



2022 ANNUAL REPORT

nagra 

ANNUAL REVIEW

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A photograph of two men in dark blue suits and ties, looking down at a large map spread out on a table. The map is covered with numerous small, light blue circular markers. The man on the left is pointing at a specific area on the map. The background is a plain, light-colored wall.

“The decision was unequivocal. I am glad that the geological setting allowed us to draw such a clear conclusion.”

Matthias Braun,
CEO

“Once again, Switzerland’s citizens demonstrated their ability to hold rational discussions with one another on complex and challenging issues.”

Lino Guzzella, President

NÖRDLICH LÄGERN IS THE SAFEST SITE

Matthias Braun and Lino Guzzella look back on the siting proposal for the deep geological repository. They explain why collaboration with the regions and authorities has been worthwhile and what changes are now in store for Nagra.

Lino Guzzella, Matthias Braun, in September 2022, Nagra proposed Nördlich Lägern as the site for a deep geological repository. How would you assess the reactions in the region and in the media?

Guzzella: Reactions were mostly constructive and objective. Once again, Switzerland's citizens demonstrated their ability to hold rational discussions with one another on complex and challenging issues.

Braun: I read in the media that Switzerland had shown maturity with its level-headed reaction – this pleased me greatly. I was impressed by the matter-of-fact reaction of the people in the affected region. Not that they rejoiced. But I sense that the region wants to make the best of the situation and become involved.

Guzzella: Collaboration with the region has borne fruit – the Nördlich Lägern regional conference and its expert groups have been dealing with the topic for years and have built up an extensive knowledge base.

Braun: Yes, this collaboration has led to better solutions. For example, we decided on the location of the surface facility together with the region. The region has long been involved in the project and helps to improve it.

Guzzella: From my point of view, the important thing is to keep safety at the core of the site selection process. Not only is this a legal requirement, it is also deeply embedded in Nagra's culture. And this fact has been acknowledged in the Nördlich Lägern siting region and beyond.

Where and how have you engaged in dialogue with people in the region since the proposal was announced, and how did you experience these discussions?

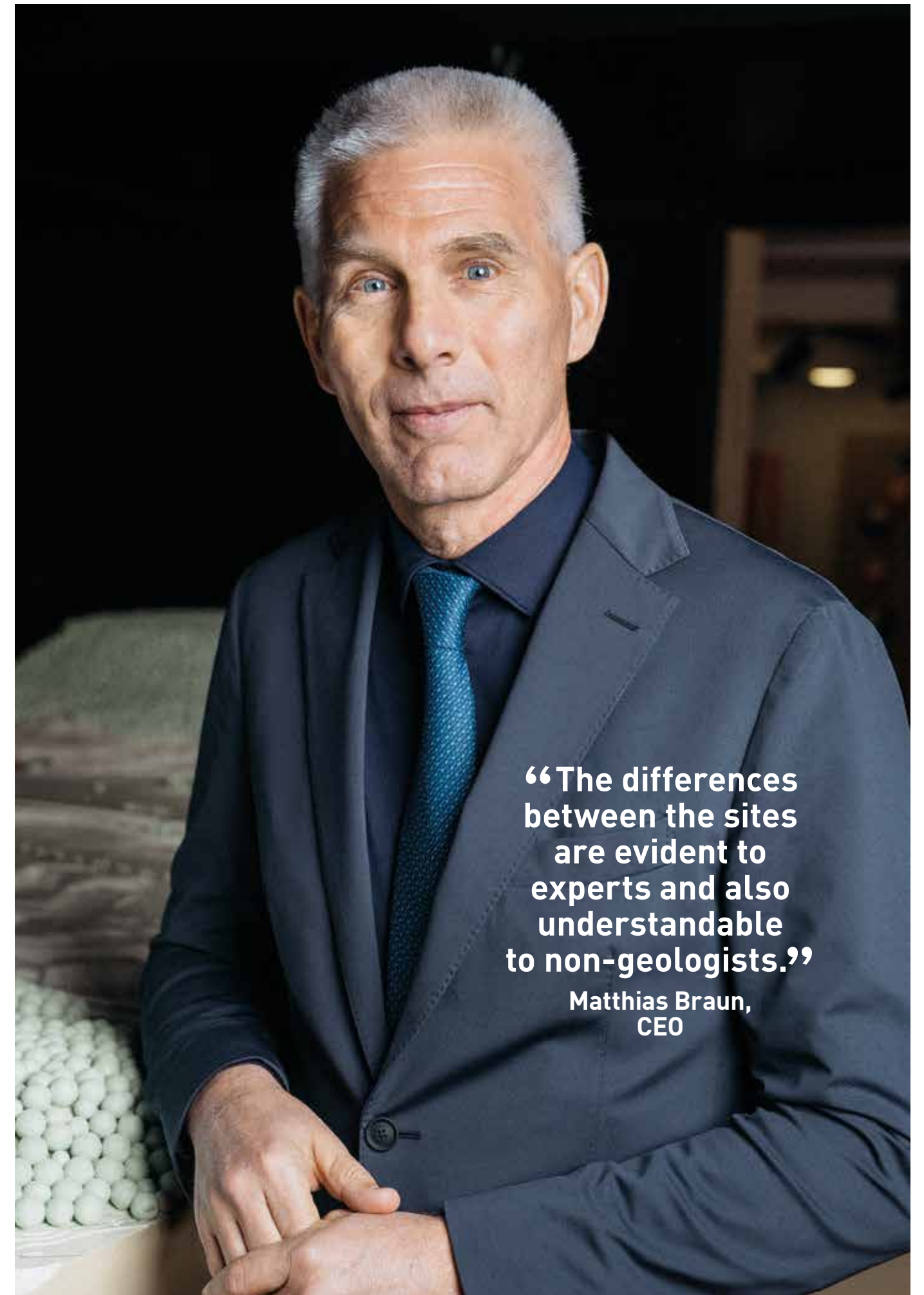
Braun: After the siting proposal, we set up an information pavilion in Windlach that was open for seven months. Personally, I had some very interesting conversations with residents there. I was impressed by the fact that many of those affected gave us concrete suggestions and asked important questions. In addition, we explained our proposal at regional conferences, at information events in the region and in social media.

