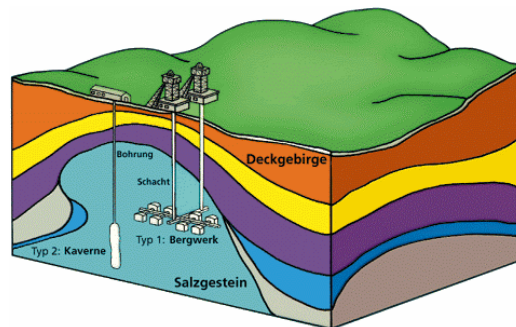
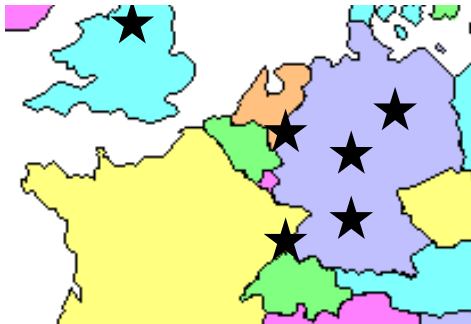


Feasibility Study of the Salt Mines Storage Route

Step 1 report

Appraisal of the salt mines storage route for residues from incineration



Checking	JACQUINOT Bernard	Expert Senior	ENVIGEPRO	21/12/99	
Author	KIRRMANN Clément	Project Manager	ENVIGEPRO	13/9/00	CK
RESPONSABILITIES	NOM Prénom	Fonction	Pole ou Société	Date	Visa
DIFFUSION : ECVM Mr. De Grève (1 ex) Mrs Unni Musdalslien (1 ex) (by E-mail) ECVM (10 copies) Sept 13 th , 2000		Bertin Technologies Clément KIRRMANN Bernard Jacquinot			

BC.001.A

Référence interne	DT B 99 101 B	Système hôte	WORD 6 (95) /CK
Fonds documentaire		Dossier d'affectation	Général
Nomenclature de gestion	affaire 00559 lot 1	Document contractuel	OUI

HISTORIQUE DES EVOLUTIONS

Indice	Date	MODIFICATIONS (raisons principales, paragraphes et pages concernés, références des demandes de modification, ...)	Authors / Checking
A	13/12/99	Création du document	C.KIRRMANN
	15/12/99	Provisional version sent to Mrs Unni Musdalslien and M.De Grève	
B	21/12/99	Completed version taking into account comments of Mrs Musdalslien (phone + mail 16/12) + Checking by BJ for main text	C.KIRRMANN / B.Jacquinot
C	7/2/00	Corrections taking into account comments given by mail from of Mrs Musdalslien and J.Mügge (21/1/00) + few corrections + addition (data on German mines after annexes) for postal mail version <u>Information on document</u> Main text + annex in Word form (.doc) Annex 4: see Eurosaltmembers2.doc Annex 5 (Additional data) : files sdsalzwerke.doc + kalisalz.doc + spain1.xls Data included in main text but available on separate files : <ul style="list-style-type: none"> • EC399L0031.doc (April 1999 European Directive on wastes) • Hintergrunddossierbergversatz.doc • Kurzfassung Bergversatz.doc Complementary data on paper (on request) <ul style="list-style-type: none"> • Stocamine information (advertisement notice) • arrêté N° 970157 du 03.02.1997 (Stocamine local authorisation) • Other French Laws on Wastes • Retsof collapse article (from newspapers web data) • Norwegian laws (ask Mrs Musdalslien) 	C.KIRRMANN
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C'	13/9/00	Diffusion requested by Mrs. Unni Musdalslien (10 copies to ECVI)	

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1. CONTEXT AND OBJECTIVES

1.1 CONTEXT

According to the OECD statistics [B1], 150 Millions tons of Municipal Solid Waste (MSW) have been produced in 1995 and 21 % of them were addressed to incineration.

The incineration of MSW provides a solution in terms of reduction of the solid quantity and volume as well as an inertization of the waste which will minimize the content in organic matter.

The basic residues from incineration are as follows:

- Bottom Ash (or Slag) from the primary combustion chamber
- Boiler Ash (if considered separately from Fly Ash)
- Fly Ash from the filtration step
- Salts from the neutralisation step

According to the gas treatment employed to meet the gas effluent specifications, the residues from MSW incineration may have different nature and composition :

Gas treatment process	Reactant	Nature of residues	Types of residues
Dry Semi-Dry Semi-wet Wet	Lime Bicarbonate	Solid	Bottom Ash/Fly Ash + salts or Bottom Ash/Fly Ash /Salts
Wet	Lime NaOH	Solid + liquid	Bottom Ash/Fly Ash/Liquid effluent/Filter cake
Semi-wet Wet	Lime + NaOH	Solid	Bottom Ash/Fly Ash/Salts

The management of the residues depends of the practices, regulation and site availability as a function of the country considered. Solid residues are possibly addressed either to landfills to be stored with possible stabilisation treatment, road construction applications or salt mines storage.

Liquid residues are released in the environment after being treated for pollutants removal (HM, acids, solids, pH control to 7).

In any case the residue has to fulfil with the regulation in force prior to be stored in its final destination.

The possibility to release liquid effluents in the environment becomes more and more limited. Most of the wet gas treatment previously exploited in Belgium and Germany have been replaced by dry, semi-dry, semi-wet or mostly semi-wet/wet systems.

1.2 OBJECTIVES OF THE STUDY

It is aimed at evaluating the present situation of MSW incineration in terms of management of the residues as well as corresponding quantities involved. A special attention will be paid to the route for storage in salt mines.

This first part of the study is devoted to this salt mines storage route, in order to evaluate the current situation, its interest and possible future (sustainability of this route)

The largest salt mines facilities are located in Germany, but most of the authorisations for storing MSW residues will end up in 2001. The uncertainty of the possible exploitation follow up caused a price drop.

The second part will consist in the collection of the required data for the evaluation of the technico-economic interest of this way to manage the residues from MSW incineration.

This will be aimed at evaluating the capacities involved as well as the location of the mines and therefore the price for transportation. This will enable to estimate the competitiveness area for each salt mine in comparison with alternative surface landfilling possibilities.

Work programme is divided into two successive steps :

STEP 1 : APPRAISAL OF THE SALT MINES STORAGE ROUTE FOR RESIDUES FROM INCINERATION

1.1. Salts mines location in Europe and corresponding capacities

1.2. Current practices for the storage of MSWI residues in salt mines :

Identification of the salts mines which accept MSWI residues, corresponding technical specifications, capacities

1.3. Regulations associated to MSWI residues storage in salt mines.

This will include legislation when existing as well as possible specifications from local or regional authorities.

As an example, in France a single salt mine is used for MSWI residue storage and it is likely to have been given a "prefectoral" authorization thus at the department level. The regional or local authorities for each salt mines will be therefore contacted for this task.

It has been reported than Dutch incinerators used to address their residues to Norwegian mines for final storage. The corresponding specification and regulation will be identified.

The possible evolution of the regulation will be searched in order to appraise the sustainability of this route (refer to chapter 2)

STEP 2 : COMPARISON OF THE SALT MINES STORAGE WITH COMPETING ROUTES FOR MSWI RESIDUES MANAGEMENT :

This step of the study is aimed at evaluating the different competing routes already exploited :

- landfill storage (type of class to be identified) after stabilisation as in France, Belgium and Italy
- landfill storage without stabilisation (Great Britain, Belgium (Flandres), Denmark (temporary storage...))
- Salt mines storage (Germany)
- Equivalent storage (Austria ?, Norway where a part of the residues from Denmark are sent)
- Building and road construction.

For this purpose, an average composition of MSW and its PVC content will be identified to determine the nature, composition and quantity of residues. The impact of PVC content in the MSW will then be evaluated in terms of quantity, quality and corresponding cost of the residues in given scenarios for their final destination.

Then the different routes for MSW residues management will be compared in terms of specification requirements and cost (apart from transportation). Transportation costs will be further considered and the maximum distance from the incinerator to the mines determined for keeping the competitiveness of salt mines storage. This will also enable the evaluation of the corresponding capacities of residues production to be possibly addressed to the different salt

mines.

2. Appraisal of the salt mines storage route for residues from incineration

2.1 Salts mines location in Europe and corresponding capacities

2.1.1 Statistics on salt production

Salt exploitation in Europe and around is given by the following illustration :

Country	Mt/year
Germany	12936
Netherlands	5300
UK	4990
France	4932
Italy	4370
Romania	4100
Spain	2925
Turkey	1845
Portugal	935
Belgium	600
Denmark	600
Austria	500
Switzerland	600
Greece	200
Total	44833



Salt production in Europe [F1]

Only part of the salt production comes from mines. Salt can be produced by mainly 3 types of production :

- rock mining → rock salt
- solution mining (brine pumping) → vacuum salt (salines)
- solar sea salt → sea salt

2.1.2 Main producers

Main salt producers are given on the following table, given by ESPA (European Salt Producers' Association). For each producers, it gives the country and the type(s) of production (vacuum salt, sea salt, or rock salt).

The last column gives whether they practise residue disposals, when this information is known, for Companies owning Rock Salt facilities only (Salines are out of the present focus, but could also be considered, see comments below on this question).

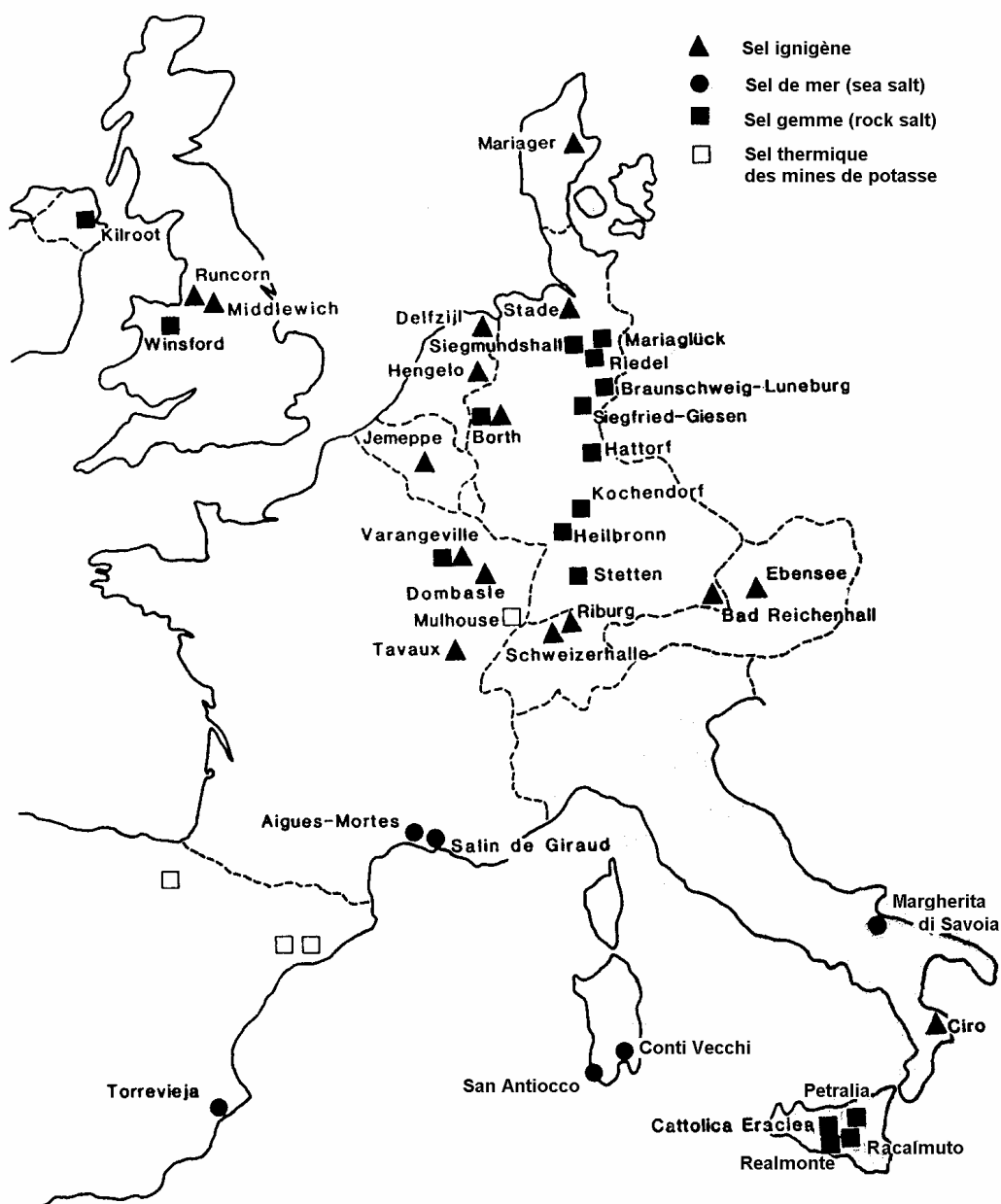
Usually, this activity is done by a subsidiary or an associated company, but not directly by the salt producers.

Company Name	Country	Vacuum Salt	Sea Salt	Rock Salt	Residue Storage
Akzo Nobel International B.V. (The Netherlands)	NL	VS			
Akzo Nobel Salz GmbH (Germany)	DE	VS			
Amministrazione Autonoma dei Monopoli di Stato (Italy)	It	VS	SS		
Aragonesas Industrias y Energia S.A. (Spain)	SP		SS		
British Salt Ltd. (United Kingdom)	UK	VS			
Cleveland Potash Ltd. (United Kingdom)	UK			RS	No
Compagnie des Salins du Midi et des Salines de l'Est (France)	F	VS	SS	RS	No
Dansk Salt A/S (Denmark)	DK	VS			
General Directorate of Tobacco, Salt and Alcohol Enterprises (Turkiye)	TK	VS	SS	RS	?
Hellenic Saltworks SA (Greece)	GR		SS		
Irish Salt Mining Ltd. (United Kingdom)	UK			RS	No
Italkali Società Italiana Sali Alcalini S.p.A. (Italy)	It			RS	?
Kali und Salz GmbH (Germany)	DE	VS		RS	Yes
Mines de Potasse d'Alsace (France)	F			RS	Yes
New Cheshire Salt Works Ltd. (United Kingdom)	UK	VS			
Österreichische Salinen GmbH (Austria)	O	VS		RS	No
Saline d'Einville	F	VS			
Salinera Española S.A. (Spain)	SP		SS		
Salrom (Romania)	RO	VS		RS	?
Salt Union Ltd. (United Kingdom)	UK	VS		RS	No
Société Vaudoise des Mines et Salines de Bex (Switzerland)	CH	VS		RS	No
Solvay S.A. (Belgium)	B	VS			
Solvay S.A. (France)	F	VS			
Solvay S.A. (Spain)	SP	VS		RS	No
Solvay Salz GmbH (Germany)	DE	VS		RS	Project
S.p.A. Ing. Luigi Conti-Vecchi (Italy)	It	VS	SS		
Südsalz GmbH (Germany)	DE	VS		RS	Yes
Südwestdeutsche Salzwerke AG (Germany)	DE			RS	Yes
Union Salinera de España S.A. (Spain)	SP		SS		No
Vereinigte Schweizerische Rheinsalinen (Switzerland)	CH	VS			
Wacker-Chemie GmbH (Germany)	DE			RS	Yes

2.1.3 Location of production sites in Europe

Location of main sites are shown on the following map. It corresponds to Western Europe situation in 1980, for units having big capacity (> 200 000 tons/year).

It shows that Main rock salt mines are located in Germany. Other rock salt mines are located in Northern Ireland (Killroot), England (Winsford), Italy (Sicilia), Spain (South of Pyrénées Mountains), France (Alsace). This map is not complete : only big facilities are indicated, and mines located in Eastern part of Europe are not mentioned (see Map of Germany further on which gives more complete information for Germany).



Sites de production de sel en Europe occidentale (situation 1980, capacités > 200 000 t/an
Figure 1. Location of production sites in Europe

2.2 Current practices for the storage of MSWI residues in salt mines

2.2.1 Why using salt mines for residue storage or disposal

Salt mines are well suited for long-term or "perpetual" disposal of wastes, and especially for residues which have high leachability.

