

nagra ● we care

**annual report
2014**

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Foreword



Nagra staff



Corina Eichenberger, President of the Board of Directors

On the occasion of the annual general meeting of the Board of Directors in June 2014, I was elected as the new President of Nagra. I accepted this challenging task with great pleasure and anticipation as decisive years lie before us in the search for sites for deep geological repositories. We all share responsibility for moving forward steadily with the implementation of safe solutions for waste disposal. It is our ethical duty towards future generations to prepare for and construct safe geological repositories for radioactive waste and, together, we are well on the way to achieving this goal.

Cooperation with the siting regions continued to play a key role in 2014. The evaluation of the proposed siting areas for the surface facilities was completed and, based on input from the regions, Nagra was able to identify siting areas for the surface facility in all six regions. The contribution of all the actors in the Sectoral Plan process to realising this significant step forward was nothing short of exceptional.

The Swiss site selection process assigns the highest priority to safety and there is broad consensus on this approach. During the year, Nagra was faced with the complex technical task of performing a safety-based comparison of the six geological siting regions. The two siting regions finally proposed – Zürich Nordost and Jura Ost – have the best properties and will now undergo further investigation. The supporting documentation on which the proposals are based was published at the beginning of 2015, allowing everyone to form their own impression of the huge amount of work involved.

I was able to experience first-hand how competently, conscientiously and responsibly Nagra performs its work. Despite extremely high workloads, my questions were always taken seriously and answered comprehensively. Openness and transparency are the fundamental values of Nagra and they are also very important to me personally. In particular, I would like to encourage the proposed siting regions and Cantons to formulate their questions and concerns regarding waste disposal and to communicate these openly. Such dialogue makes an important contribution to the process of realising the repositories – which is ultimately in everyone's interest.

I would like to thank my fellow members of the Board of Directors most sincerely for their collaboration during the year. My thanks also go to the Executive Board and all the Nagra employees who, on a daily basis, show a great sense of responsibility in carrying out the mandate entrusted to them. I look forward to working with you all in the coming years.

A handwritten signature in black ink, appearing to read 'C. Eichenberger', written in a cursive style.

Corina Eichenberger



Thomas Ernst, Chief Executive Officer

Nagra can look back on a successful year in 2014. By the end of May, planning studies for the surface facilities of the repositories had been published for all six siting regions; this was the result of intensive collaboration with the different regional conferences. Acting as a reliable dialogue partner in the Sectoral Plan process, Nagra designated only surface facility siting areas that were as compatible as possible with the expectations of the regional conferences.

At the annual general meeting in June, the members of the Nagra Cooperative elected a new President of the Board of Directors. In Corina Eichenberger we have not only a highly experienced and competent politician at the helm, but also a person who identifies fully with our responsibility for finding safe solutions for radioactive waste disposal.

An important full-scale test run for the future repository for high-level waste was initiated in 2014, but without any waste. Preparations have been underway in the Mont Terri Rock Laboratory for the last three years for what is Nagra's largest and most costly demonstration experiment to date. Three heated dummy containers were emplaced in a test tunnel in the Opalinus Clay and successfully backfilled with bentonite. The thermal, hydraulic and mechanical behaviour of the rock and the technical installations will be observed in detail in the coming years in order to improve the understanding of safety-relevant processes.

The real focus of Nagra's work during the year was on the safety-based comparison of the geological siting regions. The comparison was based exclusively on aspects of safety and engineering feasibility. The result is clear: all six siting regions are suitable for construction of a repository, but the two regions Zürich Nordost and Jura Ost best fulfil the very strict safety requirements. The impermeable rock layers that provide safe containment of the radioactive waste are located at an optimum depth in these regions; they are protected against erosion, are stable on the long term and offer sufficient space for repository construction. Nagra has proposed to the Federal Council that these two regions be further investigated in Stage 3 of the Sectoral Plan process and that the other four regions be placed in reserve.

Documenting the result of the narrowing-down process represented a huge challenge and the production of the extensive supporting reports placed high demands on Nagra and its employees. The required knowledge base had to be developed and the regulatory requirements translated into a robust methodology that was then applied consistently in line with objective scientific and technical criteria. To achieve these goals, Nagra employees and the numerous contractors involved in the work had to show high a level of competence and great commitment, as well as a true team spirit. They all deserve my sincere thanks for their outstanding efforts.

A handwritten signature in black ink, appearing to read 'T. Ernst', written in a cursive style.

Dr. Thomas Ernst

Highlights in 2014



12th June: The Grimsel Test Site celebrates its 30-year anniversary.



26th June: National Councillor Corina Eichenberger is elected as the new President of Nagra's Board of Directors.



16th September: 16-year old Dominic Müller presents his model of a deep geological repository to Nagra.



30th December: Nagra submits its extensive documentation for Stage 2 to the SFOE.

April On 15th April, the Swiss Federal Office of Energy (SFOE) publishes a modified timetable for the period up to the start of operation of the deep geological repositories. Important forward-looking decisions will be made in the coming years: following an extensive investigation programme, Nagra will announce the siting regions that will be the subject of the general licence applications around 2020.

April Overflying of the siting regions in preparation for the investigations to be carried out for Stage 3 of the Sectoral Plan process is completed successfully on 22nd April. High-resolution aerial photographs and models of the earth's surface are required for planning the 3D seismic campaigns.

May Nagra presents the final planning studies for the siting areas for the surface facility in the Nördlich Lägern siting region. At least one siting area for the surface facility has to be designated in each siting region.

June The Grimsel Test Site celebrates 30 years of operation with the opening of a new exhibition entitled "Underground Research - Worldwide". The underground research laboratories of Nagra's partners from around the world are presented in 16 large-format posters.

June At the annual general meeting, the members of the Nagra Cooperative elect Corina Eichenberger as the new President of the Board of Directors. She takes over from Pankraz Freitag who died in October 2013. The 60-year old lawyer comes from Canton Aargau and has been a member of the National Council since 2007. Thanks to her many years of political and professional activity, she brings with her wide experience in the areas of energy, the environment and legal issues.

September Dr. Philipp Hänggi becomes the new representative of BKW Energie AG on Nagra's Board of Directors as from 1st September. He replaces Hermann Ineichen for the remainder of the term of office 2012 – 2015.

September 16-year old Dominic Müller constructs a model of a deep geological repository for radioactive waste for his final secondary school project and donates it to Nagra.

November Test run for a repository: a 50 metre long tunnel with a diameter of three metres on a 1:1 scale with a future repository emplacement tunnel is excavated for the Full-Scale Emplacement Experiment (FE Experiment) in the Mont Terri Rock Laboratory. The aim of the experiment is to investigate the effects of heat on the granular bentonite backfill and the surrounding Opalinus Clay host rock.

November Nagra's new website goes live on 18th November. It is designed particularly to be compatible with smartphones and tablets, with content and navigation optimised for these devices.

December On 30th December, Nagra submits the documentation on the proposals for the siting regions for further investigation in Stage 3 to the SFOE for detailed review. The documents include a main report (NTB 14-01), key supporting reports and more than 150 reference reports.

Our mandate

The safe, long-term disposal of radioactive waste in deep geological repositories is a technical and societal challenge that Nagra undertakes with the necessary respect and sense of responsibility in the interests of intergenerational protection of humans and the environment. The Nuclear Energy Act embodies the polluter pays principle for management of radioactive waste. As the major shareholders in the electricity utilities that operate the nuclear power plants, the Cantons thus bear responsibility for safe disposal, as do the power plant operators, Nagra and the Federal Government.



The Federal Parliament building in Bern

Our mandate

Radioactive waste arises in Switzerland from the operation and subsequent decommissioning of the nuclear power plants, as well as from the use of radioactive materials in the areas of medicine, industry and research (MIR waste). Nagra was established in 1972 by the producers of radioactive waste and was assigned responsibility for developing and implementing safe and environmentally sustainable solutions for the disposal of the waste. The members of the Nagra Cooperative are the operators of the nuclear power plants, the interim waste storage facility Zwiilag and the Swiss Confederation; the latter is responsible for MIR waste. The legal framework currently in place calls for Nagra to plan, construct and operate deep geological repositories for all types of waste arising in Switzerland. This task of national significance also includes the search for suitable repository sites in line with the Sectoral Plan process, which is under the lead of the Swiss Federal Office of Energy. Nagra is responsible for making siting proposals, which are then reviewed by the responsible authorities and commissions. The Federal Council then makes a decision following a broad consultation process. Nagra also submits the general licence applications for the repositories: one for low- and intermediate-level waste (L/ILW), one for spent fuel, high-level and long-lived intermediate-level waste (SF/HLW/ILW) or one for a combined repository for both waste types.

Nagra is also responsible for ongoing inventorying of radioactive materials and advises the waste producers on conditioning of their waste to meet disposal criteria. With a view to fulfilling these responsibilities, the organisation has been conducting a broadly based research and development programme since the mid-seventies. The R&D work is carried out in close cooperation with the Paul Scherrer Institute (PSI, Villigen) and various universities and research institutes, both in Switzerland and abroad.

Our activities

- Collaborating with the authorities and the siting regions within the framework set by the Sectoral Plan process
- Characterisation and inventorying of radioactive materials as the basis for planning repository 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 safety analyses and repository projects
- Designing the repository facilities and the engineered barrier systems and planning operating procedures
- Ongoing analysis of results and data as part of safety assessment studies and evaluation of the knowledge base with a view to upcoming repository licensing procedures
- Development of databases and fine-tuning of the methods used to evaluate disposal system behaviour; verification and validation of the data and models used in safety analysis
- Active participation in international collaborative projects, with the aim of coordinating and optimising planning and development activities
- Fulfilling responsibilities in the area of communication and information, in particular keeping the public informed about Nagra's activities
- Providing expert services to third parties

Developments in 2014



Installing one of the approximately 600 sensors used for monitoring the FE Experiment

Legal framework

The legal provisions applying to radioactive waste management are contained in the Nuclear Energy Act and the associated Nuclear Energy Ordinance.

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 permanent protection of humans and the environment.
- All radioactive waste produced in Switzerland must, in principle, be managed and disposed of in Switzerland.
- The duty of disposal lies with the waste producers, in line with the polluter pays principle.
- The management strategy specified for all waste types is monitored deep geological disposal.
- The waste producers are required to prepare a waste management programme, 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 national referendum. Participation of the siting Canton, neighbouring Cantons and neighbouring countries in the process is required by law.
- The Federal Government defines the objectives and requirements applying to the site selection process in a Sectoral Plan.
- The costs of decommissioning and waste disposal are covered by funds that are supervised by the Federal Government.

Swiss Federal Nuclear Safety Inspectorate, Federal Nuclear Safety Commission, Nuclear Waste Management Advisory Board

The Swiss Federal Nuclear Safety Inspectorate (ENSI) is the national regulatory body with responsibility for the nuclear safety and security of the Swiss nuclear installations. In this capacity, it monitors Nagra's siting investigations for deep geological repositories and the later construction and operation of the facilities. The Expert Group on Nuclear Waste Disposal (EGT) was set up by ENSI to provide support to the regulator on engineering and geological aspects of deep geological disposal. The EGT also has responsibility for certain tasks within the framework of the Sectoral Plan process.

The Federal Nuclear Safety Commission (NSC) advises the Federal Council, the Department of the Environment, Traffic, Energy and Communications (DETEC) and ENSI on questions of nuclear safety.

The Nuclear Waste Management Advisory Board (Beirat Entsorgung) was set up by DETEC to advise the Department on the implementation of the repository site selection process within the framework of the Sectoral Plan for Deep Geological Repositories. It is able to offer an outside perspective thanks to its independent status and its position as a national advisory board.

Decommissioning and Waste Disposal Funds

The Waste Disposal Fund secures the financing of disposal of operational waste and spent fuel assemblies following the shutdown of the nuclear power plants and of reprocessing waste. The Decommissioning Fund covers the financing of the decommissioning and dismantling of the nuclear facilities at the end of their operational lifetime and disposal of the resulting waste. The two Funds are fed by contributions by the owners of the nuclear facilities and are supervised by the Federal Government. At the end of 2014, the accumulated capital in the Waste Disposal Fund was around 4.1 billion CHF; the figure for the Decommissioning Fund was around 1.9 billion CHF. More detailed information can be found on the website www.entsorgungsfonds.ch (some material is available in English). The cost estimates for deep geological disposal that serve as the basis for calculating the contributions to the Waste Disposal Fund were updated by Nagra during 2011.

The Federal Council decided in 2014 to revise the Ordinance on the Decommissioning and Waste Disposal Funds and this entered into force on 1st January 2015. New is that a safety supplement is levied on the decommissioning and waste disposal costs. The basis for calculating the inflation rate and the return on investment was also revised. The safety supplement, the inflation rate and the return on investment will be reviewed once future cost studies become available and will be modified if necessary. The duration of the obligation to make contributions to the two Funds now ends with the completion of decommissioning of the nuclear plant in question, i.e. 15 to 20 years after final shutdown. The cost studies are updated every five years; the next update will be in 2016.

Waste Management Programme as specified in the Nuclear Energy Act

Article 32 of the Nuclear Energy Act requires the waste producers to prepare a Waste Management Programme for all types of waste arising in Switzer-

land. The Programme is reviewed by the federal authorities and approved by the Federal Council. Together with the Sectoral Plan for Deep Geological Repositories, it provides the framework for deciding on the way forward in the Swiss waste management project. Nagra submitted the first Waste Management Programme to the authorities for review in 2008. It was approved by the Federal Council in 2013 following a broad open consultation phase.

Sectoral Plan for Deep Geological Repositories

Article 5 of the Nuclear Energy Ordinance requires the objectives and criteria for the deep geological disposal of radioactive waste to be specified by the Federal Government in a Sectoral Plan. The Federal Council approved the conceptual part of the Sectoral Plan for Deep Geological Repositories, which regulates the site selection process, on 2nd April 2008. The technical feasibility and safety of geological disposal had already been confirmed with the approval by the Federal Council of the high-level waste "Entsorgungsnachweis" feasibility study in June 2006 (the feasibility of safe disposal of low- and intermediate-level waste was recognised in 1988).

The Sectoral Plan approach (see Figure 1 and text on page 12) attaches great importance to the requirement for transparent information and participation of affected parties. The authorities and the public in the siting regions and in neighbouring foreign countries, as well as interested domestic and foreign organisations, have broad rights of participation in the process, which ends with a decision of the Federal Council and Parliament on the general licences for the repositories. Their decision is then subject to an optional national referendum.

