nagra we care

annual report 2007

Foreword

Nagra is one of twelve partner organisations participating in the research projects in the Mont Terri Rock Laboratory.

Hans Issler, President of the Board of Directors

The objective of the Swiss waste producers, who joined together in 1972 to form Nagra, is to construct safe deep geological repositories for all categories of radioactive waste without delay and at reasonable cost. Today, the feasibility of constructing such repositories in Switzerland using currently available technology is well documented and has been recognised by the safety authorities. Switzerland also has suitable host rock formations.

The next step in the process is to select disposal sites. The Federal Government is required to specify the objectives and requirements applying to the site selection procedure in a sectoral plan for deep geological repositories. Nagra's Board of Directors has been involved intensively over the last year in evaluating the proposals made in this connection by the Federal Office of Energy (FOE), the lead authority in the sectoral plan process. Nagra also had the opportunity to submit a detailed response to the FOE as part of the official consultation process on the draft version of the sectoral plan. The purpose of the sectoral plan approach is to ensure that disposal sites are identified and evaluated within the framework of a fair, transparent participatory process. Implementation will be in three stages, with interim milestone decisions being made by the Federal Council, and will culminate in submission of an application for a general licence in accordance with the Nuclear Energy Act. The expectation of the members of the Swiss Parliament is that the Government will move forward with the procedure without delay and will make available the required manpower to ensure this. A parliamentary motion to this effect has already been submitted.

Nagra's role in this process is that of an expert and project planner. At a specified time, Nagra will propose potential siting areas to the authorities based on the selection criteria set out in the sectoral plan. The Board of Directors is fully informed regarding the technical and geological basis for the siting proposals and has also been involved extensively in discussing the content of the sectoral plan and the procedure proposed therein.

With a view to meeting the upcoming challenges, the Board has strengthened its position with the appointment of Peter Zbinden, former Chief Executive Officer of Alptransit Gotthard AG (new railway link through the Alps). Thomas Ernst took over as Chief Executive Officer of Nagra on 1st May.

On behalf of the Board of Directors, I would like to thank Nagra's Executive Board and all Nagra staff for their great and enthusiastic work commitment.

Hans Issler

Thomas Ernst, Chief Executive Officer

Following the approval in 2006 of the "Entsorgungsnachweis Project", which demonstrated the feasibility of disposing of high-level waste in Switzerland, the year 2007 was dominated by activities surrounding the preparation by the Federal Office of Energy of the first strategic part of the sectoral plan for deep geological repositories. The plan defines the boundary conditions applying to the selection of sites for deep geological repositories in Switzerland and was the subject of a broad consultation phase from January to April. Based on the feedback from this consultation, the plan was then revised and submitted again to the federal offices and to a final consultation round by the Cantons. The Federal Council is expected to approve this first part of the sectoral plan in spring 2008, launching the search for disposal sites for high-level and low- and intermediate-level waste within well defined guidelines.

Nagra's efforts in the year of reporting were thus focused on preparing the background for the so-called preliminary orientation according to the sectoral plan. This means that, in stage 1 of the site selection process, planning perimeters defined based on a review of the spatial planning situation and potential geological siting areas that have been evaluated in terms of safety are included in the sectoral plan following a three-month consultation phase. As the representative of the waste producers, it is Nagra's task to propose potential geological siting areas. To consolidate the basis for making these proposals, Nagra was involved during the year in two geothermal borehole projects. The entire geological database was also updated and transferred into digital form.

A further focus of our activities was preparing a waste management programme as required by the Nuclear Energy Act. This will be submitted to the responsible authorities in 2008.

On 1st May 2007, I took up my position as Chief Executive Officer of Nagra, in the firm belief that Switzerland has an obligation to dispose of its radioactive waste permanently and safely within its own borders. Together with my colleagues at Nagra, I am committed to working daily towards solving this challenging task.

I would like to take this opportunity to thank all my co-workers most warmly for their great effort during the year. Their commitment to their work and the technical competence they bring to solving the issues they face have paved the way for meeting the challenges that will arise in the current business year. Without doubt, the most important of these is proposing several potential siting areas for geological repositories to the authorities based on safety criteria. We look forward with anticipation to the next stages in the site selection process, which will extend in the coming years over three phases and will end in submission of an application for a general licence.

Dr. Thomas Ernst

Highlights 2007

January The Federal Office of Energy (FOE) initiates the open consultation process on the third draft of the strategic part of the sectoral plan for deep geological repositories. Public information events are hosted by the authorities in Bern, Lausanne, Zürich and Lottstetten (Germany). The draft plan is open for comment until April (page 10).

January Nagra formulates corporate and divisional objectives and establishes a target-oriented management structure on all levels as the basis for a performance-based remuneration system. At the same time, an efficient IT tool is introduced for project controlling.

June As part of an event focusing on experiencing the geology of Switzerland ("Erlebnis Geologie Schweiz"), Nagra organises visits to the Grimsel Test Site (GTS) for schools and the public on 1st and 2nd June. Throughout the year, around 2000 visitors are welcomed to the GTS.

June Nagra's annual general meeting is held on 12th June in Bern. Michael Plaschy and Peter Zbinden are elected to the Board of Directors (page 33).

June Nagra's roadshow (information tour) visits ten cities in the German-speaking part of Switzerland. The slogan for the tour is "Switzerland has radioactive waste. We are taking care of it. Nagra. Who else". The aim is to make the public more aware of upcoming activities in the waste disposal programme (page 29).

June In the final voting round of the summer session, the members of the Swiss Parliament ratify the new law on the Federal Nuclear Safety Inspectorate (ENSI). From 1st January 2009, HSK will be replaced by this newly established independent body under public law (page 9).

October The International Conference on Geological Repositories (ICGR'07) takes place in Bern from 15th to 17th October and is attended by around 200 participants from 19 countries. Nagra is involved extensively in the organisation of the event (page 27).

November At the beginning of the month, the Cantons receive the revised version of the strategic part of the sectoral plan for final consultation. This version was also sent to the relevant federal offices for comment at the end of September (page 10).

November The geological data from a geothermal borehole at Oftringen are evaluated. The Effingen Beds formation, which is more than 200 metres thick, proves to have a very low hydraulic conductivity. The 719 metre-deep borehole was investigated by Nagra on behalf of NOK.

November An open day is held at the Mont Terri Rock Laboratory on 10th November, with around 300 people taking the opportunity to visit the facility. During 2007, Nagra guides some 1700 visitors through the Laboratory.

November Work begins on the expansion of the Mont Terri Rock Laboratory. Around 170 metres of galleries and 80 metres of niches will be excavated by autumn 2008 (page 23).

Our mandate – our work

"As an established national competence centre in the field of nuclear waste management, our aim is to construct safe deep geological repositories for all categories of radioactive waste arising in Switzerland, without delay and at reasonable cost."

Nagra has been operating its own rock laboratory on the Grimsel pass for more than twenty years.

Our mandate

Radioactive wastes arise in Switzerland from the operation and later decommissioning of the five nuclear power plants and from the use of radioactive materials in various areas of medicine, industry and research (MIR waste). The Nuclear Energy Act of 2003 states that the waste producers are responsible – under the supervision of the federal authorities – for the permanent, safe management and disposal of all categories of radioactive waste. The Federal Government is responsible for MIR waste. With a view to fulfilling this task of safe disposal, the operators of the nuclear power plants and the Federal Government set up Nagra in 1972.

The Nuclear Energy Act, which came into force in February 2005, calls for deep geological disposal for all categories of waste. Two types of repository are planned: one for low- and intermediate-level waste (L/ILW) and one for spent fuel, high-level and long-lived intermediate-level waste (SF/HLW/ILW).

Nagra's role is to provide the scientific and technical basis for implementing safe, long-term management of radioactive wastes. This involves proposing a waste management concept, evaluating the suitability of potential repository sites and preparing concrete projects. Nagra also ensures ongoing inventorying of radioactive materials and advises the waste producers on conditioning of wastes into forms that are suitable for disposal. In order to meet these responsibilities, Nagra has been pursuing a broadly based research and development programme since the mid-seventies. The work is carried out in close collaboration with the Paul Scherrer Institute (PSI, Villigen) and various universities and scientific institutions, both in Switzerland and abroad.

Our work

- Characterisation and ongoing inventorying of radioactive materials as a basis for planning disposal projects; checking waste specifications as part of official waste clearance procedures and as a service to the Members of the Nagra Cooperative.
- Acquisition and evaluation of the field data required for site selection, safety assessment and disposal projects.
- Project studies providing input for designing repository installations and engineered barrier systems, and for planning operating procedures.
- Ongoing analysis of results and data within the context of safety assessment studies and evaluation of information with a view to licensing procedures.
- Development of databases and fine-tuning of the methods used to analyse disposal system behaviour; verification and validation of the data and models used in performance assessment.
- Active participation in international collaborative projects, with the aim of coordinating and optimising planning and development activities.
- Fulfilling responsibilities in the areas of communication and information, in particular keeping the public informed on the current status of disposal programmes and proposals for waste management solutions.
- Providing expert services to third parties.

Developments in 2007

A group of visitors in the Mont Terri Rock Laboratory.

Energy policy, legislation, authorities

Radioactive waste

With a combined output of 3220 MWe, the five nuclear power plants produced around 26.4 billion kWh of electricity in 2007, making a contribution of approximately forty percent to total Swiss electricity production. The annual exchange of fuel elements gives rise to spent fuel for disposal; the operation of the power plants and the use of radioactive materials in the areas of medicine, industry and research also produce low- and intermediate-level waste. An up-to-date overview of waste types and volumes can be found on page 50 of this report.

Swiss Federal Nuclear Safety Inspectorate (ENSI)

On 18th October 2006, the Federal Council passed the draft of the new law on the Federal Nuclear Safety Inspectorate (ENSI). The effect of the legislation will be to make the current Swiss Federal Nuclear Safety Inspectorate (HSK) an organ of the Federal Government under public law, which will be independent of the Federal Office of Energy. The law was approved unanimously by the Council of States on 22nd June 2007 with 42 votes and by the National Council by 183 to 2 votes. The period for calling for a referendum expired with no call on 11th October 2007. ENSI will be managed by the ENSI Council, which is responsible for electing the executive board and defining the strategic objectives. This includes planning the direction of future activities, as well as manpower and resources. As a first step, the provisions applying to the ENSI Council will enter into force on 1st January 2008, with the remainder following one year later on 1st January 2009. This will allow the ENSI Council to prepare the necessary groundwork for the transition from HSK to ENSI. The Federal Commission for the Safety of Nuclear Installations (KSA) will be replaced from 1st January 2008 by the Commission for Nuclear Safety (KNS). As an advisory body to the Federal Government, the Department for the Environment, Transport, Energy and Communications (DETEC) and ENSI, KNS will be responsible for reviewing nuclear safety issues and can prepare expert opinions on ENSI's decisions. The members of the ENSI Council and KNS were appointed by the Federal Council on 17th October.

