

employed are approaching retirement age. In addition, relatively few schools offer mining engineering programs, and the small number of graduates is not expected to increase.

Mining operations around the world recruit graduates of U.S. mining engineering programs. Consequently, job opportunities may be better worldwide than within the United States. As a result, graduates should be prepared for the possibility of frequent travel or even living abroad.

Earnings

Median annual earnings of mining and geological engineers, including mining safety engineers, were \$60,820 in 2000. The middle 50 percent earned between \$47,320 and \$78,720. The lowest 10 percent earned less than \$36,070, and the highest 10 percent earned more than \$100,050.

According to a 2001 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in mining engineering received starting offers averaging \$42,507 a year and master's degree candidates, on average, were offered \$54,038.

Sources of Additional Information

For general information about mining engineers, contact:

► The Society for Mining, Metallurgy, and Exploration, Inc., P.O. Box 625002, Littleton, CO 80162-5002. Internet: <http://www.smenet.org>

(See introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.)

Nuclear Engineers

(O*NET 17-2161.00)

Nature of the Work

Nuclear engineers research and develop the processes, instruments, and systems used to derive benefits from nuclear energy and radiation. They design, develop, monitor, and operate nuclear plants used to generate power. They may work on the nuclear fuel cycle—the production, handling, and use of nuclear fuel and the safe disposal of waste produced by nuclear energy—or on fusion energy. Some specialize in the development of nuclear power sources for spacecraft; others find industrial and medical uses for radioactive materials, such as equipment to diagnose and treat medical problems.

Employment

Nuclear engineers held about 14,000 jobs in 2000. About 58 percent were in utilities, 26 percent in engineering consulting firms, and 14 percent in the Federal Government. More than half of all federally employed nuclear engineers were civilian employees of the Navy, and most of the rest worked for the Department of Energy. Most nonfederally employed nuclear engineers worked for public utilities or engineering consulting companies. Some worked for defense manufacturers or manufacturers of nuclear power equipment.

Job Outlook

Good opportunities should exist for nuclear engineers because the small number of nuclear engineering graduates is likely to be in rough balance with the number of job openings. Because this is a small occupation, projected job growth will generate few openings; consequently, most openings will result from the need to replace



Nuclear engineers design, develop, monitor, and operate nuclear plants used to generate power.

nuclear engineers who transfer to other occupations or leave the labor force.

Little or no change in employment of nuclear engineers is expected through 2010. Due to public concerns over the cost and safety of nuclear power, no commercial nuclear power plants are under construction in the United States. Nevertheless, nuclear engineers will be needed to operate existing plants. In addition, nuclear engineers will be needed to work in defense-related areas, to develop nuclear medical technology, and to improve and enforce waste management and safety standards.

Earnings

Median annual earnings of nuclear engineers were \$79,360 in 2000. The middle 50 percent earned between \$67,590 and \$89,310. The lowest 10 percent earned less than \$58,030, and the highest 10 percent earned more than \$105,930. In 2000, the median annual earnings of nuclear engineers in electric services were \$77,890. In the Federal Government, nuclear engineers in supervisory, nonsupervisory, and management positions earned an average of \$71,700 a year in 2001.

According to a 2001 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in nuclear engineering received starting offers averaging \$49,609 a year and master's degree candidates, on average, were offered \$56,299.

Sources of Additional Information

General information about nuclear engineers is available from:

► American Nuclear Society, 555 North Kensington Ave., LaGrange Park, IL 60525. Internet: <http://www.ans.org>

(See introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.)

Petroleum Engineers

(O*NET 17-2171.00)

Nature of the Work

Petroleum engineers search the world for reservoirs containing oil or natural gas. Once these are discovered, petroleum engineers work with geologists and other specialists to understand the geologic formation and properties of the rock containing the reservoir, determine the drilling methods to be used, and monitor drilling and production operations. They design equipment and processes to achieve the maximum profitable recovery of oil and gas. Petroleum engineers rely heavily on computer models to simulate



Favorable job opportunities are expected for petroleum engineers.

reservoir performance using different recovery techniques. They also use computer models for simulations of the effects of various drilling options.

Because only a small proportion of oil and gas in a reservoir will flow out under natural forces, petroleum engineers develop and use various enhanced recovery methods. These include injecting water, chemicals, gases, or steam into an oil reservoir to force out more of the oil, and computer-controlled drilling or fracturing to connect a larger area of a reservoir to a single well. Because even the best techniques in use today recover only a portion of the oil and gas in a reservoir, petroleum engineers research and develop technology and methods to increase recovery and lower the cost of drilling and production operations.

Employment

Petroleum engineers held about 9,000 jobs in 2000, mostly in oil and gas extraction, petroleum refining, and engineering and architectural services. Employers include major oil companies and hundreds of smaller, independent oil exploration, production, and service companies. Engineering consulting firms and government agencies also employ many petroleum engineers.

Most petroleum engineers work where oil and gas are found. Large numbers are employed in Texas, Louisiana, Oklahoma, and California, including offshore sites. Many American petroleum engineers also work overseas in oil-producing countries.

Job Outlook

Employment of petroleum engineers is expected to decline through 2010 because most of the potential petroleum-producing areas in the United States already have been explored. Even so, favorable opportunities are expected for petroleum engineers because the number of job openings is likely to exceed the relatively small number of graduates. All job openings should result from the need to replace petroleum engineers who transfer to other occupations or leave the labor force.

Also, petroleum engineers work around the world, and many foreign employers seek U.S.-trained petroleum engineers. In fact, the best employment opportunities may be in other countries.

Earnings

Median annual earnings of petroleum engineers were \$78,910 in 2000. The middle 50 percent earned between \$60,610 and \$100,210. The lowest 10 percent earned less than \$48,120, and the highest 10 percent earned more than \$118,630.

According to a 2001 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in petroleum engineering received starting offers averaging \$53,878 year and master's degree candidates, on average, were offered \$58,500.

Sources of Additional Information

For further information about petroleum engineers, contact:

► Society of Petroleum Engineers, P.O. Box 833836, Richardson, TX 75083-3836. Internet: <http://www.spe.org>

(See introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.)