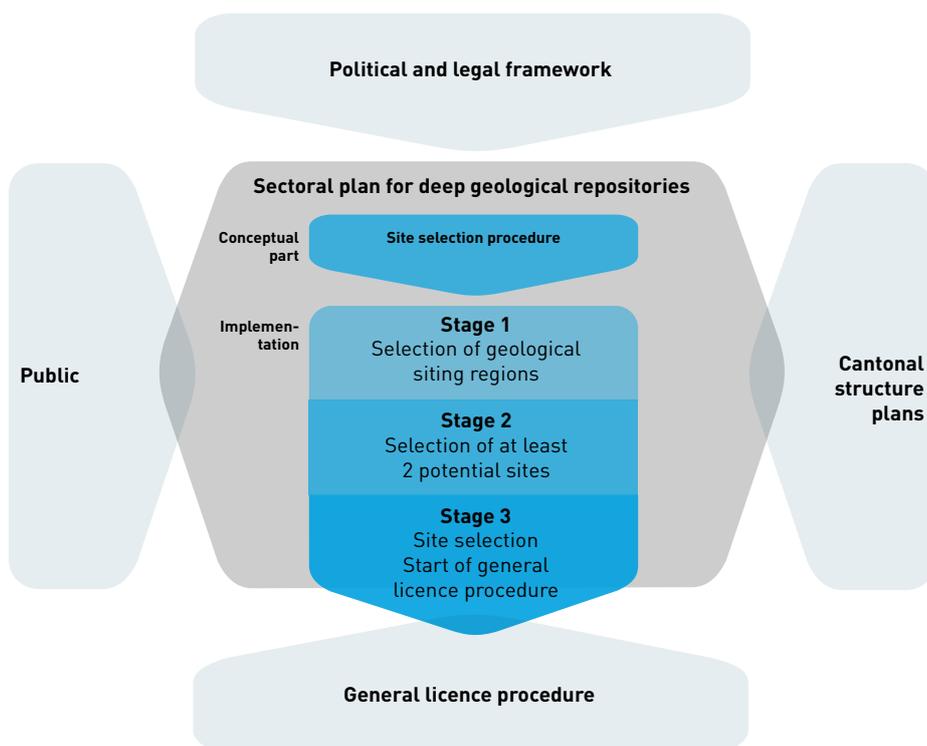


Figure 1: Stages, responsibilities and interactions in the Sectoral Plan for Deep Geological Repositories (from the SFOE)

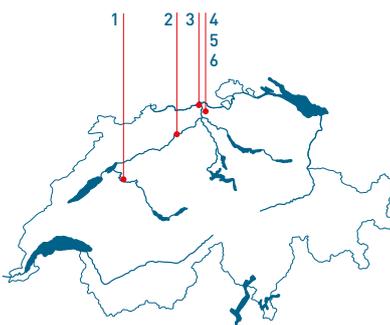
The Model Inventory of Radioactive Materials (MIRAM) quantifies and characterises all Swiss radioactive waste that has arisen to date as well as expected future arisings from the nuclear power plants and from medicine, industry and research; the version MIRAM 14 was completed during the year. It was used extensively in Nagra projects and for responding to questions from the members of the Cooperative. The waste inventories, volumes and key data are available for a range of nuclear energy scenarios, including the anticipated revision of the Radiological Protection Ordinance with new nuclide exemption limits. In this context, materials that are initially classified as radioactive but can be disposed of conventionally after several years of decay storage were also included. An inventory of chemo-toxic materials in the future geological repositories was also prepared.

The centralised inventory of existing radioactive waste maintained by Nagra was expanded to include the waste packages produced in 2014 as well as the high-level waste recently emplaced in the centralised interim storage facility (Zwilag). With the combination of tools for preparing the waste inventories supplemented by radiological measurements of waste samples, the waste producers have at their disposal a complete inventory of the waste stored at the nuclear power plants, in the Zwilag facility and in the Federal Government's interim storage facility.

Tests on pyrolysis were carried out using organic ion-exchange resins and a cement recipe for solidification of the end-products was developed at PSI. It was shown that the waste matrix properties required by Guideline ENSI-B05 can be met. Further long-term experiments on potential gas production are underway using organic resins from a German nuclear power plant. Similar experiments will start in 2015 with inactive resins used in the Swiss NPPs.

Tools for activation calculations – particularly for low activation areas – were further developed based on measurements of neutron fluxes in the power plants conducted during the previous year. This work was underpinned by a comprehensive measurement programme aimed at identifying the components of potentially activated materials. New containers which are optimised in terms of transport and interim storage were designed for packaging of the waste from decommissioning.

Quality assurance and consistency checks were carried out on the documentation accompanying the reprocessing waste being returned from France and the UK and the data were taken over into the centralised waste inventory. The work being carried out together with PSI on the quality control of conditioned waste products from the nuclear power plants, PSI and Zwilag continued successfully and the requirements of the ENSI Guideline B05 relating to the conditioning of radioactive waste were met without exception. Development work also continued on solidification methods for special wastes from PSI and Zwilag that cannot be conditioned using routine methods, with the aim of demonstrating compatibility with the regulatory requirements. Nagra also performed assessments of the suitability of wastes from the power plants and PSI for later deep disposal as part of disposability certification procedures, all with positive results. This was carried out in line with the applicable ENSI guidelines and led to clearance of the conditioning procedures.



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

Sectoral Plan process

Clear rules for site selection

The criteria and procedures applying to repository site selection were specified with the approval of the conceptual part of the Sectoral Plan for Deep Geological Repositories by the Federal Council on 2nd April 2008. The roles of the different actors in the process were also clearly defined. The siting issue will be clarified in three stages, working together with the siting Cantons and communities. Safety has the highest priority throughout the entire process, although spatial planning and socio-economic aspects are also taken into consideration.

From how to where

The fundamental technical question of how to safely dispose of all types of radioactive waste arising in Switzerland has already been answered. The feasibility demonstration for low- and intermediate-level waste (L/ILW) was approved by the authorities in 1988 and, in 2006, the Federal Council approved the demonstration of disposal feasibility (Entsorgungsnachweis project) for high-level waste (HLW). The question of where the repositories for HLW and L/ILW can be constructed is being clarified within the framework of the Sectoral Plan for Deep Geological Repositories. Safety always has the highest priority in the search for sites. Because of its transparent, systematic approach and the extensive rights of participation of a wide range of stakeholders, the Swiss site selection process is also considered to be exemplary by other countries with nuclear programmes.

Waste Management Programme: planning framework approved by the Federal Council

The Nuclear Energy Act and Ordinance require the waste producers to submit a Waste Management Programme (WMP) to the responsible authorities and to update this every five years. The Programme sets out the fundamental approach for realising safe deep geological repositories up to the time of their closure. It also provides guidance on what decisions should be made and when, what the basis for these decisions should be and how the supporting background information is prepared. The WMP contains information on the origin, types and volumes of the waste, its allocation to the deep geological repositories and the financing of waste disposal. The Programme does not pre-empt any decisions to be made as part of the ongoing site selection process within the framework of the Sectoral Plan or in later licensing procedures.

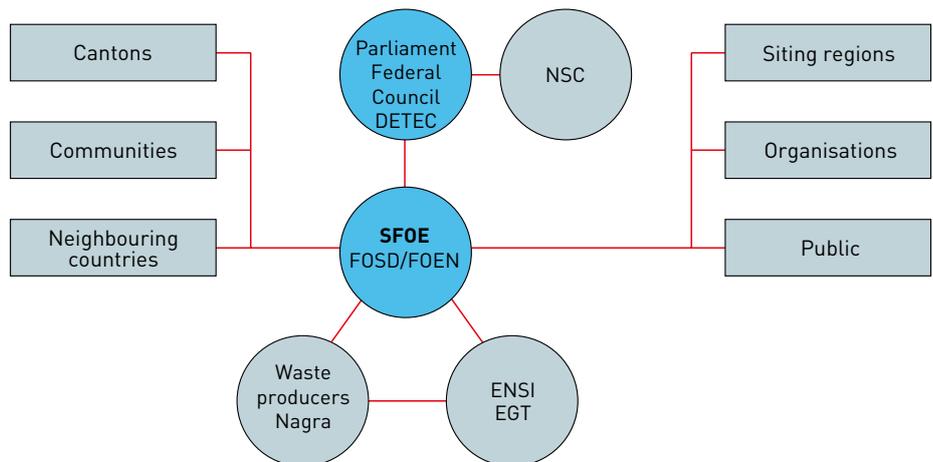
The first WMP was submitted to DETEC by Nagra (on behalf of the waste producers) in 2008 and was approved by the Federal Council in 2013. For the first time in 2016, Nagra will be required to submit an RD&D programme and the Waste Management Programme simultaneously with the cost studies and to update them every five years thereafter.

Federal Government lead – siting proposals by Nagra – independent supervision

The Sectoral Plan process consists of three stages and is led by the Swiss Federal Office of Energy (SFOE). The process is supported by a large number of advisory bodies and involves the siting Cantons and communities, neighbouring countries, interested organisations and associations, political parties and the public (see Figure 2, page 13). Nagra is responsible for preparing the scientific and technical background for the site selection process, proposing geological siting regions and then sites. At the end of Stage 3, it also submits the general licence applications for the repositories. The Federal Nuclear Safety Inspectorate (ENSI) reviews Nagra's proposals from the viewpoint of safety and technical feasibility, for which it relies partly on the support of external experts. Each stage includes broad consultation and participatory processes, after which the responsible authorities and the Federal Council conduct an overall assessment of the situation.

Stage 1 complete

The first stage of the Sectoral Plan process lasted from 2008 to November 2011. Starting with the whole of Switzerland, Nagra applied a systematic site selection approach based on the safety criteria and the narrowing-down steps prescribed in the conceptual part of the Sectoral Plan. This resulted in three potential geological siting regions for the high-level waste (HLW) repository and six (overlap with three of the HLW regions) for the low- and intermediate-level waste (L/ILW) repository. Nagra's proposals were subjected to a rigorous safety-based review by different authorities and technical bodies, who all agreed that the six geological siting regions should be carried forward for further investigation in Stage 2 of the process. The Cantonal Commission (Ausschuss der Kantone AdK) also reviewed the processes in Stage 1 and found that the requirements relating to fairness, transparency and participation had been met. The Commission also called for uncertainties regarding geological conditions to be addressed by carrying out suitable investigations before the end of Stage 2. Following a broad consultation process on the results of Stage 1, the Federal Council announced on 30th November 2011 that all six potential siting regions would be carried forward to Stage 2. The starting signal was thus given for the second stage of the process, which will last around six years. The decision of the Federal Council on Stage 2 is expected for the middle of 2017.



* The siting regions are represented by the regional conferences

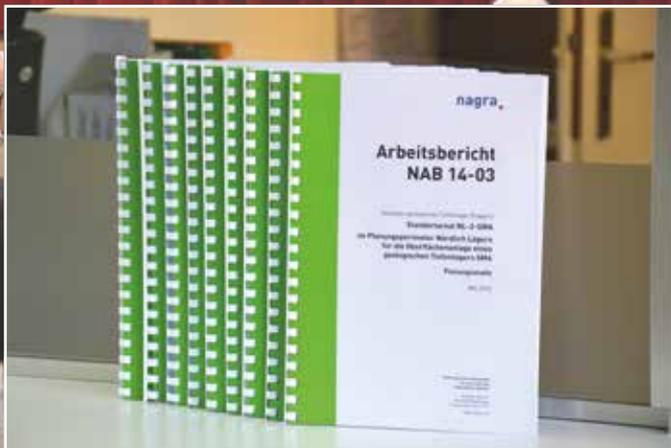
Figure 2: Actors in the site selection process

Two objectives for Nagra in Stage 2

One of the tasks to be carried out by Nagra in Stage 2 is to designate at least one siting area for the surface facility of a repository in each of the regions. This work is carried out in close cooperation with the regional conferences. Nagra also has to propose at least two siting regions each for the HLW and L/ILW repositories for more detailed investigation in Stage 3. Socio-economic-ecological impact studies were also carried out for all the siting regions under the lead of the SFOE.

Intensive participation of the siting regions

In contrast with the underground facilities of a repository, the safety of the surface facility depends primarily on the layout and design of the facility itself



The planning studies for Zürich Nordost and Nördlich Lägern were published in 2014 (small image above)



Cooperation with the siting regions was also intensive in 2014

Visualisation of the surface facility in the siting area JO-3+ in the Jura Ost siting regions (small image left)

rather than on the site. The element of flexibility in selecting the siting area for the surface facility is used within the context of regional participation to take the needs and wishes of the region into consideration in so far as this is compatible with considerations of safety and engineering feasibility. The regional conferences function as the representatives of the siting regions in this process. They consider individual issues in technical working groups set up on the surface facility, the socio-economic-ecological impact analysis and repository safety.

Responses submitted to the proposals for siting areas for the surface facilities

The SFOE published the proposals submitted by Nagra for the siting areas for the repository surface facilities at the beginning of 2012. This was followed by a period of intensive deliberations by the regional conferences, with consideration of alternative areas and preparation of responses to the proposals. The regional conference for Zürich Nordost was the last to deliver its response on 25th January 2014.

Working groups on the surface facilities show great commitment in handling the challenging work

The discussions and evaluations of the proposed siting areas for the surface facilities were led on behalf of the regional conferences by dedicated working groups. Working together with external expert advisers, these groups have developed their own tools and criteria lists for evaluating the siting proposals. The regional conferences also have the possibility to propose alternative siting areas themselves or to request Nagra to prepare alternative proposals.

Collaboration with the Cantons takes time

The siting Cantons also entered the discussion in 2012. Nagra was requested to propose potential siting areas based on a harmonised set of criteria prepared by the responsible cantonal authorities. The Cantons attached differing weight to different aspects; this applied in particular to the greater weight attached to groundwater protection compared to the use of forested land and aspects of site development and access. Technical discussions were held with the cantonal authorities to identify potential areas that would come into question from the viewpoint of the Cantons. In some siting regions, no new options were identified by the affected Cantons, while others chose not to carry out their own evaluation of the potential new areas identified by Nagra, leaving this instead to the regional conferences.

The regional conferences then had to decide whether they wished Nagra to prepare further proposals for siting areas within some of the potential areas. These proposals were then included in the evaluation process in addition to the existing proposals.

Spectrum of regional responses underlines the primacy of safety

As was to be expected, the responses of the regional conferences to the proposals for siting areas for the surface facilities varied widely. In one region, for example, it was decided that one of the siting areas had the most advantages and the least disadvantages and it was recommended to focus on this area for the next steps in the selection process. In another region, the conclusion was that all of the siting areas proposed by Nagra were unsuitable to a

Regional conferences

The regional conferences represent the interests of the siting regions in the participation process. They are made up of between around 85 and 110 members, including representatives of local communities, regional organisations (e.g. associations or political parties) and individual members of the population.

Each regional conference has set up technical working groups that are responsible for considering specific topics in more depth and providing opinions on these. All the regions have working groups on the surface facility, the socio-economic-ecological studies and repository safety. The SFOE guides and supports the work of the conferences.

Current information on the regional conferences (websites in German):

Südranden

www.plattform-suedranden.ch

Zürich Nordost

www.zuerichnordost.ch

Nördlich Lägern

www.regionalkonferenz-laegern.ch

Jura Ost

www.jura-ost.ch

Jura-Südfuss

www.jura-suedfuss.ch

Wellenberg

www.plattform-wellenberg.ch

Principles for narrowing down the geological siting regions in Stage 2

- An extensive geological investigation programme was conducted in Stage 2 to improve the existing knowledge base. This took into account the 41 requirements set out previously by ENSI for investigations for Stage 2.
- If, based on the results of these investigations, Nagra can demonstrate reliably that certain siting regions have clear disadvantages in terms of safety compared to other regions, these siting regions will not be proposed for Stage 3.
- All the remaining siting regions will be proposed by Nagra and investigated in more detail in Stage 3 (with boreholes and 3D seismic campaigns).