It offers a unique closed environment for storage : natural gas-impermeable salt layers, well isolated (depth from 150 to 1000 m), very dry, with stable atmosphere, allowing very long term conservation.

Natural water barriers (impermeable layers such as clay layers) protect the salt layers against water risk (infiltration or flooding).

In addition, artificial barriers can be added to natural ones, if necessary, creating further reliable sealing measures (packing, brick walls, massive damming walls) against any outside communications.

This combination ensures secure isolation of wastes which represent a hazard to human beings and the environment in above-ground landfills because of their water-solubility and concentration of toxic substances (e.g. dioxins and furans, and also APC residues).

Such underground storage has been practised for over 25 years in Germany, especially in the German Herfa-Neurode mine ([F3] & kalisalz.doc).

Other items such as valuables (art works, pictures, books, pieces of furniture, archives, licences,..) can be kept safe in mines ([F8]).

It could be considered as the better type of landfill sites, for it assures both security and no ground occupation (except already existing wells used for former or current salt production).

2.2.2 Why not salines ?

Within the scope of the present study, we only consider storage of residues in rock mining facilities, but of Saline facilities (or equivalent cavern sites) could also be concerned by this question.

Disposal of liquid residues, or sludge by injection is practised in some countries, as suggested in [B2] (Canada) as follows : "*Placement of solid wastes in dissolved cavern in salt is increasingly being view as an environmentally secure technology for low-toxicity wastes*". Powdered residues such as APC residues could be involved in sludges and injected in salt caverns. Such practice seems not to be current in Europe, although [A29] gives an example in UK ("ICI has for many years disposed of wastes, including chlorinated organics, in brine cavities near

Northwich") and [F20] gives saline caverns as "type 2" sites for residue storage (see figure 2).

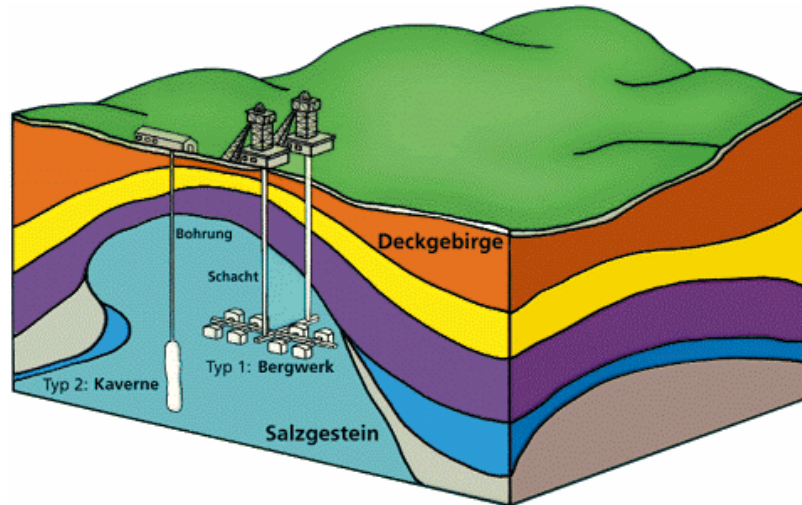


Figure 2. Underground Storage in a salt layer

"Prinzipiskizze einer Untertagedeponie im Salzgestein" [F20]

The main problem with salines is that pure "storage" is not possible : there is usually no well to access to cavities, in order to check the environment, or to assure possible reversibility. But from that last point of view (no reversibility), salines are not fundamentally different as the "mine-valorisation" sites in Germany.

NB. There also exist equivalent sites where underground elimination of industrial wastes is practised by injecting them into deep cavities formed by gas exploitation, as the one operated near Lacq in France (SOBEGI, Mourenx, injection at a depth of 4000 m in a cretaceous layer, 100 000 m³/year waste water). This site has a restricted authorization for salt effluents produced by local chemical activities and is not allowed to treat external wastes [A32].

An attempt of underground elimination was done by 1990 by GEOFIX (subsidiary of ELF) in the South-East of France (Passaire, near Manosque), where it was intended to inject around 60 kt/year of wastes composed of 45% fly ash [M.Maes, A31].

2.2.3 Particular German situation

Storage of residues in salt mines is mainly practised in Germany, where there are currently two types of waste elimination sites :

- **underground landfills ("Untertagedeponien"),**
where ultimate residues are stored

These sites are classified as ultimate waste landfills (as "Class I" French disposal treatment centers, see Annex 2)

- **mine-valorisation sites ("Bergversatz"),**
where residues are used as part of mine materials for filling or building and assuring security in the mines. These is considered as a recovery or recycling practise according the German law, and not as a landfill practise.

There are only 3 underground landfills and several mine-filling sites ("Versatzbergwerke"), as shown on the following tables, which refers to the German map below. Around 24 mine-filling sites are given on the list, but some are not in activity.

1) Underground landfills (*Untertagedeponien*)

Location on map	Region Bundesland	Location Ort	Location Ort	Company	Comments
A	Hessen	Herfa-Neurode	Heringen	Kali und Salz Entsorgung GmbH	since 1972 K+S [F3]
C	Baden-Württemberg	Heilbronn	Heilbronn	Südwestdeutsche Salzwerke AG + UEV Umwelt GmbH	200 000 t/year (planned)
B	Sachsen-Anhalt	Zielitz	Wolmirstedt	Kali und Salz Entsorgung GmbH	since 1995 K+S [F3, F11]
D	Nordrhein-Westfalen	Niederrhein	Borth	Solvay Salz	Project 2000
E	France (Alsace)	Puits (1999)	Joseph-Else 68 Wittelsheim	StocaMine (EMC + TREDI + MDPA)	opened in 1999

table 1. Underground landfills in Germany and France

The two last ones are a project in Germany (Borth), and a new site opened in France (Wittelsheim), also given on the German map.

In Herfa-Neurode, according to the owner (Kali und Salz [F3]), the waste is stored at depths between 700 and 800 m in the middle of a 300 m thick and gas-impermeable salt deposit. Above the salt deposit there are 4 clay layers (100m) which act as a water barrier, covered by 500 m sandstone. The deposit has remained unchanged for about 240 million years.

More detail, and equivalent characteristics for SWS AG and StocaMine are given in annexes.

2) Mine-valorisation sites ("Bergversatz") :

These sites don't practise "residue storage" but "residue valorisation" : residues are used as filling or building materials in mines.

Residues partly replaces other mineral materials which are strongly needed to strengthen mines and avoid collapsing, according to mine operators.

Some details on "Bergversatz" (text from Joachim Mügge) :

"The so-called "Bergversatz" is in practice for many years, because it is necessary to stabilize mines and to avoid collapsing in order to reduce economical and environmental impacts. Collapsing mines lead to a sinking down of the ground surface thus damaging buildings like bridges, houses, water or gas pipes or sewage water pipes. Together with heavily influenced water flows this causes environmental burdens which should be avoided as far as possible. A material for the "Bergversatz" must contain a binder and a filler like cement and sand or well defined stones in concrete. The binder has to have hydraulic properties which can be found in cement or for example also in different ashes from incineration processes. As a filler all materials can be used which do not influence or even strengthen the hydraulic properties of the binder. At the end the definition of the material suitable as a filler is dependent of the chemical nature which itself defines the chemical behaviour and which is under scrutiny of the (sometimes politically influenced) authorities.

Versatzbergwerke (valorisation Centres)					
Location on map	Region Bundesland	Type of site Anlage/Bergwerk	Mine Name	Location Ort	Comments
1	Baden-Württemberg	Fluss und Clara		Oberwolfach	
2	Baden-Württemberg	Salt Mine Steinsalzbergwerk	Bad Friedrichshall -Kochendorf	Bad Friedrichshall	UEV Umwelt GmbH (SWS) [A26]
3	Baden-Württemberg	Salzbergwerk	Stetten	Haigerloch	
4	Hessen	Kali und Salzbergwerk	Hattorf	Phillipsthal	K+S [F3]
5	Hessen	"	Wintershall	Heringen	K+S [F3]
6	NRW	Schwerspatgrube	Dreislar	Medebach	
7	NRW	Metallerz- und Schwefelkiesbergwerk		Meggen	
8	NRW	Eisenerzbergwerk	Wohlverwahrt-Nämmen	Porta-Westfalica	
9	NRW	Coal Mine Steinkohlenbergwerk	Haus Aden/Monopol	Bergkamen	closed (small mine) Montalith
10	NRW	"	Ewald/Schlägel & Eisen	Herten	
11	NRW	"	Walsum	Duisburg	Montalith GmbH [A1-A3]
12	NRW	"	Hugo/Consolidation	Gelsenkirchen	(closed) Montalith
13	NRW	"	Auguste Viktoria	Marl	closed
14	NRW	Bergwerk Fürst Leopold		Wuffen	
15	Saarland	Kalksteinbergwerk	Gersheim	Gersheim	
16	Sachsen	"	Lengefeld	Lengefeld	
17	Sachsen	Kalkgewinnungsbetrieb	Königstein	Königstein	
18	Sachsen-Anhalt	Kali und Salzbergwerk	Bernburg	Bernburg	K+S [F3]
19	Sachsen-Anhalt	"	Stassfurt	Stassfurt	
20	Sachsen-Anhalt	v	Teutschenthal	Teutschenthal	30 DM/t [A4,A11]
21	Sachsen-Anhalt	Schwefelkiesbergwerk Einheit		Elbingrode	
22	Thüringen	Kali und Salzbergwerk	Bleicherode	Bleicherode	[A11]
23	Thüringen	"	Sondershausen	Sondershausen	[A11]
24	Thüringen	"	Untereibzbach	Untereibzbach	K+S [F3]
25	Thüringen	"	Solstedt	Solstedt	

NRW = Nordrhein-Westfalen

Kali = Potash (KCl, Potassium chloride) Kali und Salzbergwerk = KCl or NaCl mines

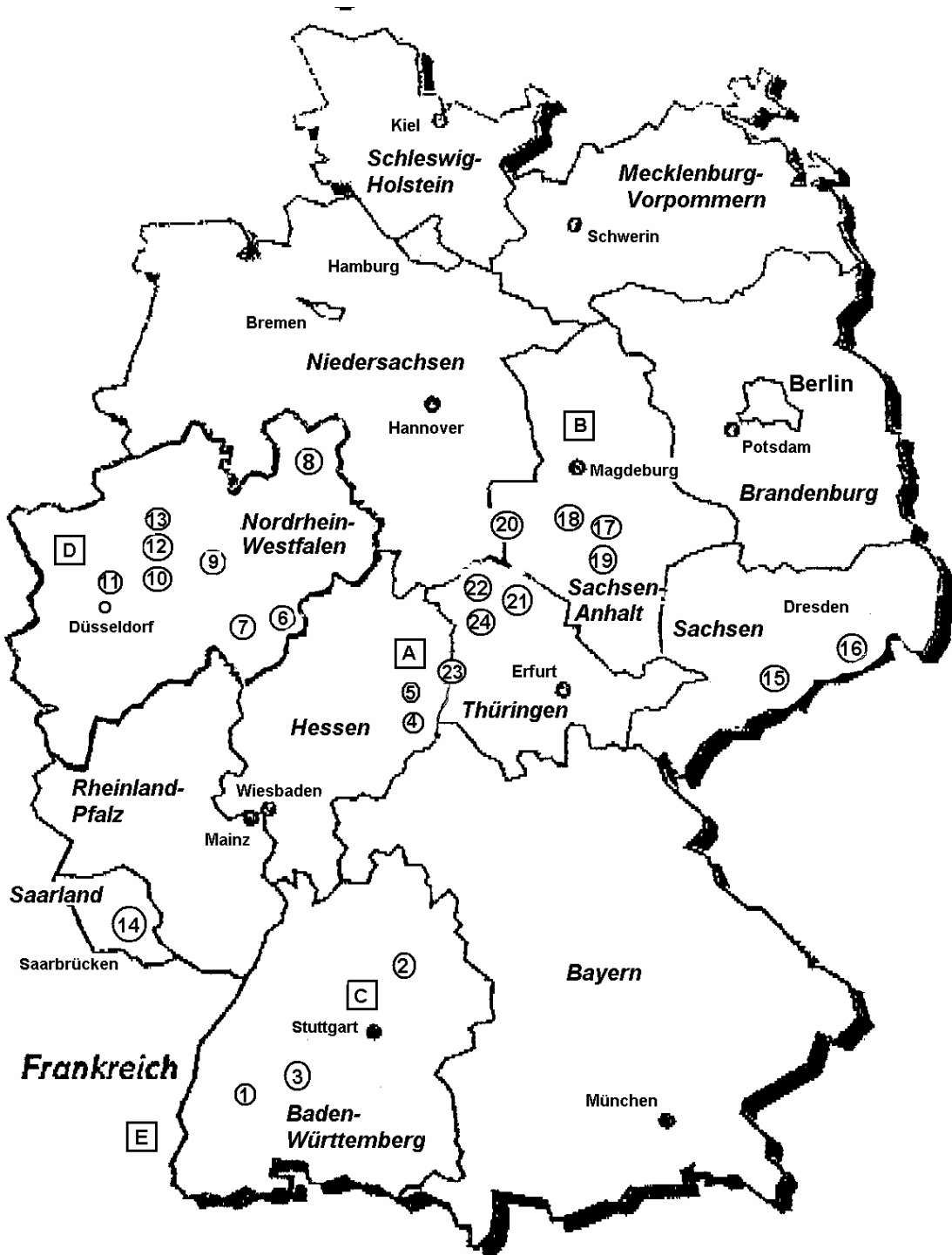
table 2. Mine-valorisation sites in Germany (1997+recent partial updating)

Example of Kali und Salz GmbH

"Kali und Salz Entsorgung GmbH" Company (subsidiary of "Kali und Salz GmbH" in charge of residue questions) owns 6 mines (2 underground storage + 4 underground reutilization sites), which can be "visited" on their web site [F3] (see also annex kalisalz.doc). It shows some characteristics of sites and different "reutilization" method, called by K+S :

- dump stowing
- consolidation of waste
- stack stowing (stacking of big bags)

Wastes are first conditioned according to various formulations permitted by mining authorities.



(from a map and data published in Abfallwirtschaft magazine[A27])

Figure 3. German and French salt mine storage and mine-valorisation sites

Legal problem for mine-filling

Mine-filling is considered as a recovery practise in Germany, but is not is not yet classified in European Regulation.

This question was recently debated, first within Germany, and more recently between the German State and the European Commission (according to some recent information, no legal text could be opposed to the German point of view). Details on this question are discussed below.

2.2.4 Salts mines practising residue storage in Europe

From the strict point of view of residue storage, we have to exclude German mine-valorisation sites. Thus there are only 4 salt mine residue storage sites in Europe, and 2 other ones projected :

Currently under operation (see details in table 1)

- Herfa Neurode (DE) (Hessen) (since 1972)
- Heilbronn (DE) (Baden-Württemberg) (since 1972)
- Zielitz (DE) (Sachen-Anhalt, open in 1995) [F3, F11]
- Wittelsheim (F) (Alsace) (since 1999)

Projects

- Borth (DE) (Nordrhein-Westfalen) (Solvay Salz)
- Bostock (UK) (Middlewich) (Minosus Ltd)

2.2.5 Situation in various countries and possible equivalent storage practises

- France : the only underground storage salt mine is one of the 13 ultimate waste disposal centres (see French situation in annex 2). Overall capacity is large enough for France, although each region has to open such a site according to legal dispositions (proximity principle) (that is why new sites have to open in the South of France, e.g. near Toulouse).
- Norway and Scandinavian Countries : no salt mines are available (salt is only imported). One equivalent storage site is an old quarry located on a island (Langøya, exploited by NOAH), which is also used for Danish wastes (see Norway situation and the Langøya characteristics in Annex 2).
- Austria : 4 old salt mines exist but are not used as disposal sites (see annex 1). The main reason for not using them as waste storage sites seems to be a political reason, as expressed by [E4], but tourist activity can also be a strong reason.
- Spain : some salt mines are in exploitation (3 sites, South of Pyrénées Mountains, e.g. Suria (Solvay). No waste filling or storage seem to be practised.]. Torre Vieja mines have tourism activities and that could hinder their use as landfill sites. The waste question for APC residues is not yet a big problem in Spain (only 7% of waste are incinerated, and 8 MSWI are in operation) [A30] (see attached file spain1.xls giving data on Spain MSW).
- Italy : no information yet available, but some rock salt mines exists (Sicilia).