How clearly did the decision point in favour of Nördlich Lägern?

Braun: The decision was unequivocal. I am glad that the geological setting allowed us to draw such a clear conclusion. The differences between the sites are evident to experts and also understandable to non-geologists.

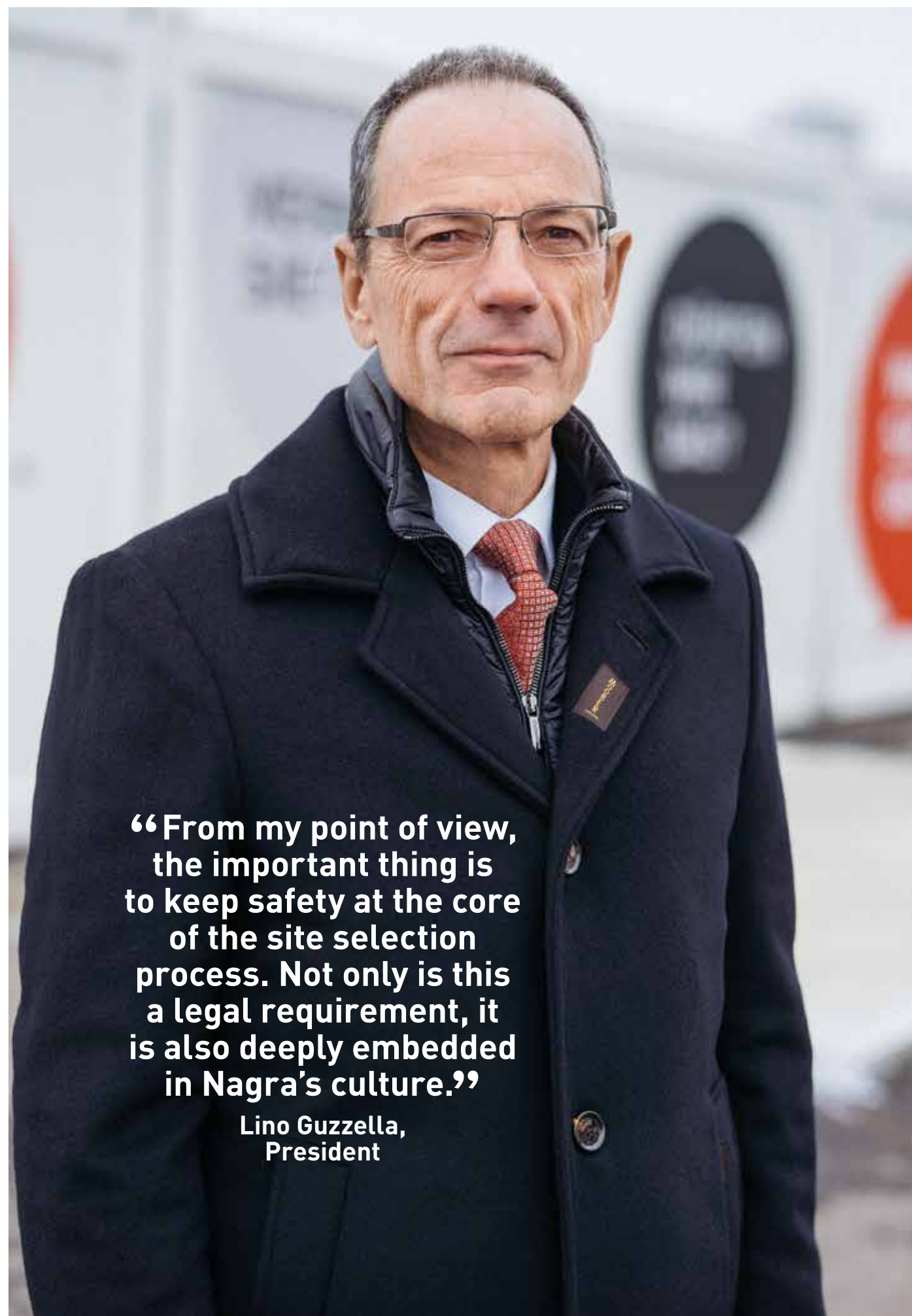
Guzzella: At the same time, Nagra was spoiled for choice: all three remaining siting regions were confirmed to be suitable for a deep geological repository and any resulting radiation would fall below the legally prescribed dose limit. However, Nördlich Lägern simply has the greatest safety reserves.

We owe this conclusion to the many years of dedication shown by Nagra's employees who have worked towards this milestone. On behalf of the Board of Directors, I would once again like to express our gratitude to all current and former employees for their excellent work.



“The differences between the sites are evident to experts and also understandable to non-geologists.”

**Matthias Braun,
CEO**



“From my point of view, the important thing is to keep safety at the core of the site selection process. Not only is this a legal requirement, it is also deeply embedded in Nagra’s culture.”

**Lino Guzzella,
President**

“Collaboration with the region and the authorities is working well.”

Lino Guzzella, President



Nagra CEO, Matthias Braun, with representatives of the region and the canton at the media conference in Stadel on 12th September.

However, the fact that in 2015 Nagra wanted to shelve precisely this siting region caused some irritation.

Braun: Yes, I can understand that our proposal surprised some people, but we have learned a lot since 2015. At the time, we could not rule out the possibility that construction technology was not up to the task. We have been able to alleviate these concerns because we now possess much more data today than we did back then. From today’s perspective, we were too cautious at the time – and we are now thankful that the authorities insisted on us investigating not only Jura Ost and Zürich Nordost in depth, but also Nördlich Lägern.

Guzzella: For me, this decision is proof that the Sectoral Plan process works and that dialogue between the regions, the authorities and Nagra has brought about the best solution.

The German Expert Group on Swiss Repositories (EScht) has praised Nagra for its siting proposal, and the cantons have also expressed positive opinions. Did you expect that?

Braun: We always kept the cantonal experts informed about our work, especially the deep borehole campaign, showed them our data and discussed our results with them. Our proposal came as no surprise to the cantons, as they were able to draw their own conclusions from our data and apparently came to the same verdict as we did at Nagra. The opinion of the German Expert Group confirmed that we are on the right track.

