rivm
National Institute
for Public Health
and the Environment

gasunie

Influence of a statutory one-call system on the risk of natural gas pipelines

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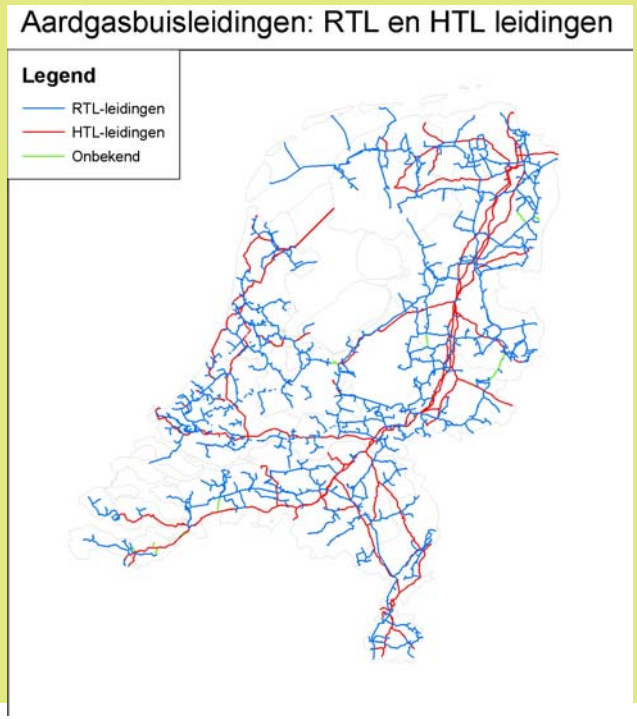
Zoning distances for natural gas pipelines

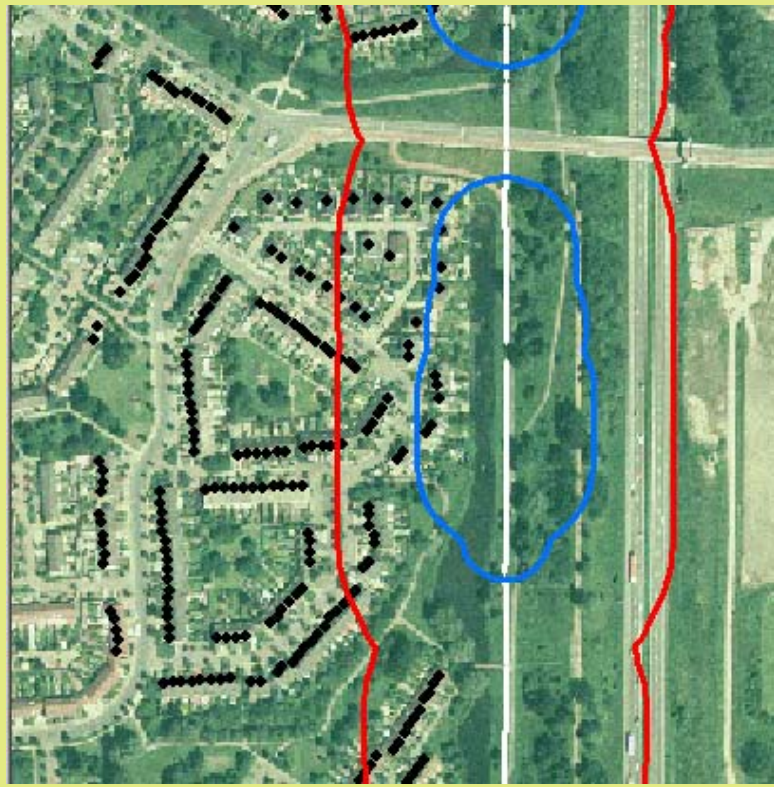
- In the Netherlands 12,000 km of high pressure natural gas pipelines
- N.V. Nederlandse Gasunie owns and operates the grid
- New zoning distances based on risk methodology
  - Individual risk
  - Societal risk
- Policy introduced by the ministry of the Environment
- RIVM supervises the proposed calculation methodology



