, proving that his leukemia, cataract, cancer, sterility, etc. was actually the result of overexposure to ionizing radiation during the course of employment. Proof of causation is sufficiently troublesome in many cases of ordinary traumatic injuries. It is substantially more difficult in radiation injury cases, primarily because a considerable proportion of the population will develop leukemia, cataract, cancer or sterility from wholly natural causes, or at least from causes unrelated to radiation. Yet such cases will be indistinguishable from those resulting from radiation. They are nonspecific diseases. Again we examine the Tennessee statutes.

With respect to "accidental injuries" the act merely provides that to be compensable they must "arise out of" and occur "in the course of employment."<sup>50</sup> Proof of these facts establishes the requisite causation. The question has been frequently litigated in Tennessee, and the essential elements are fairly well established. An injury is received in the course of employment when it happens while the workman is carrying out a task which he is employed to perform. It arises out of the employment when it is apparent to the rational mind upon consideration of all the circumstances that there is a casual connection between the conditions under which the work is required to be performed and the resulting injury. This excludes an injury that cannot fairly be traced to the employment as a contributing proximate cause.<sup>51</sup> Obviously this standard imposes a considerable burden upon the worker who is overexposed to radiation and shows no immediate injury, yet who later develops a cataract, a case of leukemia, or some other delayed manifestation.

With respect to "occupational diseases," causation is spelled out at

---

49. See *AEC Recommended Standards* at 8.

50. TENN. CODE ANN. § 50-902 (1956).

51. For more complete discussion under the Tennessee cases, see *STONE & WILLIAMS, TENNESSEE WORKMEN'S COMPENSATION § 19* (1957), together with the *COVINGTON SUPPLEMENT §§ 18, 19* (Covington ed. 1965).

great length in the Tennessee Code. After enumerating the ten specific classes of disease which can be compensated under the act, including "diseases or conditions caused by exposure to ionizing radiation from sources inside or outside the body," the act continues with respect to proof of causation in section 50-1101 as follows:

A disease shall be deemed to arise out of the employment only if there is apparent to the rational mind, upon consideration of all the circumstances, (1) a direct causal connection between the conditions under which work is performed and the occupational disease, (2) it can be seen to have followed as a natural incident of the work as a result of the exposure occasioned by the nature of the employment, (3) it can be fairly traced to the employment as a proximate cause, (4) it does not come from a hazard to which workmen would have been equally exposed outside of the employment, (5) it is incidental to the character of the business and not independent of the relation of employer and employee, and (6) it must appear to have had its origin in a risk connected with the employment and to have flowed from that source as a natural consequence, though it need not have been foreseen or expected before its contraction."

Note that these requirements are all in the conjunctive, and the burden of proof rests on the claimant. What a heavy burden it is! Suppose the victim has developed leukemia. How can he prove that the disease arises from exposure and not from natural causes? An excursion into available statistics reveals that, out of over 100,000 persons in the United States today, about 107 will die of leukemia from non-radiation causes during the next twenty years. Suppose the victim has been subjected as a result of a radiation accident to what is termed a "doubling dose," *i.e.*, a total dosage of about 50-70 rems such that doctors or scientists might be willing to testify that he is twice as likely to become a victim of leukemia as he would if he had not been exposed. Therefore, we conclude that the chances of the victim developing leukemia in the next twenty years have been increased by 107/100,000 or about 1/10 of one percent.<sup>52</sup> How can he lift the burden of proof placed upon him by section 50-1101 of the Tennessee Code? How can he make it "apparent to the rational mind" (does this mean by the weight of the evidence?) that the required "direct causal connection" is present, that the leukemia followed as a "natural incident" of the exposure, that the exposure was the "proximate cause," or that the disease derived from the exposure "as a natural consequence"? The burden is a most difficult one, and the victim will probably die uncompensated.

