How are Radiation Risks from Pantex Plant Operations Evaluated in the EIS? The discussion of risk in this EIS provides two relative comparisons:

- Between the risks from Pantex Plant operations and the risks from other causes.
- Between the alternatives under consideration in this EIS.

Baseline Cancer Incidence:

- Cancer incidence is defined as the probability of contracting a fatal cancer among individuals or groups of individuals. Approximately 20 percent of all deaths in the U.S. are from cancer (NAP 1990). Consequently an individual has, on average, a lifetime fatal cancer probability of approximately 0.2 (20 percent) from all causes. This probability varies from group to group and from individual to individual. Thus, this EIS uses the 20 percent figure solely to provide a relative comparison between baseline cancer incidence and the increase in fatal cancer probability from exposures related to Pantex Plant operations.
- Cancer incidence can also be described in terms of individual or societal risk. For the purpose of making comparisons between different contributors to risk, the risk associated with a specified event is defined as the "Consequence" of the event per unit of time. For example, there are approximately 25,090 deaths from cancer per year in the State of Texas. The total societal risk from cancer can therefore be defined as 25,090 deaths per year. Because the State of Texas contains approximately 17 million residents, the average individual risk is defined as:

$$\frac{\text{25,090 fatal cancers/year}}{\text{16,986,510 residents}} = 1.5 \times 10^{-3} \frac{\text{LCF for an individual}}{\text{year}}$$

  Similarly, a person in the vicinity of Pantex Plant has an annual fatal cancer risk of 1.7×10^{-3} excess cancer fatalities/year. With 267,107 residents in the Pantex Plant Region of Influence, the societal risk from cancer can be calculated as:

$$\left[\frac{1.7 \times 10^{-3} \text{ fatal cancers}}{\text{year individual}}\right][\text{267,107 residents}] = 454 \text{ fatal cancers per year}$$

  The annual fatal cancer risk varies from group to group and from individual to individual. Thus, these calculations are used in the EIS solely to provide a relative comparison between baseline cancer risk and any increase in cancer risk from Pantex Plant operations.

Risk Factors for Radiological Exposures

- Exposure to ionizing radiation increases a person's likelihood of experiencing a latent cancer fatality. It is referred to as "latent" because the cancer may take many years to develop and for death to occur.
- Radiation exposure can cause other health effects, including non-fatal cancers and genetic effects. This EIS uses the risk of excess cancer fatality as the basis for comparison of impacts among alternatives. The International Commission on Radiological Protection conservatively estimates the total detriment (fatal cancers, non-fatal cancers, and genetic effects) by multiplying the estimates of excess cancer fatalities by 1.46.

FIGURE 4.14.2.1–1.—*Evaluation of Risk.*

Risk Factors for Radiological Exposures (Continued)

- DOE uses risk factors that are recommended by both National and International radiological protection organizations. The public and occupational health risk from radiological exposures analyzed in the EIS uses dose-to-risk conversion factors established in the National Research Council's Committee on the Biological Effects of Ionizing Radiation BEIR V Report, 1990 (NAP 1990). These risk factors have also been endorsed by the International Commission on Radiological Protection, U.S. Environmental Protection Agency, Nuclear Regulatory Commission, and National Council on Radiation Protection and Measurements. These risk factors are 0.0005 death per rem to the general public and 0.0004 deaths per rem for workers (the lower number for workers accounts for the absence of children in the workforce).

DOE's Position on Societal Risks from Accidents

- The number of cancer fatalities from accidents should be less than one-tenth of one percent of the number of cancer fatalities from all causes in the population at risk (Nuclear Safety Policy Notice, SEN-35-91, U.S. Department of Energy, Washington, DC, Secretary of Energy, September 9, 1991).
- This position implies a limit to the societal risk from accidents resulting from DOE activities at Pantex Plant to approximately 0.45 cancer fatalities per year in the Region of Influence (i.e., 0.001 x 454 cancer fatalities/year).

How is the Societal Risk from Potential Pantex Plant-related Accidents Evaluated for the Public Surrounding Pantex Plant?

- Risk is defined as Frequency x Consequences, or more specifically, the expected number of excess fatal cancers per year due to accidents at Pantex Plant. Where:

  Frequency = The number of expected occurrences per year of specific accident scenarios.

  Consequences = The expected number of excess fatal cancers given the occurrence of specific accident scenarios.

- For example, Accident Scenario 1-configuration 2 is expected to occur with a frequency of 1.1 x 10^{-5} per year. The consequences given the occurrence of this scenario would be 3.3 x 10^{-1} excess fatal cancers. Therefore, the societal risk from this potential accident is 3.5 x 10^{-6} excess fatal cancers per year. The average individual risk in the ROI from this potential accident is defined as:

$$\frac{3.5 \times 10^{-6}}{267{,}107} = 1.3 \times 10^{-11} \text{ excess fatal cancers/year}$$

- The societal risk from the risk-significant accidents for configuration 1 listed in Table 4.14.2.1–2 is approximately 1.5 x 10^{-5} excess fatal cancers per year. The average individual risk from the risk significant accidents is approximately 5.6 x 10^{-11}.

FIGURE 4.14.2.1–1.—*Evaluation of Risk*-Continued.