Individual risk

Frequency per year that an unprotected person residing permanently at a fixed location will be killed as a result of an accident at a potential hazardous source

For dwellings the individual risk limit is set to 10^{-6} per year

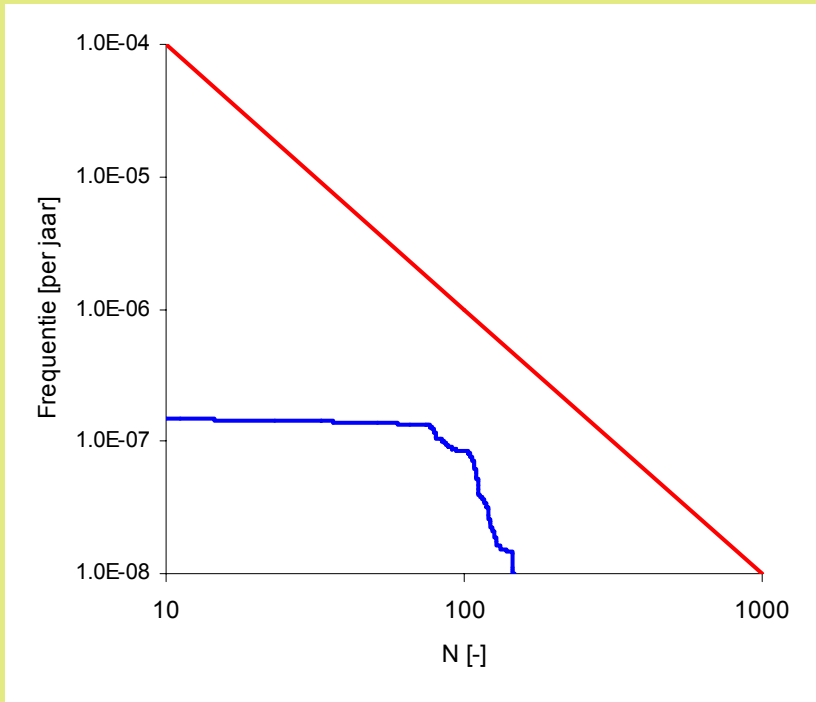


Societal risk

- Frequency (F) that N or more people will be killed as a result of an accident at a potential hazardous source
- Presented in an F-N curve
- For pipelines an indicative limit is set to

$$F_{\lim}(N) = \frac{10^{-2}}{N^2}$$

(per year per kilometer pipeline)



Risk methodology for natural gas pipelines

- Frequency
  - Pipeline ruptures dominate the risk
  - Failure frequency dominated by external interference
    - Hit frequency (calculated as function of the depth of cover)
    - Fracture mechanics
  - Statutory one-call system might reduce the hit frequency

- Consequences
  - Jet fire is used to determine the consequences
  - Lethality criteria based on heat radiation

Statutory one-call system

Notification of excavation activities to the pipeline or cable operators

- Will be laid down by law
- Replaces the current voluntary system

Influence on hit frequency is investigated by RIVM in close co-operation with Gasunie

- review of the current voluntary against a statutory one-call system
- follow-up of notification

Review of current one-call system
Notified digging activities

Helicopter patrols by Gasunie

- To spot excavation activities near gas transmission pipelines
- Every two weeks inspection of the complete network
- About 10,000 registered helicopter reports each year
- 400 helicopter reports analyzed
  - to determine the percentage of *notified* excavation activities
  - a-select chosen
  - representative for all digging activities

Conclusion: 65% of all digging activities are notified

Review of current one-call system
Damages

Review of damage reports (1996-2001):