- UK : no other site as the one projected
- Belgium : no such sites. Exportation to German mines would be under discussion [E3].
- The Netherlands : no such sites
- Swiss : salt mines are available, but hazardous residue storage is not practised ; residues are exported to Germany. Although [F10] (Aurec / Panagora SA) describes such a site, which could be in fact located in Germany (no clear information on the location of the mine).

2.2.6 Capacities

1) In France (Stocamine) :

- 50 000 tons of waste can be stored per year
- 320 000 tons of waste are licensed (for a period of 30 years)

For comparisons,

- 803 000 tons of waste were stored in other Class I sites in year 1998.

Other key figures and characteristics of StocaMine are given in Annex 2.

2) In Germany (from [A4, A10] & other sources)

- 194 000 tons of dangerous wastes were stored in Underground facilities in 1995.
- 395 000 tons of dangerous wastes used as mine-filling materials in the same year. They represents 27% of the total amount of wastes used as mine-filling materials (1500 000 tons).
- 136 000 tons, i.e. 35% of these dangerous wastes were put in Sachsen-Anhalt mines, main region where this is practised, located in Eastern Germany

Table and figure below show this evolution from 1992 to 1996. Total for 1998 is around 800 000 tons according to [A7] (Dr. B. Breuer).

Various other figures of interest :

- 200 000 ton /year = planned for Heilbronn underground deposit, permission given for 30 years [A8].
- 2 500 000 m³ / year = overall mine-filling capacity in Germany [A16]
- 150 000 tons / year = capacity for Sondershausen [A23]
- 12 000 000 m³ = volume to be filled in Bad Friedrichshall-Kochendorf [A26]

NB. all units are metric : 1 ton = 1 tonne = 1000 kg.

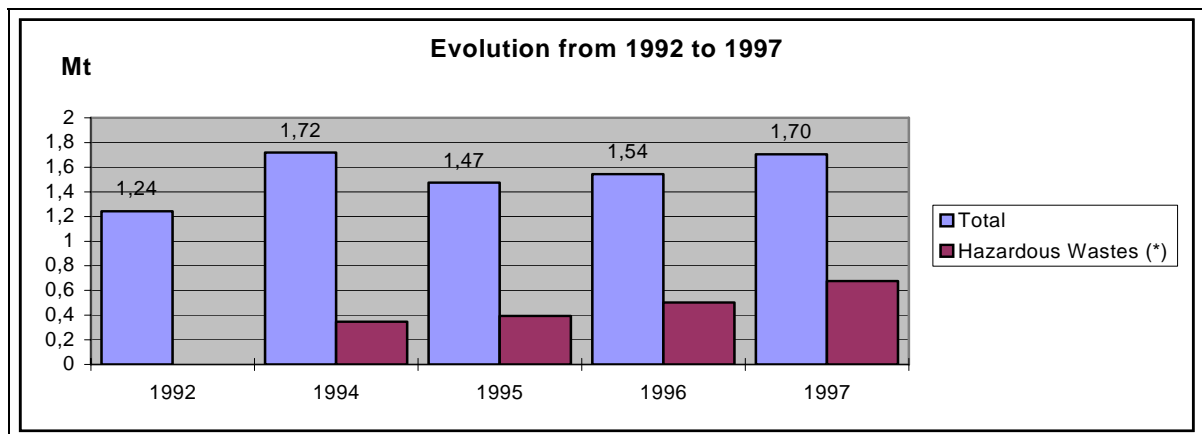
Bundesland	1992	1994		1995		1996		1997	
			<i>dangerous waste</i>		<i>dangerous waste</i>		<i>dangerous waste</i>		<i>dangerous waste</i>
Baden-Württemberg	62327	92492	48269	149651	105173	90277	47387	180684	59262
Brandenburg	62000	213138	0	112249	0	44255	0	82432	0
Hessen	16000	26479	5801	42735	21858	73495	42039	81144	78634
Niedersachsen	1683	1598	1598	1930	1930	1574	1574	2127	2127
NRW	284601	295824	66770	314289	65497	398973	154110	345996	181460
Saarland	104000	239895	48000	264791	4401	264739	34081	295852	52288
u.Rheinland-Pfalz									
Sachsen	0	95000	0	55150	0	55066	0	54000	0
Sachsen-Anhalt	117966	66862	63036	229761	136004	265560	122977	299328	126291
Thüringen	596656	689862	115323	305636	61262	350178	101344	362280	176232
Total	1245233	1721150	348797	1476192	396125	1544117	503512	1703843	676294

Dangerous waste = "waste which need cautious treatment" (included in other quantities)

**table 3. Residue recycling in Germany
Evolution from 1992 to 1997**

Source :[A27, A28]. See also [A4] comments on 1992 and 1994 figures, [A10] : 1995 figures. Figures given by Umweltbundesamt Jahresberichts or Länderausschuss Bergbau.

No figures are given for region who do not practise mine-valorisation (Bayern, Berlin, Bremen, Hamburg, Mecklenburg-Vorpommern, Rheinland-Pfalz und Schleswig-Holstein). Niedersachsen figures concerns a single cavern for hazardous wastes.



(*) "davon besonders überwachungs-bedürftige Abfälle" (hazardous wastes ?)

**Figure 4. Residue mine-recycling in Germany
Evolution from 1992 to 1997 [A27, A28]**

These figures show the importance of the question, and the recent increase trend, due partly to the fact that some authorisation will end up in 2001, added to very low prices (see below).

2.2.7 Storage prices

Prices depends on quantities (price is higher for small quantities because of analysis and handling procedures).

Typical ranges :

- Ultimate Waste disposal site : **200 to 450 Euros / t** (400 to 900 DM / t) [A4]
- StocaMine (France) (for APC residues) : **200 Euros / t** (1300 F / t) [E9]
- Bergversatz (hazardous w.) (*) : **100 to 150 Euros / t** (150 to 300 DM / t) [E3]
- Bergversatz (lowest price, non dangerous wastes): **15 Euros / t** (30 DM / t) [A4]
(coal mines, Teutschenthal...)

"Bergversatz" prices are fairly low as compared to Class I sites in France (see annex 2). According to [E3], import from France is mainly hindered by French competitors, while import from other countries (Holland, Denmark, Belgium) is or would be possible.

(*) From Mr. J.M. :The price for the " Bergversatz " is extremely dependent on the characteristics of the material itself (Chemical nature, kind of additional work which has to be used to convert it in a building material suitable for mine filling, legal classification...) Although minimum price given for some mines is 15 Euro/ton, no mine will accept APC residues at such a price. Usual price for APC residues is in the range of 100 Euro to 140 Euro.

2.3 Additional technical considerations on coal and salt mines

2.3.1 German coal mines

(according to information on Montalith [A1-A3, E3].

Coal mines are also considered as waste valorisation facilities, although geological conditions are very different from salt mines (high humidity, permeable ground).

Residues are used only in mines which are under exploitation, and for two applications :

- filling material (Versatz) : material needed to fill abandoned cavities and holes
- building material (Baustoffe) : material needed in underground constructions, in order to stay (strengthen) mine galleries.

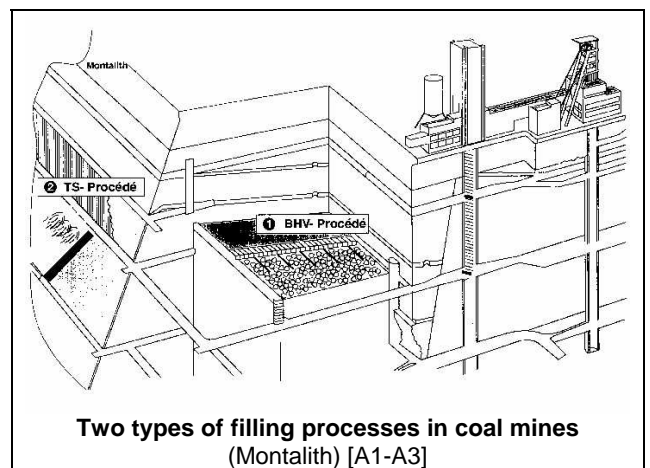
In both case, the main objective is two assure the security of underground workers. They need in fact

any cheap mineral material which is compatible and lead to a high enough bounding effect (≈ puzzolanic efficiency).

Legal authorisation were given in 1987 for 3 sites :

- Hugo/Consolidation, D-45897 Gelsenkirchen
- Walsum, D-47179 Duisburg
- Haus Aden/Monopol, D-59192 Bergkamen

Two of these sites are given on the German map in annex. Main site is Walsum (near Duisburg). Bergkamen mine is closed, but there is a waste treatment facility on the site. Hugo/consolidation is now closed (see information on Duisburg in[F19]).



Characteristics : Depth around 800 m or more, high humidity (acid humidity due to natural mineral content). Natural Heavy Metal content of the ground can be much higher than APC or Fly Ash content (but only for some chemical species) [E3].

Residues are never used in raw form, but are always incorporated (5 to 15%?) in other materials including binders and stabilisers. This operation can be done on the surface and produce a mortar which can be used directly in the mines. Montan-Entsorgung GmbH & Co KG (subsidiary of Ruhrkohle Montalith) is the only German company to produce such a mortar [E3].

Admission of wastes is submitted to some limitations, and laboratory verification, from points of view of usability, security and environment : nature (maximal grain size 5 mm), content analysis (organic matter < 1,5% or 2%, Heavy metals content), no toxic reaction with water....

Precise criteria are not available.

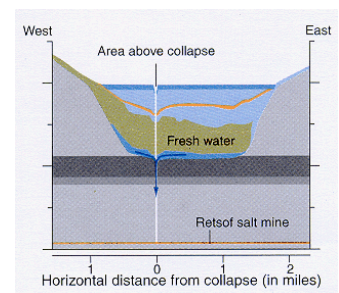
Fly ashes from Municipal Waste Incineration or Coal combustion (and some neutralization residues : De-SOx flue gas treatment residues of coal combustion) are generally accepted.

Acceptance of MSW APC residues is not clear : these residues have a high leachable content and should not be accepted in a raw form regarding the high humidity inside coal mines. Stabilisation by binders may be sufficient to reduce leachability. No precise information was found on this point.

2.3.2 Salt mines

The problem of leachability is much different in salt mines, which are very dry and should be able to store MSW APC residues safely, provided no communication with water layer is possible.

Communication with water layer is a problem for mines which are to close to the surface. Recent complete collapse of the Retsof mine in USA [B5] gives a good illustration of the question. The mine was only 300 m deep and was located under a river, under a sedimental (shale) layer. The underground flooding resulted not only in the destruction of the mine (and end of any exploitation), but in damages on the surface (collapses).



Retsof salt mine collapse

On the opposite, a site like "Stocamine" is 600 m deep, very far from the phreatic ground water layer (30 m deep). Special tunnels are dug into an NaCl layer, located under formerly exploited KCl layers. Geological studies were done previous to licensing. Ecological movement nevertheless claims that a communication with water layers is not completely excluded according to these studies (see StocaMine complete data in annex 2). According to StocaMine operators, a countervaluation done by INERIS experts confirmed there isn't any flooding risk for this well.

Note that the well casing is regularly checked ; there are protection such as gates against any

possible water coming the surface. Some residual water is collected at the bottom of the mine and is pumped to the surface.

Attention should be given to this safety problems for all salt mines practising residue mine-filling of storage. Perhaps it can influence the sustainability of the mine-filling salt mine route.

A complete approach of the flooding or collapsing question has in fact to consider different aspects such as :

- exploitation risk : partial or total end of exploitation
- ground safety : damage to ground construction (collapses, earthquakes)
- environmental risk : pollution from residues by leaching after flooding or by infiltration and also from salt,...

Considering all the risks, complete mine filling can in fact be a good solution.

For the use of residues in that filling, it must at least be demonstrated that no pollution hazards will remain when the mine is filled. The use of residues can lower the price of filling thus can be encourage mine owners to do fill dangerous mines.



Stocamine situation

2.4 Regulations associated to MSWI residues storage in salt mines.

2.4.1 European regulations

A comprehensive list of current European directives concerning wastes is given in annex "Regulations". Main relevant directives are the following :

- Directive 75/442/EEC of 24 July 1975 on wastes (OJ EC No. L 194 p. 39), amended by :
 - Directive 91/156/EEC of 18 March 1991 (OJ EC No. L78, 26.3.1991, page 32)
 - Directive 91/692/EEC (OJ EC No. L377 p. 48)
(waste must be recycled/recovered by means that do not endanger human health and that do not employ procedures or methods that could damage the environment).
- Directive 91/689/EEC on hazardous waste (EC Official Journal no. L 168 p. 28), amended by directive 94/31/EC of 27 June 1994
- Directive 85/337/EEC, amended by directive 97/11/EC, JO L 14.3.1997, page 5
- Directive 1999/31/EC of 26 April 1999 on the landfill of waste, JO L 182 16.7.1999, page 1 (see comment in annex, complete text in EC399L0031.doc)
- A future Directive on Incineration of waste is being worked on (first reading 14 April 1999, Last reading 2 December 1999) [D10]

International transport of waste through Europe (import/export) is regulated through :

- Council Regulation (EEC) No 259/93 of 1 February 1993.
- Basel agreement of 22 March 1989.

2.4.2 Storage current rules : regulations and status of disposal sites

1) German basic regulation [D1] gives the current basic legal principles for Germany. It refers to above European regulations (75/442/EEC and amendments, 91/689/EEC and amendment, Import/export rules). It doesn't take into account "mine recycling" sites for wastes, and it contains only a single quotation on salt caverns and mines (see comments in annex) (complete text is available in English on request, or in German on the web). It doesn't refer to the recent directive on landfill of waste.

The question of mine-filling practices is discussed below.

2) France basic principles are given in annex. The only salt mine disposal site, StocaMine has a special authorisation from regional authorities [D4], referring to French 1975 law [D5] (*), and is an official ultimate waste disposal site. The French green movements claims this disposal site may discourage recycling, but disposal price seems to be high enough to avoid "Eco-dumping", while it may not be the case for some German mines which offer very low prices [A24].

(*) and to European Directive 259/93 and French law [D7] on the transport of wastes. No references to recent 1992 and 1994 French laws [D8] and [D9] on industrial wastes was found, for these laws don't apply to underground storage.

3) Norwegian law dated December 30, 1994 No 1231 refers to Council Regulation (EEC) No 259/93. Langøya is considered as an official ultimate waste disposal site.

4) Austria : Austrian current regulation on waste landfill is given in [D3]. We have not found any reference to salt mines.

Reference to salt mines in regulations ?

None of these regulations refer to salt mine, except for the European regulation on landfill of wastes, in which salts mines are considered as possible "underground storage" disposal sites. This law is still to be transposed to regulations of the European states.

2.4.3 German mine-filling (Bergversatz)

Mine-filling residue valorisation sites are not considered as disposal facilities by the German law. They are considered as "recycling" or "reutilization" sites and not as "disposal" sites, as thus have not to respect the laws on disposal of wastes.

This practice currently refers to regional (Bundesland) regulation and permitting, and to general German regulations on mining exploitation rules (Bundesberggesetzes).

No special classification has been devoted to this type of activity in European waste nomenclature (by the way, it raises a problem for export/import).

This question, whether this industrial activity has be classified as "recycling" or "disposal", is currently under debate, inside Germany and recently between the European Commission and the German State. Many articles are available on this question (see [A4-A24]).

The German Green movement claims that the current practice is against both current German law [D1] and European laws (see [A4-A7]), although the current law mainly addresses "waste for disposal" and not "waste for recycling" practices (see dosberg [A4] §4. Alles ganz legal..? §5. Verstoß gegen Europarecht ?).

An infringement procedure is under way since August 1999 (Vertragsverletzungsverfahren, Commission against Bundesrepublik Deutschland) [A21]. Text [D2] given in annex explains the legal base of an infringement procedure for non-compliance with community. If this procedure continues, this can lead to a judgement of the European Court such as the one which occurred recently for the disposal of waste oil (9 September 1999).

Debate on this question is to be taken into account. A clear common regulation for mine-filling practice is required by many people and companies, and is currently under work [A22]. The problem with the Commission should speed up the writing of a German regulation.