Guzzella: It is important to me to work closely with everyone affected, and this includes the neighbouring communities across the border in Germany. We are therefore glad that the German experts consider our reasoning to be correct.

“Our proposal came as no surprise to the cantons. They were able to draw their own conclusions and came to the same verdict as we did.”

Matthias Braun, CEO

Other voices, however, criticised the fact that the proposal was communicated before all scientific reports were available.

Guzzella: We did not want to present those affected with a fait accompli. Nagra was therefore right to communicate the proposal in autumn 2022, rather than to prepare the general licence applications behind closed doors. This timely communication reflected our wish for transparency, and we can now address the concerns of the region actually affected when preparing the general licence application for the repository.

Now that the siting proposal has been announced: what has changed for Nagra and what has remained the same?

Braun: What has changed is that we no longer always have to talk in the subjunctive. Honestly: for me, this is a relief. The project has become more concrete, and we are already working with the region to find solutions to various challenges.

I notice a marked difference in the mood and level of interest of the region. The local authorities have become very active and have taken the reins. Last autumn, for example, the communities of Stadel, Weiach and Glattfelden organised an event with the former mayor of Sedrun. Until a few years ago, Sedrun had a large construction site for the New Railway Link through the Alps (NEAT). The aim of this event was to show a community how it can and should deal with a major project, and where potential opportunities and risks lie. I welcome this proactive stance of the communities.

I also noticed that the questions have become more specific: residents want to know which roads the trucks will take. Members of sport-shooting clubs ask if they can continue to use their shooting range – yes, by all means! And others are wonder-

ing where the construction workers will be accommodated. We can already answer many questions in principle. For others, we will work together with the region to find answers.

Our activities are shifting more and more to the siting region. Eventually, Nagra will move its offices to the region. But we are not there yet.

Guzzella: At the same time, Nagra will change as an organisation. After decades of research and a painstaking site selection process, the future will be about planning and implementing the project in more detail. These changes will take place over longer periods of time.

The Board of Directors will ensure that the necessary resources and structures are available. I am very much looking forward to these developments.

Let's take a look into the future: what are the priorities for the next few years?

Braun: We are now working on the general licence applications, which we plan to submit at the end of 2024. We must bear in mind that no shortcuts can be taken in this project – safety cannot be compromised under any circumstances.

At the same time, we want to collaborate with the people from the region even more closely than before. Under no circumstances do we intend to leave them to deal with this on their own.

Guzzella: Nagra's Board of Directors wants to uphold scientific and technical competence – we will ensure the necessary boundary conditions for this. In addition, however, Nagra's performance capabilities will be enhanced even further at project level.

All members of the Board of Directors agree on this. I also consider the collaboration with the authorities and the region to be goal-oriented and beneficial. Together, we will achieve our objective: a safe deep geological repository.



→ Download the report on the siting proposal

➔ **MARKUS FRITSCHI**

Well-deserved retirement

Markus Fritschi, Deputy CEO of Nagra, retired at the end of February 2023.

Markus represented Nagra for many years and was thus a familiar face in the public eye. He obtained a doctorate in physics and began working for Nagra on 1st September 1991. From 1994 to 1997, he was Technical Manager at the Cooperative for Nuclear Waste Management Wellenberg. Later, he headed the Collaboration Sectoral Plan and Public Outreach Division (till 2021). Until his retirement, he was also Deputy CEO of Nagra. “In Markus Fritschi, Nagra is losing a figure who was always committed to transparent communication with the public, politicians and authorities. He played a key role in shaping Nagra's work and achieved an enormous amount over the decades. On behalf of the Board of Directors, I would like to thank him for his great dedication and wish him all the best,” says Nagra President, Lino Guzzella.



CHANGES IN THE EXECUTIVE BOARD



➔ **IRINA GAUS**

Elected to the Executive Board

Experienced scientist Irina Gaus takes a seat on Nagra's Executive Board.

With a doctorate in hydrogeology, Irina has been working for Nagra since 2007. At the end of 2022, the Board of Directors elected her to the Executive Board and, since 1st January 2023, she has been responsible for the new Optimisation Project. In this function, she will lead the continuous improvement of the project of the century of deep geological disposal – with a particular emphasis on long-term safety, construction and costs. Over the coming years, the technical details of the deep geological repository will be further optimised. The aim is to use state-of-the-art technology when construction of the access structures begins in around ten years. The Optimisation Project is thus developing a digital environment that incorporates all the analyses and evaluations related to safety, construction and cost. “We will continue our research and keep on learning – and eventually construct a state-of-the-art repository,” vows Irina Gaus. “I look forward to taking on this challenge together with my team.”

175 Millionen
Jahre (gepflegte)
Langeweile.

A JOURNEY THROUGH EARTH'S HISTORY

How do you design an exhibition that centres around an inconspicuous grey rock? This was the challenge that Nagra faced at the end of the deep borehole campaign. A hall at the Eurobus company in Windisch was rented to house the exhibition in spring 2022.

Communicating science in a comprehensible way is an ambitious task. But Nagra had even more in mind with its drill core exhibition: to arouse curiosity, seek dialogue, say thank you. "Our exhibition paved the way for the siting proposal in autumn," says Project Manager Jagna Züllig. With support from her teammates, the Nagra media spokesperson was responsible for breathing life into the exhibition. She succeeded. Thanks also go to "our man on the scene", as Züllig describes her right-hand colleague, Heinz Sager. He was fascinated by the "Room of Silence" that featured nothing but an enormous block of Opalinus Clay: "This inconspicuous grey rock was our unsung hero."

"We used lights and wall projections to really set the scene," explains Public Affairs Manager Sager. You can feel the dedication and passion the two invested in the event. They became quite attached to their exhibition, and it was not easy to part with it after a mere six weeks. "It was a very special experience for me, also thanks to the collaboration with many wonderful people, internally and externally," Sager reflects. The exhibition comprised over 400 drill cores, which were admired by around 2,500 visitors over 40 events.