Result: No siting region will be ruled out because it has been investigated less extensively than the others, or because there is less knowledge of its relevant properties.

greater or lesser extent and that the whole planning perimeter was actually unsuitable based on the strategies formulated in the cantonal and regional development concepts for construction of a facility of this scale.

However, all the regional conferences did agree that the selection process has to be conducted openly and fairly based on the primacy of safety.

Identifying the siting areas to be followed up – a task for Nagra

The responses of the different regional conferences represented important input for Nagra in terms of taking into account (as far as possible) the concerns expressed by the regions when designating the siting areas for the surface facilities (see Figure 3). Nagra prepared so-called planning studies based on the regional responses; these studies document and describe the designated siting areas and provide information for the socio-economic-ecological impact study in Stage 2. They also form part of the proposals for the siting regions to be made by Nagra in Stage 2 and provide the basis for the preliminary investigation and preparation of a specification for the environmental impact assessment (EIA) required when submitting a general licence application in Stage 3.

The planning studies for the six regions were presented at full meetings of the regional conferences between September 2013 and May 2014.

Proposals for Stage 3 – focus on a safety-based comparison

Deciding which geological siting regions are to be proposed for Stage 3 is a scientific/technical issue. At the centre of the decision-making process is a safety-based comparison that is focused on the geological characteristics of the siting regions. This is complemented by an engineering risk analysis of the access infrastructure to the repository.

Detailed investigations carried out in Stage 2

With a view to carrying out the safety-based comparison, Nagra already began in Stage 1 to improve its understanding of the properties of the host rocks and the geological situation in the siting regions. ENSI reviewed the proposed investigation programme and, in 2011, came to the conclusion that the required knowledge base could be achieved if 41 requirements formulated by ENSI for additional investigations in Stage 2 were met before submission of the documentation for Stage 2 by Nagra. Exploratory boreholes that require a permit will only be required in Stage 3. At the request of the siting Cantons and the NSC, Nagra also decided to bring forward the 2D seismic measurements planned for the regions Südranden, Nördlich Lägern, Jura Ost and Jura-Südfuss. These measurements were completed in March 2012.

Knowledge base sufficient for the safety-based comparison

Between March 2013 and July 2014, a total of eleven meetings on individual technical areas were held to check whether the level of knowledge required for the safety-based comparison had been achieved. These so-called interim assessment meetings were led by ENSI and involved the Expert Group on Nuclear Waste Disposal (EGT), the Nuclear Safety Commission (NSC), the Cantonal Working Group on Safety (AG SiKa), the Cantonal Expert Group on Safety (KES), the SFOE, a representative of the German Federal Ministry for

the Environment, Nature Conservation, Building and Reactor Safety (BMUB), Nagra and various technical experts. In August 2014, ENSI confirmed that Nagra had covered the issues raised in the 41 requirements formulated in 2011 completely and in sufficient detail. The geological knowledge base is therefore sufficient for Nagra to proceed with proposing at least two siting regions for each repository type to the SFOE.

Narrowing down the siting regions – method for comparison defined in advance

The foundation for moving forward with the work on the safety-based comparison and completing it by the end of the 2014 was laid by the investigations carried out, the ongoing documentation of results and associated reviews. ENSI defined the method to be used by Nagra for the comparison of the siting regions in 2012, with input from the NSC and cantonal experts; the method was documented in an ENSI memorandum in January 2013. A siting region is placed in reserve only if it shows clear disadvantages in terms of safety compared with the other regions. If this is not the case, the region will undergo further investigation in Stage 3. ENSI has also defined the requirements for the engineering risk analyses and for the supplementary safety analyses for the access infrastructure.

Safety-based comparison – a clear result

The six siting regions incorporated into the Sectoral Plan process by the Federal Council in Stage 1 were evaluated and compared as part of a stepwise process. In line with the primacy of safety, only technical and scientific criteria were considered in this comparison.

The narrowing-down of the siting regions was based on a safety-oriented optimisation process: In the siting regions with more than one host rock, these were first compared with one another. Because of its good properties, the Opalinus Clay qualified as the priority host rock in these regions. The

Where are we now?

- Six geological siting regions were identified in Stage 1, three for the HLW and L/ILW repositories and a further three for the L/ILW repository
- Working together with the regions, siting areas for the surface facility were identified in Stage 2
- All six siting regions are suitable in terms of safety, but a detailed comparison shows decisive differences
- The siting regions Zürich Nordost and Jura Ost have been proposed by Nagra for further investigation in Stage 3

Boundary conditions:

- Site selection process under the lead of the Federal Government
- Site selection in three stages
- Safety has highest priority

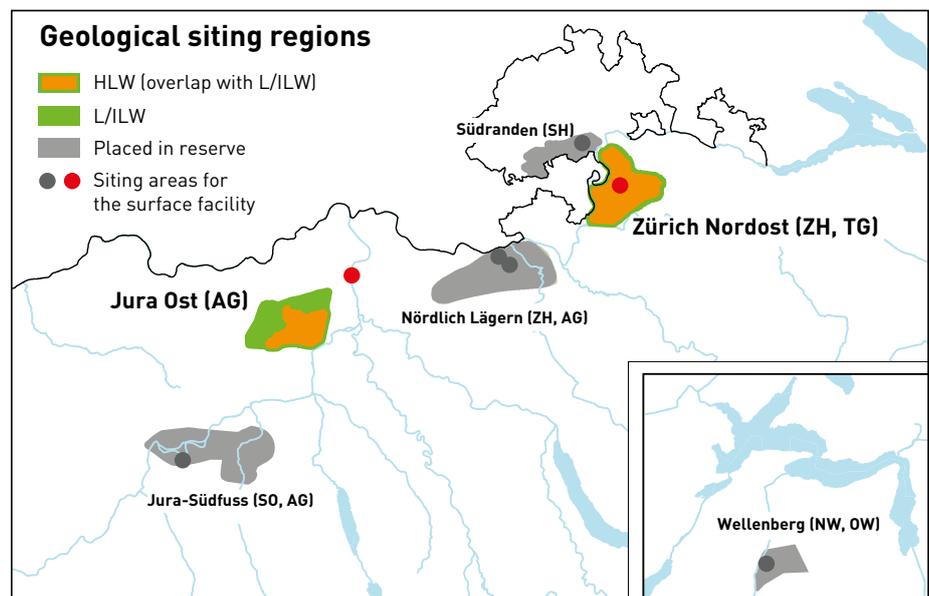


Figure 3: Based on its extensive investigations and the results of the safety-based comparison, Nagra proposes the siting regions Zürich Nordost and Jura Ost for further investigation in Stage 3

geological siting regions are large and the next step involved defining disposal perimeters within these regions that have the best properties for constructing a repository. These disposal perimeters were compared with one another and the geological siting regions for further investigation were then proposed on this basis.

The safety-based comparison has shown that all six geological siting regions meet the strict safety requirements specified by the Federal Government and are thus suitable for constructing deep geological repositories. However, a detailed comparison shows clear differences. The most important criterion for decision-making is long-term safety. Nagra therefore proposes the siting regions Zürich Nordost and Jura Ost for further investigation in Stage 3; the siting regions Südranden, Nördlich Lägern, Jura-Südfuss and Wellenberg are placed in reserve. Zürich Nordost and Jura Ost best fulfil the safety requirements for both a high-level waste and a low- and intermediate-level waste repository. The impermeable rock layers that ensure safe containment of the waste are found at an optimum depth in these regions; they are protected against erosion, are stable on the long term and have a sufficient spatial extent. Both regions would also be suitable for a combined repository.

Nagra's proposals were submitted to the SFOE in December 2014 and are now being reviewed by ENSI.

Socio-economic-ecological impact study

The final report can be downloaded together with other relevant documents on the SFOE website. The reports are available only in German.

Impacts on the economy, environment and society

A series of investigations are carried out in Stage 2 into the socio-economic-ecological impacts of a repository. The SFOE investigated the impacts of a repository on the economy, environment and society in all the siting regions. The method used for this analysis was approved by the Federal Council in its decision on Stage 1. The impacts have to be identified as early and as objectively as possible with a view to counteracting potential negative developments, but also to allow opportunities for positive developments to be realised. The results were published by the SFOE in November 2014.

Impacts on the environment relate mainly to land usage, crop rotation areas, excavated material and wildlife corridors. The differing requirements of the surface facility sites in terms of links to the road and rail network are also relevant. Sites are also evaluated more negatively in the case of densely populated areas, areas where a large population growth is desired and where the surface facility is more visible. The evaluation is less negative if there are already industrial facilities in the area. In terms of the regional economy, positive impacts dominate, but these are relatively small and lie – for the entire period from construction of the rock laboratory to closure of the repository – below one percent of the present regional added value, employment or tax income.

The regional conferences formulated a series of additional questions to address the concerns of the regions that were not covered by the above study and these were considered by different experts. The results of the SFOE study and the additional questions will be brought together in a synthesis report.



Backfilling machine, test container and bigbags filled with bentonite: the preliminary tests for Nagra's FE Experiment were carried out in a facility in Grono in Canton Graubünden

Scientific and technical background

The research and development work carried out in 2014 was aimed at improving the existing knowledge base for repository safety assessment; it also contributed to optimisation of facility concepts and designs. Activities included expanding the database for the safety-based comparison of the geological siting regions in Stage 2 of the Sectoral Plan process. Longer-term studies are focused primarily on preparing the background for the general licence applications to be submitted in Stage 3 of the Sectoral Plan process.

Geological field work

Stratigraphic and geophysical investigations were carried out in a number of boreholes drilled by third parties (mainly geothermal boreholes) to expand the database on rock structure and the thicknesses of the host rocks and confining units. The data were used to calculate continuous plots of clay mineral content. The full database with material from new and older boreholes forms part of the reporting for Stage 2.

The planning of the field work for Stage 3 was documented in detail in a concept report. In particular, the preparations for the 3D seismic investigations in Stage 3 have moved forward. Studies on engineering feasibility in the geological siting regions in Northern Switzerland are documented in a series of reports. A sample application was prepared and submitted to the SFOE in January 2015 as a dry-run for preparing the upcoming exploration applications for Stage 3.

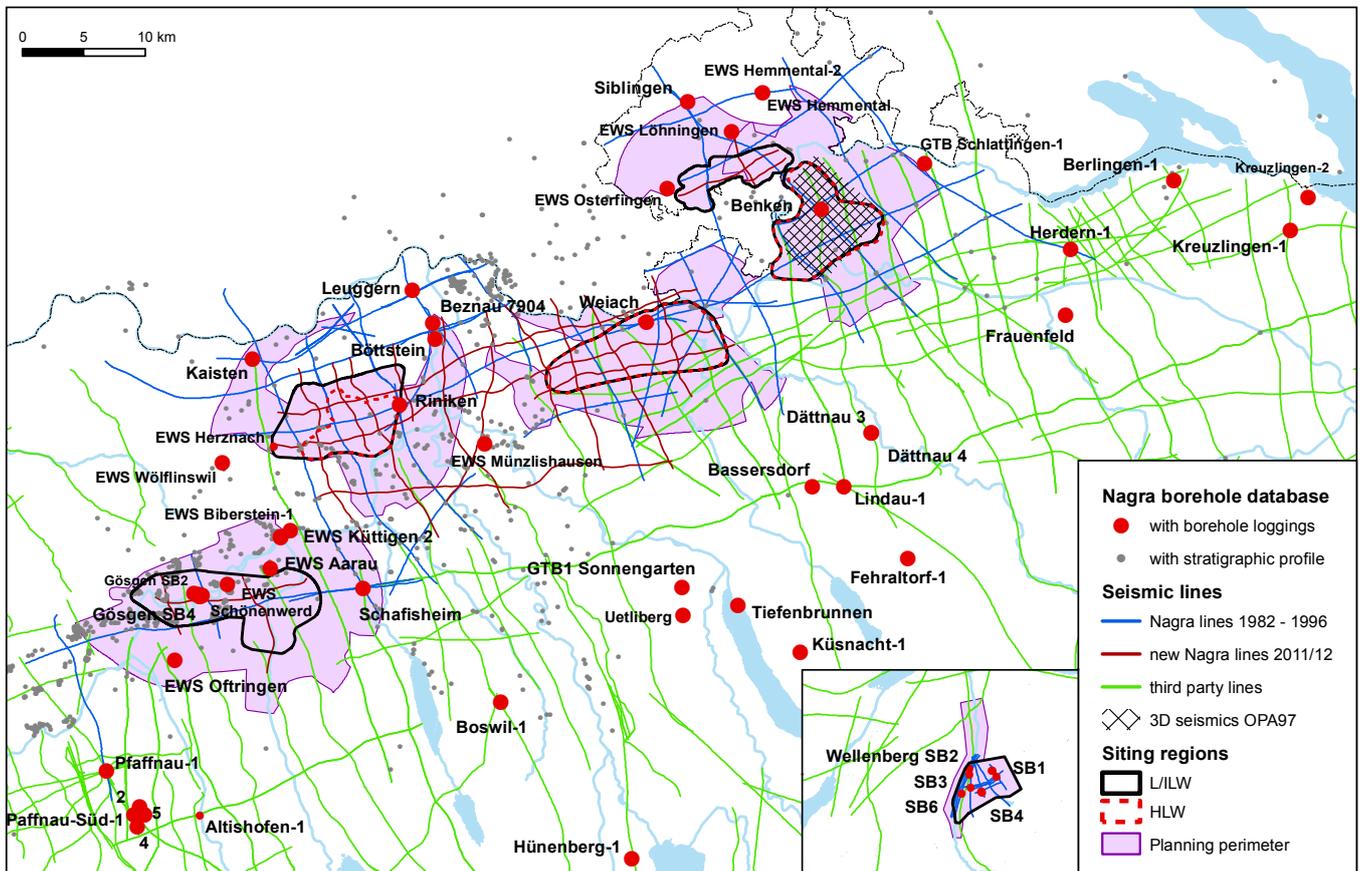


Figure 5: Siting regions and geological data. The regions are covered by a dense network of seismic lines and a large number of boreholes

Analyses, modelling and syntheses

In summer 2014, the series of so-called interim assessment meetings involving ENSI, the NSC, the Expert Group on Nuclear Waste Disposal and the Cantons (AG SiKa/KES) came to an end. ENSI reached the conclusion that Nagra had built up the necessary knowledge base to allow the siting regions to be narrowed down in Stage 2 and had carried out the required analyses and modelling studies. Prior to these meetings, Nagra provided the authorities with the final drafts of the relevant reference reports and the final versions of the reports then took into account the recommendations and requirements of the authorities.

The following topics were discussed at the meetings: near-field geochemistry, conceptual models for the provisional safety analyses, build-up of gas pressure and gas transport in the repository, long-term evolution of the system, erosion and the geomorphology of Northern Switzerland. Other topics included the hydrogeology and long-term stability of the Wellenberg siting region, repository-induced effects, rock stresses, subsoil models and engineering risk analyses, as well as safety analyses for the access infrastructure during the operational phase.