This problem doesn't concern the 3 official ultimate waste disposal sites ("Untertagedeponien"), but only the "mine-filling" sites. The attached text by Dr Breuer ([A7], in German, see annexe 3) gives an abstract of the legal situation, by comparing the different points of view on regulations.

From this debate, it seems that this practise could be really considered as a reutilization practise if it is proven either that :

- at least : wastes are technically needed as material for building or filling in the mines (for exploitation purpose, or for a security reason such as avoiding collapses) (*)
- at best : wastes have special physical characteristics (for ex. binding properties) which not only allow their use but justify it ("notwendige bauphysikalische Funktion"). It may be proven by the use of a significant percentage of wastes in the mixing with other materials (UTA [A17])

Filling of very deep salt mines not longer under exploitation, if no security problems can justify it arise, could only be classified as "disposal" sites (although being environmentally safer).

The question will remain to prove that there is no damage to environment (which is to defined and controlled...), and that mine reutilization will apply environmental rules equivalent to the ones imposed for underground landfills (why should the law be more strict for deep storage which could be basically safer ?).

(*) In many areas within Germany heavy problems exist because the ground is sinking gradually caused by collapsed mines. For example, some areas are expected to sink down 12 m in the next 20 years which makes it necessary to build or to enlarge dikes in order to avoid flooding of larger areas. In several parts of the Ruhrgebiet only hundreds of pumps guarantee that the water is flowing towards the Rhine river.

2.4.4 Possible consequences of April 1999 European Directive

The new European Directive of April 1999 on landfilling practices is not yet taken into account by European Countries. This law has to be applied before 2001 for new sites (obligation for states to transpose the law within two years), and before 2009 for old sites (obligation to apply the state law within 7 years).

A short analysis of this law, presented in annex, concludes that, concerning the residues storages :

- 1) This law gives place to a **special classification and regulation for salt mine underground storage** sites when declared as landfill sites. They can be exempted of parts of obligations (gas

analysis, leachate analysis, water surveillance and monitoring). This exemption has to be defined by each Country.

2) Future for "Mine-filling" is neither defined nor considered.

This practice can match this law either if :

- if it is accepted as a "recovery" practice and not as landfilling : in that case the law can't be applied
- or it applies the same rule as landfilling or underground storage and is classified as such sites.
- or it can benefit of some special criteria to be defined by a technical Committee, criteria for "certain hazardous waste to be accepted in landfills for non-hazardous waste". In that case mines should be classified as landfills for non-hazardous wastes (this possibility doesn't seem to be applicable to residues such as APC residues)

Of course, possible laws about "safe recycling practices" or special laws on salt mines could be issued in the future and oblige mine-filling practice to obey somewhat equivalent constraints as the law on landfilling.

2.4.5 Storage licensing

According to M.Paar [E1], permitting/licensing is a long and weary experience with much political implications and that, on top of that, prices are under severe pressure. There is excess capacity in Germany right now and this won't change in the near future.

This point of view is a good abstract of the current situation.

Excess of capacity is also the case in France, where 13 ultimate waste disposal sites are already available (see in annex), and a 14th is projected in the South of France. The opening of the first deep underground storage (StocaMine) is said to be strongly related to political reasons rather than economical reasons (avoid complete abandon of the facilities, create new jobs in the area, acquire technical knowledge in underground storage practice, offer a unique alternative to ultimate waste disposal...).

Opening of the site was nevertheless difficult, because of ecological pressures (see ecological point of view in annex).

Minosus Ltd, (Bostock, Middlewich, UK) [E8, A29] is also trying to open a salt mine as an ultimate waste storage, may be in 2000. Their told us licensing needs a long time. Two authorisations have to be obtained :

- permission in principle from the British Council (or from the Cheshire County Council)
- licence = "detailed permission " (licence for exploitation, giving precise types of waste), from the Environmental Agency.

Current conditions for future permitting is given in the April 1999 European Directive (especially art. 7 and 8).

3. Conclusion on the sustainability of the mine storage route

The question of "sustainability" is : "can it continue or not in the future ?"

The answer depends mainly on the regulations, thus the question can be turned into : "can it comply with existing and future European Regulations ?"

We must consider separately the two types of residue elimination sites :

1) Underground storage or disposal sites

Deep underground facilities like "Untertage Deponien" in Germany and StocaMine in France should be able to continue exploitation during at least the next 30 years.

Capacity of storage is only a question of legal authorization, for these storages can be extended as needed (other galleries can be used and if necessary, new galleries can be dug in the salt layers, as it is done by StocaMine). The acceptance of the opening of the new salt mine storage in the UK (Middlewich) [E8, A29] will be a good test whether it can be extended to all Europe (for region where it could be economically viable).

Adaptation to recent laws, and especially to April 1999 European directive on landfill practices should not raise big problems for these facilities. Firstly, main obligations are already fulfilled by operators (analyses of residues, book-keeping...). Secondly, this directive lets each country give a special status to salt mine underground storage, and exempt them from obligations which are not relevant for these sites. Future country laws (to be issued before 2001) will give precise aspects of these exemptions.

2) Mine-valorisation

Continuation of German "mine-valorisation" practice is less sure. It depends on the ability to prove that this practice is in agreement with principles given in the European regulation.

It must either comply with new regulation on landfills and underground storage (that will be difficult) or keep to be considered as a recovery or recycling practice in order not to be obliged to comply with these regulations.

It seems that the European acceptance as a recovery practice is under way (no legal obstacles has been found, according to recent information).

Its future will thus depends on the future German law which should be prepared for this practice, and on the agreement of the Commission on that law.

Technically, the acceptance of Fly ashes and APC residues in mine-filling should depend on the confidence in their correct stabilisation, i.e. in leaching properties and durability of the final material in which they are incorporated. And of correct checking on each sites for each types of waste.

Logically, it should be proven that this material is really needed for the mine, in order to be considered as recycling. But the question of security (fill the mine in order to avoid collapsing) can probably always be considered as such a proof.

Technically, the Norwegian Langøya centre is in a similar situation as German salt mines, for it is in fact both a landfilling and a mine-filling site. But it applies rules of ultimate disposal centres. Sustainability should not raise problems for it, provided it also adapt its regulation to the last European Directive.

Prospective point of view : whatever the current issue of the legal debate, it will not be accepted in the future to have less strict rules for residue recycling (in mine-filling or in any other industrial activity, to broaden the debate) than for residue disposal. Perhaps the question should be opened to a more general question on "safe recovery practices", which could be the subject of some future environmental laws, may be within the next decade.

4. References

4.1 Documents on residue storage or recycling

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- [A2] Recyclage des matériaux secondaires lors de l'extraction de la houille. UTR Umwelt GmbH & Co KG, Gladbeck. Montan-Entsorgung GmbH & Co KG, Karlsruhe.
- [A3] Revalorisation des cendres volantes et des sels provenant de la purification des gaz des incinérateurs de déchets ménagers comme matériaux de construction (mortier) dans les galeries de mines de charbon.
Waste incineration-fly ash + flue gas scrubbing salts recycling as high quality building materials for mining specific application.
Montan-Entsorgung GmbH & Co KG, Karlsruhe.
- [A4] Dossier Bergversatz : Hintergrunddossier. Die zweifelhaften Erfolge der Verwertung in Deutschland Beispiel: Abfälle als Bergversatz. Öko-Institut. <http://www.oeko.de/deutsch/umwelt/dosberg.htm>. 14.01.1998.
- [A5] Halle : Bergversatz bedarf bundesweit akzeptierter Regelungen. Mathias Weiland, umweltpolitischer Sprecher der ehemaligen Landtagsfraktion Bündnis 90/Die GRÜNEN Sachsen-Anhalt. AKP 3/1998.
www.kommunal-info.de/Themen/Abfall/Ahalle.htm
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www.umwelt.de/ags/pm020399.html.
- [A7] "Kurzfassung Bergversatz". Dr. Barbara Breuer. in German. 3 pages paper given in annex 3.
- [A8] SAS AG erweitert Aktivitäten bei Deponierung und Konditionierung. Umweltwirtschaft Re Nr18 v30.04.1996.
Untertagedeponie Heilbronn 200.000 Tonnen pro Jahr geplant.
- [A9] Bergamt und Umweltministerium hoffen auf Berufungsverfahren. Umweltwirtschaft Re Nr32 v.05.08.1997.
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- [A10] Trend zum Sondermüll-Versatz in Bergwerken hält weiter an. Umweltwirtschaft Re Nr43 v.21.10.1997.
1995 knapp 400 000 Tonnen Sonderabfälle als Versatzmaterial.
- [A11] Versatzbergwerke mit strategischer Allianz. Umweltwirtschaft Re Nr51/52 v16.12.1997.
Die Bündelung ihrer technischen Möglichkeiten haben die Versatzbergwerke in Sondershausen, Teutschenthal und Bleicherode beschlossen.
- [A12] Bonn: Bergversatz als Verwertung anerkennen. Umweltwirtschaft Re Nr29 v.14.07.1998.
- [A13] Versatz von Mishckunststoffabfall unter Tage ist keine Verwertung. Umweltwirtschaft Re Nr49 v.01.12.1998
VGH Mannheim revidiert Urteil des Verwaltungsgerichts Stuttgart.
- [A14] AGS für nationale Verordnung zum Bergversatz von Abfällen. Umweltwirtschaft Re Nr49 v.01.12.1998
"Im Berversatz zunehmend auch gefährliche Abfälle entsorgt".
- [A15] Call for end to disposal in German mines. HAZNEWS N°133, April 1999, p.7. (see in Annex).
- [A16] Umweltministerium weist Vorwurf zum Versatz von Abfällen zurück. Umweltwirtschaft Re Nr33 v.17.08.1999.
Reaktion auf Spiegel-Bericht / Antwort auf EU-Manhnschreiben".

- [A17] Sondermüll : Streit um Bergversatz. UTA 1/IX/99 Seite 4-5 (contains a criterium on the use of waste in mine-filling)
- [A18] Brüssel will Kritik an Bergversatz mit Entschiedenheit verteidigen. EUWID Recycling und Entsorgung Umweltwirtschaft Re Nr36 07.09.1999. Ludwig Krämer gab Übersicht über umweltpolitische Vorhaben der EU.
- [A19] bsve fordert einheitliche Kriterien für Bergversatz. Umweltwirtschaft Re Nr36 07.09.1999
- [A20] Energetische Verwertung kein Gegensatz zu stofflichem Recycling". Umweltwirtschaft Re Nr37 14.09.1999.
- [A21] Deutschland will Einstellung des Brüsseler Verfahrens zu Bergversatz". Umweltwirtschaft Re Nr37 14.09.1999.
- [A22] Bundesverordnung zum Bergversatz in Arbeit". Umweltwirtschaft Re Nr40 v.05.10.1999.
- [A23] GSES darf Abfall unter Tage verbringen. Umweltwirtschaft Re Nr43 v.26.10.1999. (Sondershausen can put 150 000 tons)
- [A24] Öko-dumping auf dem Vormarsch ? öko-dumping durch Deponierung und Versatz in Deutschland und im benachbarten Ausland. Deutsche Projekt Union GmbH (DPU). Projekt Nr.1.11.1521.1.texte\extern-I.doc - 18.09.1998. (§2.7 Rechtliche Sonderregelungen zum Bergversatz in Bergwerken, §2.8 Rechtliche Rahmen und Praxis im benachbarten Ausland...).
- [A25] Acceptance of waste in landfills : Final report / Institut für Umweltschutz und Energietechnik. Köln : TÜV Rheinland Sicherheit und Umweltschutz GmbH, 1999 - 196p. (Contract DGXI B4-3040/97/000090/MAR/E3)
this study gives an overview of existing waste acceptance criteria in the 15 member states. Based on particularly the German situation the study also presents the state of the art concerning waste acceptance criteria in landfills. Finally, the study evaluates the waste acceptance criteria used in the 15 member states and proposes the harmonisation of specific criteria.
(not available : requested from DGXI information Centre ; fax from Marie-Anne PAUWELS, 16 déc. 1999 : No copy available → Ask the Editor for it), requested also from Mr.Paquot. Will send a copy. Suggest contact Mrs Meret Kristoffersen, Centre thématique sur les déchets de l'Agence Européenne pour l'Environnement.)
- [A26] Versatzbetrieb im Bergwerk Bad Friedrichshall-Kochendorf. UEV Umwelt, Entsorgung und Verwertung GmbH Salzgrund 67 - 74076 Heilbronn (subsidiary of SWS AG).
(10 km North of Heilbronn - Salt exploitation from 1899 to 1994 - Capacity : 12 Mio.m3 has to be filled in 10 year programs - Depth 180 m - Acceptance of APC residues from MSWI.
- SWS AG = Südwestdeutsche Salzwerke AG
- [A27] Untertagedeponien und Versatz bergbaufremder Abfälle unter Tage in Deutschland. Abfallwirtschaft Magazine, 1997 or 1998 p.35-36. (map + table giving evolution from 1992 to 1996).
- [A28] Bochumer Beiträge zum Berg und Energierecht. Von Danwitz (Hrsg.) Bergbau und Umwelt. Band 32 Boorberg, 1999. (table giving evolution from 1992 to 1997).
- [A29] Sarp plans slat mine disposal facility for hazardous waste (UK 1st underground waste storage and disposal facility) ENDS Report 288 - January 1999.
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«L'injection d'effluents pollués dans le sous-sol de Lacq, pratiquée depuis 1978, est-elle dangereuse ? Ce procédé est jugé utile pour a chimie fine autour de laquelle s'organise la reconversion du site. Dominique Voynet pourrait y mettre un terme. Inquiétude des élus et industriels.»

4.2 Other technical papers

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- [B2] Salt solution caverns for petroleum industry toxic granular solid waste disposal. SPE/ISRM rock mechanics in petroleum engineering : Trondheim, 8-10 July 1998. Duyvestyn, Davidson, Duseault, U. of Waterloo, Ontario, Canada.
"Placement of solid wastes in dissolved cavern in salt is increasingly being view as an environmentally secure technology for low-toxicity wastes"....
- [B3] Infrastructures et aides pour la gestion des déchets industriels dans le plan wallon des déchets "Horizon 2010". Vincent Detemmerman / Confédération Construction Wallonne/ 1998-01-04. www.club.internet.innet.be/~pub00316/articles/pwd-infrastructures_et_aides.htm
- [B4] Stabilisation des déchets et environnement 1999". [www.insa-lyon.fr/Laboratoires/ POLDEN/ thematique.htm](http://www.insa-lyon.fr/Laboratoires/POLDEN/thematique.htm)
- [B5] "Effects of the 1994 Retsof Salt Mine Collapse in the Genesee Valley, New York. William M.Kappel, Todd S.Miller, Ricahrd M.. US Geological Survey, Ithaca.
"http://ublib.buffalo.edu/libraries/e-resources/ebooks/records/8206.html

4.3 Regulation or projected regulation

See also annex on Regulation (list of European laws + comments)

- [D1] Act for Promoting Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Waste Disposal (Gesetz zur Foerderung der Kreislaufwirtschaft und Sicherung der umweltvertraeglichen Beseitigung von Abfaellen (Kreislaufwirtschafts und Abfallgesetz - Krw-/AbfG) 27 Sept.1994 + last changes in Aug.1998.
Urteil des Bundesverwaltungsgerichts vom 05.03.1997 - 11 A 25.95.
<http://www.penelope.gr/penelope/Library/Libs/Dlib/krw-e/old/krw-e.htm> (English).
http://www.penelope.gr/penelope/Library/Libs/Dlib/krw-e/krw_dm.htm (German).
(see extracts in Annex, English text in 32 pages available on request)
- [D2] Explanation of European Commission infringement proceeding for non-compliance with community law. MEMO/99/57, Brussels, 16 November 1999.
(given in Annex, 2 pages)
- [D3] Austrian law on waste deposit
1/2/16. Verordnung des Bundesminisiters für Umwelt über die Ablagerung von Abfällen (Deponieverordnung). BGBl 1996/164. 1 Jan. 1997. (18 pages available on request on paper form only). (fax from SVP 15/12/99).
- [D4] Arrêté N° 970157 du 03.02.1997 portant autorisation d'exploiter au titre des installations classées. (StocaMine authorisation for Wittelsheim storage site). 37 pages. available on paper only (sent by StocaMine).
- [D5] Loi n°75.633 du 15 juillet 1975 relative à l'élimination des déchets et à la récupération des matériaux.
- [D6] Loi n°76-663 du 19 juillet 1976 relative aux installations classées pour la protection de l'environnement.