LEAVING ROOM FOR CRITICAL DIALOGUE

In recent years, Nagra has drilled nine deep boreholes to provide a complete picture of the underground in Northern Switzerland. The results were shown in Windisch. In addition, Nagra went back in time to present a historical journey through 50 years of radioactive waste management, laid out over a 50-metre-long exhibition. It also presented a glimpse into the future of the project of the century. The exhibition was later honoured with an award. It was

"This inconspicuous grey rock was our unsung hero."

also intended as a thank you: "On the one hand, for our employees themselves, who are committed to this important task. On the other, for the experts, our partners in the deep borehole campaign or landowners and residents of the drill sites," explains Jagna Züllig. "We also really wanted to present the Nagra employees behind the scenes, who are involved with this project on a day-to-day basis. And not just any Nagra project, but one that is relevant for the whole of Swiss society."

"At this point, we knew that a safe deep geological repository could be constructed in all three siting regions," says Heinz Sager. "This gave us a very large framework for our exhibition" – "... and provided the perfect environment to engage in dialogue with us", adds Züllig. Many people came with questions – or concerns. Not only the media, but also critical organisations, the regional conferences and others directly or indirectly involved in the process signed up for a visit or were invited to tours.

Two days of the packed schedule were reserved for the general public. Most of the visitors had only some prior knowledge. For Jagna Züllig, this was not a disadvantage, but an opportunity to strike the right note when dealing with the public and presenting a highly complex topic in a clear and simple way.

"If we managed to make only every second person a little curious, we can call this a great success for us and for the project of the century of deep geological disposal."



“The drill cores on display formed an important basis for the siting proposal.”

Jagna Züllig,
Media Spokesperson

PUTTING HEART AND SOUL INTO THE PROJECT OF THE CENTURY

Jagna Züllig helps to bring people closer to the cross-generational project of deep geological disposal. In Windisch, she did this by means of a journey through 200 million years of the earth’s history.

“We are working on a project that benefits society but also requires its collaboration – and for that, we have to put our heart and soul into our communication work. I like people and enjoy listening to them. This helped me when planning the Nagra exhibition in Windisch. Close exchange with our scientists was important. When faced with the task of showing 200 million years of the earth’s history, we were spoilt for choice: 6,000 metres of drill cores lay before us! Which ones would we choose to illustrate our journey to the siting proposal? How to combine scientific meticu-

lousness and vivid aesthetics? This was a balancing act: we expected many experts, but lay people as well. I think we managed to bring our project closer to all visitors. The drill cores on display formed an important basis for our siting proposal.

AN OPEN EAR

The repository is not only a matter of concern for the region – it is a national, cross-generational project. Our task is to reach everyone here in Switzerland, as this topic also affects everyone. If our children and grandchildren understand why the

radioactive waste has been disposed of below ground, then we will certainly have achieved one of our objectives. For this to succeed, we would like to talk even more about the project of the century and all the actors involved. Above all, we always have an open ear: we welcome questions and criticism from society and hope to learn from them. In Windisch, we listened to geologists, consultants, residents from the region and other interested parties. Our journey through depth and time offered a unique opportunity to do this. We can now show that we are using these discussions to make further improvements.

We are working on a major project, and all of us provide individual pieces of the puzzle that will eventually lead us to the solution. Everything we do today contributes to the future operation of a deep geological repository – personally, I find this a rather beautiful concept.



One section of the exhibition shone a light on the history of deep geological disposal in Switzerland.

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Nagra CEO Matthias Braun gave a guided tour of the exhibition at a media event.



FACTS & FIGURES

➔ RESEARCH PROGRESS AT THE GRIMSEL TEST SITE

Key experiments in the “hot phase”

Progress at the Grimsel Test Site: the two long-term experiments, HotBENT and GAST, entered a new phase in spring 2022.

Despite the pandemic, the diverse experiments being conducted at the Grimsel Test Site continued without interruption. Some of them have a duration of several years, such as the HotBENT Experiment (High Temperature Effects on Bentonite Buffers). In this experiment, the impact of high temperatures on engineered barriers consisting of bentonite is being investigated. Four heaters are being used to simulate the heat generated by the radioactive waste. Since late May 2022, these have been running at target temperatures between 175 and 200 degrees Celsius. This phase calls for patience, with developments being continuously monitored.

The GAST (GAs-permeable Seal Test) Experiment entered the exciting test phase: after many years of preparation, the gas migration test started in May 2022. The gas flow was successfully set up and maintained. The main objective of this experiment

is to find out how to increase the gas transport capacity of the underground structures without negatively impacting their ability to retain radioactive substances. The next test with a mixture of gas tracers will start in 2023.

Other Grimsel activities were ramped up again: after being forced to reduce the course programme for two years, the Grimsel Training Centre (GTC) was able to conduct three workshops in August and September 2022. The GTC was launched in 2017 to promote training and the exchange of knowledge between international waste management organisations.



➔ grimsel.com/gts-projects/hotbent-high-temperature-effects-on-bentonite-buffers/hotbent-introduction

➔ AWARD FOR NAGRA GEOLOGIST

Outstanding research recognised

In recent years, Nagra researchers have carried out extensive investigations of the underground in the Jura Ost, Nördlich Lägern and Zürich Nordost regions – including seismic measurements and deep boreholes. One of geologist Rodney Garrard’s responsibilities was to coordinate stress measurements in the boreholes.

The American Rock Mechanics Association honoured the documentation of these stress measurements with an award that recognises outstanding contributions in the fields of rock mechanics and geomechanics. The measurements help to understand how rock behaves when forces act upon it. This is important, for example, during the construction of the emplacement drifts in the planned repository, or for the period following waste emplacement. The data obtained are unique in terms of data density and are central to the detailed planning of a deep geological repository: over the course of 900 operating hours, 15 different rock formations consisting of various rock types were tested. To this end, more than 1,200 measurement cycles were conducted at around 185 points in eight boreholes.



➔ Download the research paper: Stress-Measurement Campaign in Scientific Deep Boreholes: From Planning to Interpretation



Patricia Hinterholzer-Reisegger and Cornelia Wigger at the Nagra drill site in Bachs in spring 2022.