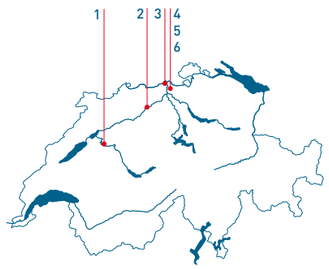
Revision of the Radiation Protection Ordinance

The Federal Council passed the revised Radiation Protection Ordinance on 24th October 2007; it will enter into force on 1st January 2008. Swiss radiation protection legislation is based on the recommendations of the International Commission on Radiological Protection (ICRP).

Decommissioning and waste management funds

The revised ordinance on the decommissioning and waste management funds for nuclear installations was approved by the Federal Council on 7th December 2007 and enters into force on 1st February 2008.

The purpose of the funds is to cover the costs of disposing of operational waste and spent fuel after the decommissioning of the power plants, as well as the costs of decommissioning and dismantling the plants and disposing of the waste arising from these activities. The funds are supervised by the Federal Government. More detailed information can be found on the website www.bfe.admin.ch/entsorgungsfonds.



Nuclear power plants and interim storage facilities
1 NPP Mühleberg
2 NPP Gösgen-Däniken
3 NPP Leibstadt
4 NPP Beznau
5 ZWILAG
6 Federal Government interim storage facility

Legal framework

The legal provisions applying to radioactive waste management are contained in the Nuclear Energy Act and the associated Nuclear Energy Ordinance. Both entered into force on 1st February 2005.

The following principles apply:

- Radioactive materials should be handled in such a way as to minimise waste production.
- Radioactive waste must be disposed of in a way that ensures the long-term protection of man and the environment.
- In principle, radioactive waste arising in Switzerland must be disposed of domestically.
- The duty of disposal lies with the waste producers.
- The selected strategy is monitored deep geological disposal.
- The waste producers are required to produce a waste management programme (Article 32 of the Nuclear Energy Act), which has to be reviewed and approved by the Federal Government.
- The licensing procedures are focused at federal level. The general licence for a nuclear installation is subject to an optional referendum. Participation of the siting Cantons, neighbouring Cantons and neighbouring countries is assured.
- Site selection procedure: the Federal Government has to define the objectives and requirements in a sectoral plan.
- The costs of decommissioning and waste management are to be covered by funds supervised by the Federal Government.

Systematic compilation of federal legislation

An English version of the Nuclear Energy Act can be found in the OECD/NEA Nuclear Law Bulletin, supplement to No. 72 (Switzerland, Act on Nuclear Energy), 2003.

The Nuclear Energy Ordinance has also been translated into English by the Federal Office of Energy.

The cost estimates on which payments made by the facility operators into the funds are based are reviewed periodically. Nagra reviewed the estimates for geological disposal in 2006 on behalf of the power plant operators and handed the information over to the operators for their approval. The updated estimate was approved by the authorities in 2007.

Sectoral plan for deep geological repositories

Article 5 of the Nuclear Energy Ordinance requires the objectives and criteria for the disposal of radioactive waste in deep geological repositories to be specified by the Federal Government in a sectoral plan. The sectoral plan approach is designed to ensure integrated coordination of all spatial planning impacts of a geological repository in a potential siting region and to ensure timely involvement in the siting procedure of the affected Cantons, communities and authorities of neighbouring countries, as well as the affected public and other interested organisations. At the end of 2004, the Federal Office of Energy (FOE) was requested by the Federal Government to prepare the necessary background for the sectoral plan procedure. The plan consists of two parts: a strategic part and an implementation part with fact-sheets for potential siting regions. The procedures and criteria to be followed in site selection are specified in the strategic part, while the fact-sheets of the implementation part will be used to record the results of the stepwise siting process.

In 2006, the first two drafts of the strategic part of the plan were subjected to a wide consultation and participation phase involving the Cantons, interested federal offices, neighbouring countries, organisations, political parties and representatives of the general public. A third draft was prepared based on the feedback from these consultation exercises and was submitted to a formal hearing phase from the middle of January until 20th April 2007. The hearing phase was accompanied by information events for the public; these were organised by the Federal Office of Energy on 15th January in Bern, 22nd January in Lausanne and 29th January in Zürich. On the invitation of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), a similar event was held in the German community of Lottstetten.

Authorities from Switzerland, Austria and Germany and representatives of Cantons and Swiss organisations made good use of the opportunity to express their views on the draft plan, with around 150 responses being received (125 from Switzerland, 22 from Germany and 3 from Austria). A further 10,600 responses, mainly in the form of joint petitions, were received from individual persons. After further reworking and internal consultation with the responsible federal offices, the Cantons then had a further opportunity, based on the Spatial Planning Act, to give their final views on the draft sectoral plan from November 2007 up to the end of the year.

Report of the International Energy Agency on Swiss energy policy

On 26th November 2007, a report of the International Energy Agency (IEA) documenting an in-depth review of Swiss energy policy after 2003 was presented in Bern. Regarding waste management, the IEA recommends the Federal Government to maintain its lead role in the site selection process and construction of a repository for high-level waste and to move the process forward efficiently and without unnecessary delay.

Preparations for the waste management programme in accordance with the Nuclear Energy Act

Article 32 of the Nuclear Energy Act calls for a waste management programme to be prepared by the waste producers for all waste types. The programme will be reviewed by the federal authorities and approved by the Federal Council. Together with the sectoral plan, the programme will provide a sound basis for deciding on the way forward in the Swiss waste management programme and securing the necessary political support. Article 52 of the Nuclear Energy Ordinance requires the waste management programme to provide information on waste types and volumes, interim storage facilities, geological repositories and plans for their realisation.

Nagra has been requested by the waste producers to prepare the programme, based largely on the decision of the Federal Council on the Entsorgungsnachweis project, the specification of the site selection procedure in the sectoral plan and input from the 2006 cost study (see page 24). Nagra continued with its preparations in 2007 and is ready to submit the programme to the authorities in 2008.

Inventory of radioactive materials

A centralised inventory of all radioactive wastes is maintained by Nagra.

Background image: ammonite "Leioceras opalinum" in Opalinus Clay.

Transport of radioactive waste in Switzerland has been ongoing for many years without any accidents. The photograph shows waste destined for the interim storage facility being loaded from rail to road in Würenlingen.

Nagra continued to maintain a centralised inventory of existing radioactive wastes and materials, which was updated to include waste packages produced in 2007. The inventory includes all waste packages and fuel elements in containers currently stored at the nuclear power plants, in ZWILAG and in the Federal Government's interim storage facility At all times, it provides a complete overview of all wastes and materials stored in Switzerland.

The Model Inventory of Radioactive Materials (MIRAM) was developed further. All data from the centralised inventory of existing wastes were taken over into MIRAM and the waste type classification adapted in accordance with the waste categories specified in the current legislation. The inventories and data in MIRAM represent important input for the waste management programme and the sectoral plan procedure. The tool is used to determine volumes and inventories of waste and materials that will arise in the future (see page 51).

Key research and development work on conditioning of waste products was carried out at the Paul Scherrer Institute (PSI). One important aspect of this is quality control of the waste products from the plasma furnace at ZWILAG. Together with PSI, all the procedures for checking waste products were brought up to state of the art and will be integrated into the corresponding guideline of the authorities.

Inventories were determined and packaging concepts developed for strongly activated components from the reactors of the nuclear power plants Gösgen and Leibstadt and a first conditioning campaign was successfully completed. In parallel, a project on detailed 3D modelling of activation processes continued; this integrates results from measurements made at the Gundremmigen power plant in Germany.

Contract work included a further project on preparation of an inventory for waste from CERN; this runs until the end of 2008.

During the year, waste certification procedures were again carried out for waste from the power plants and PSI. For the power plants, the procedures for reprocessing waste from Sellafield Ltd. (previously BNFL) and Areva NP (previously Cogema) should be mentioned as these wastes will be transported back to Switzerland in the coming years. In terms of research waste, the focus was on the certification procedure for the waste from the Megapie project at PSI.

Once again, the work described above was carried out in close collaboration with the waste producers. They ensure that the conditioning and characterisation of Swiss radioactive waste fulfil the requirements set out by the regulatory authorities and are carried out in accordance with internationally recognised standards.

Sectoral plan procedure

The site selection process – from how to where

In June 2006, the Federal Council approved the demonstration of disposal feasibility for high-level waste (HLW). Such a demonstration had already been made successfully in 1988 for low- and intermediate-level waste (L/ILW). The fundamental question of how to implement safe disposal of all radioactive waste types in Switzerland in deep repositories has thus been answered. In the stepwise process leading to disposal, the question now is where the required repositories should be constructed; the Federal Council has decided that this question is to be addressed as part of a federal sectoral plan process. The authorities will define the site selection process and the associated criteria for both L/ILW and HLW in a sectoral plan for deep geological repositories. When selecting sites, safety criteria continue to be assigned top priority, although spatial planning and socio-economic aspects are also taken into consideration.

With the requirements relating to procedure and criteria becoming more clear in the strategic part of the sectoral plan, Nagra's activities during the year focused mainly on the geological and technical background. Information on waste properties and volumes, technical containment concepts and safety-relevant properties of potential host rocks was consolidated and reviewed.

Basis for implementing the new sectoral plan process

Information on the geological structure of the Swiss midlands and the formations that come into question as potential host rocks has been integrated into a Geographic Information System (GIS). This dataset was subjected to a detailed review in 2007 and the original data from numerous 2D seismic profiles from the oil industry in Switzerland were re-evaluated. Work was also completed on a comprehensive databank that includes all borehole and geothermal measurement data. The databank now contains information from more than 6000 boreholes in differing degrees of detail. Where the opportunity arose, Nagra was again involved in investigations being carried out by third parties on the geological structure of Switzerland, for example measurements in geothermal boreholes. During 2007, Nagra was able to obtain data from boreholes at Frauenfeld, Winterthur, Küttigen and Oftringen. These comprehensive databases provide the basis for identifying potentially suitable siting areas for repositories.