Geochemical retention processes and transport mechanisms

In order to quantify geochemical retention processes and transport mechanisms, the geochemical evolution of the deep geological repository has to be described sufficiently accurately, taking into account the complex interactions between the host rock and the repository with its individual components. A report on these topics was prepared for the SF/HLW repository and for the L/ILW and ILW repositories.

Chemical processes in the SF/HLW repository are determined by the bentonite near-field with the SF/HLW containers. The main factor is the influence of iron corrosion products on the chemical stability of the bentonite backfill and the evolution of the shotcrete lining, taking into account the interaction with bentonite and Opalinus Clay. The influence of increased temperatures due to heat production from the fuel assemblies and the vitrified high-level waste on the mineralogy of the near-field was also investigated. The cementitious near-field is particularly relevant for the chemistry of the L/ILW and ILW repositories; investigations included the influence of the waste on the evolution of the cement backfill material and interactions between the host rock and the cement. The results show that, despite the different interactions between the waste, the backfill material and the host rock, a significant barrier function is maintained over the required time periods.

Cementitious materials make up a significant proportion of the volume of the L/ILW repository and perform important safety functions on both the short and long term. Lining the disposal caverns with concrete provides mechanical stability during the operational phase. The cement mortar used for waste conditioning and backfilling the caverns has a high sorption capacity for many radionuclides and ensures their retention in the near-field.

The differing chemical properties of the porewaters (pH and composition) result in interactions between cement mortar and the host rock. Formation of

new minerals can block the cement-rock interface, which has an influence on water and gas exchange. Spectroscopic analyses carried out at PSI and the University of Bern on cement and clay samples from the Mont Terri Rock Laboratory showed minor formation of new minerals. To date, there are very few experimental data on the interactions between cement and clay as these occur very slowly. Mathematical models therefore serve as an important tool for estimating such processes.

Investigation of gas pressure build-up and gas transport

The formation of gas in a sealed repository can have an impact on the barrier system and is therefore a safety-relevant process. A significant contribution to gas formation in the L/ILW and ILW repositories comes from the corrosion of metals. An experiment started at the University of Toronto in 2012 on measuring the corrosion of steel in cement mortar under both saturated and unsaturated conditions is now complete. The anaerobic corrosion of carbon steel was investigated under conditions that are relevant for the L/ILW repository. In most cases, the measured corrosion rates were less than 5 nanometres per year. A follow-up experiment was initiated to provide more data. Besides confirming the results of the previous study, this is intended to provide corrosion rates for a wider spectrum of environmental conditions that are typical for the L/ILW and ILW repositories.

The model used for calculating gas formation was modified to bring it into line with the updated model inventory of radioactive materials MIRAM 14 and the underlying concepts were further refined. For example, the stoichiometry of the degradation of organic substances is now explicitly included for each material class in MIRAM 14 using so-called model reactions. A local reduction in the pH value as a result of the degradation of organic components in the waste can also now be taken into account when calculating gas formation due to metal corrosion.

The analyses carried out in 2014 of gas pressure build-up in the L/ILW and HLW repositories have shown that gas formation has no significant influence on the barrier function if the repository is designed appropriately. An engineered system for gas removal (Engineered Gas Transport System EGTS) can be used to increase the gas transport capacity of the L/ILW repository. In order to demonstrate the feasibility and functionality of an EGTS, the multi-year, large-scale GAST demonstration experiment was set up at the Grimsel Test Site in 2011. A key question regarding controlled removal of gas through an EGTS is the long-term behaviour of the sealing structures as a result of geochemical processes (precipitation). A report on this was completed in 2014. It was found that a sealing structure that is appropriately dimensioned and constructed of suitable materials will retain its favourable properties with respect to gas transport and radionuclide retention over the entire time period of 100,000 years considered for the L/ILW repository.

Design of the repositories and the engineered barriers

The generic (site-independent) consideration of safety and groundwater protection carried out in 2013 in connection with the repository surface facility was documented in a technical report (NTB 13-01). The focus in 2014 was on generic analyses of safety under normal operating conditions and during accidents in

the underground facilities (including the access and transport infrastructure). It was reported (NAB 14-51) that safe operation of the repository in line with legal and regulatory requirements is possible.

The analyses carried out are also used to optimise the facilities in terms of safety through taking appropriate measures. Deviations from normal operation and accidents can thus be avoided as far as possible and their impacts minimised. The basis for the discussed measures is the internationally recommended concept of staged safety (defence in depth, several successive complementary levels of active and passive measures).

A risk analysis was also carried out as part of the safety-based comparison of the geological siting regions in Stage 2. The risks associated with the construction of the access infrastructure for all the siting regions and siting areas for the surface facilities and for all access configurations that come into question (ramp/shaft) were analysed and evaluated. In a first phase, the routing of the access infrastructure from the surface facility to the underground disposal perimeter was optimised in terms of risk avoidance or minimisation. A stepwise qualitative risk analysis and evaluation of all relevant hazards was carried out for each siting region and all access configurations. The results formed the basis for preparing risk profiles for each siting region and all access configurations. The results for the underground accesses showed no significant differences for the comparison of the siting regions and the different access configurations (ramp/shaft) if suitable measures for risk management are put in place. The analyses also indicated no reservations regarding safety during construction of the accesses.

Defining the disposal perimeter – depth of the disposal level is important

The maximum depth of the disposal level is of considerable importance for defining and evaluating the disposal perimeter. This was also taken into consideration in the narrowing-down proposals in Stage 2. The depth of the disposal level has an influence on the geotechnical conditions for the disposal chambers and the other structures at this level and is also important for analysing any possible impairment of the barrier system in and directly around the disposal chambers. The safe and reliable construction and operation of the underground facilities has to be assured and perturbation and damage to the surrounding host rock and the engineered barriers (bentonite backfill) also has to be restricted. In the sense of optimising safety, investigations were carried out of how the requirements can be fulfilled as a function of depth below terrain. The existing geodatabase was systematically reprocessed and updated and different analytical methods (experience from tunnel construction, semi-empirical procedures, analytical and numerical calculation methods) were used to investigate the behaviour of the rock and the disposal system during the construction and operation of the underground structures for a large number of model configurations for all the siting regions. The results show that the underground facilities can be constructed and operated safely and reliably for all the siting regions provided suitable construction techniques and tunnel lining over the entire depth range are selected (i.e. minimum requirement of 800 metres for the L/ILW repository and 900 metres below terrain for the HLW repository). To minimise the damage to the barrier system, the depth was restricted to around 600 metres for the L/ILW repository and 700 metres for the HLW repository.

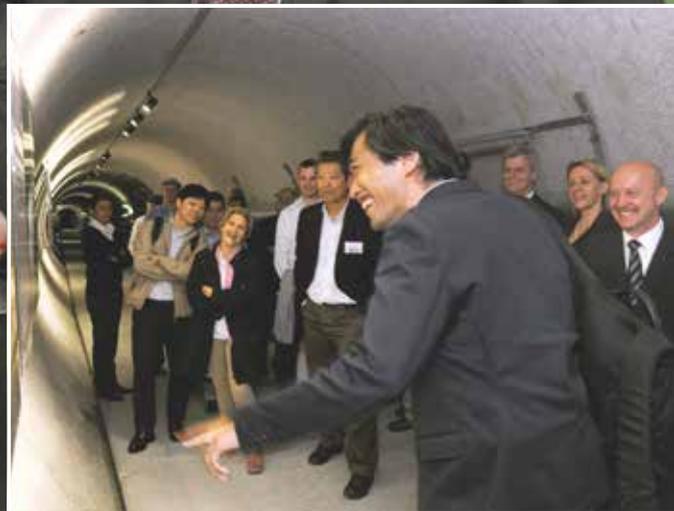
Further research on copper-coated containers

The collaboration continued between Nagra and its Canadian sister organisation NWMO on development of copper-coated disposal containers for spent fuel assemblies and vitrified high-level waste. Following a successful demonstration of feasibility and investigation of the basic properties of such containers, the work focused on the application of the coating technology in large-scale experiments. Disposal containers and lids were coated with copper using the so-called Cold Spray technology. Work was also carried out on characterising the corrosion behaviour of copper coatings applied electrolytically and using the Cold Spray method. Both types of copper coating showed virtually identical corrosion behaviour to the forged steel containers coated in copper that are being investigated by SKB in Sweden.

Together with The Welding Institute (TWI) in the UK, a new welding method was developed for the copper-coated hemispherical lid of the SF/HLW container that would make thermal after-treatment of the welding seam superfluous. The aim is to avoid heating up the waste in the container excessively during the welding process. Other welding techniques are currently being evaluated.

In 2014, the Swiss Federal Laboratories for Materials Science and Technology (EMPA) prepared a review report on the selection of materials and designs for SF/HLW containers. The report considered a wide spectrum of possibilities. The evaluation of suitability and feasibility in the study was based on an analysis of the following parameters: mechanical integrity, corrosion and aging behaviour, impacts on the surrounding engineered and geological barriers, lifetime, manufacturing technology and costs. EMPA came to the conclusion that, of all the variants considered, the copper-coated container and the Swedish copper-steel container have the lowest project risks.

A report was prepared together with SKB and Posiva (Finland) on the stability of the safety-relevant properties of bentonite under expected repository conditions. The results show that bentonite can tolerate the increased temperatures that will prevail in the near-field of the HLW repository after emplacement of spent fuel assemblies and vitrified high-level waste and that the safety requirements can be met.



On the occasion of the 30-year anniversary of the Grimsel Test Site in June, Nagra opened a photo exhibition on underground research worldwide together with its international research partners

Rock laboratories

Main projects at the Grimsel Test Site

BELLT (Bentonite Large-scale Load Test)

Investigation of the long-term stability of bentonite blocks of differing density and water content under loading conditions

CFM (Colloid Formation and Migration)

Fundamental aspects of radionuclide migration in crystalline rock. Formation and transport of colloids and their influence on radionuclide mobility under realistic conditions

FEBEXe/DP (Full-scale HLW Engineered Barriers Experiment Extension/Dismantling Project)

1:1 demonstration of the emplacement concept for high-level waste

FORGE¹ (Fate of Repository Gases)

Experiments on gas migration in engineered barriers (bentonite/sand)

GAST (Gas Permeable Seal Test)

Gas sealing experiment: controlled gas transport through the engineered barriers (gas-permeable tunnel seals for the L/ILW repository under realistic conditions and on a realistic scale)

ISC (In situ Stimulation and Circulation Test)

Testing and development of analysis methods; project in preparation stage

LASMO (Large-Scale Monitoring)

Monitoring and characterisation of the geosphere

LCS (Long-term Cement Studies)

Long-term interactions between cement solutions, porewaters and rock; the cement injection experiment JGP (previously the JAEA Grouting Project) is now integrated into LCS

LTD (Long-term Diffusion)

Long-term diffusion of radionuclides

MACOTE (Material Corrosion Test)

Corrosion experiments (engineered barrier system components)

MoDeRn (Monitoring Developments for Safe Repository Operation and Staged Closure)

Work package of the EU project for testing cable-free monitoring techniques

Plug experiment (Engineering Studies and Demonstration of Repository Designs, previously an ESDRED sub-project)

Use of low-pH cements

¹Sub-project of an EU project

Grimsel Test Site (GTS)

Nagra has been operating the Grimsel Test Site (GTS) since 1984. The laboratory is located in the crystalline formations of the Aar Massif in the Bernese Alps. Experiments are carried out to test and further develop concepts for safe disposal of waste in deep geological repositories and the facility is now recognised worldwide as an important research platform.

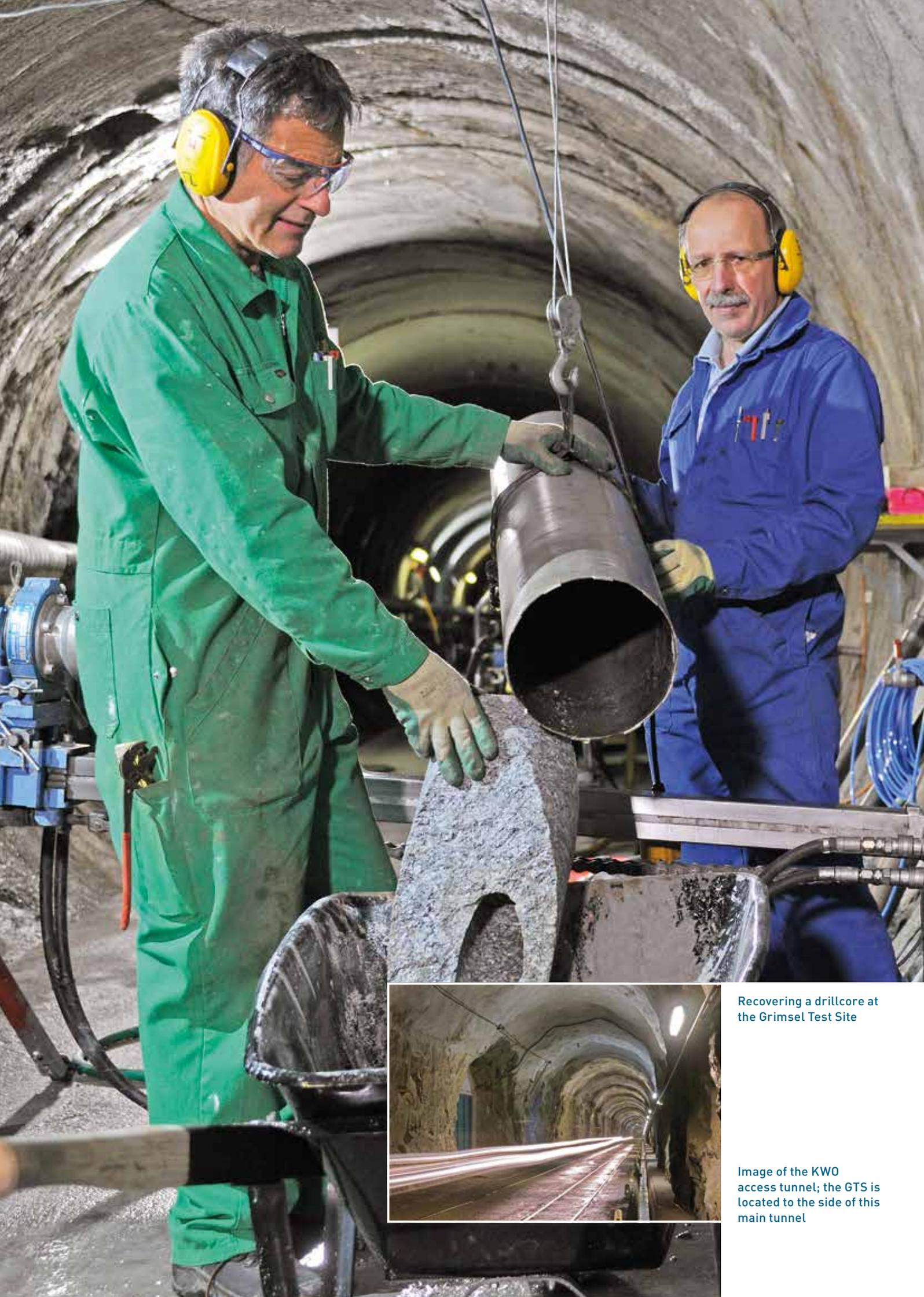
20 organisations from 12 countries are currently involved in the projects. In 2014, the Obayashi Corporation of Japan was welcomed as a new partner (participation in the FEBEXe/DP project; for abbreviations see the box on the left). On the occasion of the annual International Steering Committee (ISCO) meeting in June 2014, the representatives of the partner organisations confirmed their continuing interest in the projects at the Test Site. Besides the excellent infrastructure, the geological conditions, with alternating tectonically strongly overprinted and homogeneous zones, offer ideal conditions for the research projects of Nagra's international partner organisations. An important contribution to the attractiveness of the location is that it is the only rock laboratory worldwide where transport experiments with radionuclides can be carried out in fractured rock under controlled conditions.