➔ SUCCESSFUL CAMPAIGN

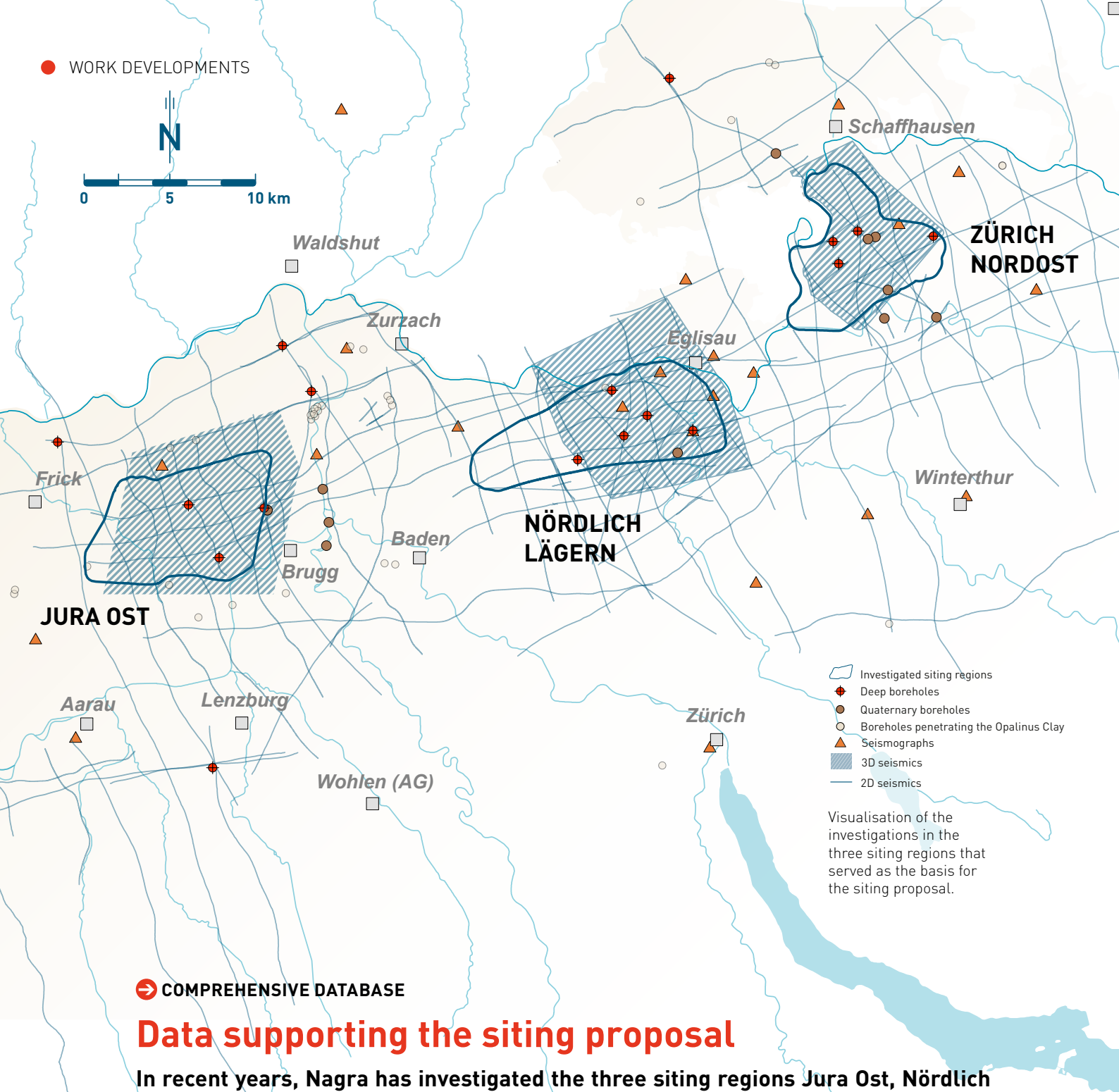
Drilling completed

After three years, Nagra successfully concluded its deep borehole campaign in spring 2022. Thanks to the rock samples obtained and numerous measurements carried out in the boreholes, Nagra was able to complete the picture of the underground. A few figures on the nine deep boreholes drilled in the three siting regions:

- ➔ over **10,000** metres drilled
- ➔ over **6,000** metres of drill cores recovered
- ➔ over **4,000** samples taken
- ➔ more than **3,500** visitors welcomed to the drill sites

Cost of all underground investigations in Northern Switzerland since early 2019:

- ➔ CHF **240** million of which
- ➔ CHF **170** million went to the deep borehole campaign



➔ COMPREHENSIVE DATABASE

Data supporting the siting proposal

In recent years, Nagra has investigated the three siting regions Jura Ost, Nördlich Lägern and Zürich Nordost in great detail. More than 4,000 samples were taken from nine deep boreholes. These were analysed in laboratories in Switzerland and around the globe, including Japan and Australia.

The borehole campaign provided insights into the strength and tightness of the rock. Additional tests were carried out in the boreholes, for example, measurements of the rock stress (s. page 15).

Shallower Quaternary boreholes also provided Nagra with important information that contributed to a better understanding of how rivers and glaciers shaped landscape features in the past. As boreholes can only provide information about the rock formations they penetrate, seismic measurements were also carried out to provide a three-dimensional im-

age of the underground. A total of 250 square kilometres were explored in this way.

The combination of these investigations led to a comprehensive understanding of the geological conditions in the three siting regions. Nagra's siting proposal of Nördlich Lägern is based on these data.



➔ Further information:
Data basis for decision-making



➔ MONT TERRI ROCK LABORATORY

Research into long-term safety

What will happen underground thousands of years from now when minuscule amounts of radioactive waste – radionuclides – reach the rock surrounding the deep geological repository? The behaviour of these radionuclides in the Opalinus Clay has been intensively researched over the last 25 years.

However, what if an unfavourable scenario were to occur in which the rock at the point in question is also deformed? Nagra is leading the DR-E Experiment (Long-Term Radionuclide Diffusion Experiment in the Main Fault Zone) in the Mont Terri Rock Laboratory. The objective is to observe the long-term diffusion of radionuclides. In 2022, all decisions were made regarding drilling, equipment and tracer composition. As a result, the actual experiment was able to start at the beginning of 2023: research on the long-term diffusion of some radionuclides in two new boreholes drilled in a deformed zone.

The experiment addresses a "what if" scenario: the objective is to determine what could happen in a highly unlikely situation. The findings help to reduce uncertainties and provide additional support for the long-term safety of a deep geological repository. The project will be completed around three years from now.