Preparation of the design for the disposal caverns and tunnels and technical containment concepts for various rock options is almost complete. As part of the sectoral plan process, the option of constructing caverns for all waste types at one site is being considered. In the late seventies and eighties, the concepts for a L/ILW repository assumed horizontal access to the disposal caverns and, to ensure a sufficient rock overburden, disposal facilities in mountains accessed from the valley floor were foreseen. Today, heavy loads can also be transported via shafts and ramps and the restriction to locations in the Alps, Pre-Alps and the Jura mountains thus no longer applies. This means that, for L/ILW, the geologically less complex areas in northern Switzerland also come into question.

The lead, and hence the responsibility, for the site selection process for deep geological repositories lies with the Federal Government.

Background images pages 15, 22, 26 and 30: Opalinus Clay in the Mont Terri Rock Laboratory.

Information event hosted by the Federal Government.

Preparing to implement siting requirements
Based on the narrowing-down criteria set out in the draft version of the sectoral plan, preliminary work began on selection of potential siting areas and their evaluation. Before the corresponding documentation is handed over to the authorities, all this work will have to be reviewed in the light of the final requirements specified by the Federal Council. In Nagra's opinion, the sectoral plan approach will lead to socially sustainable siting decisions for deep geological repositories in Switzerland.

Technical background

Until a preliminary selection of siting areas has been made, the focus of research within the context of the sectoral plan process will be on expanding and verifying existing information.

Geochemical retention processes and transport mechanisms
Most of the work on characterising geochemical retardation processes and radionuclide transport mechanisms is carried out in collaboration with the Waste Management Laboratory (LES) at PSI, with Nagra contributing fifty percent of the research costs. The investigations are looking at how transport of radionuclides through the engineered and natural barriers is retarded by chemical processes. The focus is on diffusive transport through clay barriers (bentonite and Opalinus Clay) and retention processes in cement, which is the main component of the near-field in L/ILW and ILW repositories. A further important task in 2007 involved preparing a sorption databank for a range of potential host rocks; this will be used in the evaluation of potential siting areas as part of the sectoral plan procedure. The databank takes into account the influence of the chemical composition and mineralogy of the host rocks on radionuclide retention phenomena and provides important input for safety analyses.

HLW programme: Work continued on diffusion and retention (sorption) of radionuclides in bentonite and Opalinus Clay. A key aspect of this was supplementing the long-term migration test DR (diffusion and retention) at Mont Terri with diffusion experiments on a laboratory scale. Mechanistic characterisation of retention processes used various spectroscopic methods, mainly Micro-XAS (X-ray absorption spectroscopy) using the beam line at the Swiss Synchrotron Light Source (SLS) at PSI. New work included studying the microstructure of Opalinus Clay using neutron imaging. The mechanistic description of cation (e.g. caesium) transport in compact clays was further developed. Important information was obtained on the retention of the safety-relevant iodide anion in clay.

L/ILW programme: The cement present in the disposal tunnels of L/ILW and ILW repositories functions as an effective chemical barrier for many radionuclides. The understanding of these retention mechanisms has been improved by wet chemistry and spectroscopic investigations. Some of the work focused on the redox behaviour of specific nuclides such as neptunium. When considering the effectiveness of the cement barrier, it has to be borne in mind that components such as concrete additives can also increase the mobility of certain radionuclides. This aspect is part of a new experiment looking at the influence of various organic additives on nuclide behaviour. A further safety-relevant process is the interaction between cement and clay (bentonite, Opalinus Clay) and investigations of this are being carried out as part of the CI experiment (Cement-Clay Interaction) at the Mont Terri Rock Laboratory.

Technical background: This includes improving the information base and modelling tools used to describe the behaviour of radionuclides in the near-field and host rock of a deep repository and provides input to both the L/ILW and HLW programmes. Work continued on the international thermodynamic databank and new data were included in the Nagra-PSI databank. The software tools for describing the transport and retention of radionuclides were further developed and an international benchmarking project (comparison of calculation codes) was initiated. Molecular-scale modelling continued for clay and cement systems, providing important background for understanding the mechanisms involved in the diffusion of water and ions in electrically charged clays. A statistical method was also developed for identifying uncertainties in geochemical modelling.

Some of these investigations on the retention and transport of radionuclides are carried out as joint projects with other partners within the Sixth Framework Research Programme of the EU.

Engineered waste containment
Thanks to numerous international contacts and strong collaborative efforts, the year of reporting allowed Nagra to obtain further valuable knowledge relevant for designing the engineered barriers. With a view towards upcoming licensing procedures (general, construction and operating licences), the aim of this work is to further optimise the design of the engineered containment measures.

As part of the European Union's Sixth Framework Programme, Nagra is participating in the NF-PRO project, which is aimed at building up an understanding of key processes in the near-field of a deep repository. Nagra's contributions to the project are mainly in the form of sorption investigations on near-field materials (bentonite), characterisation of the hydromechanical evolution of the near-field during the saturation phase and description of the evolution of the excavation damaged zone as the most important component of the transition zone between the engineered and geological barriers. The technical work on the NF-PRO project was completed towards the end of 2007.

Nagra is also involved in a new project which is investigating the radionuclide component released from spent fuel immediately after canister corrosion into the bentonite barrier surrounding the canister. This project is being carried out at PSI together with Nagra's Swedish sister organisation SKB.

The first results are now available from experimental work and model simulations forming part of a study on characterisation of the bentonite granulate Nagra plans to use for a range of applications. They relate to the behaviour of

bentonite under increased temperatures, particularly its swelling capability. An important milestone in understanding coupled thermal, hydraulic and chemical processes in bentonite is provided by the results of an experiment carried out in the Äspö rock laboratory in Sweden (LOT experiment), where a borehole filled with bentonite was heated to a temperature of up to 130 degrees Celsius over a period of five years. A similar experiment is being carried out with alternative backfill materials in another borehole at Äspö.

In order to obtain a better understanding of the build-up of gas pressure and gas transport in the near-field, two new projects were initiated towards the end of the year together with various universities and research institutes. The modelling tools that are being developed describe the coupling of hydro-chemical and hydromechanical processes. Numerical methods are also being developed for determining scale-dependent flow and transport parameters.

Nagra works closely with the Waste Management Laboratory at the Paul Scherrer Institute.

Background image: Electron microscope image of Opalinus Clay (image height approx. 0.015 mm). In the centre, a feldspar crystal can be seen embedded in the clay minerals.

Rock laboratories

Investigations at the Grimsel Test Site.

Background image: Opalinus Clay sample.

Projects at the Grimsel Test Site

CFM Formation and transport of colloids and radionuclides under realistic conditions
1) Laboratory programme, 2) field experiments for characterisation of the experiment site, 3) hydraulic and transport modelling, 4) long-term field experiments.

C-FRS Hydrogeological and geological characterisation of tectonic fracture systems
1) Characterisation and preparation of the test site, 2) test phase: tracer tests, radon measurements, acoustic tomography and resin injection test, 3) overcoring and analysis in the laboratory.

ESDRED (EU project) Use of low-pH cements
1) Filling of a tunnel section with bentonite, 2) sealing installation, 3) monitoring of system behaviour.

FEBEX 1:1 demonstration of the emplacement concept for high-level waste (part of the EU NF-PRO project)
1) Laboratory programme for optimisation of measurement techniques, 2) long-term behaviour of the engineered barrier system under natural conditions.

FUNMIG (EU-Projekt) (EU project) Fundamentals of radionuclide migration
1) Geophysical and hydraulic characterisation of the tunnel near-field, 2) geochemical interactions.

GMT Gas transport through the engineered barriers and surrounding rock (completed in 2006)
1) Laboratory programme, 2) synthesis and modelling.

LCS Long-term interactions between cement solutions, porewaters and rock
1) Development and testing of low-pH cements, 2) testing cement properties, 3) long-term tests on interactions between rock and cement solutions, 4) determining the effects on radionuclide transport (planned).

LTD Long-term diffusion of radionuclides
1) Monopole experiment, 2) dipole experiment, 3) natural tracers, 4) in situ measurement of porosity, 5) radionuclide diffusion processes.

PSG Determination of pore space geometry in the matrix
Field campaign.

TEM Testing of monitoring methods
Comparison of geophysical monitoring methods and wireless data transfer with conventional monitoring techniques.

Grimsel Test Site (GTS)

Nagra has been operating the Grimsel Test Site (GTS) in the Berner Oberland region since 1984. Thirteen partner organisations from nine different countries, as well as the EU, are involved in the current investigations in the rock laboratory. Added to this is the significant contribution to the success of the experiment programme by numerous universities and research institutes from both Switzerland and abroad. Some of the experiments are supported financially by the European Union and the Swiss State Secretariat for Education and Research (SER).

The projects at the GTS currently have a running time of five to seven years, with each project including both intensive field work and a specially tailored laboratory and modelling programme. The GTS also offers the possibility to carry out less complex projects that can be realised in a relatively short time. These include, for example, tests of new investigation methods and equipment. What all the projects have in common is that they integrate different scientific disciplines, which is the only viable approach for solving the complex issues involved.

At the centre of the activities in Phase VI (2003 – 2013) are projects aimed at improving the understanding of engineered barrier systems and their practical implementation on a 1:1 scale under realistic conditions (construction and operational phase of a repository). A further focus is on projects looking at the transport behaviour of radionuclides under realistic, repository-relevant conditions. As part of the LTD (long-term diffusion) project, for example, a so-called monopole experiment was initiated, in which a low-activity radionuclide cocktail is injected into the rock matrix over an extended period of time. In the LCS (long-term cement studies) and CFM (colloid formation and migration) projects, the focus in 2007 was on further characterisation and preparation of the locations for the planned in situ experiments. Based on decisions made at the CFM and LTD project partner meetings, it was decided at the International Steering Committee (ISCO) meeting in June 2007 to plan and initiate the next project phases. A further important event in the first half of the year was the decision of Criepi (for abbreviations see page 53) and SKB to join as partners in the CFM project.

Besides the key experiments, other projects focused on the improvement and testing of methods for characterising the host rock. A three-year project was initiated together with Criepi for the hydrogeological and geological characterisation of crystalline rock and tectonic fracture systems. A project managed by the Japanese organisation RWMC on further development of geophysical investigation techniques was completed successfully at the beginning of the year.

As a member of the IAEA "Centres of Excellence" initiative, and in partnership with the University of Bern and the ETH (Zürich), the GTS makes an important contribution to the training of young scientists.

Measurements in the Mont Terri Rock Laboratory.

Investigating rock samples from Mont Terri at the University of Bern.