Although the lifting of the burden of proof may seem difficult, it

---

52. The figures are derived from Estep, *Radiation Injuries and Statistics: The Need for a New Approach to Injury Litigation*, 59 MICH. L. REV. 259 (1960).

is not always impossible, as is evidenced by the recent New York Appellate Division decision in *Besner v. Walter Kidde Nuclear Laboratory*.<sup>53</sup> In this case an employee had died of leukemia, and his dependents claimed that the injury was caused by exposure to radiation. The record showed that he was exposed to radiation for a substantial part of two periods and also at other times in various amounts. The total exposure was not stated in the opinion but the record showed that it was not extreme. Testimony of medical experts was introduced to the effect that there is no "threshold" or "safe" dosage, that scientific knowledge is not sufficient to permit a firm conclusion concerning the effect of radiation on the body, and that individuals vary in sensitivity to exposure. It further appeared that the decedent had been in good health prior to employment. The Workmen's Compensation Board made an award. The reviewing court concluded that there was "substantial evidence" to support it and that the claimant was entitled to a certain benefit from the presumption provisions in the New York Workmen's Compensation Law.<sup>54</sup> So we see that the burden of proof can be lifted by skillful marshalling of evidence, but it is not easy.

Difficult as it may be to prove a claim for leukemia, it becomes virtually impossible in connection with other types of radiation damage, such as sterility, genetic damage, and shortening of life span. Suggestions have been made elsewhere to the effect that workmen's compensation laws should be amended to make proof of causation easier in at least two respects. First, it has been suggested that the problem of proof should be eased by a legislative command of liberal interpretation of the law in its application to specific cases. This suggestion is already embodied in section 50-918 of the Tennessee Code, which declares that the Workmen's Compensation Act is a "remedial statute which shall be given an equitable construction by the courts to the end that the objects and purposes of this law may be realized and attained." Second, it has been suggested that a statutory rebuttable presumption should be created to support the claimant's position, at least as to causation, and possibly also with regard to other issues. Ashley St. Clair, counsel for the Liberty Mutual Insurance Company, testifying before the Subcommittee on Research and Development of the Joint Congressional Committee on Atomic Energy in the hearings on Employee Radiation Hazards and Workmen's Compensation, said:<sup>55</sup>

---

53. 24 App. Div. 2d 1045, 265 N.Y.S.2d 312 (3d Dep't 1965). See also a very recent article, O'Toole, *Radiation, Causation and Compensation*, 54 GEO. L.J. 751 (1966).

54. N.Y. WORKMEN'S COMP. LAW §§ 3, 47.

55. 1959 Hearings at 429.

A person suffering from an injury which he believes due to exposure to radiation at work faces a difficulty of proof that (1) he was so exposed and (2) the disease resulted from the exposure. The law of every state should require every employer using a radiation source to keep a record of the exposure of every employee exposed to radiation, to preserve such records, and to supply such records to the employee on request.

If such records establish that an employee has suffered a significant exposure to radiation, and if he is suffering from a disease which is known can result from the kind of radiation to which he was exposed, he should be given the benefit of a rebuttable presumption that the disease resulted from the exposure.

Presumption provisions are in fact found in some of the compensation acts. For example, New York has the two provisions relied upon in the *Besner* case, either or both of which may help the radiation injury claimant. Section 21 of the New York Workmen's Compensation Act reads in part "In any proceeding for the enforcement of a claim for compensation under this chapter, it shall be presumed in the absence of substantial evidence to the contrary . . . that the claim comes within the provisions of this chapter. . . ."<sup>56</sup> Section 47 of the act reads in part "If the employee, at or immediately before the date of disablement, was employed in any process mentioned in the second column of the schedule of diseases (and this includes injuries due to radiation) the disease presumptively shall be deemed to have been due to the nature of that employment."<sup>57</sup> Presumption provisions are also found in the Federal Longshoreman's and Harbor Workers' Compensation Act,<sup>58</sup> and in the laws of Massachusetts.<sup>59</sup>

We may conclude that some sort of statutory presumption to assist with the proof in radiation cases is rather clearly needed. Indeed, it will be quite necessary (or some other remedial device must be utilized) if the Tennessee Workmen's Compensation Act is to cover effectively such radiation injuries as sterility, cancer, leukemia, cataract, shortened life span, and genetic damage.

Another proposal to deal with the problem of proof of causation in radiation injuries involves an ingenious use of a so-called "contingent injury" fund.<sup>60</sup> This proposal deals with the problem by

---

56. N.Y. WORKMEN'S COMP. LAW § 21.

57. N.Y. WORKMEN'S COMP. LAW § 47. For a general discussion of presumption provisions, see 1 LARSON 123-31.

58. 44 Stat. 1424 (1927), 33 U.S.C. § 920 (1964).