The focus of the current project phase (2013 to 2018) was on the detailed planning of the work programmes and field experiments for the individual projects. For example, further tests and modifications to the experiment set-up were made at the beginning of 2014 as part of the CFM Project. Following completion of the design work in May, work began on installing the 'source packer' with selected radiotracers for the long-term in situ test. In the LTD Project, the circulation of the radionuclide tracer cocktail 'monopole 2' was initiated and long-term monitoring was started successfully.

Activities in the FEBEXe/DP Project focused on preparing for the dismantling of the in situ heater experiment planned for spring 2015. The Project started at the beginning of June 2014 and the heating phase and the long-term monitoring are running in parallel as planned. In the LCS Project, the focus was on monitoring the in situ experiments and the laboratory and modelling studies. Work started in parallel on the test boreholes for the future overcoring of the LCS in situ experiments.

Following a first saturation phase, water injection in the long-term GAST experiment had to be interrupted at the beginning of 2014 as a result of a drop in pressure associated with water exfiltration in the area of the cable feed-through. The cause of this was investigated and a sealing concept was developed and implemented in the subsequent months. Continuation of the injection/saturation phase is planned for the beginning of 2015. Long-term monitoring aimed at investigating the behaviour of the sand/bentonite material is continuing in parallel with the work on sealing. The instrumentation for the GAST mock-up experiment was extended at the beginning of 2014 and gas injection started in June. The investigation of the sand/bentonite material is planned for the first half of 2015.

A further focal point in 2014 was the start of intensive field work as part of the LASMO Project. This included setting up the measurement systems for mon-



Recovering a drillcore at the Grimsel Test Site



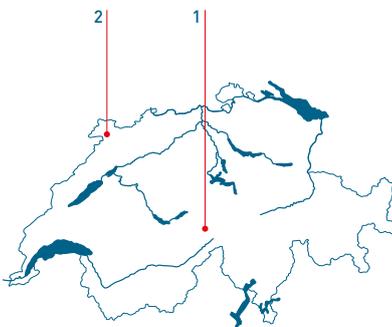
Image of the KWO access tunnel; the GTS is located to the side of this main tunnel

itoring pore pressure, stress changes, fracture displacements and micro-seismicity during the drainage of the Räterichsboden reservoir at Grimsel. A programme of high-resolution geochemical measurement campaigns was also initiated. Other highlights included the installation of the modules (sensors of copper, carbon steel and stainless steel as well as copper-coated sensors in MX-80 bentonite under anoxic conditions) as part of the first experimental phase of the MACOTE Project. Long-term monitoring and water sampling began at the same time. The test stand for the experiments of the BELLT Project was set up in the first half of the year and the first test was carried out.

Other research groups continued to use the rock laboratory for their own experiments in 2014. In the second half of the year, the kick-off meeting was held for the ISC Project and the first test measurements were carried out by the ETH Zürich.

On the occasion of the 30-year anniversary of the Grimsel Test Site, a photo exhibition on underground research worldwide was opened in June 2014; the event was attended by partner organisations and representatives of the media. The laboratory also continued to welcome visitors in 2014. As part of the annual radiation control inspection by the authorities and an inspection by an institute responsible for operational safety, the high standard of the GTS infrastructure and the professional working methods in a challenging environment were acknowledged.

Again, the GTS team was able to rely on support from the local communities of Guttannen, Innertkirchen and Meiringen and from many local companies. In particular, the long-standing collaboration with Kraftwerke Oberhasli (KWO) contributed to another successful year of operation, with numerous coordination and information meetings.



1 Grimsel Test Site (Nagra)
2 Mont Terri Rock Laboratory
(Swisstopo)

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



View from the FE test tunnel with the bentonite pedestal in the foreground

Close-up of a sensor for measuring temperature and humidity

Key experiments in the Mont Terri Rock Laboratory

CI (Cement-Clay Interaction)

Mineralogical interaction between clay and cement

DB (Deep inclined borehole through OPA)

Cored borehole through the entire section of Opalinus Clay

DB-A (Pore Water Characterisation, Benchmarking and Investigation of Interface to Adjacent Aquifer)

Investigations of porewater on samples from the DB experiment

DR-A (Diffusion and Retention)

Diffusion and retention of radionuclides

DR-B (Long-term Diffusion)

Long-term diffusion experiment

FE (Full-scale Emplacement Demonstration)

1:1 emplacement experiment for investigating the near-tunnel environment

HE-E (Heater Experiment)

Behaviour of the engineered barriers under the influence of heat

HG-A (Gas Path Host Rock and Seals)

Gas flowpaths through the Opalinus Clay and along sealing structures

HG-D (Reactive Gas Transport in Opalinus Clay)

Reactive gas transport in clay

HT (Hydrogen Transfer)

Transport of hydrogen gas

IC (Iron Corrosion in Opalinus Clay)

Corrosion of various types of steel in Opalinus Clay

IC-A (Corrosion of Iron in Bentonite)

Corrosion of various types of steel in Opalinus Clay

MA-A (Modular platform for microbial studies)

Microbial processes in the bentonite barrier

VA (Investigation of Spatial Variability within Opalinus Clay)

Variability of rock properties

Nagra participation in experiments in the Mont Terri Rock Laboratory (FMT)

The international Mont Terri research project (St-Ursanne, Canton Jura) has been underway since 1996. The experiments are located in side tunnels of the security gallery of the Mont Terri motorway tunnel and are aimed at the geological, hydrogeological, geochemical and geotechnical characterisation of the Opalinus Clay. Participating in the Mont Terri Project allows Nagra to carry out detailed 1:1 scale investigations of the properties of the Opalinus Clay that are relevant for radioactive waste disposal and thus to improve process understanding with a view to upcoming licensing procedures.

15 partner organisations from 8 countries are currently involved in the experiments. The programme is drawn up by a committee on which each partner is represented. The Mont Terri project is led by the Swiss Federal Office of Topography (Swisstopo) and is supported by a "Commission stratégique". The interests of Canton Jura are represented by the "Commission de suivi".

The 19th programme phase was completed as planned in the first half of 2014. Nagra is involved in 25 of a total of 46 experiments in Phase 20, which runs from July 2014 to June 2015. These include the continuation of the LUCOEX Project from the 6th EU Framework Programme as part of the FE Experiment. A new experiment has started on investigation of microbial processes in the bentonite barrier (MA-A).

Based on Nagra's own experience and the recommendations of the authorities arising from the review of the 'Entsorgungsnachweis (feasibility demonstration) Project', the focus of the work is on detailed investigation of the properties of the host rock (VA, DB and DB-A experiments), radionuclide diffusion in the Opalinus Clay (DR-A and DR-B experiments), gas migration (HG-A, HG-D and HT experiments), the corrosion of construction and container materials (IC and IC-A experiments) and the continuation of a long-term experiment on the interaction between clay and cement (CI experiment). Cement is used in the L/ILW and ILW repositories as a solidification, backfill and construction material.

The year also saw the continuation of the large-scale FE Experiment, which is looking at the behaviour of the Opalinus Clay in the vicinity of a waste emplacement tunnel under the influence of temperature on a 1:1 scale. The main interest is in the effect of temperature on hydraulic and mechanical processes in the host rock. Practical experience will also be gained in excavating and securing disposal tunnels and with emplacing waste containers and backfill material. The saturation of the bentonite and the evolution of the tunnel atmosphere are also being investigated. The FE Experiment is co-financed by the EU as part of the LUCOEX project (for abbreviations see page 35). The instrumentation for the experiment is now complete and two of the three dummy containers with heaters which simulate the spent fuel containers had been emplaced by the end of the year. The tunnel segments were then backfilled with bentonite. Electrical heating systems are used to simulate the heat production of the waste.



Participants at the 2014 ISCO (International Steering Committee) meeting in Thun

Consulting services

International Services and Projects (ISP)

Nagra's ISP Division is responsible for activities with funding sources outside the Swiss national programme, as well as for the Grimsel Test Site. The activities cover a wide spectrum of projects in the radioactive waste management field – strategic programme planning, specification of waste inventories, site selection, characterisation and evaluation, repository design, safety case development, safety analyses, public communication, focused training and know-how build-up, as well as projects in other scientific and technical fields such as geothermal exploration.

Reviewing the costs of deep geological repositories/waste management programme

Preparations began in 2014 for the 2016 cost study. In this connection, the Federal Government commissioned a review of the method used for cost estimation for the 2011 study. For the waste management programme to be submitted in 2016, Nagra analysed the conditions attached by the Federal Council to the 2008 programme and made a proposal regarding how to address the individual recommendations and document them transparently. The waste management programme will be coupled with the RD&D plan in future; the documentation for these two projects will be submitted simultaneously with the cost study.

International Services and Projects (ISP)

With its current know-how, Nagra is in a strong position to effectively support its partner organisations. These consulting services are offered by a motivated team of employees who are also actively involved in the Swiss national programme. The focal points of the international project work in 2014 are outlined in the paragraphs below.

Within Europe, work was carried out for ONDRAF/NIRAS (Belgium) on the safety and feasibility demonstration for high- and intermediate-level waste. Several projects were also carried out for RWM (UK) and two new projects were initiated on the sealing of exploratory boreholes and the behaviour of waste containers. Nagra experts were also invited to lead hydrogeological and hydrochemical workshops for RWM. Closer to home in Switzerland, Nagra geoscientists continued to support various geothermal development projects, including deep drilling campaigns.

Nagra also continued to support the research programmes of Japan's JAEA in their underground laboratories, as well as neotectonic studies in Japan. Nagra was also represented at JAEA workshops on long-term safety analysis and the disposal of spent fuel.

Still in Japan, the ongoing collaboration with RWMC was extended to include a report on RD&D activities in Switzerland. The work with NUMO on the planning and design of demonstration experiments for deep geological disposal in Japan continued. A new project was initiated in autumn together with the Obayashi Corporation looking at cement/bentonite interactions and their influence on gas migration processes.

A project with the Korean organisation KORAD on criteria for site selection and development of research programmes for a rock laboratory in South Korea was completed. A guest scientist from KORAD worked with Nagra during the project. The collaboration will continue with the development of geological databases.

Nagra experts also took part in the "Geoscience Review Group" on site selection for the Canadian high-level waste repository site and the "Independent Technical Review Group" for development of the Canadian HLW programme. As part of a bilateral workshop organised by NWMO, Nagra was able to bring its wide knowledge on the manufacture, emplacement and behaviour of granular bentonite material to the table. Nagra was also involved in international contracts and workshops organised by the IAEA in China, South Korea and the USA.

34 International collaboration

A regular exchange of information between Nagra and 16 foreign partner organisations takes place within the framework 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 in Switzerland and abroad) or together with international organisations. Projects are also carried out in the laboratories of various research institutes and on development of models and evaluation of databases, including the OECD/NEA project on the thermochemical database. Nagra was also actively involved in the OECD/NEA project "Preservation of Records, Knowledge and Memory (RK&M) Across Generations", on transferring information on deep repositories to future generations. The results for the 2011-2013 phase of this project were presented in 2014 at an international conference in Verdun (France).

Besides the formal collaboration structure, international contacts have also generated a close network of personal relationships, which provide Nagra scientists with a wealth of opportunities for informal discussion of technical issues with their peers. This network includes not only partner organisations but also the wider scientific community that is integrated into Nagra's daily activities through review of its scientific work.

Nagra's participation in the EU Framework Programmes continues to represent an important component of its research and development activities. Collaboration with EU partners has been strengthened by Nagra's involvement in the "Implementing Geological Disposal of Radioactive Waste Technology Platform" (IGD-TP). Technical-scientific projects have started on several of the topics within the development programme or are being discussed in working groups.

Nagra staff continue to be represented in various advisory bodies and working groups (particularly in Belgium, France, Canada, Finland and Sweden) and are able to benefit directly from the experience of sister organisations worldwide. Over and above the various specific joint projects, Nagra is also represented in working groups of the OECD/NEA and works together with the IAEA on relevant projects. Nagra is also a member of EDRAM, an association of senior-level staff from waste management organisations worldwide.

During the year, Nagra also took part in international meetings on the topic of geological disposal. Members of staff were invited to make presentations and were active on the organising committees of several events, including the Clay Conference 2015 and the International Conference on Geological Repositories ICGR 2016.

7th EU Framework Research Programme

PEBS (Long-term Performance of Engineered Barrier Systems – EBS)
Validation of thermo-hydro-mechanical models for simulating the HLW near-field in the early post-operational phase

Coordination: BGR (Germany).
 Participation: 10 organisations from 5 countries.
 Duration: 2010 – 2014

LUCOEX (Large Underground Concept Experiments)

Demonstration of the emplacement and backfilling technologies for geological repositories

Coordination: SKB (Sweden).
 Participation: 4 organisations from 4 countries
 Duration: 2011 – 2014

DOPAS (Full Scale Demonstration of Plugs and Seals)

Investigation of the sealing concepts for the access structures of a geological repository for clay, salt and crystalline host rocks

Coordination: Andra (France).
 Participation: 14 organisations from 8 countries
 Duration: 2012 – 2016

CAST (Carbon14 Source Term)

Investigation of the release rate and speciation of ¹⁴C due to corrosion of activated steels and Zircaloy and by leaching of exchange resins and graphite under repository-relevant conditions

Coordination: NDA (UK).
 Participation: 33 organisations from 15 countries
 Duration: 2013 – 2018

Framework Research Programmes of the European Union (EU)

The Framework Research Programmes of the EU function as an important instrument for promoting collaboration on research projects within Europe. The idea is to promote scientific and technological capacities and to encourage European competitiveness and innovation by supporting improved cooperation among researchers. Many of the challenges faced by industry and society today can no longer be solved in isolation by one country alone.

The 8th Framework Research Programme “Horizon 2020 – Research and Innovation” was initiated in January 2014 with a budget of around 80 billion Euros. The parallel programme on research and education measures in the nuclear field (Euratom Programme) is now integrated into “Horizon 2020”.

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

The research projects in the area of deep geological disposal of radioactive waste allow Nagra to expand its technical knowledge base efficiently and to be instrumental in shaping important developments in Europe. The focus in 2014 was on participation in various 7th Framework Programme projects (see box).

The project FIRST-Nuclides (nuclide release from spent fuel assemblies) ran from 2012 to 2014, with Nagra providing review services and expert support.

As part of the “Horizon 2020” Programme, Nagra is involved in applications for the projects “MODERN2020” (monitoring), “MIND” (microbiology) and “CEBAMA” (cement interactions).