Expansion of the Mont Terri Rock Laboratory began in autumn 2007.

Key experiments in the Mont Terri Rock Laboratory

CI Mineralogical interaction between clay and cement

DR Diffusion and retention of radionuclides

GM-A Geomechanical long-term monitoring

HG-A Gas flowpaths through clay and along sealing structures

HG-C Long-term migration in undisturbed clay formations

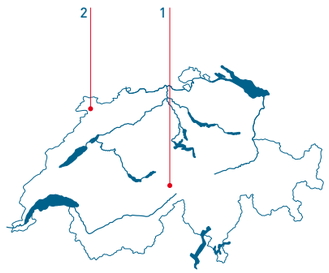
MB Deformation and hydromechanical effects during the excavation of tunnels and galleries

NT Concentration profiles of natural water components in the Mont Russelin tunnel

SE-H Self-sealing of fissures in the excavation damaged zone, taking into account thermal influences

SF Self-sealing processes in fault zones

VE (II) Ventilation experiment



1 Grimsel Test Site
2 Mont Terri Rock Laboratory

Overview of ongoing investigations:
www.grimsel.com
www.mont-terri.ch

Mont Terri Rock Laboratory (FMT)

The international Mont Terri research project (St-Ursanne, Canton Jura) has been underway since 1996 in side tunnels of the security gallery of the Mont Terri motorway tunnel. The experiments are aimed at the geological, hydrogeological, geochemical and geotechnical characterisation of clay formations, in particular the Opalinus Clay. The project allows Nagra to further investigate, on a realistic scale, the properties of this potential host rock that are relevant for disposal of radioactive waste.

Twelve partner organisations from six countries (Belgium, Germany, France, Japan, Switzerland and Spain) are currently involved in the extensive research programmes. The project is managed by the Federal Office of Topography (Swisstopo) and is accompanied by a "Commission stratégique". The interests of Canton Jura are represented by the "Commission de suivi".

In the first half of the year, the 12th programme phase was completed as planned, with Nagra being involved in 24 of a total of 31 experiments. Participation in the current phase 13 (July 2007 – June 2008) includes continuation of all the experiments from the previous phase plus the initiation of new experiments in the areas of rock mechanics and geochemistry. Projects from the 6th Framework Programme of the EU (GM-A and SE-H experiments) are also continuing. Based on experience and recommendations made by the authorities arising from the review of the Entsorgungsnachweis project, the focus of Nagra's planned experimental activities is on in-depth research on the evolution of the excavation damaged zone (MB, SE-H, SF and VE(II) experiments), diffusion of radionuclides in the Opalinus Clay (DR and NT experiments), gas migration (HG-A and HG-C) and setting up a long-term experiment on the interaction between cement (used as a solidification, backfilling and construction material) and clay (CI experiment).

As the space available for conducting experiments in the galleries and niches was effectively full at the end of phase 12, it became clear that an expansion of the rock laboratory would be necessary. Work on this began in November 2007 and, following completion in October 2008, the facility will have an additional 170 metres of galleries and 80 metres of niches. The excavation work will also be used as an opportunity to investigate the rock mechanical properties of the Opalinus Clay in more detail.

Commercial services

2006 review of waste disposal costs

To secure the financing of waste management activities, the power plant operators are required to set aside financial reserves, the amount of which is determined on the basis of estimated disposal costs. The cost estimates are reviewed periodically and updated where necessary. The last update was carried out in 2006 and the results were submitted to the authorities. HSK reviewed the cost study in 2007 and recommended that the amount of the contributions to the decommissioning and waste management funds should be based on the cost study. At the same time, HSK also made several recommendations that will be important for the next update. The administrative commission for the two funds approved the cost estimates at its meeting of 6th December 2007.

International Services and Projects (ISP)

In 2007, Nagra's ISP Division celebrated its first round birthday. During the 10 years since it was established, the breadth and scope of its activities have seen a steady growth. The know-how and experience in the field of radioactive waste management accumulated by Nagra over the last 35 years continues to be recognised as a valuable resource for other national waste management programmes, as well as for technical applications outside the nuclear area. The spectrum of support offered ranges from strategic programme planning, specification of waste inventories, site selection, characterisation and evaluation to repository design, safety case development, safety analyses and public communication. ISP is strongly committed to providing timely, high quality and cost-effective solutions, maximising the value offered by engaging motivated and dynamic staff who are also actively involved in the national programme. Of particular interest are joint projects that have synergies with the activities in the Swiss national programme, either directly strengthening the basis for ongoing tasks or expanding the knowledge base.

A large proportion of the contract work in 2007 came from partners in Japan. The work was carried out as part of the various bilateral collaboration agreements between Nagra and Criepi, JAEA, JNFL, Numo, RWMC and Obayashi (see page 53 for abbreviations). The year also saw a marked increase in the number of projects in Europe and North America, as well as nascent steps in South Korea. Examples include the evaluation of alternative disposal systems (Saanio & Riekkola OY, Finland), contribution to the engineering design of the Hungarian geological repository, review of the Slovenian spent fuel repository concept, advising on site exploration and evaluation for the LLW repository in Canada (OPG) and field investigations for characterisation of the excavation disturbed zone in underground test caverns in Korea. In addition, Nagra geoscientists acted as expert advisers on major infrastructure projects (e.g. railway tunnels), environmental issues (e.g. CO_2 sequestration) and technology development (e.g. measurement techniques for cap rocks); these activities continue to be a small but enriching part of our work.

Collaboration with Numo during the year ranged from support of field training activities (Yokosuka test site) to methodologies for developing the safety cases for potential volunteer sites.

For higher-activity low-level waste, JNFL of Japan is moving forward with its project for a medium-depth repository at the Rokkasho site. Construction of a test cavern at a depth of approximately 80 metres has been completed and the Nagra-Obayashi consortium is providing technical support in several areas. For example, technologies developed by Nagra for characterising excavation disturbed zones and their resaturation behaviour are being used. This work is linked with the installation of sealing structures in the tunnels of geological repositories.

Nagra and JAEA continued their long and successful collaboration, with the focus on JAEA's rock laboratory programme, which involves parallel development of two underground facilities (Mizunami in crystalline rock and Horonobe in sediments), and the evaluation of related surface investigation activities within the context of the knowledge management system being developed by JAEA.

In 2007, collaboration with Criepi was further strengthened with the initiation of a multi-year project for the characterisation of fractured rock at the Grimsel Test Site.

International collaboration

Federal Minister Leuenberger giving the opening address at the international ICGR'07 conference in Bern: "We all bear responsibility for the safe disposal of radioactive waste. Collective responsibility in this respect carries more weight than individual opinions."

In June 2007, representatives of the international partners involved in the research at the Grimsel Test Site met in Switzerland for the annual ISCO meeting.

A regular exchange of information between Nagra and its foreign partner organisations takes place as part of the various formal bilateral agreements. Joint projects are also carried out with several partners, either on a multilateral basis (e.g. rock laboratory projects) or together with international organisations (particularly the OECD/NEA and the EU). In addition to the formal collaboration structure, international contacts have also resulted in a close network of personal relationships, which provide Nagra with a wealth of opportunities to discuss technical issues. This network includes not only the partner organisations but also the wider scientific community that is integrated into Nagra's daily activities through review of its scientific work.

The joint research projects at the Grimsel Test Site and the Mont Terri Rock Laboratory moved forward in 2007 and Nagra staff continued to be involved in Andra's Bure rock laboratory in France. These projects were all complemented by joint laboratory and modelling programmes run by various research institutes; this includes the projects run under the auspices of the OECD/NEA on sorption and on the thermochemical databank. Nagra's involvement in EU Framework Programmes has now become an important component of its research and development activities. Nagra staff are also involved in advisory bodies of foreign sister organisations (particularly Belgium, Finland, France and Canada) and are able to benefit directly from this experience. Over and above the various specific joint projects, Nagra is also represented in several working groups of the OECD/NEA and works together with the IAEA. Key results of international collaboration are presented in the project-specific sections of this report.

As in previous years, Nagra took part in international meetings on the topic of waste disposal, frequently making presentations on various aspects of the Swiss programme. Nagra is also represented on the programme committees of several international scientific conferences and workshops.

As part of what is now an annual event, Nagra attended the meeting of the German-Swiss Commission (DSK, working group 4).

Important international conference in Bern

From 15th to 17th October 2007, the city of Bern was host to the international ICGR'07 conference with the title "Geological Repositories: A Common Objective, a Variety of Paths". 193 high-level decision-makers from 19 countries participated in the event, which was dedicated to addressing the challenges faced by decision-making in the areas of site selection and implementation of geological repositories. The conference was organised by Nagra and co-sponsored by the IAEA, OECD/NEA, the European Commission and EDRAM (International Association for Environmentally Safe Disposal of Radioactive Materials).

Framework Research Programmes of the European Union (EU)

Since 1984, the Framework Research Programmes of the EU have functioned as an important instrument for financing research projects in Europe. Many of the challenges faced by industry and society today can no longer be solved in isolation by one country alone. The 6th Framework Programme (2002 – 2006, partly extended) is aimed specifically at creating a European Research

Sixth EU Framework Research Programme (2002 – 2006)

CARD Coordination of research, development and demonstration focal points for deep geological disposal of long-lived radioactive waste Coordination: Nirex (United Kingdom). Participation: 10 disposal organisations. Duration: 2006 – 2008.

ESDRED Engineering studies and demonstration of repository designs in underground rock laboratories Overall lead: Andra (France). Participation: 13 project partners from 9 European countries. Duration: 2004 – 2008.

FUNMIG Fundamental processes of radionuclide migration in the geosphere Overall lead: FZK/INE (Germany). Participation: 51 organisations from 15 countries. Duration: 2005 – 2008.

MICADO Model uncertainty for the mechanism of dissolution of spent fuel in a nuclear waste repository Lead: Armines Nantes (France). Participation: 19 organisations from 7 countries. Duration: 2006 – 2009.

NF-PRO Building up understanding and model descriptions of key processes in the near-field for various host rock types and disposal concepts Lead: SCK•CEN (Belgium). Sub-project leader: PSI. Participation: 46 partners from 10 European countries. Duration: 2004 – 2007.

PAMINA Performance assessment methodologies in application to guide the development of the safety case Lead: GRS mbH (Germany). Participation: 26 organisations from 10 countries. Duration: 2006 – 2009.

TIMODAZ Thermal impact on the damaged zone around a radioactive waste repository in clay host rocks Coordination: ESV EURIDICE GIE (Belgium). Participation: 14 partners from 8 countries. Duration: 2006 – 2010.