59. MASS. ANN. LAWS ch. 152, § 7A (1965).

60. For discussion see Estep, *supra* note 52; an earlier discussion appears in STASON, ESTEP & PIERCE, *op. cit. supra* note 26, at 511-32; for the latest discussion, see a paper by Estep in 1 U.S. DEP'T OF LABOR & AEC, STUDIES IN WORKMEN'S COMPENSATION LEGISLATION 311-29 (1965).

eliminating it. A fund would be built up in the state treasury (or perhaps the federal treasury) with contributions from employers who overexpose their employees. Contributions would be measured by the extent of overexposure and the corresponding statistical likelihood of delayed injury in the form of leukemia, cancer, cataract, genetic damage or some other delayed effect. This determination would require statistical information on the subject vastly superior to that available today. Under the plan the employee would be obliged to prove only the time, place and amount of his overexposure—this to be done within a reasonable time after the accident. The employee would not be required to prove causation or damages. If he later develops the disease, he would be automatically compensated from the contingent injury fund without further proof. The proposal holds promise for the future when the requisite factual background is available. As of today we shall be obliged to rely upon cruder methods.

Nevertheless, whatever amendatory action is taken, proof of causation is destined to be one of the chief hurdles to obtaining awards for over-exposure to radiation in future nuclear activities.

### G. *Employee Benefits*

There are three general categories of employee benefits in Tennessee—medical benefits, compensation, and rehabilitation.

1. *Medical Benefits.*—Workmen's Compensation Acts in the United States provide for hospital and medical care for injured employees in varying amounts. In Tennessee, the total amount of such benefits is limited to 1800 dollars, with a provision for an additional 700 dollars "where it shall be determined by the tribunal having jurisdiction of the claim . . . that unusual medical expenses should reasonably be incurred . . ." Moreover, in Tennessee, medical and hospital benefits are limited to one year after the notice of injury.<sup>61</sup> It is certain that the Tennessee law does not provide adequate medical and hospital benefits for the more severe types of radiation injuries, such as radiation-induced leukemia, leukopenia, cancer, or cataract. Since radiation diseases develop gradually and may extend well beyond the one year provided by the Tennessee act, it is apparent that both the present maximum allowable payments and the one year limitation, originally established for quite different kinds of injuries, will cause the medical benefits to fall far short of covering the injuries of many employees who are overexposed to ionizing radiation. The Atomic

---

61. TENN. CODE ANN. § 50-1004 (1956). By way of contrast, well over one-half of the states grant unlimited medical and hospital benefits, both as to amount and time. See 2 LARSON 542.

Energy Commission recommends full coverage as to both amount and time<sup>62</sup> and many states already so provide.

2. *Compensation.*—Under the terms of the Tennessee act, compensation is provided for four classes of disabilities—temporary total disability, temporary partial disability, permanent partial disability, and permanent total disability.

The compensation levels vary and are somewhat complicated. In the case of temporary total disability, compensation is 65 per cent of the average weekly wages, but not more than 38 dollars nor less than 15 dollars per week. For temporary partial disability it is 65 per cent of the *difference* between the wages of the employee and “the wages he is able to earn in his partially disabled condition,” for a period not to exceed 400 weeks. For permanent partial disability it is the sum of the allowance for temporary total disability, if there is any, added to an allowance for dismemberment, if any, according to a prescribed schedule, *e.g.*, for a leg, 65 per cent for 175 weeks; for an eye, 65 per cent for 100 weeks. Finally, for permanent total disability, compensation is the same as for the temporary total; but it is continued, with some minor variations, for 550 weeks.<sup>63</sup> In no case can the total compensation exceed 14,000 dollars.<sup>64</sup> The same compensation rates apply to both cases of accidental injuries and cases of occupational diseases.<sup>65</sup>

