South Stream
Offshore Pipeline
ENERGISING EUROPE

Appendix 9.2: Overview of ADMS and Model Validation

1 ADMS Model Overview

ADMS 5 is a practical, short range dispersion model that simulates a wide range of buoyant and passive releases to the atmosphere either individually or in combination. It is a new generation air dispersion model developed by Cambridge Environmental Research Consultants (CERC) in the UK, which means that the atmospheric boundary layer properties are characterised by two parameters rather than in terms of the single parameter Pasquill-Gifford class:

- The boundary layer depth; and
- The Monin-Obukhov length.

Dispersion under convective meteorological conditions uses a skewed Gaussian concentration distribution (shown by validation studies to be a better representation than a symmetrical Gaussian expression). The model is applicable up to 60 km downwind of the source and provides useful information for distances up to 100 km.

The ADMS 5 model includes:

Model options	ADMS 5 has a number of model options including: dry and wet deposition; NO_X chemistry; impacts of hills, variable roughness, buildings and coastlines; puffs; fluctuations; odours; radioactivity decay (and γ-ray dose); condensed plume visibility; time varying sources and inclusion of background concentrations.
Meteorological pre-processor	ADMS 5 has an in-built meteorological pre-processor that allows flexible input meteorological data both standard and more specialist. Hourly sequential and statistical data can be processed, and all input and output meteorological variables are written to a file after processing.
User-defined outputs	The user defines the pollutant, averaging time (which may be an annual average or a shorter period), which percentiles and exceedence values to calculate, whether a rolling average is required or not and the output units. The output options are designed to be flexible to cater for the variety of air quality limits, which can vary from country to country, and are subject to revision.
Visualisation	ADMS 5 includes the ADMS Mapper: an integrated mapping tool for displaying and editing source data, buildings and receptor locations and viewing results. The model has links to the Surfer contour-plotting package, in addition to ArcGIS and MapInfo Professional Geographical Information System (GIS) software. The GIS links can be used to enter and display input data, and display output, usually as colour contour plots.

A comparison of ADMS versus other models is presented below:

	ADMS 5	AERMOD	ISC
Meteorology			
Meteorological pre-processor	✓	✓	✗
Dispersion			
Boundary-layer structure	h, L_{MO} scaling	h, L_{MO} scaling	Pasquill stability classes
Plume rise	Advanced integral model	Briggs empirical expressions	Briggs empirical expressions
Concentration distribution	Advanced Gaussian	Advanced Gaussian	Basic Gaussian
Complex effects			
Buildings	ADMS buildings module*	PRIME buildings module*	PRIME buildings module*
Complex terrain	Based on calculation of flow field and turbulence field by FLOWSTAR model	Interpolation between neutral flow approximate solution and stable flow impaction solution	Simple approach assuming plume trajectory unaffected by terrain
Deposition (wet and dry)	✓	✓	✓
Chemistry	Generic Reaction Set 8 reaction scheme	Ozone limiting model, assumes maximum conversion of NO to NO_2	Ozone limiting model, assumes maximum conversion of NO to NO_2
Other options			
Fluctuations	✓	✗	✗

Continued…

	ADMS 5	AERMOD	ISC
Visible plumes	Condensed plume visibility	✗	✗
Radioactivity	Radioactive decay / γ-ray dose; decay chain database	Simple decay	Simple decay
Puff model	✓	✗	✗
Coastline module	✓	✗	✓
Input of vertical profiles of meteorological data	✓	✓	✗

* Robins, 2000:A discussion of the building modules in ADMS 3 and PRIME.

Complete.