➔ DECADES-LONG MEASUREMENTS

Long-term monitoring of the underground

During the deep borehole campaign, an intensive hydrotesting programme was conducted to investigate the hydraulic properties of the aquifers, the confining geological units and the Opalinus Clay.

During the drilling process, pumping tests were carried out over several days in very tight rock formations in the siting regions. Additional measurements will have to be conducted over longer periods of time to determine the undisturbed conditions. In the case of the Stadel-3 deep borehole in the Nördlich Lägern siting region, the decision has already been made to continue these measurements over several decades.

To this end, systems for the long-term monitoring of pore pressures were installed in one borehole in each of the siting regions in spring and summer 2022. Using these systems, the layers are separated hydraulically and the pore pressures measured in each layer over the coming years. A similar system has been in place in the Benken borehole since 1999.

Temperature profiles can now also be measured with the new systems using fibre-optic technology. The long-term monitoring system in the Stadel-3 borehole thus already contributes to the monitoring of the future deep geological repository.



“OUR MODELS ARE BECOMING MORE AND MORE DETAILED”

For Michael Schnellmann, the challenge in 2022 was to explain complex science in factually correct, yet understandable terms. He is also looking forward to benefiting from further digitalisation and other precision tools.

“With the siting proposal, 2022 was a very important year for us. We started consulting external geological advisors back in January to refine our arguments. Together with our Communication Section, we agreed on terminology that is comprehensible yet scientifically correct. To supplement the site selection report and provide an in-depth insight into the relevant geological differences between the siting variants, we prepared additional fact sheets on key topics.

I have been working for Nagra for 17 years and have therefore been involved in the Sectoral Plan process, which was launched by the Federal Government in 2008, from the very beginning. We are working on a very exciting, unique project at the interface between science and society. The range of geological topics is very broad. There is no other job like this in Switzerland – this makes it so interesting for me.

DATA, DATA AND YET MORE DATA

Geology provides many clues, but never a complete picture. Over the years, we have deliberately collected a wide range of data that would allow us to characterise and compare the three siting regions. The seismic measurements and the deep borehole campaign played a central role. By integrating all these data and by relying on geological models and experience from other projects, we have been able

to create as accurate a picture as possible of the underground. To do so also requires a good understanding of the geological evolution of Northern Switzerland over the last millions of years. For us, it is crucial to understand the past in order to create reliable scenarios for the future. Thanks to comprehensive site investigations, we now have a very extensive understanding of the underground of the three siting regions Jura Ost, Nördlich Lägern and Zürich Nordost. In the future, our focus will be on Nördlich Lägern.

SEIZING NEW OPPORTUNITIES

We are currently working on the general licence applications. In addition to our regular Nagra reports, we are increasingly publishing our work results in scientific journals. The lead often lies with partner universities. These publications undergo extensive external review by the national and international scientific communities. We benefit from this additional quality assurance.

Our project is becoming increasingly local, and the models more and more detailed. This will make our work even more exciting in the future. With the submission of the general licence applications and beyond, everything will become more digital, more precise, more high-resolution. Specialists have joined our team to support us for precisely these challenges. We are now well prepared to move forward with our project of the century.

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MICHAEL SCHNELLMANN

Michael holds a doctorate from the Swiss Federal Institute of Technology Zürich and has conducted geological investigations for Nagra since 2005. Initially reaching from Lake Geneva to Lake Constance, these were successively narrowed down to focus on the Jura Ost, Nördlich Lägern and Zürich Nordost siting regions.

As Senior Project Manager Geosciences, he is responsible for preparing the geological documentation for the general licence applications. Michael is married and has three children. To clear his mind from work, he likes to head to the mountains – on foot, by bike or on skis.



ANGELA PAULSEN

A Norwegian father, a German mother, born in Rotterdam and raised in England, the USA and Germany – Angela seems predestined to be a translator.

And indeed, she began by studying languages: American Studies as her major, British and Japanese Studies as minors. After obtaining her Master's degree, she worked for the U.S. Consulate General in Frankfurt, Germany, and assisted American politicians travelling to or through the consular district. This work included the occasional translation request. For this 24/7 job, her private life had to take a back seat. After the birth of her children, and for the sake of her family, Angela subsequently worked from home – as a translator. At Nagra, she took up her first pure desk job, which is why she also likes to step out of the office to help out at a trade fair or at information booths.

“LANGUAGE SKILLS ALONE ARE NOT ENOUGH”

Angela Paulsen enjoys teamwork, and the complex subject matter she deals with provides constant challenges. She is particularly pleased that Nagra attaches great importance to the quality of its texts.

“My adventure here began in 2017 as a freelancer. This became a permanent position in 2019, which I was very happy about. For me, the lockdown due to the coronavirus meant a step back into a life that I had intentionally left behind: working on my own and without seeing my teammates. Nagra has a great working environment, and I appreciate the collaboration with my colleagues. In my daily work as translator and copyeditor, I have the advantage of being enough of an outsider to be able to judge whether something would be understandable to others. This is important, because the subject matter is already complicated enough. Linguistic errors can also cast doubt on the overall quality of the scientific statements. My predecessor, Linda McKinley, has taught me a lot. I mainly translate from German to English and occasionally the other way around. In addition, I coordinate French translation assignments.

FROM A SINGLE MOULD

Terminology is my biggest challenge. Scientific and technical writing relies on the consistent use of defined terms. This limits writers at times, but also helps to ensure that a text is factually solid and as easy to understand as possible.

Language skills alone are not enough in my job. You also always have to know for whom you are translating something. Some prefer literal translations, others want the exact opposite. Communication with my colleagues is essential. Working in-house instead of for an agency is a great luxury for me. I collaborate with all divisions of our organisation and learn about what they are currently working on.

In agencies, the translation job is often passed on to employees who are available, but do not necessarily have the relevant background knowledge. At Nagra, everything is created from a single mould – and not just linguistically. We continuously strive to improve our scientific expertise and to communicate our findings. This is possible because our in-house experts know exactly what they are writing about and can rely on copyeditors, translators and graphic designers for extra polish. I am proud of Nagra for attaching great importance to the quality of its texts.