When we consider the applicability of these compensation provisions to radiation injuries, we note several features that cause us to conclude that the coverage under the present Tennessee act will fall short of being adequate for the protection of employees in nuclear operations. Radiation workers will range from highly skilled technicians to top level scientists—from salaries of 10,000 dollars to 25,000 dollars and higher. Radiation injuries such as leukemia and cancer are long-lasting and usually terminal illnesses. Cataract develops slowly but is devastating. The maximum of 38 dollars per week with a total of 14,000 dollars will not be very comforting to many of the victims of these diseases. Certain other states (for example, New York, California, Illinois, Ohio, Nevada, Wyoming, and North Dakota) compensate at rates of upwards of 50 dollars per week for life. Alaska has a maximum of 81 dollars per week. United States employees may receive up to 121 dollars per week. These figures are more realistic for nuclear scientists and technicians than are the present Tennessee levels.<sup>66</sup>

---

62. See *AEC Recommended Standards*.

63. TENN. CODE ANN. § 50-1007 (Supp. 1965).

64. TENN. CODE ANN. § 50-1005 (Supp. 1965).

65. TENN. CODE ANN. § 50-1105 (1956).

66. See 2 LARSON 524 for a complete tabulation of compensation levels as of 1960.

Moreover, it should be noted that compensation in Tennessee for partial disability is based upon the usual "wage-loss" principle, that is, on the difference between wages before and after injury. Yet certain radiation injuries are not ordinarily accompanied by wage losses, even though the injuries are very real to those who are afflicted by them. There are no wage losses, for example, with respect to blood disorders, sterility, shortened life span, and genetic damage. At the present time scientific knowledge is inadequate to afford a proper basis either for predicting such injuries from various levels of overexposure or for estimating their monetary equivalent. Experience records are being accumulated, however; and in due course the requisite knowledge will be available to assure reasonably adequate appraisal of the likelihood of injury. At that time, consideration must be given to extending compensation to employees suffering from such injuries. It is probable that the compensation should be based not upon the wage-loss principle, but upon a factor related to the presumed biological effect of the measured overexposure. A departure in this respect from the wage-loss principle is not without precedent in workmen's compensation, for the specific schedule benefits hitherto mentioned is also a departure from the principle.

3. *Rehabilitation.*—The Tennessee Workmen's Compensation Act (apart from covering the cost of crutches and prosthesis) makes no provision for rehabilitation of injured employees. In this respect it falls short of the laws of some twenty other states, as well as that of the United States Government.<sup>67</sup> Rehabilitation laws are relative new-comers to the compensation scene. Their nature is such that they call for an administrative agency to supervise the process, and Tennessee has no Workmen's Compensation Commission equipped with appropriate powers.

In the nuclear field a very special problem will arise in connection with the employee who has already received more than (or nearly as much as) the prescribed maximum of radiation; that is 5 (N-18) rems where N is his age. At that level he can no longer be permitted to work in a restricted risk area,<sup>68</sup> for additional exposure may tip the scales and produce serious effects. His employment may have to be changed to a completely new and unfamiliar line of activity, perhaps one that will be less remunerative. He probably will be a skilled

---

67. See *Id.* at 544-47 for a tabulation of the laws on rehabilitation.

68. It has become common practice to transfer the employee whose exposure for a given period has approached maximum permissible limits, and place him in an unrestricted area until as time goes on he "averages out." This is normally done within the industry without loss of wages. A quite different problem is presented, however, when the prospective employer is confronted with a new applicant who is already "overloaded" with radiation.

person and will be in good physical and mental condition; yet a period of rehabilitation may be absolutely essential to train him for continued gainful activity. Support must come from somewhere—preferably from the compensation system; but the Tennessee act does not presently offer assistance to this end.<sup>69</sup>

#### H. *Employment of Previously Over-Exposed Persons*

Radiation workers are in scarce supply and great demand. In addition their skills are such that they are more likely than the average person to move around and change employment. They may move from academic life to industry, or vice-versa, to government laboratories, to medical clinics, or to research institutes, both here and abroad. Any one individual may be exposed in several different employments.