Area (ERA). The aim is to promote excellence in scientific and technological capacities and to encourage European competitiveness and innovation by supporting improved cooperation among researchers and the coordination of their projects.

Based on the research agreement between Switzerland and the EU, Swiss researchers have been able, since 2004, to participate fully in the 6th Framework Programme. In return, Switzerland makes a direct contribution to the total budget of the EU Framework Programme.

The research projects planned in the area of deep geological disposal of radioactive waste developed as part of the EURATOM programme allow Nagra to expand its technical knowledge base efficiently and continuously and to be instrumental in shaping important developments in Europe. In the final outline of proposals for the 6th Framework Programme issued in 2005, Nagra applied together with its European sister organisations for the support of the EU in the following areas:

- Coordination of research and development on deep geological disposal of spent fuel and long-lived radioactive waste (CARD).
- Improvement and harmonisation of methods and tools for demonstrating long-term safety (PAMINA).
- Investigation of the dissolution mechanisms of the spent fuel matrix (MICADO).
- Thermal effects on the excavation damaged zone of a deep repository in clay (TIMODAZ).

In 2007, Nagra's participation focused on the continuation and completion of the projects ESDRED, FUNMIG and NF-PRO, all of which have been running for several years. Preparations for the projects CARD, MICADO, PAMINA and TIMODAZ are also underway.

As part of the first call for the 7th Framework Programme (EURATOM work programme 2007), discussions have been held on monitoring of repositories (MoDeRn; coordination Andra) and gas transport (FORGE; coordination BGS).

Public relations

Dialogue with the public

As is their right, the citizens of Switzerland expect clear and understandable answers to their questions surrounding the issue of radioactive waste disposal. The interests of the widest possible spectrum of societal groups are involved, with economic, ecological, energy policy and ethical issues being reflected in the ongoing debate. The drafting of the first part of the sectoral plan on geological repositories during 2007 had the effect of increasing the information needs of politicians and the public alike. Nagra is aware of the significance of direct, open communication with the public, the media, the authorities, political circles, research partners and the scientific community as a whole and makes every effort to fulfil its responsibilities in this respect.

Exchange of opinions with the public is of key importance. Nagra was in direct contact with the public on more than 240 days in 2007 – at trade fairs and exhibitions, tours of the rock laboratories, invited presentations and the roadshow which visited ten cities in the German-speaking part of the country.

Two information trips to Germany, Sweden and Finland gave politicians and representatives of the authorities the opportunity to experience first-hand the status of the waste management programmes in these countries. Representatives of cantonal governments and parliaments and politicians from Germany also visited the Swiss rock laboratories.

Open dialogue during the information tour, exhibitions and guided tours

In summer 2007, the information roadshow visited ten cities in the German-speaking part of Switzerland. With the slogan "Switzerland has radioactive waste. We are taking care of it. Nagra. Who else", the aim was to make the public more aware of the important task entrusted to Nagra. Large numbers of the public took advantage of the opportunity to obtain information on waste management and to discuss issues of interest with Nagra staff. The use of new media was tested, with the possibility to enter a competition on the website or using text messaging.

Local exhibitions and trade fairs are popular meeting points and offer a very direct form of contact with the public. Nagra was present during the year at local trade fairs in Frauenfeld, Embrach, Zofingen and Marthalen and at the larger autumn fairs in Schaffhausen and Winterthur. We also provided materials for a training seminar for teachers in Canton Bern and, in summer, were involved in a countrywide event on experiencing geology with two open days at the Grimsel Test Site.

The rock laboratories at Grimsel (Canton Bern) and Mont Terri (Canton Jura) continue to be a popular destination for visitors. During the year, around 3700 people visited the two facilities. An open day at the Mont Terri Rock Laboratory in November attracted more than 300 people.

Working with the media

In 2007, numerous articles on radioactive waste management were published in the Swiss media. Key topics were the sectoral plan procedure and the link between waste management and the question of the future use of nuclear energy. Nagra produced media releases on its ordinary general meeting, new

During 2007, Nagra's information tour visited ten cities in Switzerland.

Visitor group in the Mont Terri Rock Laboratory.

Nagra's information stand can be found every year at local exhibitions and trade fairs.

research projects at the Grimsel Test Site, waste management and energy policy, the new Nagra CEO, an opinion poll conducted during the year and the ICGR meeting in October. Around 60 articles and advertisements appeared in technical publications.

Information service for individuals and schools

During the year, Nagra's in-house information service sent out around 800 packages with brochures, DVDs and videos to individuals, organisations and clubs. Responses were provided to a wide range of questions from the public. Schools continued to be supported intensively and numerous inquiries were received from teaching staff for information, teaching materials and measuring equipment. As in previous years, measuring radioactivity continues to be of particular interest and the 40 sets of measuring equipment were constantly on loan.

Print products and website

In 2007, Nagra published an annual report, a brochure on natural analogues and the pocket-book "Stein" on the geology of Switzerland. Three issues of "nagra info", with information on current waste management issues, reached around 60,000 readers in Switzerland. In December, the first "e-info" electronic newsletter was sent to around 1600 subscribers. It appears at the same time and with the same content as "nagra info", but additional topics may be included. With more than 800 hits, the number of daily visitors to the website doubled compared to the previous year.

As the central component in Nagra's information palette that is continually kept up to date, the website is being redesigned to better reach identified target groups, particularly with a view to the upcoming orientation on potential siting regions. The work on redesigning the website began in autumn and the new version will go online during the announcement of the siting proposals as part of the sectoral plan process; this is expected to take place in summer 2008. Work also began in autumn on a film that will meet the anticipated additional information needs of the public. Parts of the film will be included on the website.

Organisation

Executive Board and President of the Board of Directors of Nagra: Piet Zuidema, Hans Issler, Markus Fritschi and Thomas Ernst (from left to right). On 1st May 2007, Thomas Ernst took over from Hans Issler as Chief Executive Office; Hans Issler continues to serve as President of the Board of Directors.

Organisation

Headquarters

At the end of 2007, 76 people were employed at Nagra's headquarters, corresponding to 70.3 full-time positions (70.0 in the previous year). 14 people – corresponding to 5.5 full-time positions (5.7 in the previous year) – were also employed as part-time and support staff and trainees. A large part of Nagra's work is carried out together with research institutes, technical universities and geological and engineering consultants.

On 1st May 2007, Dr. Thomas Ernst took up his position as Chief Executive Officer. Dieter Camenzind took over as Head of Controlling and Finance on 1st July.

Board of Directors and general meeting

The Board of Directors held four meetings to deal with current business. Focal points included Nagra's response to the draft sectoral plan for geological repositories prepared by the Federal Office of Energy and specification of the content of the waste management programme to be submitted to the authorities by the waste producers in 2008. To consider the technical and geological basis for selecting potential siting regions as part of the sectoral plan process, the Board of Directors met behind closed doors in July. The Board took note of the research and planning activities for 2008 and approved the required outline credit. It was also decided to introduce an internal controlling system and to update the performance-based salary system. In this connection, the Board established a compensation committee.

Important technical questions were discussed by the various commissions. The Technical Committee held four meetings and the Commission for Information met three times. The Finance Commission met twice to consider the closing of the annual accounts and the budget for 2008.

The ordinary general meeting of the Members of the Nagra Cooperative took place on 12th June 2007 in Bern. The Members approved the annual report and accounts for 2006. Total expenditure amounted to 33.79 million CHF. 3.71 million CHF could be allocated to services performed for third parties and 0.68 million CHF to services for the Members of the Cooperative. Research contributions amounted to 0.30 million CHF and other operating income to 0.19 million CHF. The resulting net expenditure for the Members of the Cooperative for 2006 amounted to 28.93 million CHF.

On the occasion of the ordinary general meeting, Benoît Revaz of Energie Ouest Suisse (EOS) announced his intention to step down; the new EOS representative will be Dr. Michael Plaschy. The revision of the Statutes in 2006 created the possibility to bring in external persons as Members of the Board of Directors and Peter Zbinden was accordingly elected as a Member.

Members of the Cooperative, Board of Directors, Commissions, Auditors

Members of the Cooperative
Swiss Federal Government
Bern

BKW FMB Energie AG
Bern

Kernkraftwerk Gösgen-Däniken AG
Däniken

Kernkraftwerk Leibstadt AG
Leibstadt

Nordostschweizerische
Kraftwerke AG
Baden

Energie Ouest Suisse
Lausanne

Board of Directors
(period of office 2006 – 2009)

Hans Issler
President
Nagra

Dr. Manfred Thumann
Vice-president
Nordostschweizerische
Kraftwerke AG

Benoît Revaz
Energie Ouest Suisse
(until 12. June 2007)

Dr. Michael Plaschy
Energie Ouest Suisse
(from 12. June 2007)

Peter Hirt
Kernkraftwerk Gösgen-Däniken AG

Hermann Ineichen
BKW FMB Energie AG

Martin Jermann
Paul Scherrer Institute

Mario Schönenberger
Kernkraftwerk Leibstadt AG

Peter Zbinden
(from 12. June 2007)

Technical Committee
Mario Schönenberger
Chairman
Kernkraftwerk Leibstadt AG

Finance Commission
Michael Sieber
Chairman
Nordostschweizerische
Kraftwerke AG

Commission for Legal Issues
Hansueli Sallenbach
Chairman
Nordostschweizerische Kraftwerke AG

Commission for Information
Peter Hirt
Chairman
Kernkraftwerk Gösgen-Däniken AG

Auditors
PricewaterhouseCoopers AG
Zürich

Annual accounts 2007

Comments on the annual accounts for 2007

In 2007, total expenditure increased by a total of around 7.1 million CHF compared to the previous year. This was due mainly to extraordinary reserves in the amount of around 1.2 million CHF for future restructuring costs and to additional expenditure in the national programme. The latter is mainly a result of contribution to the expansion of the Mont Terri Rock Laboratory (1.5 million CHF), additional geological field investigations (2.4 million CHF) and active preparation for stage 1 of the sectoral plan process (0.9 million CHF). Services purchased increased by 6 million CHF to 25 million CHF. Personnel costs, including reserves, increased compared to the previous year by around 1 million CHF to 13.5 million CHF.

Total revenues also increased by 7.1 million CHF compared to the previous year to 40.9 million CHF. The contributions of the Members of the Cooperative increased by 6.8 million CHF to 35.7 million CHF.