- [D7] Arrêté ministériel du 3 janvier 1985 relatif au contrôle des circuits d'élimination des déchets générateurs de nuisances.
- [D8] Arrêtés du 18/12/92 : (Installations existantes J.O. du 16 avril 1993, installations nouvelles J.O. du 30 mars 1993) :
- Stockage de certains déchets industriels spéciaux ultimes et stabilisés pour les installations nouvelles (JO du 30 mars 1993), modifié par l'arrêté du 29 juin 1993 et celui du 18 février 1994
 - Stockage de certains déchets industriels spéciaux ultimes et stabilisés pour les installations existantes (JO du 16 avril 1993), modifié par l'arrêté du 18 février 1994 (J.O. du 26 avril 1994)
- [Both laws don't apply to underground storage sites\) \(excluent les stockages souterrains de leur champ d'application\)](#)
- [D9] Arrêté du 9 septembre 1997 relatif aux décharges existantes et aux nouvelles installations de stockage de déchets ménagers et assimilés (JO du 2 octobre 1997)
- [Don't apply to underground storage sites\) \(exclut les stockages souterrains\).](#)
- [D10] European Parliament legislative resolution on the Council common position for adopting a European Parliament and Council directive on the incineration of waste (11472/1/1999 – C5-0274/1999 – 1998/0289(COD))
- [Only one reference to residues : "Residues resulting from the operation of the incineration or co-incineration plant shall be minimised in their amount and harmfulness. Residues shall be recycled, where appropriate, directly in the plant or outside in accordance with relevant Community legislation \[and national provisions\]" \(\[amendment by Parliament\]\)](#)

4.4 Main E-mails and other information exchanges

- [E1] **Wim.Paar@Akzonobel.com (Akzo Nobel Salt)**
* P.O Box 25, 7550 GC Hengelo * (+31) 74 2443401, - fax (+31) 74 2443041
Tue, 7 Dec 1999 14:57:29 +0100,
I regret to inform you that I have no special knowledge or information on the subject other than you most likely already have in your position.
I know of existing underground salt mine disposal facilities in Germany (Herfa Neurode, Bernburg, Sondershausen (potassium) and Heilbronn(?)) and such that intend to develop such a facility (Borth).
It is my understanding that permitting/licensing is a long and weary experience with much political implications and that, on top of that, prices are under severe pressure. It seems to me that there is excess capacity in Germany right now and that this won't change in the near future.
- [E2] **Johannes.Neises@ suedsalz.de**
Date: Fri, 3 Dec 1999 14:57:24 +0100
Further to your questions, I have outlined some information.
First of all, here you can find additional information:
 - www.eu-salt.com (European Salt Producers Association)-- a map will also there available
 - www.saltinstitute.org (World Salt Producers Organisation)
 - www.salzindustrie.de (German Salt Producers Organisation)Our key figures:
 - largest supplier of salt in Germany
 - rocksalt: 3.5 m tons/year (SWS AG)
 - refined salt: 0.4 m tons/year
 - Salt mine : Berchtesgaden Heilbronn (SWS AG)-residues from incineration can be landfilled (Contact the UEV - Umwelt, Entsorgung und Verwertung GmbH, a subsidiary company of Südwestdeutsche Salzwerke AG (SWS AG)-www.salzwerke.de)
- [E3] **Peter Schmidt, Montan-Entsorgung Succursal Karlsruhe, Bunsenstrasse 22, D-76135 Karlsruhe, tel 00 49 721 9 81 72 10, fax 49 721 9 81 72 55. Phone conversation 14th dec 1999.**
- [E4] **albert topitz , how2surf@image.co.at - 13 dec.1999**
Question on the four Austrian Salt mines (**Salzburg, Hallstatt, Altaussee, Bad Ischl**).
 - Are they the only ones ?
 - yes, there are no others in Austria
 - Are they still exploited ?
 - 3 of them are still exploiting - just Salzburg/Hallein is for tourism purposes only (they stopped production about 5 years ago)
 - Is there any mine in Austria where residues (ultimate waste) could be stored ?
 - technically YES - but politically NO
- [E5] SVP report 14 dec.1999 from Gerhard Weinziger, SVP correspondent AUSTRIA.
- [E6] **M.Lindemann, NOAH, Norsk AVFALLSHANDTERING AS - fax 29 Nov 1999.**
- [E7] **Mrs Unni Musdalslien, Norsk Hydro - E-mail fax 3 Nov 1999 (included in main text).**
- [E8] **Minosus Ltd: Jack Lane, Bostock, Middlewich, Cheshire, CW10 9JQ, Tel: 01606 550044, Fax: 01606 550088 (no answer yet)**
- [E9] **StocaMine. Postal Mail 04 novembre 1999.**
"StocaMine est le premier site de stockage souterrain en France. Ce stockage est réversible. Pour ce faire, StocaMine provisionne un montant à la tonne stockée de manière à constituer un fond permettant d'assurer le

déstockage et le retraitement éventuel des déchets. Cette somme est incluse dans les prix qui sont remis à nos clients. StocaMine devient dès lors responsable des déchets se trouvant dans ses blocs de stockage".
Notre prix de stockage pour les REFIOM est de 1300 F H.T. la tonne".

[E10] Mrs Unni Musdalslien, Norsk Hydro - E-mail 20 Dec 1999 (see annex data on Langøya).

4.5 Web sites

- [F1] Salt production in Europe : from www.eu.salt.com/teacher/capacities.htm (European Salt Producers Association)
- [F2] Keywords : from www.eu.salt.com/manufact/stats.htm.
European Salt Producers' Association, 17, rue Daru - 75008 Paris Tél: 01 47 66 52 90 - Fax: 01 47 66 52 66
- [F3] K+S (Kali und Salz) web site : www.kalisalz.de (include precise information on waste handling)
- [F4] www.groupe-emc.com/actu9002.htm (information on StocaMine)
- [F5] www.saltinstitute.org (World Salt Producers Organisation) (good general information on salt, and list of salt association)
- [F6] www.salzindustrie.de (German Salt Producers Organisation)
- [F7] www.wacker.de (German Salt Producer) (no useful information found)
- [F8] [www.salzwerke.de \(SWS WG\) ../untertagearchiv/geschichte/index.htm](http://www.salzwerke.de/SWS_WG/..untertagearchiv/geschichte/index.htm) (history of UTA= UnterTage Archivs, subsidiary of SWS AG).
../entsorgung-Verwertung (description of a storage site, see annex)
- [F9] www.grupe-teutschenthal.de/historie.htm, [abfall.htm](http://www.grupe-teutschenthal.de/abfall.htm), [versatz.htm](http://www.grupe-teutschenthal.de/versatz.htm), [unterg.htm](http://www.grupe-teutschenthal.de/unterg.htm) : history, waste characteristics, discussion on reutilization, photos,... :
- [F10] www.panagora.ch/sanierung/aurec.htm : PANAGORA Umwelt. Bergversatz, eine Verwertungslösung.(Panagora AG, 5322 Koblenz, Suisse)) (see [aurec_panagora.doc](#))
- [F11] <http://home.t-online.de/home/woellegret/weber.htm> : Die Untertagedeponie Zielitz - eine langzeitsichere Entsorgungsalternative für besonders überwachungsbedürftige Abfälle. Kali un Salz GmbH
- [F12] www.sondershausen.de/expo/firmen.htm (K-UTEC) (various information, 5 pages)
- [F13] www.tu-clausthal.de/ibb/ibbcp/fachaufsaetze.htm (Fachaufsätze 1998, 97,96) (4 reports indicated)
- [F14] www.itas.fzk.de/deu/tadn991/roem99a.htm : Chancen un Risiken der untertägigen Ablagerung von Reststoffen aus der thermischend Klärschlammbehandlung. Joachim Römer Mars 1999.
- [F15] www.tu-clausthal.de/ibb/mschmid/KOL1996.htm : Kolloquium "Entsorgungs-und-Sanierungsbergbau" - Aufgaben und Ergebnisse. Knissel, Schmid, TU Clausthal 1997, Heft 82, S.45-49.
- [F16] <http://home.t-online.de/home/woellegret/pflugrat.htm> Fachtagung : "Die Praxis des Bergversatzes in Deutschland : Versatz im Spannungsfeld zwischen Verwertung und Beseitigung" Schloss Teutschenthal 3.April 1988 :
- Umweltverträglichkeit und Sicherung des Allagemeinwohls Dieter Pflugradt.
 - Genehmigungspraxis Bergversatz im Land Sachsen-Anhalt, Klaus Rheda, MRLU.
- [F17] www.brandenburg.de/land/umwelt/presse/b9021901.htm : Pressemitteilungen. Abfall- und Kreislaufwirtschaft in Brandenburg (17 Feb.1999)
- [F18] <http://home.t-online.de/home/woellegret/mueller.htm> : Der Einsatz von Abfällen zur Sicherung bergbaulicher Hahlräume im Lichte des geltenden Europarechts. Fachtagung zum Bergversatz in Teutschenthal 03.04.1998.

Reinhard Müller, Birgit Süß.

- [F19] www.uni-duisburg.de/FB7/FG15/documents/hmv_rueckstaende.html : Gerhard-Mercator-U.Duisburg. Behandlung und Verwertung von HMV-Rückständen.
- [F20] www.tu-bs.de/forschung/projekte/CAMPUS/4-CAMPUS/N4_25_4/P4_25_4B.Html (U.of Braunschweig. Institut für Wärme- und Brennstofftechnik. GSF-Institut für Tieflagerung)

ANNEX 1 Complementary data on salt production

SALT PRODUCTION STATISTICS [F2]

Dietary salt intake in EU Member States (g/day)

Belgium	8.3 / 8.7
Denmark	8.2
France	7.9 / 8.4
Finland	9.0 / 10.0
Germany	7.2 / 8.9
Italy	9.8 / 10.9
the Netherlands	8.2 / 8.8
Portugal	10.7
Spain	10.2 / 10.8
United Kingdom	8.3 / 8.8

EU as a Community of 15 countries, 1995

	Chemical Industries	Miscel. Industries	Food grade salt	Highways	Total sales
ESPA countries	8000	3200	2100	5350	18650
Other countries	700	200	100	550	1550
Total	8700	3400	2200	5900	20200

European Union : crystallized salt sales (1 000 metric tons)

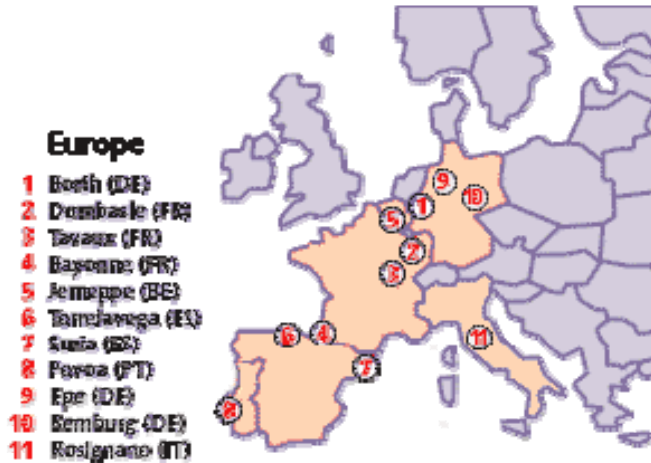
	CHEMICAL INDUSTRY	MISCEL. INDUSTRIES	FOOD	HIGHWAYS	TOTAL SALES
1988	9 769	3 035	2 185	2 758	17 747
1989	9 920	3 104	2 195	1 402	16 621
1990	9 486	3 198	2 288	2 155	17 127
1991	9 091	3 246	2 246	5 045	19 628
1992	8 693	3 431	2 196	2 292	16 612
1993	8 344	3 405	2 033	3 531	17 313
1994	8 512	3 366	1 993	4 081	17 952
1995	7 714	3 534	2 015	5 215	18 478
1996	7 643	3 378	2 044	7 026	20 091
1997	7 691	3 453	2 035	4 506	17 685

(a) from EU enlargement to 15 Member States, Austria is included

(b) as net importers, Finland, Ireland, Luxembourg, and Sweden are not included.

SOLVAY Sites (1999)

SOLVAY Salt exploitation sites are shown on the following figures



Solvay Sites in Europe



Solvay Sites in Thailand

Only two sites correspond to rock salt exploitation :

- Borth (DE) (with a future underground disposal site)
- Suria (ES)

+ Bernburg (DE) ?

Austrian salt mines

There is only one company in Austria, Österreichische Salinen AG, who is operating salt mines and salt saline productions facilities. This was a former state monopoly and since 1997 a private company.

Main sites are shown on the landscape figure below :

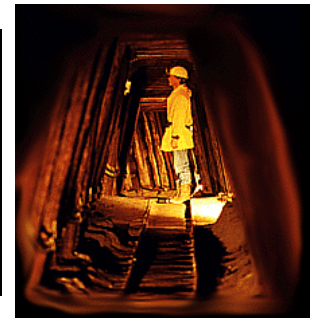
- Salzburg/Hallein
- Hallstatt
- Altaussee
- Bad Ischl

(www.salzbergwerke.com)

The 3 last facilities are still exploited for salt production, according to [E4].



Altaussee mine



Bad Ischl mine

Status of Austrian salt sites in 1999 [E5]

- [Hallstatt](#) Salt mine active
- [Altaussee](#) Salt mine active
- Bad Aussee Salt mine shut down tourist attraction
- [Bad Ischl](#) Salt mine active
- Hall in Tirol Salt mine shut down tourist attraction
- [Salzburg/Hallein](#) Salt mine shut down by 1995 [E4], (?) see [E5]
- [Ebensee](#) saline active

Austrian Salt production is given by the following table [E5] :

Year	Brine (x 1000 m3/year)	Salt (kt/year)	Number of Mines
1960	1038	132	11
1970	1747	265	7
1980	2294	420	7
1990	2246	389	4
1995	2621	523	4
1998	2447	492	4
2000 (planned)	2900	550	4

These figures are consistent with the figure given above in European statistics (500 Mt / year).

Tourism is a common practice for old salt mines. We found many other tourism sites, like Berchtesgaden in Bavaria (Germany, mine opened in 1517), Wieliczka in Poland (still in activity (www.unesco.org/whc/sites/11752.htm), and others in the USA.

Very old mines may not really be compatible with residue storage (insufficient depth, inadequate equipment, strong tourism activity, etc..).

For Austrian sites, the main reason for not using mines for waste storage seems to be a political reason, as expressed by [E4].

Austrian current waste regulation is given in [D3].



ANNEX 2
ultimate waste disposal practises
in various countries

Ultimate Waste Data for France (1998)

CSDU : Centres de Stockage de Déchets Ultimes (Ultimate Waste Disposal centre)

REFIOM : Résidus d'Épuration des Fumées de l'Incinération d'Ordures Ménagères (APC from MSWI)

Waste	France	Imports	Total
Dangerous Industrial Waste	802 576	562	803 138
• <i>Stabilised part</i>	<i>432 746</i>	<i>562</i>	<i>359 301</i>
• <i>APC (REFIOM)</i>	<i>261 454</i>		<i>261 454</i>
Sewage Sludge	3428		3 428
Common Industrial Waste	87 975		87 975
Inert Waste	23 734		23 764
Municipal Wastes	104 790		104 790
TOTAL	1 022 503	562	1 023 095

These values don't take into account additives such as binders used for stabilisation.

For dangerous Industrial Waste, binders represent 20% added mass to total waste.

For the part which is stabilised, binders represent 80% added mass. For the total of dangerous Industrial Waste, they represent 20% added mass.

