

# LABOR MARKET TRENDS FOR HEALTH PHYSICISTS THROUGH 2005

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October 1997

Prepared by:  
Analysis and Evaluation Programs  
Education and Training Division  
Oak Ridge Institute for Science and Education

Prepared for:  
U.S. Department of Energy  
and  
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U.S. Nuclear Regulatory Commission

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## INTRODUCTION

This report reviews past, current, and projected future labor market trends for health physicists through 2005. Information is provided on degrees granted, available supply of new graduates, employment, job openings for new graduates, and salaries. Job openings for new graduates are compared to the available supply of new graduates to assess relative job opportunities in the health physics labor market. The report is divided into three sections: trends during 1983-1993, trends during the mid-1990s, and projected trends for 1997 through 2005.

Definition of Health Physics Employment. The employment (and job openings) data are for scientist level positions for health physicists and exclude health physics/radiation protection technologists and technicians. The employment and job openings exclude positions in medical health physics and in active military service.

A Note on Job Openings. Job openings for new graduate health physicists result from growth in health physicists' employment (that is, increases in the total number of positions) and from net replacement needs resulting from attrition of health physicists who retire, die, leave the labor force, or switch to a different occupation (such as, business managers or technical sale representatives). While some of the health physics job openings are filled by workers moving in from other scientific or engineering occupations or by persons returning to the health physics occupation, most are filled by new graduates.

Actual labor force movements are complex and detailed data on attrition, occupational mobility, and replacement job openings do not exist. However, net replacement needs (the number of replacement jobs available for new graduates) can be estimated using methods developed by the U.S. Bureau of Labor Statistics as adjusted by the Oak Ridge Institute for Science and Education.<sup>1</sup>

Definition of Available Supply of New Graduates. The annual number of new graduates in health physics available for civilian, non-medical employment is estimated by subtracting from the total new graduates those who join the military, undertake further study, accept medical health physics positions, or accept foreign employment. Also excluded from the available supply of new graduates is an estimate of the number of graduates who are already employed as health physicists while completing their academic programs.<sup>2</sup>

## SUMMARY OF LABOR MARKET CONDITIONS BY TIME PERIOD

1983-1993. Throughout the latter half of the 1980s and the early 1990s, employment of health physicists increased in both the public and private sectors. At the same time the annual number of graduates in health physics declined through 1990 and then increased between 1990 and 1993. With increasing demand and reduced supply, employers faced a severely limited supply of new graduates relative to the number of job openings.

1993-1997. In the mid-1990s, the growth in employment for health physicists ceased. Between 1995 and 1997, employment declined by almost 10 percent from the peak in 1993. At the same time, the annual number of degrees earned continued to increase. Thus, the relative number of job opportunities available to new graduates sharply decreased and a large excess supply of new graduates occurred.

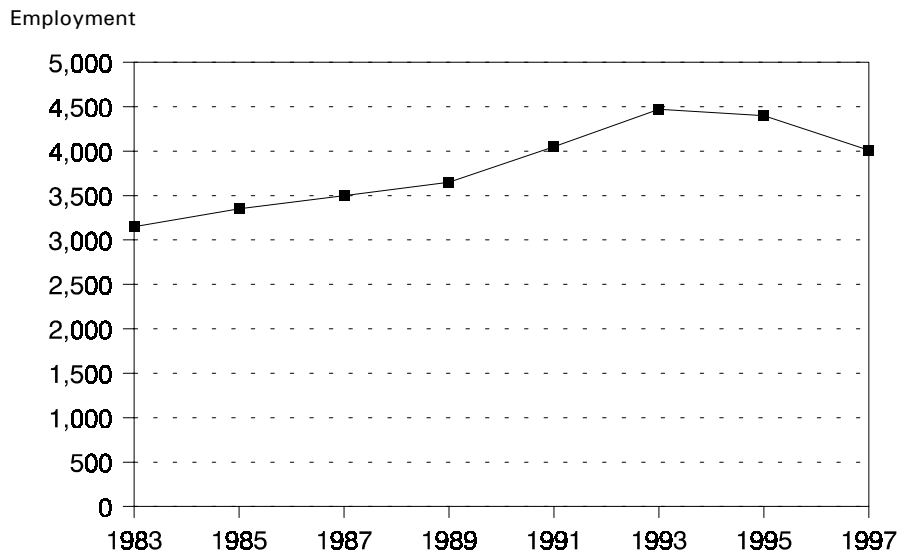
1997-2005. Projections of employment trends, job openings, and the supply of new graduates through 2005, indicates that, compared to the mid-1990s, the relative number of job openings available for new graduates should increase. However, over the next two or three years the number of new graduates seeking employment will still exceed the number of health physics job openings available for new graduates. Then, if degrees decline as projected, it is likely that after the turn of the century the labor market will be balanced with the supply of available new graduates approximately equal to demand for new graduates.