Taking into account work in progress, income from deliveries and services increased by 0.4 million CHF to 5.1 million CHF. This increase is due mainly to the following factors:
Research and partner contributions decreased by 0.2 million CHF to 0.1 million CHF compared to the previous year. Taking into account work in progress and the change in prepayments, services for third parties increased by 0.7 million CHF to 4.4 million CHF compared to the previous year.

Further information on the different positions can be found in the appendix to the annual accounts.

Wettingen, 8th April 2008

Dr. Thomas Ernst, Chief Executive Officer

Balance sheet

Assets	31.12.2006 CHF	31.12.2007 CHF	
Land and buildings	2 593 379	2 563 379	
Other fixed assets	135 700	168 500	
Capital assets	**2 729 079**	**2 731 879**	1
Work in progress	1 598 017	1 889 487	2
Receivables from deliveries and services	3 202 348	4 015 491	3
Other receivables	453 257	215 317	
Accrued income	10 558	2 475 618	4
Cash and cash equivalents	8 378 283	5 142 112	5
Current assets	**13 642 463**	**13 738 025**	
Assets	**16 371 542**	**16 469 904**	
Liabilities			
Cooperative capital	120 000	120 000	
Equity capital	**120 000**	**120 000**	
Long-term financial obligations	650 000	650 000	1
Reserves	6 420 504	7 108 376	6
Payables from deliveries and services	4 582 152	5 677 017	7
Prepayments	1 412 334	1 395 712	
Other liabilities	283 614	261 382	
Deferred income	2 902 938	1 257 417	8
Borrowed capital	**16 251 542**	**16 349 904**	
Liabilities	**16 371 542**	**16 469 904**	

Explanations in appendix pages 44 / 45

Income statement

Total performance	2006 CHF	2007 CHF	
Contributions to administration costs	600 000	600 000	
Contributions to project costs	28 329 939	35 115 749	
Contributions of Cooperative Members	**28 929 939**	**35 715 749**	9
Research contributions	304 485	66 134	
Income from other services for Cooperative Members	677 566	608 069	
Income from services for third parties	3 710 801	4 073 407	
Change in prepayments	1 089 176	16 622	2
Income from deliveries and services	**5 782 028**	**4 764 232**	
Adjustment for work in progress	**-1 119 497**	**291 470**	2
Other operating income	**194 743**	**122 523**	10
Total performance	**33 787 213**	**40 893 974**	

Total expenditure			
Services purchased	19 019 412	25 046 948	11
Personnel costs	12 509 357	13 547 228	12
Depreciation of assets	92 864	74 180	
Other operating expenditure	2 118 652	2 189 516	13
Operating expenditure	**33 740 285**	**40 857 872**	
Financial income	-92 395	-104 208	
Financial expenditure	80 102	47 907	
Taxes	59 221	92 403	
Financial result and taxes	**46 928**	**36 102**	
Total expenditure	**33 787 213**	**40 893 974**	

Explanations in appendix pages 44 /45

Cash flow statement

Change in liquid assets	2006 CHF	2007 CHF	
Annual result	-	-	
Depreciation	92 864	74 180	
Formation of reserves	90 098	1 216 088	6
Application of reserves	-	-528 216	6
Cash flow	**182 962**	**762 052**	
Change in net current assets (without liquid assets)	-4 168 107	-3 921 244	5
Cash flow from business activities	**-3 985 145**	**-3 159 192**	
Investments	-87 364	-76 979	1
Cash flow from investment activities	**-87 364**	**-76 979**	
Cash flow from financing activities	**-**	**-**	
Change in liquid assets	**-4 072 509**	**-3 236 171**	5

Statement	2006 CHF	2007 CHF	
Liquid assets as per 1.1.	12 450 792	8 378 283	
Liquid assets as per 31.12.	8 378 283	5 142 112	
Change in liquid assets	**-4 072 509**	**-3 236 171**	5

Explanations in appendix pages 44/45

Accumulated accounts

(Contributions of the Cooperative Members and their application since the founding of Nagra in 1972)

Total performance	Status 31.12.2006 CHF	Increase 2007 CHF	Status 31.12.2007 CHF	
Swiss Confederation	24 993 027	1 014 599	26 007 626	
BKW FMB Energie AG	85 703 563	3 757 459	89 461 021	
Kernkraftwerk Gösgen-Däniken AG	242 132 080	10 279 467	252 411 547	
Kernkraftwerk Leibstadt AG	265 088 891	12 325 526	277 414 417	
Nordostschweizerische Kraftwerke AG	188 016 321	7 738 698	195 755 019	
Contributions to project expenditure	**805 933 881**	**35 115 749**	**841 049 630**	
Contributions to administration costs	83 120 000	600 000	83 720 000	
Contributions of Cooperative Members to Nagra	**889 053 881**	**35 715 749**	**924 769 630**	
Contributions of GNW	**65 265 331**	**-**	**65 265 331**	
Contributions of Cooperative Members	**954 319 212**	**35 715 749**	**990 034 961**	14
Research contributions	304 485	66 134	370 619	
Income from other services for Cooperative Members	15 814 920	608 069	16 422 989	
Income from services for third parties	45 021 215	4 090 029	49 111 244	
Income from deliveries and services	**61 140 620**	**4 764 232**	**65 904 852**	15
Adjustment for work in progress	**1 598 016**	**291 470**	**1 889 486**	16
Other operating income	**5 589 483**	**122 523**	**5 712 006**	17
Total performance for accumulated accounts	**1 022 647 331**	**40 893 974**	**1 063 541 305**	

Explanations in appendix pages 46 / 47

Total expenditure	Status 31.12.2006 CHF	Increase 2007 CHF	Status 31.12.2007 CHF	
Accrued costs L/ILW (inc. GNW)	355 641 626	-	355 641 626	
Geological studies	2 401 239	6 346 878	8 748 117	
Nuclear technology and safety	1 400 938	1 737 763	3 138 701	
Radioactive materials	941 931	988 667	1 930 598	
Planning of facilities	528 506	734 010	1 262 516	
Non-site-related activities	3 063 933	3 568 414	6 632 347	
General programme costs	3 871 178	4 357 748	8 228 926	
Fees and compensation	95 824	802 769	898 593	
L/ILW programme	**367 945 175**	**18 536 249**	**386 481 424**	
Accrued costs HLW	492 815 560	-	492 815 560	
Geological studies	824 667	897 727	1 722 394	
Nuclear technology and safety	864 682	1 416 304	2 280 986	
Radioactive materials	425 092	527 324	952 416	
Planning of facilities	521 693	391 815	913 508	
Non-site-related activities	5 671 082	5 647 200	11 318 282	
General programme costs	4 204 523	4 422 204	8 626 727	
Fees and compensation	2 560 889	1 974 567	4 535 456	
HLW programme	**507 888 188**	**15 277 141**	**523 165 329**	
Expenditure for repository programmes	**875 833 363**	**33 813 390**	**909 646 753**	
Administration and general project expenditure	83 745 744	2 083 783	85 829 527	
Project-related expenditure for L/ILW and HLW repository programmes	**959 579 107**	**35 897 173**	**995 476 280**	18
Project expenditure for Cooperative Members	16 451 828	650 456	17 102 284	
Project expenditure for third parties	46 616 396	4'346 345	50 962 741	
Project-related expenditure from deliveries and services	**63 068 224**	**4 996 801**	**68 065 025**	19
Total expenditure for accumulated accounts	**1 022 647 331**	**40 893 974**	**1 063 541 305**	

Explanations in appendix pages 46 / 47

Accumulated accounts including allocations

Explanation

From the 2007 fiscal year, the accumulated accounts will be presented including allocations. Compared to previous years, this means that income and expenditure from deliveries and services, uncovered costs of the head office, other operating income and adjustments for work in progress are shown balanced in the general programme costs for the two repository programmes. If known, the contributions are allocated to a specific programme, otherwise distribution is according to the respective programme costs per year.

Total performance including allocations	Status 31.12.2006 CHF	Increase 2007 CHF	Status 31.12.2007 CHF	
Swiss Confederation	24 993 027	1 014 599	26 007 626	
BKW FMB Energie AG	85 703 563	3 757 459	89 461 021	
Kernkraftwerk Gösgen-Däniken AG	242 132 080	10 279 467	252 411 547	
Kernkraftwerk Leibstadt AG	265 088 891	12 325 526	277 414 417	
Nordostschweizerische Kraftwerke AG	188 016 321	7 738 698	195 755 019	
Contributions for project expenditure	**805 933 881**	**35 115 749**	**841 049 630**	
Contributions to administration costs	83 120 000	600 000	83 720 000	
Contributions of the Members of the Cooperative to Nagra	**889 053 881**	**35 715 749**	**924 769 630**	
Contributions of GNW	**65 265 331**	**-**	**65 265 331**	
Contributions of the Members of the Cooperative	**954 319 212**	**35 715 749**	**990 034 961**	14

Total expenditure including allocations	Status 31.12.2006 CHF	Increase 2007 CHF	Status 31.12.2007 CHF	
Accrued costs L/ILW (inc. GNW)	355 641 626	-	355 641 626	
Geological studies	2 401 239	6 346 878	8 748 117	
Nuclear technology and safety	1 400 938	1 737 763	3 138 701	
Radioactive materials	941 931	988 667	1 930 598	
Planning of facilities	528 506	734 010	1 262 516	
Non-site-related activities	3 063 933	3 568 414	6 632 347	
General programme costs	3 777 321	5 071 692	8 849 013	
Fees and compensation	95 824	802 769	898 593	
L/ILW programme	**367 851 318**	**19 250 193**	**387 101 511**	
Accrued costs HLW	492 815 560	-	492 815 560	
Geological studies	824 667	897 727	1 722 394	
Nuclear technology and safety	864 682	1 416 304	2 280 986	
Radioactive materials	425 092	527 324	952 416	
Planning of facilities	521 693	391 815	913 508	
Non-site-related activities	5 671 082	5 647 200	11 318 282	
General programme costs	-335 771	5 010 619	4 674 848	
Fees and compensation	2 560 889	1 974 567	4 535 456	
HLW programme	**503 347 894**	**15 865 556**	**519 213 450**	
Project expenditure for repository programmes	**871 199 212**	**35 115 749**	**906 314 961**	
Administration and general project expenditure	**83 120 000**	**600 000**	**83 720 000**	
Total expenditure for L/ILW and HLW programmes & administration and general project expenditure	**954 319 212**	**35 715 749**	**990 034 961**	20

Explanations in appendix pages 46 / 47

Explanations in appendix pages 46 / 47

Appendix to the annual accounts 2007

Notes on the annual accounts

1 **Property and equipment**
IIn 2007, two older vehicles were disposed of and a small bus was acquired for operations in the Mont Terri Rock Laboratory. The telephone system was also updated. Small acquisitions are contained in the position for other operating expenditure. Depreciation is documented separately. Income from the sale of property and equipment is contained in other operating income.
The facilities at Nagra's headquarters and at the Grimsel Test Site are insured against fire damage for a total of 7.2 million CHF (same as the previous year). The fire insurance value of the depot and installations in Mellingen is 3.7 million CHF.
Under long-term financial obligations, a payment of 0.65 million CHF is shown for the planned sale of the parcel of land at Hägendorf.

