ANNEX 11

KNMI EXPERIENCE IN SETTING UP AN EMERGENCY RESPONSE ORGANIZATION ON SERIOUS CHEMICAL ACCIDENTS

1. In 1997 the Netherlands was setting up their own Governmental Emergency Response System on serious chemical accidents in the Netherlands. The following are lessons learned.

One should very well realise that the NMS on it's own is not able to give good advisories towards the responsible authorities in case of a chemical accident

2. National Meteorological Services should restrict their role to giving only meteorological related advisories. NMSs have good knowledge in providing high quality forecasts on weather parameters. Parameters that are needed within the dispersion models, no matter if they are simple or very sophisticated.

3. This is one of the reasons that, similar to the Nuclear Emergency Response structures, an organisation structure was set up with technical specialists on a broad range of issues with regard to serious chemical accidents. Therefore we formed a Technical Advisory Team with specialists from many different Governmental Institutes and ministries. In this team knowledge is present about the next topics:

- Meteorological part of the dispersion problem (NMS - KNMI)
- Chemical part of the dispersion problem (Environmental Institute – RIVM)
- Water quality authorities (Institute for Water Quality Protection - RIZA)
- Environmental Protection (Ministry of Environmental Protection – VROM)
- Public Safety (Ministry for Internal Affairs – BIZA)
- Fire fighting (Fire Brigade Dept. of the Ministry for Internal Affairs)
- Agricultural expertise (RIKILT)

4. The general structure allows our Emergency Response Organisation to prepare advisories from our own working positions, meaning not really meeting together. We exchange our knowledge and the different specific advisories via a system of conferencing by telephone all together. In addition to this we sent calculation and modelling results via facsimile, in future by a dedicated and protected Internet System (Extranet). The advisories towards the official responsible authorities are made in combining the specific advisories from the individual members of this

technical team. In this overall process the Ministry of Environmental Protection (VROM) plays the trigger- and co-ordinating role in serious chemical accidents.

Selecting a suitable dispersion model

5. One of the first things we needed when we set up our E.R-organisation was a good tool in forecasting the dispersion (position, concentration and health-danger) of the chemical "cloud" that might be released during such an accident. Therefore a project team was formed to select a suitable dispersion model.

6. One should never forget that the chemical part of the dispersion problem is of very high importance especially within the short distance dispersion area (<10 km). For this reason our project team was formed with people from the National Environmental Institute (RIVM) providing the chemical expertise needed, and with experts from KNMI(one modeller and one operational meteorologist) providing the meteorological knowledge in selecting a suitable dispersion model. We did a lot of research in finding a suitable dispersion model.

7. At first we made a listing of the needed properties of such a model, with a major limiting condition: **We wanted to obtain (e.g. buy) a ready-made dispersion model that was very well commercially supported (for maintenance and future model improvements).**

8. We are very well convinced that the dispersion problem with chemical materials can be separated into two parts closely related to the distance-/timescale involved.

I. Short distance dispersion modelling (up to 10 km's)

9. The chemical part of the dispersion problem is of major importance compared to the meteorological part of the dispersion problem.

10. An accurate chemical description of the released materials together with release concentrations and a good description of the kind of release (blast, leak, buoyancy,…) is important to be present within the model. A good and very extensive database on chemical materials and their properties is needed.

11. Of course most of the time it will be difficult the get good insight knowledge on the materials involved during the early stage of a real accident and one should run different prefixed dispersion scenarios.

12. The meteorological part of the dispersion problem is important, but its role can strongly be simplified in the short distance dispersion model. One can suffice with a dispersion model with a very solid chemical part fed with simple single station meteorological input parameters on surface level:

- Wind direction and wind speed (at 10 metres)
- Stability (Pasquill or Obukhov)
- Inversion height (e.g. depth of the mixing layer)
- Precipitation

13. From these parameters the veering of the wind with height and the increase of the speed with height can be theoretically derived in the dispersion model to add the vertical dimension of the cloud dispersion.

14. Of course the most reliable way in getting these meteorological parameters is a high quality observation station near the chemical source, if not available one might use a interpolation between close stations or by deriving it from a NWP-model.

15. In most of the cases a chemical release accident looses it's serious impact on the health outside of this short distance range of 10 km's. Meaning that the above described approach is sufficient enough in most of the cases.

16. However in case of an extreme severe accident with large concentrations of high toxic materials longer distance dispersion calculations will become important as well with regards to health-risks.

II. Long distance dispersion modelling (> 10 km's)

17. Within this longer distance dispersion modelling for chemical releases the meteorological part of the dispersion problem gets much more important perhaps(??) even more important than the chemical part of the dispersion problem. Of course also the best chemical description of the source is still needed but one also needs very advanced meteorology within the dispersion model.

18. A dispersion model using meteorological field information from a very high resolution limited area NWP-model is the only solution. A chemical peel should be included in the dispersion model to describe the chemical behaviour of the source in time.

19. This long distance approach hardly allows direct input of meteorological source observations within the dispersion model. However if needed (??) a bimodal approach might solve that problem. Meaning that the first part of

the dispersion problem could be solved using the simple short distance dispersion model, according to the description given above. The second part of the problem by "picking up" the cloud at a distance of about 10 km's treating it in accordance to the description for the longer distance modelling.

Conclusions by the project team

20. Selecting a dispersion model in accordance to the description given above was not very easy. As mentioned we did not want to develop a model ourselves. The models that were available on the commercial market were in most cases only models suitable for the short range approach and we were already in possession of such a model. Most of the models also covering the longer distance-scales are models developed and used within research departments of institutes and therefore not user-friendly in operational circumstances due to very complex user interfaces or impossible computer configuration needs. Maintenance support in future was in these cases of course also a real problem. In fact we only found one suitable model suite covering both ranges, but the chemical part of that model was much too poor and development activities in that direction were badly supported. Meaning that at this moment we are still in search, waiting for the "commercial market" to give us an opportunity to buy.

21. The project team activities are frozen at this moment but we still try to follow the market developments. In the mean time we can only use the short range dispersion model we already possess.

OTHER SOURCES OF INFORMATION ON RESPONSE TO CHEMICAL INCIDENTS

- USA CAMEO Web Page (http://www.epa.gov/ceppo/web/content/cameo/)