Consider a case. Suppose John Smith, a radiation scientist, has been employed successively by B, C, and D laboratories and has experienced in each laboratory an exposure of 30 rems of whole body radiation, making a total of 90 rems. He is now 40 years of age, so his maximum total exposure under Tennessee Department of Health Regulations must not exceed 110 rems.<sup>70</sup> Potential employer E now finds that Smith, in addition to being highly qualified, fits precisely into E's need for a scientist to work, for example, with plutonium fuel fabrication in a restricted area. Will E be willing to employ Smith with the prospect of a total radiation exposure exceeding the maximum allowable under the regulations, thus running the risk not only of serious injury to Smith, but also of violating the Radiological Health Service regulations and section 53-3312 of the Tennessee Code, subjecting himself to the penalties prescribed therein? To complicate the problem further section 50-1106 of the Tennessee Code provides, with respect to successive employers of occupational disease cases, as follows:

When an employee has an occupational disease that is covered by the Workmen's Compensation Law, the employer in whose employment he was last injuriously exposed to the hazards of the disease, and the employer's insurance carrier, if any, at the time of the exposure, shall alone be liable therefore, without right of contribution from any prior employer or insurance carrier.

Accordingly, the entire burden falls on the last employer or his carrier.

---

69. Rehabilitation provisions are also included in the *AEC Recommended Standards*. See note 30 *supra*.

70. See TENN. RADIOLOGICAL HEALTH SERV. RULE 2.101 limiting the accumulated occupational dose to the whole body to 5(N-18) rems where N equals the age.



Under the circumstances, E is not likely to employ John Smith. The problem calls for solution.

Taking cognizance of somewhat analagous situations, the Tennessee act has set up two devices to mitigate the natural reluctance of a potential subsequent employer to enter into the employer-employee relationship. These devices are the "second injury fund"<sup>71</sup> and the "waiver of compensation" provision.<sup>72</sup> Neither is satisfactory from the standpoint of radiation injuries.

1. *The Second Injury Fund.*—The Tennessee Code sets up a reserve fund to contribute to the compensation for certain types of successive accidental injuries. Section 50-1027 provides in part:

If an employee has previously sustained a permanent disability by reason of the loss of, or loss of use of, a hand, an arm, a foot, a leg, or an eye, and becomes permanently and totally incapacitated through the loss, or loss of use of another member, he shall be entitled to compensation from his employer or the employer's insurance carrier only for the disability that would have resulted from the latter injury, and such earlier injury shall not be considered in estimating the compensation to which the employee may be entitled under this law from the employer or the employer's insurance carrier; provided, however, that in addition to such compensation for said subsequent injury, and after completion of the payments therefor, then such employee shall be paid the remainder of the compensation that would be due for the permanent total disability out of a special fund to be known as the "second injury fund" herein created.

Supplementing the foregoing are provisions establishing the fund in the office of the state treasurer and prescribing the payments to be made into the fund by employers or their insurance carriers in all cases of employee death or permanent partial disability.

As applied to radiation workers the fund would have only the most limited application. If previous injury falls into the rather limited category of accidents specifically enumerated (it is the rare radiation accident that causes the loss of a hand, arm, foot, leg or eye), the second injury fund would come into operation. However, the more typical radiation injuries of sterility, leukemia, cancer, and the like, would lie beyond range. To the extent that these injuries were the result of "occupational diseases" as distinguished from "accidents" (as a cataract resulting in the loss of an eye), section 50-1106, above quoted, would place the full burden upon the last employer. At the very least, then, there is an awkward and unresolved conflict at this point between section 50-1106 and the second injury fund of section 50-1027.

---

71. TENN. CODE ANN. § 50-1027 (Supp. 1965).

72. TENN. CODE ANN. § 50-1109 (Supp. 1965).

In any case, the Tennessee "second injury fund" is clearly inapplicable to our hypothetical Mr. Smith carrying his load of 90 rems, when he is seeking employment by E. The prospective employer will look elsewhere for his help.

2. *The Waiver of Compensation Provision.*—There is another way out for Smith and E, namely, resort to the waiver section of the Tennessee act. Section 50-1109 reads as follows:

When an employee, or prospective employee, though not incapacitated for work, is found to be affected by or susceptible to a specific occupational disease, he may, subject to the approval of the workmen's compensation division of the department of labor of Tennessee, be permitted to waive in writing compensation for any aggravation of his condition that may result from his working or continuing to work in the same or similar occupation for the same employer or for another employer. . . .