2 **Work in progress**
Activated work in progress results exclusively from work performed for third parties.

3 **Receivables from deliveries and services**
This position includes claims against the Members of the Cooperative in the amount of 3.1 million CHF (2.6 million CHF in the previous year). Receivables with respect to third parties increased by 0.3 million CHF to 0.9 million CHF.

4 **Accrued income**
In 2007 there was an additional claim for 2.5 million CHF for project costs to be met by the Members of the Cooperative.

5 **Liquid assets**
Liquid assets decreased by 3.2 million CHF compared with the previous year. As of 31st December 2007, there were no fixed-term deposits.
In the cash flow statement, the net current assets decreased by 3.9 million CHF. This change is due mainly to the increase in receivables of 0.8 million CHF and accrued income of 2.5 million CHF and the decrease in deferred income of 1.6 million CHF and the increase in liabilities of 1.1 million CHF.
To secure a large-income project from Japan, a currency futures transaction in the amount of 58 million Japanese Yen was completed for the expected date of payment of 30.4.2008. The current value as of 31.12.2007 is 587 540 CHF and the non-realised and non-booked profit is 22 040 CHF.

6 **Reserves**
As before, reserves include amounts for vacation and overtime hours of employees; new is a reserve for restructuring costs as per December 2007. The tax reserves have been dissolved. Reserves increased overall by 0.7 million CHF.
In 2003, Nagra took over responsibility for the Wellenberg site from the now liquidated company GNW for a one-off payment of 4.8 million CHF. For a period of ten years, this amount is to be used for site recultivation work, production of project documentation and final reports and payment of various fees. No expenditure of this nature was incurred during the year and the reserve remains unchanged.

7 **Payables from deliveries and services**
Payables from deliveries and services increased during 2007 by around 1.1 million CHF to 5.7 million CHF.
The position contains liabilities towards Members of the Cooperative in the amount of 0.4 million CHF.

8 **Deferrals**
This position decreased in 2007 by around 1.6 million CHF.
Accruals and deferrals towards third parties increased by 0.1 million CHF to 1.3 million CHF.

9 **Contributions of Members of the Cooperative**
The contributions of the Members of the Cooperative increased during the year by around 6.8 million CHF and are made up as follows:
Contribution to administration costs of 0.6 million CHF, fees for supervision by the authorities (FOE, HSK, KSA) of 2.8 million CHF (2.5 million CHF in the previous year) and contributions to project costs of 32.3 million CHF (25.8 million CHF in the previous year).

10 **Other operating income**
This position contains mainly income from renting of machinery and equipment.

11 **Services purchased**
Services purchased include direct project costs. Services purchased increased by 6.0 million CHF to 25.0 million CHF. This amount contains fees of the regulatory authorities in the amount of 2.8 million CHF.

12 **Personnel costs**
Personnel costs increased by 8.3% to 13.5 million CHF compared to the previous year. This amount contains the restructuring costs and the newly created corporate success component. The number of staff at the end of the year (75.8 full-time positions) increased by 0.1 full-time position compared to the previous year.

13 **Other operating expenditure**
This contains rents of 0.8 million CHF, as well as the repair and maintenance of vehicles, computer systems and other office installations of a total of 1.3 million CHF.

Notes on the accumulated accounts

The accumulated presentation of the contributions from the Members of the Cooperative and the application of these contributions forms the basis, at the time of waste emplacement, for any adjustment payments between the Members. It also shows which work gives rise to project-related expenditure.
The structure of the total performance is now oriented largely to the operating accounts. The total expenditure is now also presented in consolidated form (see note 20).

14 **Contributions of Members of the Cooperative**
The contributions of the Members of the Cooperative towards covering project costs are determined annually as a percentage, based on the thermal output of the individual power plants.
In 2007, the Members of the Cooperative were invoiced by Nagra in the amount of 30.0 million CHF. Taking into account the still open obligation of 2.5 million CHF and the balance from the previous year of 2.6 million CHF, the contributions of the Members amount to a total of 35.7 million CHF (28.9 million CHF in the previous year). Included in this is the contribution to administration costs in the amount of 0.6 million CHF, as well as fees passed on for supervision by the authorities (FOE, HSK, KSA) in the amount of 2.8 million CHF.
The contributions of GNW include the payments by GNW for contract work for the Wellenberg project, which is now complete.

15 **Income from deliveries and services**
The research contributions contain only contributions to the national disposal programmes.
Other entries in income from deliveries and services agree with the operating accounts and are explained there.

16 **Adjustment for work in progress**
Adjustments to the status of work in progress agree with the operating accounts and are explained there.

17 **Other operating income**
The entries for other accumulated operating income agree with the operating accounts and are explained there.

18 **Project-related expenditure for the repository programmes**
The two repository programmes are basically structured in the same way in the accumulated accounts, oriented to the most important technical tasks to be performed up to the end of waste management activity. If not explicitly assigned to a repository programme, the following explanations on the individual positions apply for both programmes.
Instead of the previous lump sum of 0.6 million CHF, the administration costs and general project expenditure now show the remaining general costs associated with the headquarters according to internal performance calculations. This is neutralised in the consolidated presentation of total expenditure.
Project-related expenditure in 2007 amounted to around 35.9 million CHF. 18.5 million CHF can be assigned to the L/ILW programme and 15.3 million CHF to the HLW programme. The administration costs and general project expenditure amounted to 2.1 million CHF.

a) Accrued costs of the disposal projects
The accumulated expenditure on the disposal projects was presented up till 2005 with a different structure, which is shown here depending on disposal project in one position. The allocation of costs accrued to date under the new division will be done at a later date.

b) Geological investigations
Geological investigations for identifying potential siting regions include studies in the investigation area of Northern Switzerland associated with geological disposal of high-level waste, as well as preparing the geological basis for a repository for low- and intermediate-level waste.

c) Nuclear technology and safety
This work includes the safety assessment of potential siting areas, laboratory investigations on the near-field and on various backfill materials.

d) Radioactive materials
Expenditure associated with the certification of suitability of wastes for disposal and ongoing documentation and inventorying of radioactive waste.

e) Planning of facilities
This position includes expenditure on the concepts for the surface and underground facilities of the deep geological repositories for both high-level and low- and intermediate-level waste.

f) Site-independent studies
This includes expenditure on development of methodologies, modelling and validation of mathematical models for safety assessment, laboratory studies, involvement in research in rock laboratories (Grimsel and Mont Terri) and in the research programmes of the EU.

g) General programme costs
This relates to expenditure arising from programme management, cost studies and public relations activities.

h) Fees and compensation
This includes mainly the fees of the safety authorities charged to Nagra.

19 **Project-related expenditure from deliveries and services**
This expenditure in the amount of 5.0 million CHF results from contracts included under income from deliveries and services and contains project expenditure for Members of the Cooperative of 0.7 million CHF and project expenditure for third parties of 4.3 million CHF.

20 **Total expenditure for the L/ILW and HLW repository programmes & administration and general project expenditure**
The total sum of the accumulated account, taking into account the described allocations. The amount should be the same as the contributions of the Members of the Cooperative under note 14.

Report of the auditors

Bericht der Revisionsstelle
an die Generalversammlung der
NAGRA Nationale Genossenschaft für
die Lagerung radioaktiver Abfälle
Wettingen

Als Revisionsstelle haben wir die Buchführung, die Jahresrechnung (Bilanz, Betriebsrechnung, Geldflussrechnung und Anhang / Seiten 37 bis 39 sowie Seiten 44 bis 45) sowie die Geschäftsführung der NAGRA Nationale Genossenschaft für die Lagerung radioaktiver Abfälle für das am 31. Dezember 2007 abgeschlossene Geschäftsjahr geprüft.

Für die Jahresrechnung und die Geschäftsführung ist die Verwaltung verantwortlich, während unsere Aufgabe darin besteht, die Jahresrechnung und die Geschäftsführung zu prüfen und zu beurteilen. Wir bestätigen, dass wir die Anforderungen hinsichtlich Befähigung und Unabhängigkeit erfüllen.

Unsere Prüfung erfolgte nach den Schweizer Prüfungsstandards, wonach eine Prüfung so zu planen und durchzuführen ist, dass wesentliche Fehlaussagen in der Jahresrechnung mit angemessener Sicherheit erkannt werden. Wir prüften die Posten und Angaben der Jahresrechnung mittels Analysen und Erhebungen auf der Basis von Stichproben. Ferner beurteilten wir die Anwendung der massgebenden Rechnungslegungsgrundsätze, die wesentlichen Bewertungsentscheide sowie die Darstellung der Jahresrechnung als Ganzes. Bei der Prüfung der Geschäftsführung wird beurteilt, ob die Voraussetzungen für eine gesetzes- und statutenkonforme Geschäftsführung gegeben sind; dabei handelt es sich nicht um eine Zweckmässigkeitsprüfung. Wir sind der Auffassung, dass unsere Prüfung eine ausreichende Grundlage für unser Urteil bildet.

Gemäss unserer Beurteilung entsprechen die Buchführung, die Jahresrechnung und die Geschäftsführung dem schweizerischen Gesetz und den Statuten.