## LABOR MARKET TRENDS, 1983-1993

### Past Employment Levels and Degrees Earned

Between 1983 and 1993, employment of health physicists increased by over 40 percent to approximately 4,500.<sup>3</sup> (See Figure 1.) Moreover, average annual growth in employment positions between 1989 and 1993 was twice that experienced between 1983 and 1989.

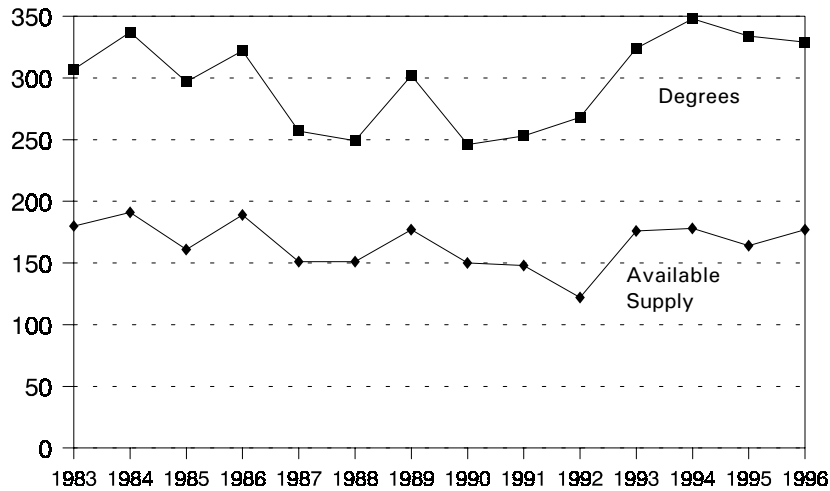
**Figure 1. Employment of Health Physicists, 1983-1997**  
(Civilian, Non-Medical Positions)



During the same 10-year period, the total number of new graduates from health physics programs (bachelor's plus master's plus doctorates) varied considerably.<sup>4</sup> (See Figure 2.) From 1983 through 1990 the number of new graduates tended to oscillate from year to year while experiencing an overall decrease. The lowest number occurred in 1990 with almost one-quarter fewer new graduates than in 1984. As job opportunities for new graduates became even more plentiful the number of degrees increased steadily between 1990 and 1993. By 1993 the annual number of new graduates was almost the same as had occurred in 1984.

Figure 2 also shows the estimated annual available supply of new graduates. The trend in available supply roughly corresponds to that of the number of new graduates; however, the low number for available supply of new graduates was in 1992.

**Figure 2. Total Health Physics Degrees and Supply of Graduates Available for Employment, 1983-1996**



### **Past Job Openings and Available Supplies of New Graduates**

For 1983-1993, estimated annual health physics job openings for new graduates (for growth in employment positions plus net replacement needs) averaged over 240 positions. During the same time period, the average annual available supply of new graduates seeking health physics positions was only about 160. Thus, on average, there were only 66 graduates available for each 100 job openings over the decade.

Dividing 1983-1993 into two time periods indicates a growing inadequacy of supply of new graduates during the decade. For 1983-1989, the average was approximately 90 available new graduates for each 100 job openings. During 1989-1993, the ratio decreased to an average of only 45 available new graduates for each 100 job openings. (See Figure 3.) Thus, while the number of degrees and available supply were increasing during 1989-1993 the number of job openings increased even faster. These data indicate a small inadequacy of available supply of new graduates during the early and mid-1980s becoming a substantial inadequacy of available supply during 1989 through 1993.