Public outreach

The identification of the siting areas for the repository surface facilities in Stage 2 of the Sectoral Plan process with the participation of the regional conferences of the siting regions was completed successfully in 2014. Nagra was invited by the authorities, the Cantons, the regional conferences and interested organisations to provide information, answer questions and deliver expert opinions.

Communication and dialogue

Providing factually correct, up-to-date information and conducting open dialogue on an appropriate level form the basis for building trust. Nagra's public relations activities are aimed at maintaining close contact with the public and providing them with comprehensive and transparent information that is directed towards specific target groups. A wide range of communication tools and contact opportunities is used for this – the internet, brochures, films, media presence, guided tours of the rock laboratories, presentations and lectures, the TIME RIDE exhibition, presence at regional trade fairs and discussion platforms.

TIME RIDE

Nagra's exhibition "TIME RIDE – a journey through space and time", which was launched in 2012, spent 51 days in the Transport Museum in Lucerne in 2014; it also visited trade fairs in Basel (Muba, 10 days), Aarau (AMA, 5 days) and St. Gallen (Olma, 11 days). A total of around 160,500 people had visited the exhibition by the end of 2014. Reactions have been largely positive; TIME RIDE underlines the message that the Opalinus Clay host rock is suitable for the safe long-term geological disposal of radioactive waste. The exhibition will continue to be used on a reduced scale for public outreach in the coming years.

Trade fairs and guided tours - Nagra on location

Nagra was present with its information stand at 15 regional trade fairs and markets, mainly in communities in the siting regions, including an event marking 30 years of the Leibstadt NPP. These events provided the opportunity for direct contact and exchange of opinions with the public.

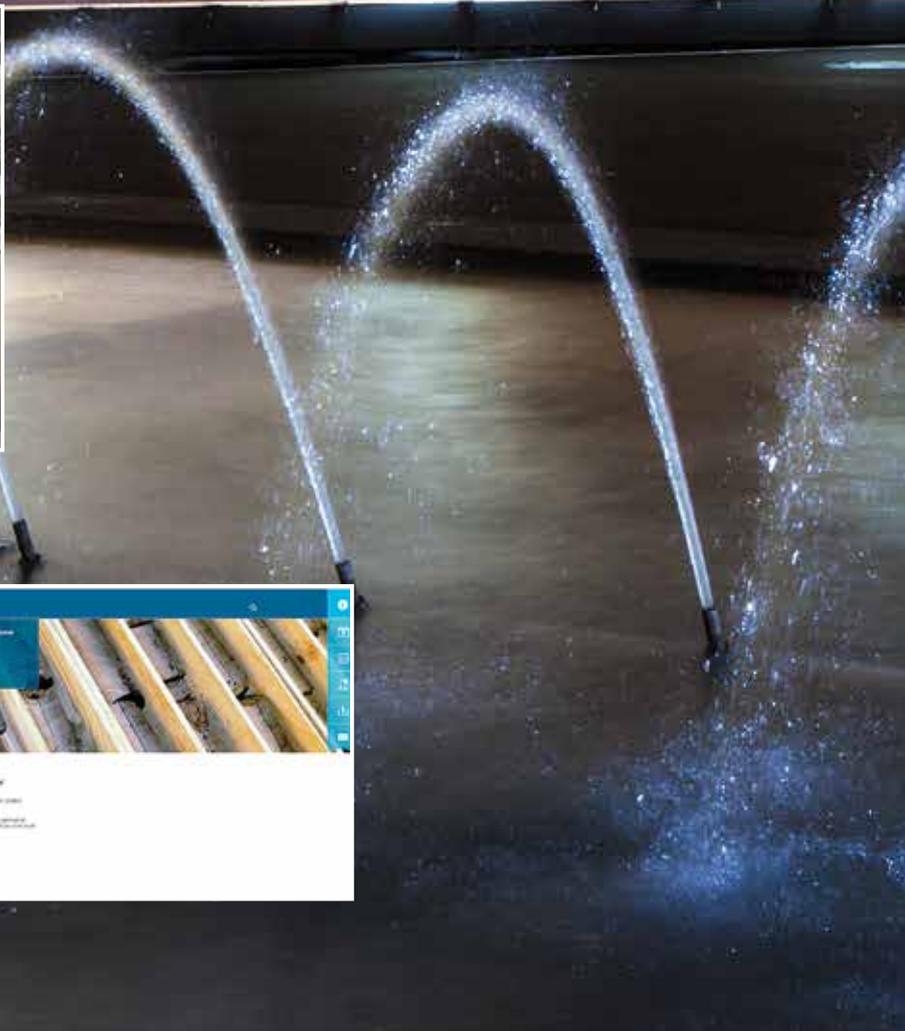
A total of 6246 people visited the two rock laboratories (1081 at the Grimsel Test Site and 5165 at the Mont Terri Rock Laboratory). Besides the regular tours of the facilities, Nagra also organised three open days at the Mont Terri Rock Laboratory for the interested public from the potential repository siting regions.

Nagra's school programme

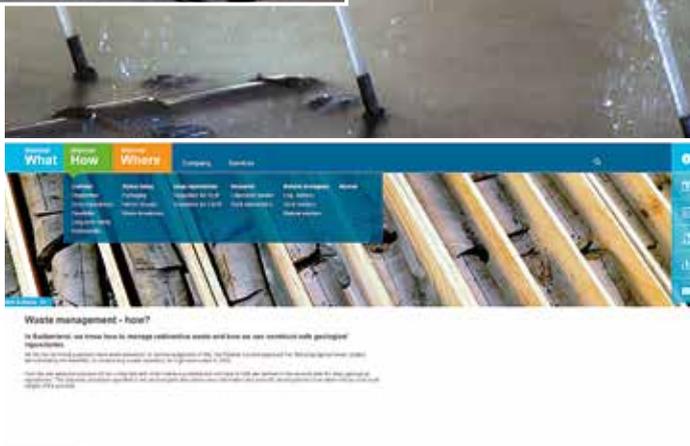
Nagra was invited to visit schools to make presentations on a range of topics and also took part in three "TecDay" events in Swiss secondary schools. These are organised on a regular basis by the Swiss Academy for Technical Sciences and have proved to be very successful in making pupils aware of the fascination of natural science subjects. Nagra was also involved teacher-training seminars at the Leibstadt and Gösgen nuclear power plants. The school lesson modules on "Traces of the Future", "Geology – fundamentals and application" and the Pillion experiment set were checked to ensure they were up to date and were modified and reprinted. Nagra also held a one-day



Shooting the video on the FE Experiment (small photo above)



Nagra was underway with the TIME RIDE exhibition in 2014



Nagra's website has a new structure and a more modern design since November 2014 (small image right)

seminar for teachers on the Phillon experiment set as part of the 30-year celebrations at the GTS and took part in the teacher-training seminar organised by Forum Vera on 12th/13th September, with a podium discussion on the topic of radioactive waste disposal. Two newsletters for teachers were also distributed.

Extensive information palette for interested readers

In 2014, Nagra mailed two issues of "nagra info" to 19,000 subscribers; around 300,000 copies were also distributed in a special action to households in the siting regions. Fact-sheets were prepared for the regions Nördlich Lägern and Zürich Nordost as part of the process of designating the siting areas for the surface facilities. In response to demand, many of Nagra's print products also had to be reprinted during the year. Print products can be ordered or downloaded directly from the Nagra website. Up to the end of the year – in parallel with the preparation of the Stage 2 reports – Nagra worked intensively on a brochure and flyer that explain and summarise the methods and results of the safety-based comparison of the siting regions. These materials were published at the end of January 2015.

www.nagra.ch

Nagra's information website

www.timeride.ch

Information on the TIME RIDE exhibition

www.seismik-news.ch

Seismic measurement campaigns

www.erdwissen.ch

Geology blog coupled with social media

New Internet presence

The Internet (websites and newsletter) allows Nagra to provide the public with information quickly and directly. The Nagra website (www.nagra.ch) is available in three languages and is continually updated with news, media releases and materials for downloading. Nagra's Internet presence was completely redesigned in 2014 and, since 18th November, has been available in a fresh, modern design and with the content structured more clearly. The new website was prepared in so-called 'Responsive Webdesign' and can therefore be viewed on smartphones and tablets. Two issues of the electronic newsletter (e-info) also appeared in 2014.

Nagra in the media spotlight

2014 saw Nagra hold its first annual media conference; this will be a fixture in the future. 19 journalists (print, radio, TV) attended the premiere, which was followed by detailed reports in the media (37 newspaper articles, 5 online articles and 5 radio / TV programmes). Five media releases were also published in 2014 and a video was produced on the FE Experiment. Interest in radioactive waste management is continually increasing within the context of the ongoing Sectoral Plan process. For example, the Swiss national news agency sda visited the Grimsel Test Site on the occasion of its 30th anniversary and the reports were taken up by a range of print media. A large part of the reporting of Nagra's work was dedicated to the FE Experiment. Nagra also accompanied journalists to Sweden and Finland on a trip organised by the 'Nuklearforum' and on a visit to the Mont Terri Rock Laboratory. These events led to publication of numerous articles and reports on waste management.

Organisational structure

President of the Board of Directors



Corina Eichenberger
President of the Board of Directors

"The safety of humans and the environment is the main priority in the management of radioactive waste. Waste disposal should have no negative impacts on mankind and has to be compatible with the needs of the affected region. It is personally of great importance to me that we should master this challenge in the future and approach it with the greatest sense of responsibility."

Executive Board



Dr. Thomas Ernst
Chief Executive Officer

"Only deep geological repositories can ensure the safe containment of radioactive waste over thousands of years."



Dr. Markus Fritschi
Division Head, Repository Projects and Public Affairs

"Our duty to future generations is to implement this environmental protection task in Switzerland without delay and not to place it on the back-burner. The technical basis for achieving this already exists."



Dr. Piet Zuidema
Head of Science and Technology

"The research and investigation programmes carried out by Nagra have resulted in an advanced level of knowledge. Switzerland has host rocks of excellent quality for confining radioactive waste and the deep geological repositories can be realised with the required level of safety."

40 Management and head office

Head office

At the end of 2014, 102 people were employed at Nagra's head office in Wettingen (98 full-time employees and 4 part-time staff/temporary employees), corresponding to 91.0 full-time positions.

Board of Directors and annual general meeting

The Board of Directors held five meetings to deal with ongoing business as well as two closed meetings. The focus of all the meetings was on the Sectoral Plan process. The Board took note of the planned research and development programme for 2015 and approved the required framework credit.

The Technical Committee met three times and the Commission for Communication and Information met twice. The Finance Commission also met twice to consider the closing of the annual accounts for 2013, the budget for 2015 and the accumulated accounts.

The annual general meeting of the members of the Nagra Cooperative took place on 26th June in Bern. The members approved the annual report and accounts for 2013. Corina Eichenberger (Member of the National Council) was elected as the new President of the Board of Directors. She succeeds Pankraz Freitag, who died unexpectedly in October 2013.

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

Members of the Cooperative

Swiss Confederation
Bern

Axpo Power AG
Baden

BKW Energie AG
Bern

Kernkraftwerk Gösgen-Däniken AG
Däniken

Kernkraftwerk Leibstadt AG
Leibstadt

Alpiq Suisse SA
Lausanne

Zwilag Zwischenlager
Würenlingen AG

Board of Directors

Corina Eichenberger
Kölliken (AG)
President of Nagra
(from 26th June 2014)

Dr. Stephan W. Döhler
Vice-President
Axpo Power AG

Dr. Philipp Hänggi
BKW Energie AG
(from 1st September 2014)

Walter Heep
Zwilag Zwischenlager
Würenlingen AG

Hermann Ineichen
BKW Energie AG (until 1st September
2014)

Dr. Thomas Kohler
Alpiq Suisse AG

Dr. Andreas Pfeiffer
NPP Leibstadt AG

Dr. Michael Plaschy
NPP Gösgen-Däniken AG

Dr. Thierry Strässle
Swiss Confederation

Peter Zbinden
Erlenbach (Zürich)
Former CEO of AlpTransit Gotthard AG

Technical Committee

Dr. Thomas Kohler
Chairman
Alpiq Suisse SA
(from 26th June 2014)

Dr. Michael Plaschy
Chairman
NPP Gösgen-Däniken AG
(until 26th June 2014)

Finance Commission

Urs Helfer
Chairman
Axpo Power AG

Commission for Legal Issues

Hansueli Sallenbach
Chairman
Axpo Holding AG

Commission for Communication and Information

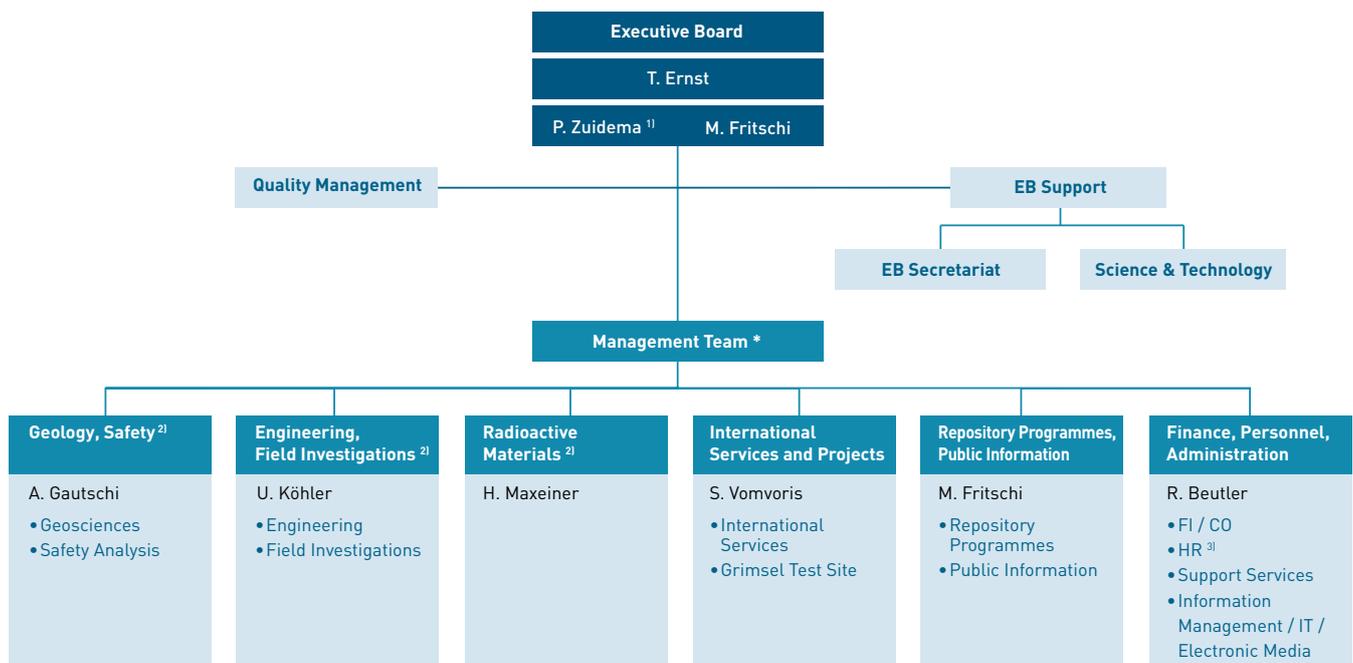
Hermann Ineichen
Chairman
BKW Energie AG
(until 1st September 2014)

Dr. Philipp Hänggi
Chairman
BKW Energie AG
(from 1st September 2014)

Statutory Auditors

PricewaterhouseCoopers AG
Zürich

Organigram of the head office



* Members of the Management Team:
T. Ernst, M. Fritschi, P. Zuidema, R. Beutler, A. Gautschi, U. Köhler, H. Maxeiner, A. Murer, A. Scheidegger, S. Vomvoris.