Classification of CET ("Centres d'enfouissement technique")

- CET de **classe I** : destiné à recevoir les déchets industriels spéciaux ultimes, il doit être implanté sur un site imperméable (perméabilité $< 10^{-9}$ m/s sur une épaisseur de 5 m)
- CET de **classe II** : destiné à recevoir les ordures ménagères et les déchets assimilés, il est situé sur un site semi-imperméable, (perméabilité $< 10^{-9}$ m/s sur 3 m ou $< 10^{-9}$ m/s sur 1 m et 10^{-6} sur 5 m)
- CET de **classe III** : destiné à recevoir les déchets inertes, il peut être implanté sur un site perméable

Some regulation aspects

- Arrêtés du 18/02/92 : Stockage de certains déchets industriels spéciaux ultimes et stabilisés. Installations existantes J.O. du 16 avril 1993, installations nouvelles J.O. du 30 mars 1993
- Arrêté du 18/02/94 : Modification de l'arrêté du 18 décembre 1992 relatif au stockage de certains déchets industriels spéciaux ultimes et stabilisés pour des installations existantes J.O. du 26 avril 1994

According to these acts, stabilisation is compulsory for hazardous industrial wastes, Waste of category A (REFIOM/APC, powdered waste from metallurgy, mineral wastes from chemical treatment), and category B.

- Loi du 13/07/92

Each French region must have a Class I site for ultimate waste disposal before 2002.

After 2002, ultimate wastes which cannot be valorised (\approx recycled) or treated will be the only ones which can be stored.

Ultimate Waste Disposal Centres in France (1999)

CSDU : Centres de Stockage de Déchets Ultimes (Ultimate Waste Disposal center) ("Class 1" disposal site)

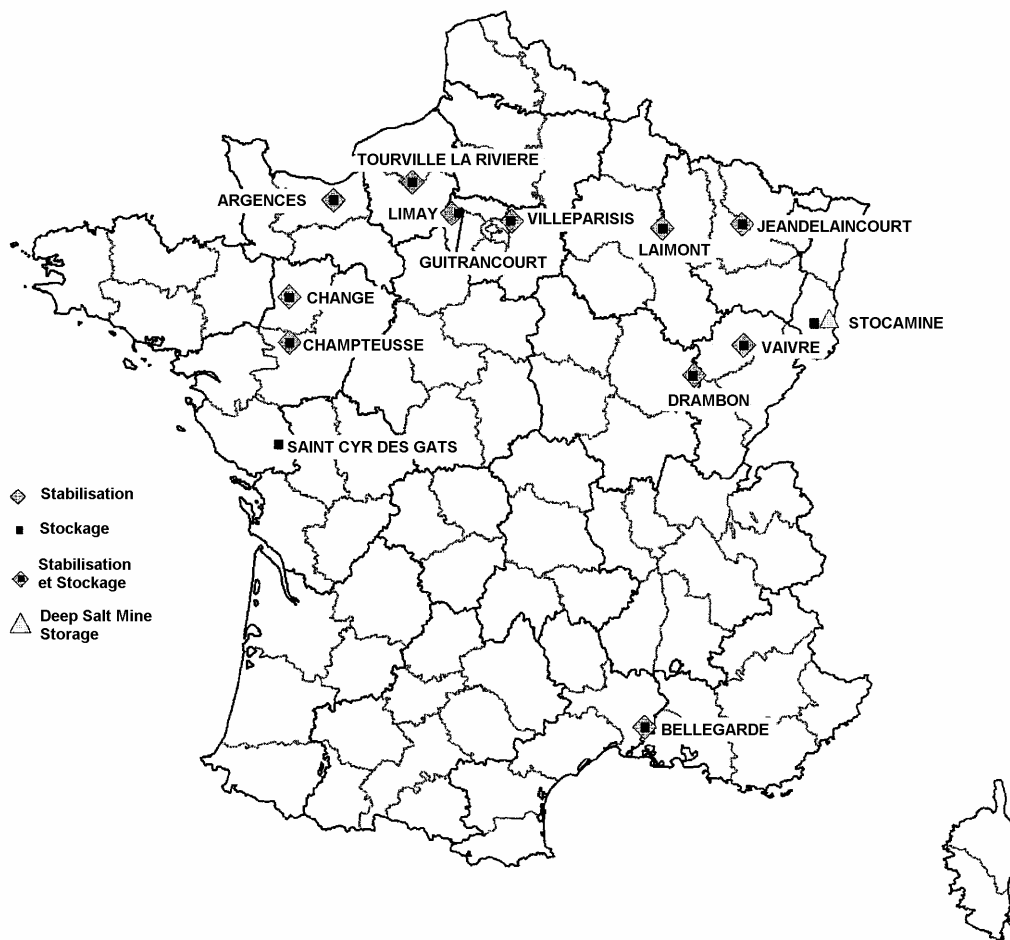
13 CSDU are open in France (see map).

• Argence (calvados)	CGEA-ONYX
• Bellegarde (Gard)	France-Déchets
• Champteusse sur Baconne (Maine et Loire)	SEDA (France-Déchets)
• Changé	Laval Service
• Guitrancourt (Yvelines)	EMTA
• Jeandelaincourt(54)	France-Déchets
• Laimont (Meuse)	DECTRA
• Pontailier sur Saône (Côte d'or)	France-Déchets
• Saint-Cyr des Gâts (Vendée)	TOP Ouest
• Tourville la Rivière (Seine Maritime)	SERAF (France-Déchets)
• Vaivre (Doubs)	ECOSPACE
• Villeparisis (Seine et Marne)	France-Déchets
• Wittelsheim-Mine Joseph Else (68).	StocaMine (EMC + TREDI + MDP)

A project for a new site in region "Rhône-Alpes" (Marboz(01) or Sury Le Comtal(42)) was presented in October 1998.

Sources :

- Data from ADEME Angers, fax from Katia Becaud, Département Industrie, Milieux et Technologies, 02 41 91 40 58 Fax 02 41 91 40 02, Stockage de classe I, 8 dec.1999.
- Map given by ADEME Angers, fax from Christian Militon, tel 02 41 20 41 22.
- List given by Bertin documentation department, and updated according to data from France Déchets and ADEME



Démarrage de l'activité de StocaMine

La société StocaMine a reçu le 10 février 1999 sa première livraison de déchets ultimes destinés à être stockés en mine de sel : 20,7 tonnes de déchets ultimes (sels de trempe cyanurés provenant d'industries métallurgiques), conditionnés par le centre TREDI de Hombourg, ont été réceptionnés.

Rappelons que le préfet du Haut-Rhin avait délivré, par arrêté préfectoral du 3 février 1997 [D4], à la société StocaMine, filiale de l'**EMC**, de **TREDI** et des **MDPA**, l'autorisation d'exploiter un centre de stockage réversible de déchets ultimes à **Wittelsheim-Mine Joseph Else (68)**.



StocaMine est le premier centre français d'enfouissement souterrain de déchets ultimes. Une part importante des déchets que recevra ce centre, basé en Alsace, sera d'origine régionale.

Le centre est autorisé à recevoir des déchets, préalablement reconditionnés, contenant des résidus comme le mercure, le cyanure ou encore l'arsenic. Il peut également admettre des terres et résidus pollués par des métaux lourds, tels que le plomb ou le cadmium. A cela s'ajoutent les résidus de l'industrie électronique, les produits phytosanitaires non organiques, les catalyseurs usés, les déchets de laboratoire, les résidus provenant du traitement des fumées d'incinération de déchets ou encore l'amiante.

Sont exclus du centre les déchets radioactifs, les déchets toxiques biologiques, les produits volatils, inflammables, liquides, les déchets présentant des variations de température ou de volume, réagissant avec l'eau ou avec le sel.

L'arrêté préfectoral d'autorisation d'exploitation prévoit que la société pourra stocker une quantité maximale de déchets de 320 000 tonnes, avec une limite annuelle de 50 000 tonnes.

StocaMine table sur un rythme de 40 000 tonnes de déchets reçus chaque année, ce qui nécessitera le creusement de cinq à six blocs par an. La société a en effet adopté la technique minière des chambres et piliers. Des galeries perpendiculaires entre elles, d'une hauteur de 2,8 mètres, sont creusées à une profondeur de 600 mètres, en laissant subsister des piliers de 20 mètres sur 20. Les chambres de stockage se trouvent entre les piliers. Un bloc est constitué de trois allées parallèles de 225 mètres de long, traversées perpendiculairement par neuf recoupes de 72,5 mètres. Les dimensions des galeries ont été calculées par l'Ecole des mines de Paris afin de maintenir la stabilité du terrain. La couche de sel gemme dans laquelle sont creusées les cavités de stockage forme une enveloppe homogène, très résistante et parfaitement étanche.

Une part importante des déchets reçus par Stocamine sera d'origine régionale. L'Alsace a d'ailleurs inclus Stocamine dans son plan régional d'élimination des déchets industriels.

Par ailleurs, Stocamine est à l'heure actuelle la seule solution en France pour prendre en charge les déchets dits de " classe O ", qui ne peuvent être stockés qu'en souterrain.

(from <http://www.groupe-emc.com/actu9902.htm>)

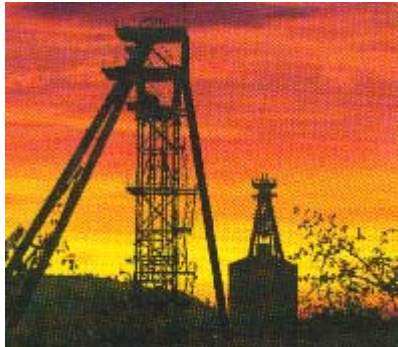
Characteristic figures on StocaMine

(according to Usine Nouvelle N°2675, 18 février 1999) :

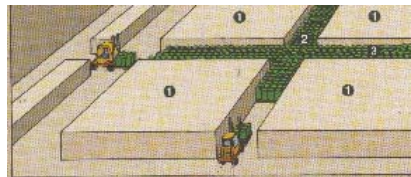
- Depth : 600 m
- Basic Investment : ≈ 100 MF (15 MEuro)
- Storage annual capacity : 50 000 t/year (maximum licensed)
- Storage overall capacity : 320 000 t (maximum licensed)
- Storage duration 100 to 150 years.

Current Licence has been given for 30 years.

- Annual Turnover (prevision) 55 MF for 40 000 t in 2001.
- Nature of wastes 40% APC, 40% local Industrial Wastes, 20% others.



Stocamine exploits an old well which was active 30 years ago.
It has been completely refitted for its new usage.



Stability is assured by pillars 20 m x 20 m, 4 times more large than storage galleries. Each pillar can stand 5 times its current stress.

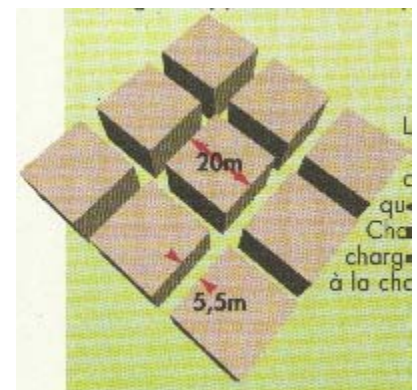


Environmental debate on StocaMine

(according to Décision Environnement 54, Mars1997) :

An environment defence association, "Alsace Nature" was opposed to the project, owing to some preoccupation :

- possible communication with water layers (there is a superficial water layer 600 m up, and another much deeper water layer). Studies done by L'Ecole des Mines de Paris" admit that a communication could be possible through plugged wells and permeable ground.
- This possibility of storage may discourage attempts to recycle or minimize wastes
- Reversibility of storage may not be really assured.



Sources : Direct mail [E9], www.groupe-emc.com/actu9002.htm.

Current practices in Scandinavian countries

(according to E mail from Unni Musdalslien, 3 nov 1999 [E7]:

1. Denmark

Landfill disposal is limited to treated waste. Therefore from 1997 untreated MSW may not be landfilled.

Bottom ash is permitted to be recycled as construction materials, dependent of concentration of heavy metals.

Fly ash must be disposed off to a monocell within a hazardous waste landfill. This is officially regarded as temporary storage until an effective long-term solution is found.

Fly ash from Denmark, approximately 10 ktons (metric tonnes) in the first half of 1998, have been disposed off at Langøya in Norway.

APC residues are presently being collected, and will be treated when an appropriate treatment process is available.

2. Sweden

There is no consensus yet over whether the recycling of bottom ash is appropriate or not and what applications, apart from daily cover at landfill, are acceptable. Fly ash and scrubber residue are regarded as hazardous and landfilled.

Due to easily leachable contaminants in fly ash and APC residues (heavy metals and chlorides), Statens Naturvårdsverk recommends that these wastes should be stabilized with cement or other methods prior to landfilling.

3. Norway

Fly ash and scrubber residue are disposed off at Langøya (information from NOAH, Norwegian Company for waste treatment, 1999-02-05).

Regulations and laws

International transport of waste is regulated through Council Regulation (EEC) No 259/93 and the Basel-convention ensuring that permission for import or export is given. In addition there is a Norwegian law dated December 30, 1994 No 1231 with reference to Council Regulation (EEC) No 25/9/93.

However, fly ash and APC residue are used to neutralise waste acids at Langøya in Norway, and in this way replace limestone. According to NOAH Norwegian Company for waste treatment, 1999-02-05) this reduces the emissions of CO₂.

Norway disposal site in Langøya

(according to information given by NOAH, Norsk AVFALLSHANDTERING AS - fax from Mr. Lindemann, [E6]).

Langøya (Long Island) is a hollow island in the Oslofjord. Nearly 50 Million ton of limestone was excavated in the years 1899 - 1985 as raw material to a cement factory. The cement factory was closed down in 1985, and the island at that time had two open craters going down to 50 meters below sea level. The island is water tight. NOAH now owns and operates a chemical factory which receives nearly all types of inorganic hazardous waste which is neutralized and chemically stabilized. The end products are stored in the interior of the island, and excess process water and rain water is pumped to the fjord under full control. The total annual quantities received are now around 300,000 tons and increasing.

Fly ash from incineration of municipal waste have been treated since 1996, and we are now receiving nearly 40.000 tons per year, mainly from Norway and Denmark, but other countries have shown considerable interest. NOAH present treating capacity for this material is 100.000 tons per year. The fly ash is received either moist in bulk or dry in big bags. Ships with capacity up to 2000 tons can be received.

The fly ash is chemically treated, and not only stored. NOAH takes the full responsibility for the material when received. There is therefore no future liability to the original producer of the fly ash.

The Norwegian authorities have put strict regulations on the activities at Langøya. The fly ash is analyzed before any contract is signed. The fly ash must contain maximum **8 ppm EOCI** and maximum **20 ppm PAH**. Remains of other chemicals are normally easy to take care of.

All fly ash contains alkalies, and this is of value to NOAH because most of the wastes received are acid. We therefore have to excavate some 70.000 tons limestone from the island each year. Fly ash reduces the requirements for this limestone. All the waste deposits are slowly converting the island to almost the original shape. These facts should be taken into account when our alternative is evaluated.

The price for treating fly ash at Langøya depends on the types and quantities in question. We consider ourselves to be quite competitive with the prices to German salt mines.

Permission to export/import must of course be obtained from the authorities in both the country of origin and in Norway. The key to this is the attitude in the export country. If the deciding office is positive and consider the Norwegian alternative to be good, then the rest is easy.

Comments and facts on Langøya center

- EOCI (maximum content in Cl) : Content in leachable organic Chlorine. *Organic Chloride ≠ mineral Chloride (no problem for mineral salt such as NaCl and KCl) (but leachability still high?).*

- annual quantities of wastes : 300 000 tons.
- annual quantities of fly ashes from MSWI : 40 000 tons (capacity 100 000 tons).
- Origin of fly ashes : mainly from Norway and Denmark
- Prices : "quite competitive with German mines prices".
- Use of "salt" APC residues ? : Perhaps Langøya uses only APC from dry treatment (common flue gas treatment in Norway), APC residues having low leachability and high neutralization (basic) characteristics.
- Classification of the centre ? : considered as ultimate waste disposal site

Additional comments

From further contacts of Mrs Musdalslien with the Environmental Authorities in Norway and also NOAH [E10] :

1. The disposal at Langøya is regarded to be classified as ultimate disposal
2. The residues, fly ash and APC, are mixed with sulphuric acid making a chemical stable mixture with no or minimal leakage of heavy metals
3. NOAH is operated according to the permits given by the Environmental Authorities in Norway (given in 1995 and 1997). These permits are available in Norwegian (obtained from the Environmental Authorities).
4. The permits include limits for aqueous and gaseous effluents. The limits for aqueous effluents are given for 13 metals, CN, N, EOCI and PAH. For the gaseous effluents limits are given only for dust. Limits are given for the effluents and parameters regarded to have the greatest environmental consequences. Furthermore, NOAH must survey the surroundings for any effect of the activity at Langøya.
5. The regulations should be based on existing EU regulation, although this is not said.
The April 1999 EU landfill directive is currently being incorporated in the Norwegian regulations.
Thus, the permits are not yet based on this directive.
6. NOAH has never rejected any waste based on the limits for EOCI and PAH.