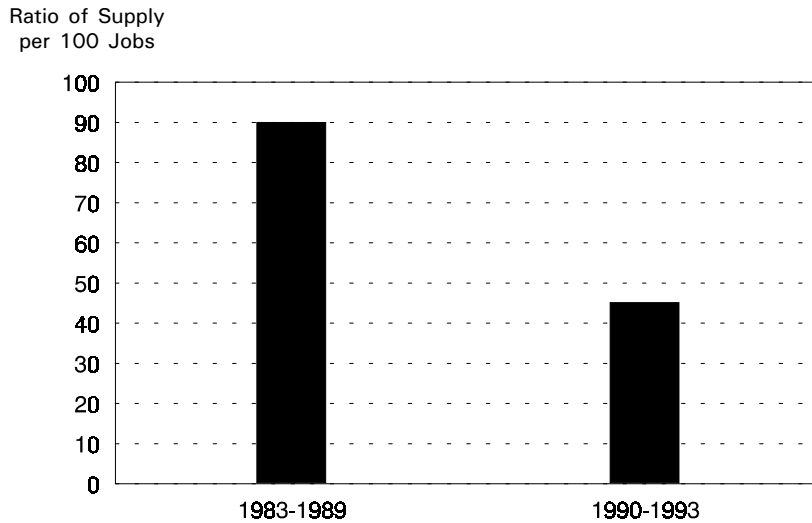
Another indicator of labor market conditions is salary trends. The evidence of an increasingly insufficient available supply of new graduates during 1989-1993 is reinforced by the salary trends. Starting salaries of new health physics graduates increased fairly rapidly during this period (5 to 8 percent annually) and by the early 1990s were on a par with engineering salaries in nuclear-related employment.<sup>5</sup>

### **LABOR MARKET TRENDS, 1993-1997**

#### **Recent Employment Levels and Degrees Earned**

Health physicists are employed in all segments of nuclear-related activities; however, in recent years over 80 percent of the employment has been concentrated in four segments – waste management and decommissioning, reactor operations and maintenance (including nuclear electric utilities), government (federal, state, and local), and universities (faculty and radiation protection officers). (See Table 1.)

**Figure 3. Annual Available Labor Supply of New Graduate Health Physicists per 100 Job Openings, 1983-1993**



**Table 1. Employment of Health Physicists by Primary Segment, 1991-1997**  
(Excludes Medical Establishments)

Primary Segment	1991 <sup>1</sup>	1993 <sup>1</sup>	1995 <sup>1</sup>	1997
Fuel Cycle, Front End	50	80	60	60
Waste Management and Decommissioning	280	500	550	340
Reactor Operations and Maintenance (includes utilities)	740	710	620	610
Reactor, Facility and Instrument Design	120	160	150	160
Health Physics and Industrial Safety	150	130	180	80
Non-University Research and Development	150	170	210	220
Weapons Development	200	210	150	110
Government (civilian)	1,770	1,940	1,940	1,920
University	430	470	450	450
Miscellaneous	160	100	90	60
<b>TOTAL</b>	<b>4,050</b>	<b>4,470</b>	<b>4,400</b>	<b>4,010</b>

<sup>1</sup>Revised.

NOTE: These segments are by primary activity of the employing establishment.

Employment of health physicists peaked in 1993, remained approximately stable through 1995, and then declined 10 percent by 1997. (See Figure 1 and Table 1.) This decline in employment occurred as a result of primarily three factors: federal funding for national security/defense programs was reduced between 1993 and 1996; federal funding for waste management and decommissioning has been reduced since 1995 (this also affects the employment in the health physics and industrial safety segment); and the employment of health physicists related to reactor operations (other than nuclear electric utilities' employees) has decreased almost one-sixth since 1991.

Between 1993 and 1996 the annual number of health physics degrees declined about 5 percent while the available supply of new graduates remained about the same. The number of degrees granted in the mid-1990s reflects the enrollment trends that occurred between 1991 and 1994 at both the undergraduate and graduate levels.

### Recent Job Openings and Available Supplies of New Graduates

During 1993-1997, the estimated number of job openings for new graduates decreased drastically to less than 100 annually. During the same time period, the average annual available supply of new graduates seeking health physics positions was approximately 175. Thus, on average over this four year period the data and statistical estimates indicate there were approximately two new graduates available and seeking employment for each health physicist's job opening. (See Figure 4.) Moreover, the data indicate that the number of job opportunities were considerably less for the 1995 and 1996 graduates than for the 1993 and 1994 graduates.

**Figure 4. Average Annual Job Openings and Available Supply of New Graduate Health Physicists, 1993-1997**



Other evidence supports the view that a large excess supply of new graduates has occurred in recent years. During 1994 through 1997 the annual percentage increase in starting salaries for new health physics graduates averaged less than half the percentage increases that occurred during the late 1980s and early 1990s.<sup>6</sup> In addition, a representative of the Health Physics Society reports that job opportunities have decreased in recent years.<sup>7</sup> Information provided in October 1997 by 17 U.S. Department of Energy management and operating (M&O) facilities including several of the large national laboratories indicates only two facilities planned to recruit and one other facility might recruit for master's level health physicists over the next 12 months.<sup>8</sup> Furthermore, between 1994 and 1996 enrollments in health physics programs declined by 18 percent indicating that students also perceive fewer opportunities in the field.