BEYOND SWITZERLAND'S BORDERS

In 2022, translating the texts for the siting proposal took up a lot of time. Often, several run-throughs were necessary to meet our own quality requirements. Keeping track of the various English and French translation assignments was not always easy.

I expect the nature of my work to change in the future. Machine translation will push my assignments more towards copyediting. Using the correct terminology will continue to be very important, particularly with regard to ensuring a uniform language for the reports for the general licence applications.

I am a latecomer – not only as a translator, but also in relation to the deep geological repository project. I am grateful that I can continue to contribute to our project of the century for a few more years. What I particularly like is that the English versions of our texts and reports will find their way beyond Switzerland's borders to countries around the world working on the same task as we are.



“WE HAVE ALL MATURED THROUGH THIS PROCESS”

Hanspeter Lienhart was elected as the first president of the Nördlich Lägern regional conference in 2011. He resigned at the end of 2022. How did he interpret his role and what was his experience of the process leading to the siting proposal?

“Which siting region will Nagra propose? In the Nördlich Lägern regional conference, everyone waited eagerly for autumn 2022 and the answer to this question. Uncertainty had fuelled speculation over the previous two years. For this reason, it was imperative for Nagra to communicate the siting proposal. This created transparency, and the process can now move forward again with all stakeholders on board.

We all know now that the repository is to be constructed in Nördlich Lägern. It is also clear that our region has not exactly hit the jackpot with this decision. I have the feeling that most people in the region have simply taken note of the situation – knowing that the process will take years.

ROLE OF THE REGIONAL CONFERENCE

For me personally, this milestone was the right moment to step down as president of the regional conference. One chapter has closed and a new one begins. I think the solution to have a co-presidency is a very good one: with Christopher Müller, we have someone with a lot of experience, and his professional background makes him well qualified. As a community councillor from Stadel, Reto Grossmann expresses the direct concerns of the siting community. I find this balance beneficial and important.

The authorities, the regional conference and the public are now all asking “Why Northern Lägern?” We will all review the proposal. The regional conference was never about being for or against a deep geological repository. Explaining this and getting people back on board was often challenging. But we managed to do so – and consider ourselves the voice of the region. For example, when discussing where to locate the surface facility, we were able to contrib-

ute by submitting a statement. For this, we first asked all members of the regional conference for their opinions. Questions like “Where is the Opalinus Clay most suitable?” are not our field. In my opinion, it was important and right that we never became involved in disputes with experts. If something was unclear, the regional conference gave a mandate requesting clarification. I see that all stakeholders and we ourselves have matured in this process.

In my function as president of the regional conference, good moderation was a major concern for me. The collaboration with those supporting us in the process, with Nagra’s communication team and the head office were also very important to me. I was fortunate to be able to count on top people. We were always well prepared. In the beginning, I didn’t know how complex this work would be – complex in the positive sense. Our regional conference has played an important and decisive role in this process. The cause was certainly worth the effort and, for me personally, the many experiences and encounters were enriching.

KEEP PARTICIPATING

A key issue now is to ensure that the participatory process is not weakened. The next steps are important and these, too, require transparency. An important question, of course, is that of discretionary payments. An agenda is essential to moving the process forward and enhancing the acceptance of the procedure. I therefore welcome the fact that the waste producers have taken up our request and are expressing their willingness to collaborate in sincere negotiations. Otherwise, acceptance will crumble. Because there is one thing we must not forget under any circumstances: this region carries the burden for the whole of Switzerland.

”



HANSPETER LIENHART

A member of the Bülach town council for the Social Democratic Party of Switzerland for 24 years, he founded his own company in 2011. That year, he was also elected as the first president of the Nördlich Lägern regional conference.

Hanspeter Lienhart completed an apprenticeship as a chemical laboratory technician and then embarked on a career as a trade union representative and politician. He is married and has a son and two granddaughters.



JULIA LEUTHOLD

Julia studied civil engineering and obtained her doctorate in the field of rock mechanics at the Karlsruhe Institute of Technology.

After graduating, she wanted to apply her know-how to a project of social relevance and expand her theoretical knowledge of rock mechanics and tunnelling. Julia found what she was looking for with Nagra and took on the position of Project Manager Rock Mechanics and Tunnel Construction in 2021, where she has been responsible for the Tunnelling Methods and Design Project since 2022. She has one child and lives with her family in Zürich.

“WE LEAVE NOTHING TO CHANCE”

How do you construct something in Opalinus Clay and how does this clay rock behave under stress? Engineer Julia Leuthold meticulously calculates the models required to find the answers.

“My tasks as a civil engineer at Nagra are similar to those at university; I didn’t have to familiarise myself with a completely new field. And yet there are differences. Here, we have a clear goal – our project of the century. It is like in any company: if you do not contribute your share of the workload, the company as a whole cannot move forward. At university, on the other hand, the worst thing that can happen is that you ruin chances for yourself.

Nagra has a long history. To a young person, this is impressive: to think about everything that has been worked through before and how many reports have already been written to reach the point where we are today. I quickly realised that nothing is left to chance here. However, in underground construction, there are always risks that we have to deal with. Bringing these two worlds together fascinates me.

TIGHT, BUT CHALLENGING

The siting proposal was very important to the geologists but, for us engineers, the work only really starts now. As Project Manager Rock Mechanics and Tunnel Construction, I am responsible, among other things, for designing stable underground structures. As a team, we determine whether tunnel construction can go ahead as planned from a structural point of view. Together with scientists from the Swiss Federal Institutes of Technology in Zürich and Lausanne, I am developing calculation models for this. For example, we have developed a constitutive model with which we can describe the hydromechanical behaviour of the Opalinus Clay.

It is important to understand that the Opalinus Clay is very suitable for the emplacement of radioactive waste, but much more challenging for tunnel con-

struction. In this field, we have worked closely with our colleagues from geomechanics. This cross-disciplinary collaboration works very well, and Nagra has enormous technical know-how. I have a very open-minded approach, which allows me to see the project from different perspectives and helps me learn a lot personally.

WE ARE CONTINUOUSLY LEARNING

I always want to understand everything for myself. That helps me in my work here. For my colleagues, it might be a little exhausting at times, but my precise approach allows me to notice things that may remain hidden to others. For example, I am very good at grasping theoretical models. This helps us to physically portray processes that we observe.