This rather drastic and even unfair provision may be used in certain cases to exculpate the employer and thus promote employment of persons already well-loaded with irradiation. Perhaps Smith will be employed by E if Smith waives all claims resulting from earlier exposure. However, this procedure opens the way to distinct hardship on the employee; and certainly it falls short of achieving the objectives of the workmen's compensation law. So we conclude that neither the Tennessee second injury fund nor the waiver provision can be deemed proper solutions for successive nuclear injuries.

Four general approaches to this problem are found in the various American compensation statutes: (1) at one extreme is the "full responsibility" rule, exemplified by Tennessee's section 50-1106, making the last employer liable for the full coverage; (2) at the other extreme is the "waiver rule" placing the full burden on the employee; (3) an intermediate possibility is found in various state apportionment statutes which seek to hold each employer contributing to the injury to his share of the total damages; and (4) there is the second injury fund approach, pursuant to which the fund picks up the difference between the total damage and the contribution of the last employer. In the nuclear field the "full responsibility" rule is clearly a barrier to subsequent employment after the earlier irradiation, if it is significant in amount. The "waiver rule" places the workman at an unfair disadvantage. The "apportionment rule" places the burden on the employee to seek out and prove causation against employers—probably remote in time and perhaps remote in space as well. Accordingly, the "second injury" idea seems best adapted to nuclear exposure. The Tennessee "second injury fund" provisions need to be radically expanded to include injuries

other than accidents resulting in dismemberment. They should also cover occupational diseases, including conditions such as incipient leukemia and cancer, that have not yet manifested themselves in active form.<sup>73</sup>

In searching for a more adequate statutory solution for the successive injury problem, reference should be made to the suggested draft of a second injury fund in the Model Workmen's Compensation and Rehabilitation Law prepared in 1965 by the Council of State Governments.<sup>74</sup> It is broad in scope and wise in its coverage. It covers any employee who has a:

[p]ermanent physical impairment from any cause or origin; and if such employee incurs a subsequent disability by injury arising out of and in the course of his employment resulting in compensation liability for disability that is substantially greater by reason of the combined effects of the pre-existing impairment and subsequent injury, or by reason of the aggravation of the pre-existing impairment, than that which would have resulted from the subsequent injury alone . . . .

the employer or his insurance carrier is required to pay the full compensation. Such employer, however, is reimbursed from the second injury fund "for all compensation payments subsequent to the first one hundred and four weeks of disability." The proposed act also covers cases in which death results from the later injury, and it defines "permanent physical impairment" as any permanent condition "of such seriousness as to constitute a hindrance or obstacle to obtaining employment," provided it arises from one or more of a list of twenty-six named conditions (one of which is "ionizing radiation injury").

The Council proposal is superior to the present Tennessee act in the following significant particulars: (1) it is not limited to dismemberment cases—the leukemia patient would be covered; (2) it is not limited to permanent total disability—the cataract victim would be compensated; (3) it is not limited to compensation for the permanently disabled—it includes death cases as well. The one-hundred-and-four week provision for determining division of the burden between the terminal employer and the second injury fund is, of course, arbitrary. It is derived from the New York law, where it seems to have worked reasonably well.

Certainly, so far as Tennessee is concerned, the handling of suc-

---

73. See STASON, ESTEP & PIERCE, *op. cit. supra* note 26, at 811-15; 2 LARSON 54-65; St. Clair, testifying in 1959 *Hearings* at 465-67.

74. See Section 20 of the *Workmen's Compensation and Rehabilitation Law* set forth in the COUNCIL OF STATE GOVERNMENTS, PROGRAM OF SUGGESTED STATE LEGISLATION 41-43 (1965).

cessive injury situations calls for attention and revision. The proposal of the Council of State Governments contains much of merit.<sup>75</sup>

### I. *Extra-Territoriality Protection for Radiation Workers*

Radiation workers are as peripatetic as any employees likely to be covered by workmen's compensation. They are more often than not employed by large companies carrying on business in many states and even in foreign countries. Being specialists and experts, they are sent by their employers on short-term installation and inspection trips, as well as on long-term tasks lasting months or even years. Over-exposure to radiation may hit them at home or in some distant place. To cover such contingencies most states make some provision for extra-territorial injuries, but it is no exaggeration to characterize the sum total of such provisions as being both inadequate and little short of chaotic.<sup>76</sup>

The Tennessee act in section 50-917 seeks to cover extra-territoriality as follows:

When an accident happens when an employee is elsewhere than in this state, which would entitle him or his dependents to compensation had it happened in this state, the employee or his dependents shall be entitled to compensation under this law if the contract of employment was made in this state, unless otherwise provided by said contract.