Before the shift in the late 1980s to inadequate supplies of new graduates in the health physics labor market, many bachelor's degree graduates obtained employment in the nuclear field as technologists or technicians. During the late 1980s and early 1990s, health physics bachelor's graduates rarely had to accept a technician position and many employers hired four-year or two-year college graduates with a

wide variety of majors and provided the training for them to become radiation protection technicians. Bachelor's graduates during the mid-1990s may have again found employment opportunities at the technician level. However, the data indicates that the number of radiation protection technician positions decreased by approximately 10 percent between 1993 and 1995<sup>9</sup>.

## **FUTURE LABOR MARKET TRENDS THROUGH 2005**

### **Outlook for Employment Levels and Degrees Earned**

The outlook for health physicists' employment between 1997 and 2000 is for a small decline of about 100 to 200 positions. Between 2000 and 2005 the level of employment is expected to remain stable or decrease slightly by about 100 positions. (See Figure 5.) The employment decreases are expected to result from further decreases in federal government funding for waste management and decommissioning activities, and from small reductions in federally-funded research and development activities.

**Figure 5. Employment of Health Physicists, 1995-2005**  
(Civilian, Non-Medical Positions)



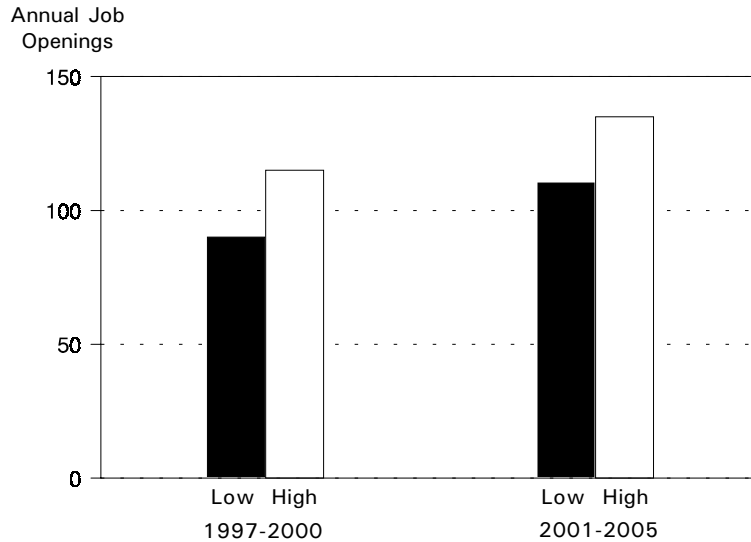
As noted, enrollments in health physics in 1996 were one-sixth less than in 1994. If these lower enrollments continue and are reflected in fewer degrees completed, then over the next couple of years the annual number of new graduates should decrease to less than 300, and after the turn of the century to about 270 annually. The recent experience of poorer job opportunities for new graduates is likely to continue to affect students' perceptions about future opportunities and thus tend to keep enrollments at lower levels.

### **Outlook for Job Openings and Available Supplies of New Graduates**

The projected small employment declines for 1997 through 2005 combined with estimates of net replacement needs provide estimates of the number of future job openings available to new graduate health physicists. During 1997-2000 the number of job openings for new graduates is expected to be in

the range of 90 to 110 per year or about 80 percent as many as were available in 1994 and 1995. (See Figure 6.) The number of job openings is likely to be closer to the low end of the range in 1997 and the high end in 2000.

