3.1 Estimating Accident Rates and LOC Probabilities

The sequence of events leading to a loss of containment (LOC) of LNG in the analysis starts with an accident involving a train containing LNG DOT-113s. The rate of mainline train accidents was applied to shipping along the routes. No QRA-ready databases of train accidents and LOC probabilities existed for LNG DOT-113s. Thus, representative accident/failure frequency and probability values were developed from industry-available databases and FRA rail accident statistics. An accident model was developed to calculate the LOC frequency for rail movements in the QRA. As shown in Figure 2, the train accident rate was first calculated. Then, given an accident, the probability of derailment for various considerations was calculated. Ultimately, the probability of LOC was calculated. Multiplying these three values together yielded the LOC rate for a given scenario. The bases, assumptions, and results are discussed in the following sections.

Figure 2.   LNG DOT-113 train accident model overview.

3.1.1 Train Accident Rates

LNG shipping by rail is historically uncommon in recent U.S. rail industry history; thus, accident data for the movement of LNG in DOT-113 rail cars do not exist. Exponent analyzed publicly-available data from the FRA to estimate train accident rates for the QRA. For the purposes of this analysis, potential train accidents were only considered to occur along the line of road. The following discussion will provide an overview of application of the available data to estimating potential LNG DOT-113 train accident rates.

The FRA Office of Safety Analysis maintains an online database that provides historical accident and failure rate data for the rail industry.[15] Accidents in the database include broken equipment, highway grade crossing collisions, train collisions, and derailments. The FRA industry-wide database for train accidents with reportable damage data[16] was first queried and downloaded for all accident reports during the twenty year period from 1997-2016, yielding a

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[15]   Accessible via safetydata.fra.dot.gov.

[16]   FRA Office of Safety Analysis, Report 3.16 – Summary of Train Accidents with Reportable Damage, Casualties, and Major Causes.