December 2014

¹⁾ P. Zuidema is responsible for the overall coordination and management of the Science & Technology programme.

²⁾ The Divisions "Geology, Safety", "Engineering, Field Investigations" and "Radioactive Materials" report directly to the person responsible for the overall coordination and management of the Science & Technology programme.

³⁾ Direct access to the Executive Board.

Annual financial statement for 2014

Comment on the annual financial statement for 2014

Total expenditure in 2014 decreased compared to the previous year by around 1.3 million CHF. The project costs, including fees, decreased by 2.3 million CHF. Personnel expenses rose compared to 2013 by 0.7 million CHF, mainly due to increases in the purchase of pension fund benefits, reserves for the corporate success component, length-of-service awards, compensation for overtime and for temporary appointments to cover workloads. Other operating expenditure increased by 0.3 million CHF as a result of renting additional office space and various other positions.

Similarly to total expenditure, Nagra's total income also decreased in the year of reporting by 1.3 million CHF compared to the previous year to 57.7 million CHF. The Provision for potential obligations of the now liquidated company Genossenschaft für Nukleare Entsorgung Wellenberg (GNW) are no longer required and were released as per 31st December 2014 (4.7 million CHF). The contributions of the members of the Cooperative decreased by 5.4 million CHF to 49.3 million CHF.

Further information on the different positions can be found in the Appendix to the annual financial statement.

Wettingen, 27th March 2015



Dr. Thomas Ernst, Chief Executive Officer

	31.12.2013	31.12.2014	
Assets	CHF	CHF	
Land and buildings	1 480 000	1 450 000	
Other property, plant and equipment	193 296	134 262	
Total non-current assets	1 673 296	1 584 262	1
Work in progress	812 653	915 335	2
Trade receivables	312 454	481 813	3
Other receivables	35 829	21 576	
Accrued income and prepaid expenses	1 737 461	482 782	4
Cash and cash equivalents	15 713 313	13 207 873	5
Total current assets	18 611 710	15 109 379	
Total assets	20 285 006	16 693 641	
Equity and liabilities			
Cooperative capital	140 000	140 000	
Total equity	140 000	140 000	
Provisions	6 469 831	1 905 796	6
Trade payables	8 490 658	8 848 726	7
Advance payments	1 412 930	1 907 763	2
Other liabilities	859 986	1 041 847	
Accrued expenses and deferred income	2 911 601	2 849 509	8
Total liabilities	20 145 006	16 553 641	
Total equity and liabilities	20 285 006	16 693 641	

Profit and loss account

	2013	2014	
Income	CHF	CHF	
Contributions to administration costs	700 000	700 000	
Contributions to project expenditure	54 047 200	48 628 415	
Contributions of members of the Cooperative	54 747 200	49 328 415	
Research contributions	95 366	517 642	
Income from other services for Cooperative members	790 730	373 554	
Income from services for third parties	3 294 237	2 726 037	
Income from deliveries and services	4 180 333	3 617 233	9
Profit from disposal of fixed assets	4 037	11 609	10
Other operating income	57 936	4 761 884	
Total income	58 989 506	57 719 141	
Expenses			
External services	40 223 581	37 907 771	11
Personnel expenses	15 926 993	16 646 194	12
Depreciation	167 511	175 991	
Other operating expenses	2 590 287	2 845 883	13
Operating expenses	58 908 372	57 575 839	
Financial income	-29 488	-26 435	
Financial expenses	46 632	67 499	
Taxes	63 990	102 238	
Financial result and taxes	81 134	143 302	
Total expenses	58 989 506	57 719 141	

Cash flow statement

	2013	2014	
	CHF	CHF	
Change in cash and cash equivalents			
Annual result	–	–	
Depreciation	167 511	175 991	1
Additions of provisions	414 633	216 137	6
Releases of provisions	–220 000	–4 780 173	6
Change in net current assets (without cash and cash equivalents)	–9 483 760	1 969 562	
Cash flow from operating activities	–9 121 616	–2 418 483	
Investments	–108 187	–86 957	1
Cash flow from investment activities	–108 187	–86 957	
Change in cash and cash equivalents	–9 229 803	–2 505 440	
Statement			
Cash and cash equivalents per 01.01	24 943 116	15 713 313	
Cash and cash equivalents per 31.12	15 713 313	13 207 873	
Change in cash and cash equivalents	–9 229 803	–2 505 440	5

Notes on the financial statements

Accounting principles

Nagra's annual financial statement for 2014 complies with the accounting principles set out in the Swiss Code of Obligations.

Applying the transitional provisions of the new accounting law, these financial statements have been prepared in accordance with the provisions on accounting and financial reporting of the Swiss Code of Obligations effective until 31 December 2012.

Valuation principles

Impairment of assets

The waste producers (identical with the members of the Nagra Cooperative) are obliged by the Nuclear Energy Act to finance the costs of waste disposal and the members of the Cooperative have undertaken contractually to meet all expenditure incurred by Nagra. From the viewpoint of the Nagra Cooperative, there is no indication that individual members are unable to meet this requirement and the intrinsic value of the assets is thus assured.

Non-current assets

Property, plant and equipment

Property, plant and equipment are carried at purchase or manufacturing cost and are subject to straight-line depreciation over the estimated useful lifetime of each asset category. Investments in hardware below 20 TCHF (one-off) and software below 100 TCHF (one-off) are debited directly to the income statement.

The lifetimes for depreciation fall within the following bandwidths for the individual categories that are relevant for Nagra:

Land	Depreciation only in the case of value impairment
Buildings	20 to 50 years
Operating and business equipment	5 to 10 years
IT hard- and software	2 to 3 years

Current assets

Work in progress

Under this position, the expenditure associated with all ongoing commercial projects is capitalised at the balance sheet date at acquisition or production costs.

Receivables

Receivables are shown at nominal value less any necessary value adjustments.

Cash and cash equivalents

Cash and cash equivalents comprise petty cash, credit balances with bank and postal giro accounts and bank deposits with an original term of not more than 90 days. They are carried at nominal value.

Liabilities

Provisions

Provisions are carried at the actual nominal value as of the balance sheet date.

Payables

This position contains short-term obligations that are carried at nominal value.

Advance payments

This position includes advance payments for ongoing commercial projects.

1 Fixed (non-current) assets

	Land and buildings	Office and workshop	Vehicles	Total
	TCHF	TCHF	TCHF	TCHF
Acquisition value as at 01.01.2013	1 825	462	673	2 960
Additions		108		108
Disposals			-36	-36
Reclassifications				0
Acquisition value as at 31.12.2013	1 825	570	637	3 032
Additions			87	87
Disposals			-71	-71
Reclassifications				0
Acquisition value as at 31.12.2014	1 825	570	653	3 048
Accumulated depreciations as at 01.01.2013	315	358	555	1 228
Additions	30	84	53	167
Disposals			-36	-36
Reclassifications				0
Accumulated depreciations as at 31.12.2013	345	442	572	1 359
Additions	30	83	63	176
Disposals			-71	-71
Reclassifications				0
Accumulated depreciations as at 31.12.2014	375	525	564	1 464
Carrying value as at 01.01.2013	1 510	104	118	1 732
Carrying value as at 31.12.2013	1 480	128	65	1 673
Carrying value as at 31.12.2014	1 450	45	89	1 584

The maximum fire insurance payments for property, plant and equipment amounted to 17 387 TCHF as of 31st December 2014 (2013: 15 726 TCHF) for each case of damage.

2 Work in progress and advance payments

The capitalised work in progress and advance payments result exclusively from contracts for third parties. Of the ongoing projects, all expenditure is capitalised under work in progress and all customer invoices are carried as liabilities under advance payments.

3 Trade receivables

	31.12.2013	31.12.2014
	TCHF	TCHF
Receivables from Cooperative members	68	82
Receivables from third parties	244	400
Total	312	482

The largest open positions, with 120 TCHF and 84 TCHF, relate to experiments at the Grimsel Test Site.

4 Accrued income and prepaid expenses

The accrued income contains the balancing of the annual accounts by the members of the Cooperative, the still open reimbursement of PSI, prepayment of rent for January 2015 and other small items.

5 Cash and cash equivalents

Cash and cash equivalents amounted to 13 208 TCHF as per 31.12.2014. They decreased during the year of reporting by 2 505 TCHF, mainly due to the release of the GNW provision (4 726 TCHF), which led to less project cost contributions being required from the members of the Cooperative. As of 31st December 2014, there were no fixed term deposits.

6 Provisions

	31.12.2013	31.12.2014
	TCHF	TCHF
Unused vacation/overtime	1 605	1 822
Provisions for restructuring	139	84
Provisions for GNW liabilities	4 726	0
Total	6 470	1 906

Overall, provisions decreased by 4 564 TCHF.

In 2003, Nagra took over possible liabilities for the Wellenberg site from the now liquidated company GNW (Genossenschaft für Nukleare Entsorgung Wellenberg) for a one-off payment of around 4 800 TCHF. The reserves created with this payment were to be used over a period of ten years for recultivation work, preparing project documentation and final reporting and paying various fees. In the current business year there was again no expenditure of this nature. The reserve (4 726 TCHF) was therefore released as of 31st December 2014 according to a decision of the Board of Directors from 2010.

7 Trade payables

	31.12.2013	31.12.2014
	TCHF	TCHF
Payables Cooperative members	7	4
Payables third parties	8 484	8 845
Total payables	8 491	8 849

The largest creditors as of the balance sheet date are PSI (annual programme 2014), ENSI and the SFOE, with a total amount of 3 517 TCHF.

8 Accrued expenses and deferred income

Accrued expenses and deferred income in the reporting year were at the level of the previous year with 2 850 TCHF (2013: 2 912 TCHF). These relate to accruals for acquired services and incurred obligations.

9 Income from third party services

The income from services for third parties is lower than in the previous year by 563 TCHF, with an amount of 3 617 TCHF (third parties -568 TCHF, research contracts +422 TCHF, Cooperative members -417 TCHF).

10 Profit from disposal of fixed assets

In the reporting year, two vehicles were replaced. These and other small disposals resulted in a profit of 12 TCHF.

11 External services

	31.12.2013	31.12.2014
	TCHF	TCHF
Projects	24 026	22 724
Communication	3 767	3 698
Fees (ENSI, SFOE)	11 518	10 775
Travel costs	913	710
Total	40 224	37 907

12 Personnel expenses

Personnel costs increased compared to the previous year by 4.5% to 16 646 TCHF within the framework of the resource planning approved by the Board of Directors. The largest increase compared to the previous year is the expenditure for purchasing pension fund benefits (0.3 million CHF). With an increase of 0.1 million CHF each compared to the previous year are compensation for overtime, reserves for the corporate success component, length-of-service awards and temporary employment to cover workloads. The staffing level at the end of year was 91.0 full-time positions (without limited-term employees and apprentices), which is a decrease of 2.2 full-time positions compared with the previous year.

13 Other operating expenses

This position contains rents and expenditure on property of 1 149 TCHF, IT costs of 421 TCHF, telephone and mobile communication costs of 197 TCHF, copying and print products of 168 TCHF and other operating costs of around 911 TCHF.

Additional information

Risk assessment

The Board of Directors regularly addresses the risk situation of the Cooperative and the procedures for this are well established. The risk situation is assessed based on a systematic survey and evaluation of significant business risks and is documented in a report submitted to the Board of Directors for approval. The Board of Directors approved the risk report for 2014 at their meeting on 2nd July 2014 and decided on any necessary measures.

Off-balance sheet transactions

As of 31st December 2014, there were no open off-balance sheet transactions.

Contingent liabilities

To secure the centralised accounting process of the customs administration, the cash deposit was increased from 6 TCHF to 8 TCHF. The cash deposit required for this is carried under other receivables. There were no bank guarantees as of 31.12.2014.

Transactions with associated persons

Transactions with associated persons are understood to mean exclusively transactions with the members of the Cooperative according to page 41. There are no other transactions with associated persons.

Events subsequent to the balance sheet date

After the balance sheet date of 31st December 2014, no events occurred. Events subsequent to the balance sheet date were taken into consideration up to 27th March 2015, when the annual accounts were approved by Nagra's Board of Directors.

Accumulated accounts

	Increase	Status	Increase	Status
	2013	31.12.2013	2014	31.12.2014
Total income	CHF	CHF	CHF	CHF
Swiss Confederation	1 561 045	34 248 415	1 404 202	35 652 617
Axpo Power AG	11 910 706	258 627 213	10 716 968	269 344 181
BKW Energie AG	5 781 429	119 976 878	5 201 679	125 178 557
Kernkraftwerk Gösgen-Däniken AG	15 821 236	335 926 089	14 235 011	350 161 100
Kernkraftwerk Leibstadt AG	18 972 784	377 561 542	17 070 555	394 632 097
Contributions for project expenditure	54 047 200	1 126 340 137	48 628 415	1 174 968 552
Contributions to administration costs	700 000	87 470 000	700 000	88 170 000
Contributions of Cooperative members to Nagra	54 747 200	1 213 810 137	49 328 415	1 263 138 552
Contributions of GNW	-	65 265 331	-	65 265 331
Total contributions	54 747 200	1 279 075 468	49 328 415	1 328 403 883

	Zugang 2013 CHF	Stand 31.12.2013 CHF	Zugang 2014 CHF	Stand 31.12.2014 CHF
Total expenditure				
Geoscientific studies	4 620 032	184 943 137	4 046 390	188 989 527
Nuclear technology and safety	2 302 842	45 805 047	2 491 475	48 296 522
Radioactive materials	2 195 806	39 378 263	2 089 580	41 467 843
Facility planning	2 462 591	28 532 679	1 995 666	30 528 345
Generic (non-site-specific) work	3 704 304	97 964 515	4 196 531	102 161 046
General programme costs	4 418 318	80 528 735	1 996 231	82 524 966
Fees and compensation	6 545 644	47 085 472	6 083 978	53 169 450
L/ILW programme	26 249 537	524 237 848	22 899 851	547 137 699
Geoscientific studies	4 634 335	326 316 582	5 464 160	331 780 742
Nuclear technology and safety	3 767 137	65 285 959	4 063 048	69 349 007
Radioactive materials	707 806	24 810 608	791 990	25 602 598
Facility planning	2 464 891	23 920 874	1 437 199	25 358 073
Generic (non-site-specific) work	6 676 311	108 871 499	7 699 839	116 571 338
General programme costs	4 575 156	66 459 993	1 580 435	68 040 428
Fees and compensation	4 972 027	51 702 105	4 691 893	56 393 998
HLW programme	27 797 663	667 367 620	25 728 564	693 096 184
Project expenditure for repository programmes	54 047 200	1 191 605 468	48 628 415	1 240 233 883
Administration and general project expenditure	700 000	87 470 000	700 000	88 170 000
Total expenditure for L/ILW and HLW programmes and administration and general project expenditure	54 747 200	1 279 075 468	49 328 415	1 328 403 883

Notes on the accumulated accounts

The accumulated treatment of the contributions of the members of the Cooperative and the application of these contributions forms the basis, at the time of waste disposal, for any adjustments of payments among the members. It also indicates what work has resulted in project-related expenditure.