**Figure 6. Projected Job Openings for New Graduate Health Physicists, 1997-2005**



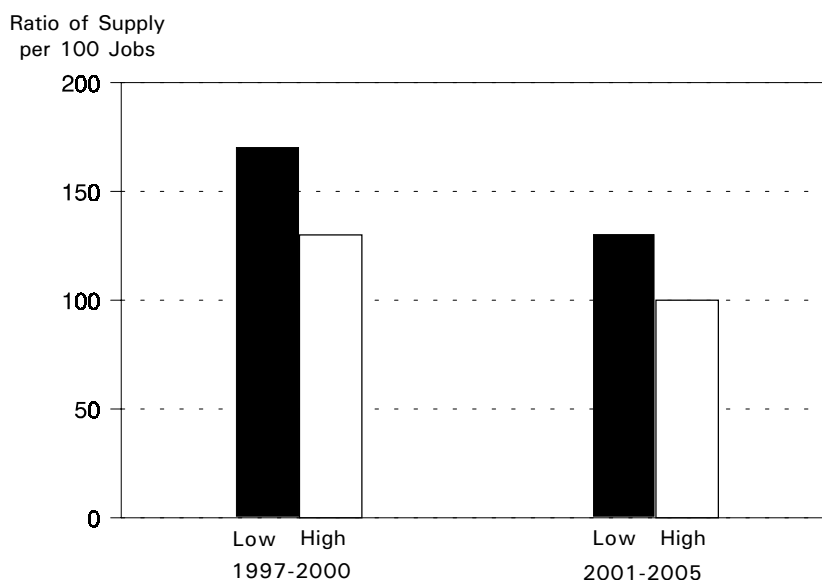
Looking further ahead the number of job openings for new graduates during 2001-2005 should increase to around 115 to 135 per year depending on whether the employment level experiences a slight decline or is stable. Factors complicating these projections are future declines in federal funding for waste management and decommissioning work, the size of future reductions in Department of Energy staff levels, any re-emergence of nuclear electric power development in the United States, and the effect of the deregulation of the electric utility industry on the role of nuclear electric power.

The projected available supply of new graduates may be estimated by multiplying the projected number of degrees by the ratio of available supply to degrees experienced during the mid-1990s. If the number of degrees decrease in line with recent enrollment decreases then the available supply of new graduates would average about 150 per year during 1997 through 2000, and about 140 per year during 2001-2005.

Comparing the projected number of job openings for new graduates to the projected available supply of new graduates provides the labor market outlook for health physics graduates. If, as discussed, the number of degrees decrease then during 1997-2000 there should be approximately 170 (more likely in 1997) to 130 (more likely in 2000) new graduates available per 100 job openings. (See Figure 7.) During 2001-2005 the number of available new graduates per 100 job openings should be in the 130 to 100 range.

Thus, the labor market projections indicate a continuation of an excess supply of new graduates for the next two or three years. After the turn of the century, the supply of available graduates should be approximately in balance with the demand for new graduates. This projected balance in the labor market after the turn of the century is dependent on a decrease in the number of degrees and in the associated available supply of new graduates, and on a return to stable employment levels for health physicists.

**Figure 7. Projected Annual Available Supply per 100 Job Openings for New Graduate Health Physicists, 1997-2005**



## ENDNOTES

1. U.S. Department of Labor, Bureau of Labor Statistics, Office of Employment Projections, "Total and Net Occupational Separations: A Report of Recent Research," Washington, D.C. 1991 and "Assessing the Adequacy of Future Science and Engineering Degree Awards," Michael G. Finn and Joe G. Baker (Oak Ridge, TN: ORISE, 1992).
2. New graduates available for civilian, non-medical employment are estimated by subtracting from total new graduates those who join the military, undertake further study, accept medical-related employment, or accept foreign employment. Also excluded from the available new supply are the graduates from one institution who are already professionally employed while completing their academic programs.
3. The employment data are from the biennial U.S. Department of Energy "Survey of Occupational Employment in Nuclear-Related Activities" conducted by Oak Ridge Institute for Science and Education (ORISE). The health physics employment includes health physics scientists and radiation protection engineers. The survey data are augmented by data from the Institute of Nuclear Power Operations and by estimates of university faculty employment developed by ORISE staff.
4. The enrollment and degree data, the placement data, and the data on the number of graduates available for U.S. civilian, non-medical employment are developed from the annual U.S. Department of Energy "Survey of Health Physics Enrollments and Degrees" conducted by ORISE. Various years.
5. Oak Ridge Institute for Science and Education, Salary Information for Nuclear Engineers and Health Physicists, October 1993 (Oak Ridge, TN: ORISE, December 1993).
6. Oak Ridge Institute for Science and Education, Salary Information for Nuclear Engineers and Health Physicists, June 1997 (Oak Ridge, TN: ORISE, September 1997).

7. Discussions during the late summer 1997 between ORISE staff and a representative of the Health Physics Society.
8. Information collected by ORISE staff during October 1997 from Personnel/Human Resources staff at DOE M&O contractor facilities.
9. See footnote 3.