Under the foregoing section it is essential for recovery under the Tennessee act that the contract of employment be made in this state. Assume the case of an employee, skilled in nuclear science, who enters into a contract in Pennsylvania with an employer whose principal place of business is in that state. Pursuant to the contract he moves to Tennessee to take charge of the employer's laboratories located there. Thereafter, in the line of duty, he is overexposed and injured in California while supervising an atomic installation in San Francisco. He is in real trouble. He can not be compensated in Tennessee since his contract of employment was entered into in Pennsylvania; nor can he be compensated in California, for that state requires a local contract or residence within the state for its law

---

<sup>75</sup> Likewise the *AEC Recommended Standards* includes the prohibition of waivers and the extension of the second injury fund to cover radiation injuries.

<sup>76</sup> See, e.g., *House v. State Indus. Acc. Comm'n*, 167 Ore. 257, 117 P.2d 611 (1941), denying compensation to the dependents of a deceased person who was hired in Oregon and sent to manage a branch office in California. He was accidentally killed in Oregon on a temporary return from a brief business meeting. Unfortunately the California compensation laws required the place of the contract to be in California, whereas the Oregon laws required the place of regular employment to be in that state. Hence the dependents were not entitled to compensation in either state.

to apply; nor will Pennsylvania afford relief since the place of regular employment is not in that state. He falls into an unfortunate legal vacuum so far as workmen's compensation is concerned.

A satisfactory solution for the problem is not too difficult to find, but it will require the adoption of appropriate legislation by all states if it is to be fully effective on a nationwide basis. Some years ago the International Association of Industrial Accident Boards and Commissions, together with the Section on Insurance Law of the American Bar Association, appointed a committee to study the matter. The committee drafted a proposed uniform extra-territorial statute.<sup>77</sup> Also, a well-thought-out section on extra-territorial coverage has been drafted by the Council of State Governments.<sup>78</sup> Each of these proposed drafts would broaden extra-territorial coverage by establishing alternate criteria for qualification for compensation. Thus, if this method were followed, Tennessee's section 50-917 would be amended to provide coverage of out-of-state injuries if *either* the employment is principally localized in this state, *or* the employee is working under a contract made in this state in employment not principally localized in any state, *or* he is working under a contract of hire made in this state in employment principally localized in another state whose workmen's compensation law is not applicable, *or* he is working under a contract of hire in this state for employment outside the United States and Canada.

With some such broadened extra-territorial provision, Tennessee would be more nearly in line with the needs of the employees in the contemporary nuclear economy.

#### J. *Records and Record Keeping*

Although radiation injuries have been remarkably infrequent during these initial years of nuclear expansion, there have been a few such injuries and there will doubtless be many more in the future. Records of such injuries will be essential both to establish the necessary statistical background and correlations and to provide information for use in connection with employee claims for injuries. Under the current Tennessee Workmen's Compensation Law, employers file reports with the Division of Workmen's Compensation of the Department of Labor for all accidents involving a disability of over seven days. The attending physicians are also required to file reports.<sup>79</sup> With the advent of responsibility for radiation injuries under the recent agreement with the Atomic Energy Commission, the Radio-

---

77. This draft is reprinted in 1959 *Hearings* at 468.

78. See COUNCIL OF STATE GOVERNMENTS, *supra* note 74, § 7 at 97-101.

79. For copies of forms in Tennessee see STONE & WILLIAMS, *op. cit. supra* note 51 at 298-302.

logical Health Service of the Tennessee Department of Health has prescribed several additional reports to be kept and submitted to it by licensed users of radioactive materials.<sup>80</sup> These are well conceived and, as time goes on, will constitute a good start on adequate statistical material. The burden of paper work will not be inconsiderable, but it will be essential to the careful management of radiation. Moreover, a certain amount of coordination between the Radiological Health Service and the Division of Workmen's Compensation will doubtless be worked out in order to avoid unnecessary duplication of effort.