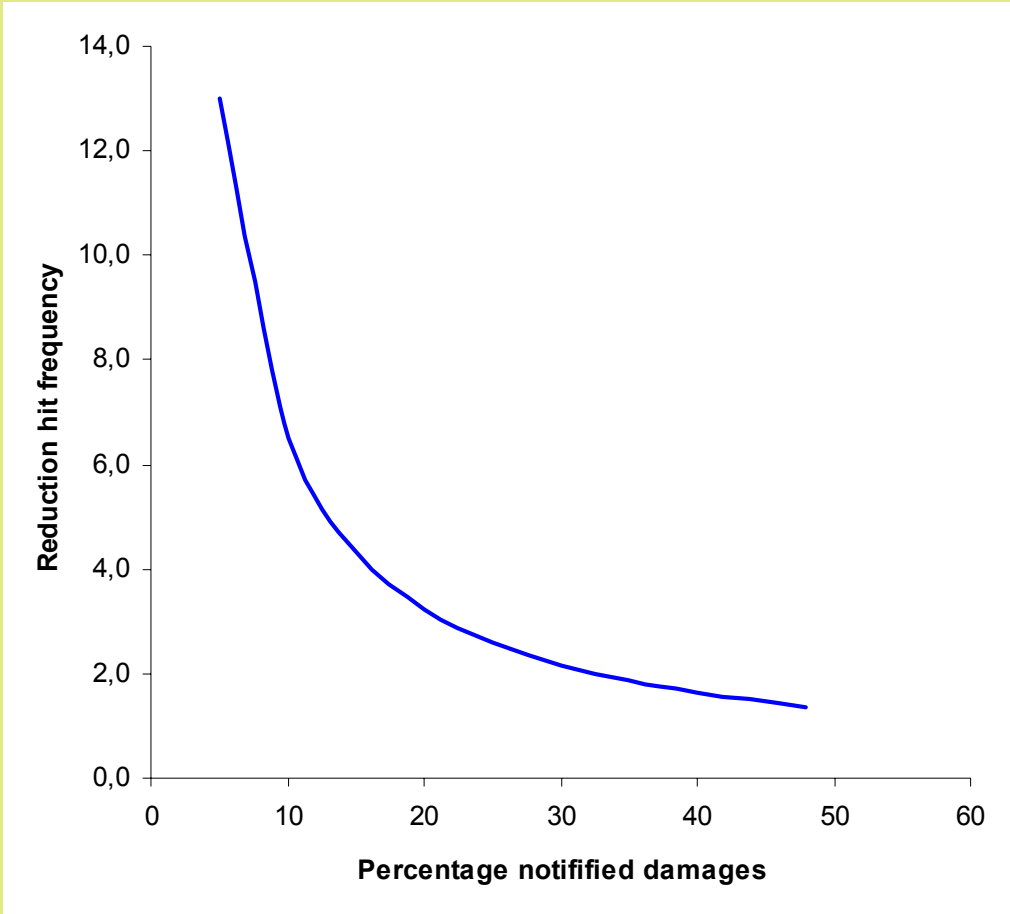
48% of all damages are notified

Damage causes despite a notification

• Start of activity not communicated to Gasunie	36%	
• Deviation from original planned activity by excavator		19%
• Agreement over supervision but activity begun too early	14%	
• Poor communication between excavator and client	7%	
• Incorrect position of the pipeline	7%	
• Incorrect interpretation of notification		5%
• Cause Unknown		12%

Effectiveness of legal obligation to notify

Only obligation to notify results in a reduction factor of 1.35



Contents of law
follow-up of notification

- Notification is statutory
  - Notification by excavator
  - Maximum 20 days before start of excavation
  - Deviations have to result in a new notification
- Additional measures have to be taken
  - by operator, excavator and client
  - excavator has to specify precaution measures
  - client has to ascertain the precaution measures
  - excavator has to perform a test excavation
  - operator has to supervise the excavation

Estimate influence additional measures

Effect of additional measures on damage causes investigated by RIVM

Basic principles used:

- percentage of notification of digging activities equals 100%
- pipeline operator has direct benefit of measures
- excavator feels time pressure
- sanctions should be effective

Conclusion:

overall reduction factor on hit frequency equals **2.5**

Conclusion

- Using data from helicopter and damage reports it was concluded that the statutory one-call system could reduce the hit frequency by a factor 2.5
- The reduction factor is already included in the risk assessment
- The ministry of the Environment committed to a result achievement
  - additional rules should be put in place if factor 2.5 is not reached
- Monitoring program introduced