Annexe 3

REGULATIONS AND LAWS

Legal Principles of Waste Disposal in France

(from www.ax-montpellier.fr/crlp/99/99en1090.html)

La décharge a été souvent l'exutoire de beaucoup de déchets. Mais, à compter du 1er juillet 2002, les installations d'élimination des déchets par stockage ne seront utilisées que pour accueillir des déchets ultimes.

Jusque dans les années 70, les décharges n'étaient soumises à aucune réglementation. Chaque commune disposait d'un lieu de dépôt ou d'incinération des déchets.

A partir de 1975 et de 1976, la mise en oeuvre de la réglementation a permis la résorption de nombreux dépôts sauvages et la mise en conformité d'usines d'incinération et de décharges.

Néanmoins, en 1993, une grande part des *déchets ménagers* finissait toujours en décharge et des dépôts et décharges sauvages existaient encore.

Aussi, une nouvelle réglementation a été mise en place.

Elle fixe comme échéance le 1er juillet 2002, date à laquelle les installations d'élimination des déchets par stockage ne seront autorisées à accueillir que des déchets ultimes, à savoir des déchets résultant ou non du traitement des déchets, qui ne sont plus susceptibles d'être traités dans les conditions techniques et économiques du moment, notamment par extraction de la part valorisable ou par réduction de son caractère polluant ou dangereux.

Suivant la nature de leur toxicité, les déchets ultimes seront stockés dans des centres différents.

Ainsi, les résidus d'épuration des fumées d'incinération des déchets ménagers et assimilés étant toxiques, ils sont déjà stockés au même titre que les résidus d'épuration des fumées d'incinération de déchets industriels dans des centres de stockage de *déchets industriels* spéciaux après stabilisation et solidification.

Par contre, pour les mâchefers non valorisés, ils sont stockés dans des décharges de déchets ménagers.

À ce jour, il existe trois catégories de décharges, définies suivant la nature et l'imperméabilité du sol d'accueil :

- les décharges de classe 1 où sont stockés certains déchets industriels spéciaux après stabilisation et solidification ;
- les décharges de classe 2 de déchets ménagers assimilés ;
- les décharges de classe 3 de déchets inertes (déblais et gravats non souillés).

La décharge doit être considérée comme une installation d'élimination de déchets soumise à une réglementation stricte qui impose notamment les principes suivants.

- Des contraintes géologiques (imperméabilité du sol) et hydrogéologiques qui vont aboutir à l'acceptation ou non du site.
- Des contrôles à l'entrée des déchets.
- La collecte et le traitement des eaux de lixiviation. Les eaux de pluie percolent en effet les déchets, entraînant lors de leur passage des matières diverses, organiques, salines et toxiques (métaux lourds, hydrocarbures...). Ces eaux sont traitées de la même façon que les eaux usées domestiques, in situ ou dans des stations d'épuration.
- La collecte et le traitement du biogaz émis. Au cours de leur fermentation, les déchets organiques

se transforment et libèrent ainsi divers gaz, principalement CO₂, CH₄, N₂, O₂, H₂S et autres mercaptans qu'il faut absolument récupérer par drainage et traiter (valorisation énergétique ou brûlage en torchère).

- Une méthode d'exploitation (travail en casiers avec étanchéification et drainage en vue de la récupération des eaux de lixiviation*, compactage et recouvrement des déchets, collecte et dérivation des eaux de ruissellement). L'objectif majeur est qu'il y ait le moins d'eau possible au contact du déchet, déjà riche en eau.
- Des contrôles de l'impact de la décharge sur l'environnement (analyses des eaux des piézomètres** mis en place autour de la décharge, des puits existants, des eaux souterraines, des eaux superficielles).
- Des dispositions pour la remise en état du site et le suivi du centre de stockage par l'exploitant après exploitation (traitement des effluents, sécurité et surveillance de l'air et des eaux superficielles et souterraines).

L'objectif de ces prochaines années c'est bien de ne stocker que des déchets ultimes, suivant des conditions d'exploitation et de post-exploitation beaucoup plus strictes et contraignantes.

* lixiviat : "jus" issu de la percolation des eaux de pluie.

** piézomètre : puits destiné à mesurer le niveau de la nappe d'eau souterraine.

European Community legislation in force on waste

Directory of Community legislation in force

Analytical register

15 - Environnement, consumers and health protection

15.10.30.30 - Waste management and clean technology

Secondary legislation

375L0442

- **Council Directive 75/442/EEC of 15 July 1975 on waste.** *OJ L 194 25.07.75 p.39*

Amended by 1991 - 391L0156 (OJ L 078 26.03.91 p.32)

Amended by 1991 - 391L0692 (OJ L 377 31.12.91 p.48)

Incorporated by 1994 - 294A0103(70) (OJ L 001 03.01.94 p.494)

Amended by 1996 - 396D0350 (OJ L 135 06.06.96 p.32)

Derogation in 1996 - 396L0059 (OJ L 243 24.09.96 p.31)

1976 - 376D0431 - Committee on Waste Management

76/431/EEC: Commission Decision of 21 April 1976 setting up a Committee on Waste Management. *OJ L 115 01.05.76 p.73*

Amended by 179H

Amended by 185I

1989 - 389Y0112 01 - transfrontier movements of hazardous waste to third countries

Council Resolution of 21 December 1988 concerning transfrontier movements of hazardous waste to third countries. *OJ C 009 12.01.89 p.1*

1990 - 390Y0518 01 waste policy

Council Resolution of 7 May 1990 on waste policy. *OJ C 122 18.05.90 p.2*

1991 - 391L0689 hazardous waste

Council Directive 91/689/EEC of 12 December 1991 on hazardous waste. *OJ L 377 31.12.91 p.20*

Amended by 1994 - 394L0031 OJ L 168 02.07.94 p.28)

1993 - 393R0259 - shipment of waste

Council Regulation (EEC) No 259/93 of 1 February 1993 on the supervision and control of shipments of waste within, into and out of the European Community. *OJ L 030 06.02.93 p.1*

Derogation in 194N

Amended by 1994 - 394D0721 (OJ L 288 09.11.94 p.36)

Amended by 1996 - 396D0660 (OJ L 304 27.11.96 p.15)

Amended by 1997 - 397R0120 (OJ L 022 24.01.97 p.14)

Amended by 1998 - 398D0368

Amended by 1998 - 398R2408

1994 - 394D0003 List of waste

94/3/EC: Commission Decision of 20 December 1993 establishing a list of wastes pursuant to Article 1a of Council Directive 75/442/EEC on waste. *OJ L 005 07.01.94 p.15*

1994 - 394D0904 List of hazardous waste

94/904/EC: Council Decision of 22 December 1994 establishing a list of hazardous waste pursuant to Article 1 (4) of Council Directive 91/689/EEC on hazardous waste. *OJ L 356 31.12.94 p.14*

1994 - 394L0067 incineration of hazardous waste

Council Directive 94/67/EC of 16 December 1994 on the incineration of hazardous waste. *OJ L 365 31.12.94 p.34*

1997 - 397D0640 control of transboundary movements of hazardous wastes and their disposal

97/640/EC: Council Decision of 22 September 1997 on the approval, on behalf of the Community, of the amendment to the Convention on the control of transboundary movements of hazardous wastes and their disposal (Basle Convention), as laid down in Decision III/1 of the Conference of the Parties. *OJ L 272 04.10.97 p.45*

1997 - 397Y0311 01 strategy for waste management

Council Resolution of 24 February 1997 on a Community strategy for waste management. *OJ C 076 11.03.97 p.1*

1999 - 399L0031 Landfill of waste

Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste *OCID=1999/1182&P.1*

1999 - 399R1421 shipment of waste

Council Regulation (EC) No 1420/1999 of 29 April 1999 establishing common rules and procedures to apply to shipments to certain non-OECD countries of certain types of waste *OCID=1999/1166&P.*

1999 - 399R1547 shipment of waste

Commission Regulation (EC) No 1547/1999 of 12 July 1999 determining the control procedures under Council Regulation (EEC) No 259/93 to apply to shipments of certain types of waste to certain countries to which OECD Decision C(92)39 final does not apply (Text with EEA relevance) *OCID=1999/1185&P.1*

(Extracted from a list of Text given by europa.eu.int/eur-lex/en/lif/dat/1999/en_399L0031.html, As delivered by CELEX on: 05/11/1999)

Comments on Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste

(see complete text with some arrangements in separate file EC399L0031.doc)

This European Directive directly applies to (art. 1 (f) and (g)) :

- **"underground storage"** : permanent waste storage facility in a deep geological cavity such as a **salt or potassium mine**
- **"landfill"** : waste disposal site for the deposit of the waste onto or **into land** (i.e. **underground**), excluding sites for treatment and temporary storage (< 3 year) before recovery, but including
 - internal waste disposal sites (i.e. landfill where a producer of waste is carrying out its own waste disposal at the place of production),
 - permanent site (i.e. > 1 year) which is used for temporary storage of waste,

On the question of use of dangerous wastes for mine-filling :

- the law applies to landfilling or underground practices, but doesn't give a clear definition which can exclude or include "mine-filling" : if it can be considered as a "recovery" or "recycling" practice, the law would not apply.
- **"mine-filling"** is not even spoken of in a way or another : no reference.
- **salt mine** is found in the above definition for *underground storage* only. No other reference.
- It is up to a committee to define specific criteria and/or test methods and associated limit values for landfilling or underground practices (art.16 + Annex II.1) (before 2 years)
- certain hazardous waste can be accepted in landfills for non-hazardous waste : acceptance criteria should be developed by the technical committee (foreword(22) + Annex II.1)
- **"underground storage"** can be exempted by Member States from some obligations (art. 3.5), concerning mainly analysis of gas, water protection and monitoring. (For salt mines, this appears to be technically logic : there is no water and leachates)

This law must be brought into force by each State Member within **2 years**, and existing landfilling sites (art. 14) have to be adapted within **8 years** after that, **i.e. < 2009 at the latest**, or else must close.

Conclusion : Mine-filling may continue in the future either if :

- if it is accepted as a "recovery" practice and not as landfilling.
But how could such a practice avoid to apply the same rules as deep mine storage? If the waste are used in the same manner, they should apply at least the same criteria for avoiding environment possible nuisances (waste analysis, particular stabilisation, leaching tests for coal mines, book-keeping,...). This could be obliged by a future (hypothetical ?) law about "safe recovery practice", or by general principles concerning the waste handling.
- it applies the same rule as landfilling or underground storage.
This can be difficult for it obliges the operator to follow more strict control and a to keep a register of waste type and location in the mine (art.11). Reversibility of the storage is not required. Costs must include a provision (financial security) for a long time period of after-care.
- It could match future criteria (to be defined by a technical Committee) for "certain hazardous waste to be accepted in landfills for non-hazardous".

Basic principles for Waste Handling in Germany

(Extracts from: Act for Promoting Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Waste Disposal [D1])

(Gesetz zur Foerderung der Kreislaufwirtschaft und Sicherung der umweltvertraeglichen Beseitigung von Abfaellen (Kreislaufwirtschafts und Abfallgesetz))

(complete text available in English, German text can be read on the Web)

The following extracts have been chosen in relation with mining activities :

" (art 2 §4) **The provisions of this Act do not apply to...**" waste occurring from prospecting, extraction, preparation, treatment, and processing of mineral resources in facilities subject to mining, inspection, except for waste not occurring directly and normally only in connection with the activities listed in the first half of this provision".

Art. 28 Execution of Disposal. (3) The party holding extraction rights for, or the entrepreneur of, a mineral-extraction operation, as well as the titleholder or owner of land used for mineral extraction, or party otherwise authorised to dispose over such land, can be obligated by the competent authority to tolerate disposal of waste in exposed tunnels in his facility, or on his land, to permit access and, to the extent that this is required, to make available existing facility equipment or facilities, or portions thereof. The party responsible for the disposal must reimburse the relevant party for incurred costs resulting from such use. The competent authority shall determine the content of this obligation. The priority of mineral extraction over waste management shall not be affected. The party required to tolerate such use shall not be liable for damage resulting from the waste disposal.

Annex IIA Disposal Procedures.

This Annex lists disposal procedures that are used in practice.

Pursuant to Article 4 of Council Directive 75/442/EEC of 25 July 1975 on waste (OJ EC No. L 194 p. 39), amended by Directive 91/156/EEC (OJ EC No. L 78 p. 32), most recently amended by Directive 91/692/EEC (OJ EC No. L 377 p. 48), waste must be disposed of by means that do not endanger human health and that do not employ procedures or methods that could damage the environment.

- D1 Deposition in or on the ground (i.e. dump sites etc.)
- D2 Treatment in the ground (for example, biological decomposition of liquid or sludgy waste in the ground, etc.)
- D3 Pressing (for example, pressing pumpable waste into bore holes, salt caverns or natural cavities, etc.)
- D12 Permanent storage (for example, storage of containers in a mine, etc.)
- D13 Mixing prior to application of one of the procedures described in this Annex
- D14 Reconditioning prior to application of one of the procedures described in this Annex

- D15 Storage until one of the procedures described in this Annex is applied (interim storage), except for temporary storage - until collection - on the site at which the waste is generated

Call for end to disposal in German mines

(article from HAZNEWS N°133, April 1999, p.7)

(given by Vestolit)

The German Association of State Hazardous Waste Management Companies (Arbeitsgemeinschaft der Sonderabfall-Entsorgungsgesellschaften der Länder, AGS), has called for the new German Environment Minister, Jürgen Trittin, to introduce federal regulations controlling the disposal of hazardous waste in mines. AGS spokesman, Jörg Rüdiger, says that the industry should not wait for the opinion of the European Commission, which categorizes mine back-filling as a disposal process, to be implemented at national level.

A change to the current federal waste law was required, said Herr Rüdiger, to exclude hazardous wastes from back-filling and set binding limits on hazardous substances. Furthermore, these limits should be applied before the mixing of back-fill in order to end the practice of diluting hazardous wastes, reports *Entsorga-Magazin*. In 1998, hazardous wastes firms in Bavaria called on the German Government to end hazardous waste disposal in mines in eastern Germany (see Haznews, April 1998, p.4).

Other articles, in German :

- Versatz von Mischkunststoffabfall unter Tage ist keine Verwertung. Umweltwirtschaft Re. Nr.49 v.10.12.1998 p5.
- AGS für nationale Verordnung zum Bergversatz von Abfällen. Umweltwirtschaft Re. Nr.49 v.10.12.1998 p5.
- Umweltministerium weist Vorwurf zum Versatz von Abfällen Zurück Re. Nr.33 cv.17.08.1999.
- Sondermüll : Streit um Bergversatz, UTA 1/IX/99, Seite 4 - 5.
- Brüssel will Kritik an Bergversatz mit Entschiedenheit verteidigen, EUWID Recycling & Entsorgung 7.09.1999,nr36.
- Bundesverordnung zum Bergversatz in Arbeit. Umweltpolitik Re Nr40 v05.10.1999.
- GSES darf Abfall unter Tage verbringen, Umweltwirtschaft Re nr43 v26.10.1999.

Kurzfassung: Bergversatz

1. Einleitung

In der Bundesrepublik Deutschland werden ca. **800.000 Tonnen Abfälle pro Jahr** in stillgelegten Bergwerken ohne abfallrechtliche Deponiezulassung mit dem Ziel der Bergbausicherung und – rekultivierung entsorgt (sog. Bergversatz). Ende August 1999 hat die **Kommission** ein **Vertragsverletzungsverfahren gegen die Bundesrepublik Deutschland** eingeleitet. Die Kommission rügt darin die von der Bundesrepublik Deutschland vertretene Ansicht, bei Bergversatz handele es sich um eine Verwertungs- und nicht um eine Beseitigungsmaßnahme.

2. Regelung des Bergversatzes nach EG-Recht

a) Abfallrahmenrichtlinie

Die Europäische Kommission¹ vertritt die Ansicht, daß Bergversatz als **Beseitigungsmaßnahme im Sinne des Anhang II A** der Abfallrahmenrichtlinie² anzusehen ist

D 1 Ablagerungen in oder auf dem Boden (z.B. Deponien usw.)