There are at least three significant aspects of radiation record keeping and reporting in addition to the typical workmen's compensation reports. These are: (1) assistance to overexposed employees to assure their staying within prescribed maximum dosage limits; (2) supervision of employers to assure compliance with safety regulations; and (3) accumulation of statistical information to build up essential information that is now lacking concerning the vital relationships between exposure to radiation and injury or disease.

We are in fact woefully inadequate in our presently existing records relative to radiation overexposure and the incidence of radiation-influenced injury. As has previously been stated, practically any radiation injury can also be caused by other means, known and unknown. For the most part, we will be able to pinpoint radiation effects on humans only by statistical studies kept over long periods of years on relatively large population samples. These studies do not exist at present; but they must be obtained if we are to proceed with assurance, either in workmen's compensation claims or in any other radiation liability proceedings. Large scale radiation record keeping is an essential of the nuclear age; and it is really a joint responsibility of the employer, the state, and the federal government. Also, each employee may find it desirable to keep his own exposure record.

The employer must assemble and maintain area survey records derived from various area monitoring devices. Also, he must keep records of such matters as film inventory age and calibration. Most importantly, he must keep individual employee exposure records and medical histories. Individual exposure records are now required by Tennessee regulations to be kept for five years after termination of employment. It would perhaps be desirable to require that they be

---

80. See Radiological Health Service, *Policies and Procedures for the Control of Ionizing Radiation* (1965). The pertinent sections of the Regulations are RHS 2.401, Records of Surveys, Radiation Monitoring and Notification; RHS 2.402 Reports of Thefts or Loss of Radioactive Material; RHS 2.403 Notification of Incidents; RHS 2.404 Report to Former Employees and others of Exposure to Radiation; RHS 2.405 Reports of Overexposure and Excessive Levels and Concentrations; and RHS 2.406 Notice to Employees and others of Exposure to Radiation.

kept even longer, at least until the individual reaches the age of 65, thus maintaining records suitable for delayed injury claims. For like purposes, area monitoring records should be maintained indefinitely in any case where individual overexposure is revealed.

The state must, of course, keep records to reveal employer compliance with regulations, as well as individual records of overexposure and records revealing area contamination.

The federal government should assemble summary records from throughout the nation, maintaining a central repository, to undertake the continuing analyses of exposure standards. Only in this way shall we be able eventually to establish the causation so necessary to lifting the burden of proof in compensation cases. Record keeping will be one of the very real burdens in the nuclear society of the future.<sup>81</sup>

#### X. CONCLUSIONS

In the foregoing pages we have noted the assumption by Tennessee of important new duties and responsibilities with respect to health and safety related to radiation hazards. The Radiation Health Service has, by adopting appropriate regulations, added a new and substantial body of law to the already existing law of the state. In a major degree this new law impinges upon the employer-employee relationship because it establishes new standards and creates new problems connected with employee injuries. Moreover, we have shown that the present Tennessee Workmen's Compensation Act falls short of the ideal in many respects—indeed, it is so far short of the standards being recommended to the states by the Atomic Energy Commission that it is properly a matter of some concern. At the present time radiation injuries are few and far between. Hopefully they will remain so, but this is really too much to expect. Perhaps the time has now arrived for a comprehensive readjustment of the Workmen's Compensation Act to fit the nuclear society of tomorrow. We here observe one of the areas of substantial impact which modern science and technology has upon the law of the land.<sup>82</sup>

---

81. In March, 1966, AEC released a report entitled A DRAFT OF A PROPOSED EMPLOYER-STATE-FEDERAL RECORDS AND REPORTS SYSTEM FOR RADIATION WORKERS. This draft is presented for discussion by interested public and private organizations. The Commission hopes that a suitable system will be developed within the next several years.

82. On June 22-23, 1966, after the completion of this article, the Atomic Energy Commission joined with the Southern Interstate Nuclear Board to organize at Oak Ridge, Tennessee, a conference entitled "The Working Man and The Atom—A New Look at Workmen's Compensation." The discussions ranged widely and included some of the specific points covered in this article. The proceedings will soon be available in printed form. In general, it may be said that the conference revealed a sense of urgency over the re-examination of the Workmen's Compensation laws of the several states, thus to assure more adequate treatment for employees suffering radiation injuries in the future.