The structure of the total income is oriented primarily to the operating accounts. The total expenditure and the total income are presented including adjustments.

14 Contributions of members of the Cooperative

The contributions of the members of the Nagra Cooperative towards covering project costs are calculated based on the thermal output of the individual nuclear power plants.

The contributions of the members in the total amount of 49.3 million CHF (54.7 million CHF in the previous year) correspond to those in the income statement. Included is a contribution to administration costs in the total amount of 0.7 million CHF.

The GNW contributions include payments by GNW for contract work on the Wellenberg project. This project is now terminated.

15 Project-specific expenditure for the repository programmes

The two repository programmes (HLW and L/ILW) basically have the same structure in the presentation of the accumulated accounts and are oriented towards the most important technical tasks to be performed up to the completion of waste disposal activities. If there is no explicit reference to a specific programme, the following explanations of the individual positions apply to both projects.

a) Geoscientific investigations

Geological investigations for identifying potential siting regions comprise geological studies in the investigation area of Northern Switzerland for deep geological disposal of high-level waste, as well as processing of geological information for the low- and intermediate-level waste repository.

b) Nuclear technology and safety

The work comprises the safety-based evaluation of potential siting regions, laboratory studies on the near-field and on the different backfill materials.

c) Radioactive materials

This includes expenditure on assessing the disposability of waste packages and on ongoing documentation and inventorying of radioactive waste.

d) Facility planning

This position includes expenditure on developing the concepts for the surface and underground facilities for the repositories for HLW and L/ILW.

e) Generic (site-independent) investigations

This includes work on developing methodologies, modelling and validation of the models used in safety analyses, laboratory studies, participation in the work in the rock laboratories (Grimsel and Mont Terri) and the research programmes of the EU.

f) General programme costs

This expenditure results from programme management, expenditure on cost studies and public relations activities.

g) Fees and compensation

This includes the fees charged to Nagra from the regulatory and safety authorities.

Report of the statutory auditor to the General Meeting on the financial statements 2014

As statutory auditor, we have audited the accompanying financial statements of Nagra Nationale Genossenschaft für die Lagerung radioaktiver Abfälle, which comprise the balance sheet, income statement, cash flow statement and notes (pages 45 to 51), for the year ended December 31, 2014.

Management's responsibility

Management is responsible for the preparation of the financial statements in accordance with the requirements of Swiss law and the cooperative's articles of incorporation. This responsibility includes designing, implementing and maintaining an internal control system relevant to the preparation of financial statements that are free from material misstatement, whether due to fraud or error. Management is further responsible for selecting and applying appropriate accounting policies and making accounting estimates that are reasonable in the circumstances.

Auditor's responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with Swiss law and Swiss Auditing Standards. Those standards require that we plan and perform the audit to obtain reasonable assurance whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers the internal control system relevant to the entity's preparation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control system. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of accounting estimates made, as well as evaluating the overall presentation of the financial statements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements for the year ended December 31, 2014 comply with Swiss law and the cooperative's articles of incorporation.

Report on other legal requirements

We confirm that we meet the legal requirements on licensing according to the Auditor Oversight Act (AOA) and independence (article 906 CO in connection with article 728 CO) and that there are no circumstances incompatible with our independence.

In accordance with article 906 CO in connection with article 728a paragraph 1 item 3 CO and Swiss Auditing Standard 890, we confirm that an internal control system exists which has been designed for the preparation of financial statements according to the instructions of Management.

We recommend that the financial statements submitted to you be approved.

PricewaterhouseCoopers AG



Willy Wenger
Audit expert
Auditor in charge



Mathias Dietrich
Audit expert

Zürich, March 27, 2015

Appendices

Waste inventories and volumes

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

Waste volumes at the end of 2014

Nagra maintains a centralised database of all waste packages as a service to the waste producers. The following table shows the volumes and activities of waste prepared for geological disposal as of the end of 2014. Not contained in the table are pre-conditioned raw wastes and waste packages, for example for processing in the Zwiilag plasma furnace.

Conditioned waste (31 st December 2014, figures rounded)	Volume (m ³)	Activity (Bq)
Nuclear power plants	3 684	$2.5 \cdot 10^{15}$
Zwiilag	1 788	$4.8 \cdot 10^{18}$
Federal Govt. interim storage facility (waste from medicine, industry and research)	1 546	$5.2 \cdot 10^{15}$

The Zwiilag waste consists of waste packages delivered to the interim storage facility from the power plants, waste packages from the plasma furnace and containers with vitrified high-level waste from reprocessing.

Predicted waste volumes and inventories for deep geological disposal

Planning of the geological repositories requires input in the form of information on expected waste volumes. The total volume of waste for disposal will be around 103 000 cubic metres packaged in disposal containers (see table for details, values are rounded). The volume of waste from medicine, industry and research is based on the operational planning of the repositories.

Predicted waste volumes (47/60 year NPP operation) ¹	L/ILW (m ³)		ATW (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), incl. post-operational phase before decommissioning	8 195	31 015				
RA-KKW NPP reactor waste (activated components)	475	1 810				
SA-KKW NPP decommissioning waste	22 440	30 760				
WA-KKW NPP reprocessing waste			100	635		
BA-ZWI Zwilag operational waste	270	290				
SA-ZWI Zwilag decommissioning waste	585	700	25	25		
BA-MIF MIR waste from FOPH, waste from PSI and CERN	7 750	12 210	185	670		
SA-MIF Decommissioning waste from PSI and CERN	13 260	13 565	30	115		
OFA Waste from the later surface facilities for the L/ILW & HLW repositories	645	2 290				
HLW Containers from reprocessing					115	380
BE Spent fuel assemblies					1 365	8 135
Total volumes (rounded)	53 615	92 635	340	1 440	1 480	8 515
Percentage (rounded)	96.7 %	90.3 %	0.6 %	1.4 %	2.7 %	8.3 %
Activity (Bq)² Percentage	7.9 · 10 ¹⁶ 0.4 %		2.2 · 10 ¹⁶ 0.1 %		1.9 · 10 ¹⁹ 99.5 %	

¹ Basis: Model Inventory of Radioactive Materials (MIRAM 14)

Operating lifetime: Mühleberg 47 years (till 2019), other NPPs 60 years

Takes into account the planned revision of the Radiological Protection Ordinance and decay storage of materials with subsequent conventional disposal

² Activity inventory for reference year 2075

Publications in 2014

Nagra Technical Reports (NTB) / Work Reports (NAB)

The safety-based comparison of the geological siting regions is described in detail in a Technical Report (NTB 14-01, with English abstract). Further reports (NTB-14-02, 14-03, 14-04, all with English abstracts) deal with the geological database, characteristic dose intervals and information for evaluating the barrier systems, as well as the model inventory of radioactive materials. The report series for Stage 2 also includes numerous other Nagra reports. All the NTBs can be downloaded from Nagra's website or are available at cost price in printed form. Nagra's work reports for Stage 2 are also available as downloads.

NTB 14-01

SGT Etappe 2: Vorschlag weiter zu untersuchender geologischer Standortgebiete mit zugehörigen Standortarealen für die Oberflächenanlage
«Sicherheitstechnischer Bericht zu SGT Etappe 2. Sicherheitstechnischer Vergleich und Vorschlag der in Etappe 3 weiter zu untersuchenden geologischen Standortgebiete»; Safety-based comparison and proposal of siting regions for further investigation in Stage 3; December 2014

NTB 14-02/I

«Geologische Grundlagen Dossier I; Einleitung und Zusammenfassung»; Geological database, introduction and summary; December 2014

NTB 14-02/II

«Geologische Grundlagen Dossier II: Sedimentologische und tektonische Verhältnisse»; Sedimentological and tectonic conditions; December 2014

NTB 14-02/III

«Geologische Grundlagen Dossier III: Geologische Langzeitentwicklung»; Long-term geological evolution; December 2014

NTB 14-02/IV

«Geologische Grundlagen Dossier IV: Geomechanische Unterlagen»; Geochemical database; December 2014

NTB 14-02/V

«Geologische Grundlagen Dossier V: Hydrogeologische Verhältnisse»; Hydrogeological conditions; December 2014

NTB 14-02/VI

«Geologische Grundlagen Dossier VI: Barriereneigenschaften der Wirt- und Rahmengesteine»; Barrier properties of the host rocks and confining units; December 2014

NTB 14-02/VII

«Geologische Grundlagen Dossier VII: Nutzungskonflikte»; Conflicts of use; December 2014

NTB 14-02/VIII

«Geologische Grundlagen Dossier VIII: Charakterisierbarkeit und Explorierbarkeit»; Ease of characterisation and explorability; December 2014

NTB 14-03

«Charakteristische Dosisintervalle und Unterlagen zur Bewertung der Barrierensysteme»; Characteristic dose intervals and documentation for evaluating the barrier systems; December 2014

NTB 14-04

«Modellhaftes Inventar für radioaktive Materialien MIRAM 14»
(A CD with all 162 waste type reports is available from Nagra); December 2014

NTB 14-06

«Solubility of Radionuclides in a Bentonite Environment for Provisional Safety Analyses for SGT-E2»; August 2014

NTB 14-07

«Solubility of Radionuclides in a Concrete Environment for Provisional Safety Analyses for SGT-E2»; August 2014.

NTB 14-08

«Sorption Data Base for the Cementitious Near-Field of L/ILW and ILW Repositories for Provisional Safety Analyses for SGT-E2»; November 2014

NTB 14-09

«Provisional Safety Analyses for SGT Stage 2 Models, Codes and General Modelling Approach»; December 2014

NTB 14-10

«Modelling of Radionuclide Transport along the Underground Access Structures of Deep Geological Repositories»; August 2014

NTB 14-11

«Geochemical Evolution of the L/ILW Near-Field»; October 2014

The lists of Technical Reports and Work Reports are available on the website (www.nagra.ch > Infocorner > Download > Publications > Technical Reports > Full Lists).

Information for the general public

Several print products aimed at the general public were published in 2014 (not available in English), in particular two issues of "nagra info" (current information and news on nuclear waste management) in July and December. In May, the last fact-sheets were also produced on the designation of the siting areas for the surface facility for the regions Zürich Nordost and Nördlich Lägern.

Up to the end of the year, Nagra worked intensively on a detailed summary of the Technical Report NTB 14-01 (see above under publications) in the form of an illustrated brochure (French and German) on the safety-based comparison of the siting regions and the proposals for Stage 3. This was published in January 2015 together with the announcement of the siting proposals. A small brochure was also published in German, French and English on the safety-based comparison (available only as a download from the Nagra website).

AG SiKa

Cantonal Working Group on Safety

Alpiq

www.alpiq.ch

Andra

Agence nationale pour la gestion des déchets radioactifs, France
www.andra.fr

ATW

Alpha-toxic waste

BGR

Federal Institute for Geosciences and Natural Resources, Germany
www.bgr.bund.de

BGS

British Geological Survey
www.bgs.ac.uk

BKW Energie AG

Formerly Bernische Kraftwerke AG
www.bkw.ch

BMUB

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
www.bmub.bund.de

DETEC

Swiss Federal Department for the Environment, Transport, Energy and Communications
www.uvek.admin.ch

EDRAM

International Association for Environmentally Safe Disposal of Radioactive Materials
www.edram.info

EGT

Expert Group on Nuclear Waste Disposal (EGT)
www.egt-schweiz.ch

EMPA

Swiss Federal Laboratories for Materials Science and Technology
www.empa.ch

ENSI

Swiss Federal Nuclear Safety Inspectorate
www.ensi.ch

EURATOM

European Atomic Energy Community
ec.europa.eu/research/energy/euratom/index_en.cfm

FMT

Mont Terri Rock Laboratory – rock laboratory in Opalinus Clay located near St-Ursanne, Canton Jura. Project managed by Swisstopo
www.mont-terri.ch

FOPH

Federal Office of Public Health
www.bag.ch

Forum VERA

www.forumvera.ch

FOSD

Federal Office for Spatial Development
www.are.admin.ch

GTS

Grimsel Test Site – Nagra's underground laboratory in crystalline rock on the Grimsel Pass, Canton Bern
www.grimsel.ch

HLW

Vitrified high-level waste from reprocessing

IAEA

International Atomic Energy Agency, Vienna
www.iaea.org

IGD-TP

Implementing Geological Disposal Technology Platform (European Commission, Research & Innovation)
www.igdtp.eu

ILW

Long-lived intermediate-level waste

ISCO

International Steering Committee, Grimsel Test Site

JAEA

Japan Atomic Energy Agency
www.jaea.go.jp

KORAD

Korea Radioactive Waste Agency
www.korad.or.kr

KWO

Kraftwerke Oberhasli
www.grimselstrom.ch

LES

Laboratory for Waste Management
Les.web.psi.ch

L/ILW

Low- and intermediate-level waste

MIR

Radioactive waste from medicine, industry and research

MIRAM

Model Inventory of Radioactive Materials

NDA/RWMD

Nuclear Decommissioning Authority/ Radioactive Waste Management Directorate, UK
www.nda.gov

NEA

Nuclear Energy Agency of the OECD, Paris
www.oecd-nea.org/nea

NSC

Swiss Federal Nuclear Safety Commission
www.bfe.admin.ch/kns

NTB

Nagra Technical Report: scientific publication series

Nuklearforum

www.nuklearforum.ch

NUMO

Nuclear Waste Management Organization of Japan
www.numo.or.jp

NWMO

Nuclear Waste Management Organization, Canada
www.nwmo.ca

Obayashi

Obayashi Corporation, Japan
www.obayashi.co.jp

OECD

Organisation for Economic Cooperation and Development, Paris
www.oecd.org

Ondraf/Niras

Organisme national des déchets radioactifs et des matières fissiles enrichies / Nationale instelling voor radioactief afval en verrijkte splijstoffen, Belgium
www.ondraf.be / www.niras.be

Posiva

Posiva Oy, Olkiluoto, Finland
www.posiva.fi

PSI

Paul Scherrer Institute, Villigen, Canton Aargau
www.psi.ch

RD&D

Research, Development & Demonstration

RK&M

Preservation of Records, Knowledge and Memory
www.oecd-nea.org/rwm/rkm

RWM

Radioactive Waste Management
www.nda.gov.uk/rwm/organisation/rmb

RWMC

Radioactive Waste Management Funding
and Research Center, Japan
www.rwmc.or.jp

SF

Spent fuel

SFOE

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

SKB

Svensk Kärnbränslehantering, Sweden
www.skb.se

Swissnuclear

Nuclear energy section of Swisselectric
www.swissnuclear.ch

Swisstopo

Swiss Federal Office for Topography;
project manager of the Mont Terri Rock
Laboratory since 2006
www.swisstopo.ch

TWI

The Welding Institute, Great Abington, UK
www.twi-global.com

Zwilag

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

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nagra ● **we care**