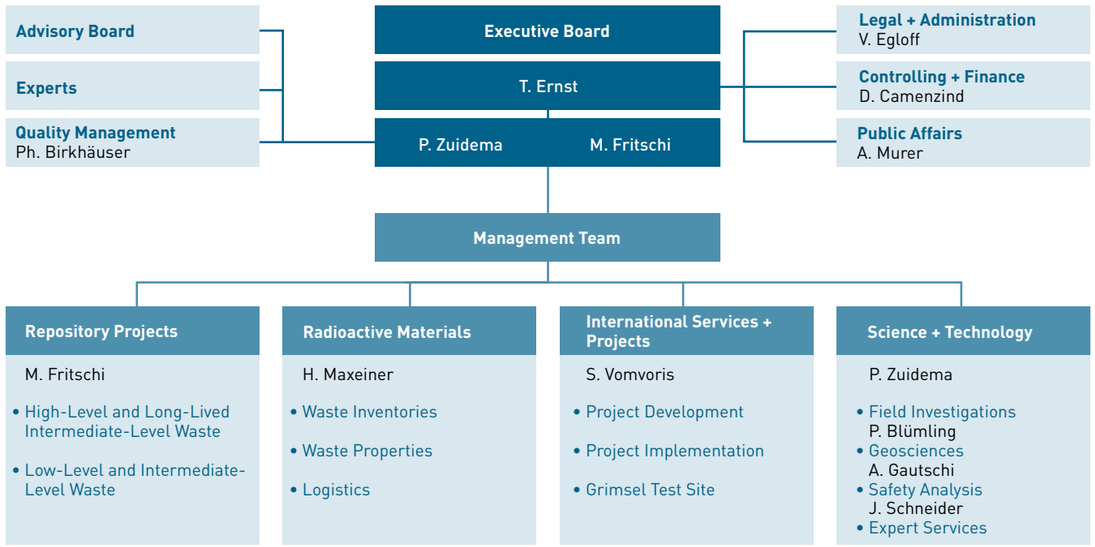
Wir empfehlen, die vorliegende Jahresrechnung zu genehmigen.

PricewaterhouseCoopers AG
Armin Bantli Stephan Bugget
Leitender Revisor

Zürich, 8. April 2008

Addendum

Organigram



Management Team: T. Ernst, P. Zuidema, M. Fritschi, H. Maxeiner, S. Vomvoris
Extended Executive Board: Management Team, V. Egloff, D. Camenzind, A. Murer

December 2007

Waste inventories and volumes

Radioactive waste arises largely from electricity production in the five Swiss nuclear power plants. Waste also arises from use of radioactive materials in the areas of medicine, industry and research (MIR waste).

Waste volumes at the end of 2007
On behalf of the waste producers, Nagra maintains a centralised databank of waste packages. The following table shows the volumes and activities as of the end of 2007 for wastes prepared for deep disposal. The table does not contain pre-conditioned raw wastes and waste packages, packaged for example for treatment in the ZWILAG plasma furnace.

Conditioned waste (31st December 2007, rounded)	**Volume (m^3)**	**Activity (Bq)**
Nuclear power plants	3 455	$1.1 \cdot 10^{15}$
Zwilag	920	$3.2 \cdot 10^{18}$
Federal Government interim storage facility (waste from medicine, industry and research)	1 385	$7.4 \cdot 10^{15}$

The Zwilag wastes are waste packages delivered to the facility by the nuclear power plants, waste packages from the plasma furnace and moulds with vitrified high-level waste from reprocessing.

Prediction of waste volumes and inventories for deep geological disposal
For the purpose of planning geological repositories, information is also required on expected waste volumes. The total volume for disposal will be around 99,000 m^3 of waste packaged in disposal containers (see table for details). The volumes were determined assuming a 50-year operating lifetime for the existing power plants. The volume of waste from medicine, industry and research depends on the operational planning of the repositories.

Predicted waste volumes (50-year NPP operation)	**L/ILW (m^3)**		**ATW[1] (m^3)**		**HLW/SF (m^3)**	
	conditioned	packaged	conditioned	packaged	conditioned	packaged
BA-KKW Operational waste from the NPPs (from cleaning systems and mixed waste), inc. post-operational phase before decommissioning	7 260	24 400	10	40		
RA-KKW NPP reactor waste (activated components)	340	1 560				
SA-KKW NPP decommissioning waste	28 265	28 265				
WA-KKW NPP reprocessing waste (substitution BNFL)			200	1 320		
BA-ZWI Zwilag operational waste	45	140				
SA-ZWI Zwilag decommissioning waste	620	655				
BA-MIF MIR waste from FOPH[2] and operational waste from PSI	4 270	9 170	325	920		
SA-MIF[3] PSI decommissioning waste	23 000	23 000				
BEVA Waste from the future SF packaging plant in the HLW/SF repository	2 220	2 220				
HAA Canisters from reprocessing (completion of existing contracts, with substitution BNFL)					115	730
BE Spent fuel					1 135	6 595
Total volumes (rounded)	**66 020**	**89 410**	**535**	**2 280**	**1 250**	**7 325**
Percentage (rounded)	97.3 %	90.3 %	0.8%	2.3 %	1.9 %	7.4 %
Activity[4]	$4.7 \cdot 10^{17}$ Bq		$3.4 \cdot 10^{16}$ Bq		$3.0 \cdot 10^{19}$ Bq	
Percentage	1.6 %		0.1 %		98.3 %	

[1] Alpha-toxic waste.
[2] Federal Office of Public Health.
[3] For the first time this contains a reserve of 12,000 m^3 for the as yet unspecified L/ILW from large-scale research facilities.
[4] Activity inventory for reference year 2050.

Publications in 2007

Nagra Technical Reports (NTBs)

A complete list of all reports published to date (including price) can be obtained from Nagra's headquarters in Wettingen or downloaded from the website. Some NTBs are also available as free downloads.

Print products for the general public

Three issues of "nagra info" appeared in 2007. The publication provides current information on waste management topics of general interest and is available free of charge.

Nagra also distributes brochures and DVDs on selected topics. The available materials can be found on Nagra's website under the heading "Publications". Individual products can be obtained free of charge or, in some cases, downloaded from the site.

In 2007, a brochure was published on the topic of natural analogues (available in German and French). Nagra also produced a small book on rock and geology with the title "Stein" (= rock; in German only). In order to illustrate the concept of long timescales, a fold-out brochure showing a trip through time was produced.

Internet addresses

Nagra
National Cooperative for the Disposal of Radioactive Waste
www.nagra.ch

BAG
Federal Office of Public Health
www.bag.admin.ch

BFE
Federal Office of Energy
www.bfe.admin.ch

Decommissioning fund (BFE)
www.stilllegungsfonds.ch

Entsorgungsnachweis (BFE)
www.entsorgungsnachweis.ch

FLG
Grimsel Test Site
www.grimsel.com

FMT
Mont Terri Rock Laboratory
www.mont-terri.ch

Forum VERA
www.forumvera.ch

HSK
Swiss Federal Nuclear Safety Inspectorate
www.hsk.ch

IAEA
International Atomic Energy Agency
www.iaea.org

ITC
International Training Centre, School of Underground Waste Storage and Disposal
www.itc-school.org

Kernenergie-Internetportal
www.kernenergie.ch

KSA
Federal Commission for the Safety of Nuclear Installations
www.ksa.admin.ch

LES
Waste Management Laboratory (PSI)
les.web.psi.ch

Nuclear Energy Agency
www.nea.fr

Nuklearforum
www.nuklearforum.ch

PSI
Paul Scherrer Institute
www.psi.ch

Radioactive waste information (BFE)
www.radioaktiveabfaelle.ch

Swissnuclear
Nuclear Energy Group of swisselectric
www.swissnuclear.ch

UVEK
Federal Department for the Environment, Transport, Energy and Communications (DETEC)
www.uvek.admin.ch

Waste management fund (BFE)
www.entsorgungsfonds.ch

ZWILAG
Interim storage facility, Würenlingen
www.zwilag.ch

Glossary

Andra
Agence nationale pour la gestion des déchets radioactifs, France.

ATW
Alpha-toxic waste.

BGS
British Geological Survey.

BMU
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany.

CERN
European Organization for Nuclear Research.

CRIEPI
Central Research Institute of Electric Power Industry, Japan.

DETEC
Swiss Federal Department for the Environment, Transport, Energy and Communications.

EDI
Federal Department of Home Affairs, Switzerland.

EDRAM
International Association for the Environmentally Safe Disposal of Radioactive Materials.

ENRESA
Empresa Nacional de Residuos Radiactivos, Spain.

ENSI
Swiss Federal Nuclear Safety Inspectorate

EU
European Union.

FMT
Mont Terri Rock Laboratory; rock laboratory in Opalinus Clay located near St-Ursanne, Canton Jura. Project managed by Swisstopo.

FOE
Federal Office of Energy, under DETEC (Switzerland).

FOPH
Federal Office of Public Health. Under EDI (Switzerland).

GRS
Gesellschaft für Anlagen- und Reaktorsicherheit (Germany).

GTS
Grimsel Test Site; Nagra's underground laboratory in crystalline rock on the Grimsel Pass, Canton Bern.

HLW
Vitrified high-level waste from reprocessing.

HSK
Swiss Federal Nuclear Safety Inspectorate (Villigen), under the FOE.

IAEA
International Atomic Energy Agency, Vienna.

ICRP
International Commission on Radiological Protection, Stockholm.

IEA
International Energy Agency, Paris.

ILW
Long-lived intermediate-level waste.

ITC
International Training Centre, School of Underground Waste Storage and Disposal, Innertkirchen (Canton Bern).

JAEA
Japan Atomic Energy Agency.

JNFL
Japan Nuclear Fuel Limited.

KNE
Commission for Nuclear Waste Management (Switzerland).

KNS
Commission for Nuclear Safety (Switzerland).

KSA
Federal Commission for the Safety of Nuclear Installations (Switzerland).

LES
Waste Management Laboratory, PSI.

L/ILW
Low- and intermediate-level waste.

MIR
Radioactive waste from medicine, industry and research.

MIRAM
Model inventory of radioactive materials.

NEA
Nuclear Energy Agency of the OECD, Paris.

Nirex
United Kingdom Nuclear Industry Radioactive Waste Executive.

NPP
Nuclear power plant.

NTB
Nagra Technical Report. Series of scientific publications.

NUMO
Nuclear Waste Management Organization of Japan.

Obayashi
Obayashi Corporation, Japan.

OECD
Organisation for Economic Cooperation and Development.

OPG
Ontario Power Generation, Canada.

PSI
Paul Scherrer Institute, Villigen, Canton Aargau.

RWMC
Radioactive Waste Management Funding and Research Center, Japan.

SCK•CEN
Studiecentrum voor Kernenergie, Centre d'Etude de l'Energie Nucléaire, Belgium.

SER
Swiss State Secretariat for Education and Research.

SF
Spent fuel.

SKB
Svensk Kärnbränslehantering AB, Sweden.

Swisstopo
Federal Office of Topography, Mont Terri project manager from 2006.

ZWILAG
Centralised interim storage facility of the Swiss nuclear power plants for all categories of waste (Würenlingen, Canton Aargau).

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