D 3 Verpressung (z.B. Verpressung pumpfähiger Abfälle in Bohrlöcher, Salzdome oder natürliche Holz-(richtig wohl: „Hohl-,“)räume usw.)

D 12 Dauerlagerung (z.B. Lagerung von Behältern in einem Bergwerk usw.)

Bergwerke, in denen Abfälle dauerhaft gelagert werden, bedürfen damit der **abfallrechtlichen Genehmigung** (Art. 9 Abs. 1 der Abfallrahmenrichtlinie).

b) Richtlinie über Abfalldeponien

Die Richtlinie 1999/31/EG über Abfalldeponien³ **ergänzt die Abfallrahmenrichtlinie um spezifische Anforderungen** an die besondere Beseitigungsart „Deponierung“.

Der Anwendungsbereich der Richtlinie 1999/31/EG umfaßt alle **Deponien** gemäß Art. 2 lit. g), d.h. jede „**Abfallbeseitigungsanlage für die Ablagerung von Abfällen oberhalb oder unterhalb der Erdoberfläche (d.h. unter Tage), ...**“.

Die Richtlinie findet **keine Anwendung** auf „**die Verwendung von geeigneten Inertabfällen für landschaftspflegerische Arbeiten/ Rekultivierungen und für Auffüllungen oder bauliche Zwecke in Deponien**“ (Art. 3 Abs. 2).

c) Richtlinie über die Umweltverträglichkeitsprüfung

Die allgemeinen Regeln für die Abfallbewirtschaftung gelten auch für die Entsorgung gefährlicher Abfälle. Die ordnungsgemäße **Beseitigung gefährlicher Abfälle** erfordert jedoch zum Teil **zusätzliche, strengere Regeln**, die den Besonderheiten dieser Art von Abfällen Rechnung tragen.

¹ Siehe etwa Krämer, EG-rechtliche Rahmenbedingungen in der Abfallwirtschaft, in: Münsteraner Schriften zur Abfallwirtschaft, Bd. 2, Februar 1999, S. 33, 36.

² Richtlinie des Rates vom 15. Juli 1975 über Abfälle (75/442/EWG), ABl. Nr. L 194 vom 25.7.1975, S. 47, geändert durch die Richtlinie des Rates vom 18. März 1991 zur Änderung der Richtlinie 75/442/EWG über Abfälle (91/156/EWG), ABl. Nr. L 78 vom 26.3.1991, S. 32.

³ Richtlinie 1999/31/EG des Rates vom 26. April 1999 über Abfalldeponien, ABl. Nr. L 182 vom 16.7.1999, S. 1.

Abfallbeseitigungsanlagen zur Deponierung gefährlicher Abfälle bedürfen **neben der abfallrechtlichen Genehmigung** einer **Umweltverträglichkeitsprüfung** im Sinne der Richtlinie 85/337/EWG⁴.

3. *Regelung des Bergversatzes nach dem deutschen Recht*

a) *Anwendungsbereich*

Das Kreislaufwirtschafts- und Abfallgesetz **gilt für** die Vermeidung, **Verwertung und Beseitigung** von Abfällen (§ 2 Abs. 1 KrW-/AbfG).

Vom Anwendungsbereich des Kreislaufwirtschafts- und Abfallgesetzes **ausgenommen sind** unter anderem Abfälle, die beim Aufsuchen, Gewinnen, Aufbereiten und Weiterverarbeiten von Bodenschätzen **in den der Bergaufsicht unterstehenden Betrieben anfallen, ausgenommen Abfälle, die nicht unmittelbar** und nicht üblicherweise nur bei den im 1. Halbsatz genannten Tätigkeiten anfallen (§ 2 Abs. 2 Nr. 4 KrW-/AbfG). Das Kreislaufwirtschafts- und Abfallgesetz gilt damit beispielsweise nicht für Rückstandssalze⁵.

b) *Abfallbegriff*

Das Kreislaufwirtschafts- und Abfallgesetzes differenziert zwischen „**Abfällen zur Verwertung**“ und „**Abfällen zur Beseitigung**“.

c) *Abfallbeseitigung oder Abfallverwertung?*

Obwohl die Anhänge II A und B des Kreislaufwirtschafts- und Abfallgesetzes die Anhänge der Abfallrahmenrichtlinie (fast) **wörtlich übernehmen**, wird der Bergversatz in der Bundesrepublik Deutschland in der Regel **nicht als Beseitigung, sondern als Verwertungsmaßnahme** im Sinne des Anhangs II B angesehen.

(1) *Argument aus § 7 Abs. 1 und Abs. 2 KrW-/AbfG*

Aus **§ 7 Abs. 1 i.V.m. Abs. 2 KrW-/AbfG** läßt sich – zumindest indirekt – herleiten, daß Bergversatz auch ein Abfallverwertungsverfahren im Sinne des Kreislaufwirtschafts- und Abfallgesetzes sein kann.

Art. 7 Abs. 1 KrW-/AbfG ermächtigt nämlich die Bundesregierung zum **Erlaß von Rechtsverordnungen**, soweit es „zur *Sicherung der schadlosen Verwertung*“ erforderlich ist.

§ 7 Abs. 2 KrW-/AbfG ergänzt hierzu, daß durch diese Rechtsverordnungen stoffliche Anforderungen festgelegt werden können, wenn „*Abfälle in der Bergaufsicht unterstehenden Betrieben aus bergtechnischen oder bergsicherheitlichen Gründen*“ eingesetzt werden.

(2) *Argument aus § 4 Abs. 3 S. 2 KrW-/AbfG*

Ein weiteres Argument für die mögliche Klassifizierung des Bergversatzes als Verwertung kann aus § 4 Abs. 3 S. 2 KrW-/AbfG hergeleitet werden. Danach ist eine stoffliche Verwertung gegeben, „*wenn nach einer wirtschaftlichen Betrachtungsweise, unter Berücksichtigung der im einzelnen*

⁴ Richtlinie 85/337/EWG des Rates vom 27. Juni 1985 über die Umweltverträglichkeitsprüfung bei bestimmten öffentlichen und privaten Projekten, ABl. Nr. L 175 vom 5.7.1985, S. 40; berichtigt in ABl. Nr. L 216 vom 3.8.1991, S. 40.

⁵ Kloepfer, Umweltrecht, 2. Aufl. München 1998, § 10 Rn. 109 m.w.N.

Abfall bestehenden Verunreinigungen, der Hauptzweck der Maßnahme in der Nutzung des Abfalls und nicht in der Beseitigung des Schadstoffpotentials liegt“.

(3) Anlagenbezogene Zulassungserfordernisse

Während **Beseitigungsanlagen** eines **Genehmigungsverfahrens mit Öffentlichkeitsbeteiligung und unter Durchführung einer Umweltverträglichkeitsprüfung** bedürfen (§ 27 KrW-/AbfG, 31 Abs. 2 KrW-/AbfG), sieht das KrW-/AbfG für Verwertungsanlagen keinerlei Zulassungserfordernisse vor.

Die **Zulassung von Verwertungsanlagen richtet sich nach den Zulassungsvorschriften, die für die jeweilige Anlage**, in der verwertet werden soll, gelten. Für Bergwerke sind dies die Vorschriften des **Bundesberggesetzes**⁶. Danach muß die Verfüllung lediglich nach den Grundsätzen des **Betriebsplanverfahrens** genehmigt werden. Dieses Verfahren sieht in der Regel weder eine Öffentlichkeitsbeteiligung noch eine Umweltverträglichkeitsprüfung vor.

4. Verhältnis zwischen Europäischem Recht und deutschem Recht

a) Pflicht zur ordnungsgemäßen Umsetzung einer EG-Richtlinie

Im Gegensatz zu EG-Verordnungen gelten EG-Richtlinien nicht unmittelbar in jedem Mitgliedstaat (vgl. Art. 249 EGV = Art. 189 EGV a.F.). EG-Richtlinien bedürfen vielmehr der **Umsetzung in nationales Recht**. Die Mitgliedstaaten sind daher verpflichtet, alle erforderlichen Maßnahmen zu ergreifen, um die vollständige Wirksamkeit der Richtlinie entsprechend ihrer Zielsetzung zu gewährleisten (vgl. Art. 249 Abs. 3 EGV und Art. 10 EGV = Art. 5 EGV a.F.). Mit anderen Worten: **der deutsche Gesetzgeber ist verpflichtet, die in der Abfallrahmenrichtlinie verankerten Rechtssätze in nationales Recht umzusetzen** und die deutschen Regelungen so anzuwenden und auszulegen, daß sie im Einklang mit den europarechtlichen Vorgaben stehen.

b) Einleitung eines Vertragsverletzungsverfahrens gemäß Art. 226 EGV (= Art. 169 EGV a.F.)

Die **Abfallrahmenrichtlinie wurde durch das Kreislaufwirtschafts- und Abfallgesetz umgesetzt**. Die Kommission ist der Ansicht, daß §§ 7 und 4 des Kreislaufwirtschafts- und Abfallgesetzes **mit der Abfallrahmenrichtlinie nicht vereinbar** seien. Sie hat daher ein **Vertragsverletzungsverfahren gegen die Bundesrepublik Deutschland eingeleitet**.

CK: This paper was prepared by Dr Barara Breuer for a speech given by M.Joachim Eckstein. Text firstly obtained from Dr. Bühl (fax 22 oct 1999), file given by Dr. Barbara Breuer (mail 20 dec 99).

⁶ BGBl. 1980 I, S. 1310.

EXPLANATION OF EUROPEAN COMMISSION INFRINGEMENT PROCEEDINGS FOR NON-COMPLIANCE WITH COMMUNITY LAW

MEMO/99/57 Brussels, 16 November 1999

Principles

Each Member State is responsible for the implementation of Community law (adoption of implementing measures before a specified deadline, conformity and correct application) within its own legal system. Under the Treaties, the European Commission is responsible for ensuring that Community law is correctly applied. Consequently, where a Member State fails to comply with Community law, the Commission has powers of its own (action for non-compliance) to try to bring the infringement to an end and, where necessary, may refer the case to the European Court of Justice. The Commission takes whatever action it deems appropriate in response to either a complaint or indications of infringements which it detects itself.

Non-compliance means failure by a Member State to fulfil its obligations under Community law. It may consist either of action or omission. The term State is taken to mean the Member State which infringes Community law, irrespective of the authority - central, regional or local - to which the compliance is attributable.

Admissibility of complaints

Anyone may lodge a complaint with the Commission against a Member State for any measure (law, regulation or administrative action) or practice attributable to a Member State which they consider incompatible with a provision or a principle of Community law. Complainants do not have to demonstrate a formal interest in bringing proceedings. Neither do they have to prove that they are principally and directly concerned by the infringement complained of. To be admissible, a complaint has to relate to an infringement of Community law by a Member State. It cannot therefore concern a private dispute.

Stages of infringement proceedings

In infringement proceedings, a case may be handled in the following stages:

Information gathering

In response to complaints or after the Commission has on its own initiative become aware of potential violation of Community law, it may be necessary to gather further information to determine the points of facts and of law concerning the case.

Opening of an infringement procedure: formal contacts between the Commission and the Member State concerned

If the Commission considers that there may be an infringement of Community law which warrants the opening of an infringement procedure, it addresses a "letter of formal notice" to the Member State concerned, requesting it to submit its observations by a specified date (the deadline for a response is at the discretion of the Commission it is normally two months but may be one week or less). The Member State has to adopt a position on the points of fact and of law on which the Commission bases its decision to open the infringement procedure.

In the light of the reply or absence of a reply from the Member State concerned, the Commission may decide to address a "reasoned opinion" to the Member State, clearly and definitively setting out the reasons why it considers there to have been an infringement of Community law and calling on the Member State to comply with Community law within a specified period (again, the deadline for a response is at the discretion of the Commission it is normally two months but may be one week or less).

The purpose of these formal contacts is to determine whether there is indeed an infringement of Community law and, if so, to resolve the case as soon as possible without having to take it to the Court of Justice.

In the light of the reply, the Commission may also decide not to proceed with the infringement procedure, for example where the Member State provides credible assurances as to its intention to amend its legislation or administrative practice. Most cases can be resolved in this way.

Referral to the European Court of Justice

If the Member State fails to comply with the reasoned opinion, the Commission may decide to bring the case before the European Court of Justice . On average, it takes about two years for the Court of Justice to rule on cases brought by the Commission.

Judgements of the Court of Justice differ from those of national courts. At the close of the procedure, the Court of Justice delivers a judgement stating whether there has been an infringement. The Court of Justice can neither annul a national provision which is incompatible with Community law, nor force a national administration to respond to the request of an individual, nor order the Member State to pay damages to an individual adversely affected by an infringement of Community law.

It is up to a Member State against which the Court of Justice has given judgement to take whatever measures are necessary to comply with it, particularly to resolve the dispute which gave rise to the procedure. If the Member State does not comply, the Commission may again bring the matter before the Court of Justice seeking to have periodic penalty payments imposed on the Member State until such time as it puts an end to the infringement.

(text obtained from www.euroweb.eu.int/rapid/start/cgi/guesten/ksh?p_action.gettxt=...).

ANNEXE 4

Address list of European Salt Producers Association

(open the following window or see file "euosaltmembers2.doc")

**Members of European Salt Association
(Address list, per country)**

<http://www.eu-salt.com/membres.htm>

Austria

Österreichische Salinen GmbH phone: 43/6132 200 2114
Wirerstrasse10 fax 43/6132 200 4100 or 4414
A-4820 BAD ISCHL e-mail monika.haim@salinen.com

Belgique

Solvay SA phone: 32/2 509 66 58
Chemicals Sector - SBU Salt fax : 32/2 509 65 05
33, rue Prince Albert e-mail michel.brun@solvay.com
B-1050 BRUXELLES jan.vaningen@solvay.com

Denmark

Dansk Salt A/S phone: 45/96 68 78 88
Hadsundvej 17 fax 45/96 68 78 90
DK-9550 MARIA GER e-mail DanskSalt@DanskSalt.dk

France

Compagnie des Salins du Midi et des Salines de l'Est phone: 33/1 49 24 15 00
51, rue d'Anjou fax 33/1 49 24 15.11
F-75008 PARIS

Mines des Potasses d'Alsace / SCPA tél. : 33/03 89 36 36 04
2, Place du Général de Gaulle fax 33/03 89 36 36 98
F-68100 MULHOUSE e-mail : SpecklinG@scpa.fr

Saline d'Einville Tel.: 33/03 83 72 90 03
Route de Maixe fax 33/03 83 72 91 19
F-54370 EINVILLE e-mail saline.deinville@wanadoo.fr

Solvay Sels France phone: 33/1 40 75 84 69
12 cours Albert 1^{er} fax 33/1 53 76 01 04
F-75383 PARIS CEDEX 08 e-mail : Denis.Schwartz@solvay.com

Germany

AKZO Nobel Salz GmbH tel.: 49/ 4141795-100
Postfach 1729 fax: 49/4141 795-190
D-21657 STADE

Kali und Salz GmbH phone: 49/561 301-2236
Geschäftsbereich Salz fax 49/561 301-2286
Postfach 10 20 29 e-mail klaus.neubarth@kalisalz.de
D-34111 KASSEL web-site klaus.baier@kalisalz.de
www.kalisalz.de

Solvay Salz GmbH phone: 49/2803 48-631
Postfach 14 01 40 fax 49/2803 48-630
D-46476 WESEL e-mail dietmar.oetterer@solvay.com

Südsalz GmbH phone: 49/71 36/9 60-1 10
Herr Dr. Ulrich Kowalski fax 49/71 36/9 60-1 19
Saline 5 e-mail doris.eisenbarth@suedsalz.de
D-74177 BAD FRIEDRICHSHALL

Südwestdeutsche Salzwerke AG phone: 49/7131 959-217
Postfach 3161 fax 49/7131 179-071

ADDITIONAL DATA

(on attached files)

German mines

(main underground deposits and recycling sites)

- Südwestdeutsche SalzWerke AG : see file sdsalzwerke.doc
- Kali und Salz GmbH : see file kalisalz.doc or paper copies

Municipal Wastes in Spain

- Spain1.xls