I am a relative newcomer and have less professional experience than my colleagues. This gives me a more impartial, flexible view of things. This works well for a project such as the deep geological repository, since we have never constructed one before. We have to continuously learn and improve. Moreover, outside Nagra, almost everyone I work with is male. To be young, female and straight out of university did not make my start with the project any easier. By now, though, I can say that I have been able to improve communication and collaboration with our contractors and open up new approaches to finding solutions.

Working at Nagra is also great in terms of external impact. What we do is important for society. I started working for Nagra in mid-2021 and would say that, by 2022, I had really arrived, really found my vocation. With my outside perspective and attention to detail, I am trying to improve the project even further.



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Kernkraftwerk
Gösgen-Däniken AG

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Zwilag Zwischenlager
Würenlingen AG

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Swiss
Confederation

Matthias Neuenschwander
Neuenschwander
Consulting Engineers SA

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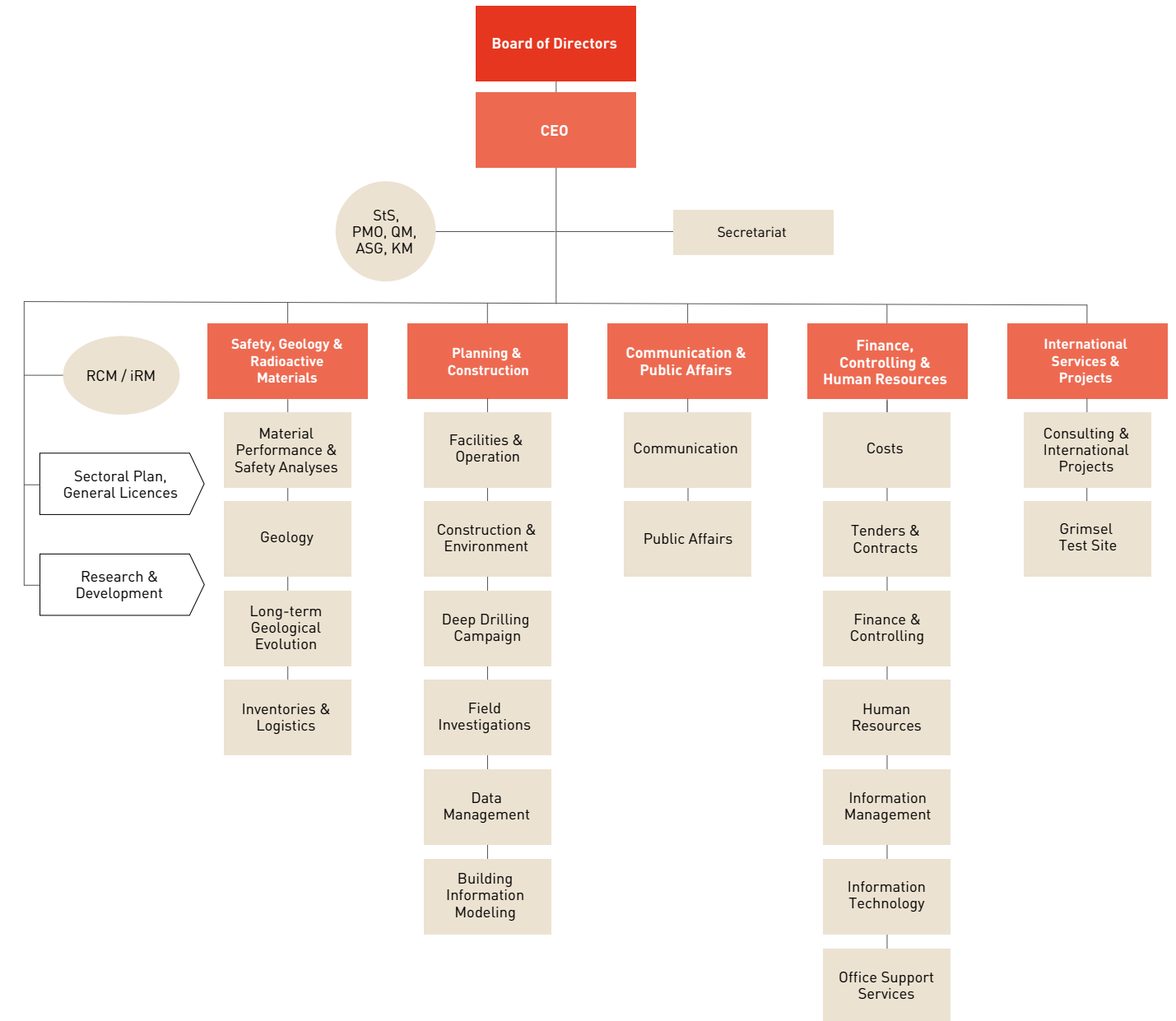
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PricewaterhouseCoopers AG
Zürich

ORGANIGRAM OF THE HEAD OFFICE



OHS Occupational Health and Safety
iRM integrated Risk Management
KM Knowledge Management
PMO Project Management Office
QM Quality Management
RCM Requirements and Configuration Management
RP Radiation Protection

Status as of 2022

EXECUTIVE BOARD



Matthias Braun
Chief Executive Officer



Maurus Alig
Coordinator Major Project
Sectoral Plan Stage 3 / General Licences



Markus Fritschi
Deputy CEO (until 28th February 2023)



Reto Beutler
Division Head
Finance, Controlling & Human Resources



Irina Gaus
Manager Optimisation
(from 1st January 2023)



Philipp Senn
Division Head
Communication & Public Affairs



Severin Wälchli
Division Head
Planning & Construction



Tim Vietor
Division Head
Safety, Geology & Radioactive Materials

ANNUAL FINANCIAL STATEMENTS 2022

COMMENTS ON THE ANNUAL FINANCIAL STATEMENTS 2022

The current financial statements for 2022 were prepared in line with the provisions of the relevant Swiss legislation, in particular the articles on commercial accounting and financial reporting of the Code of Obligations for individual financial statements (Articles 957 to 962).

Total expenditure minus proceeds from sales of goods and services and other income is borne by the members of the Cooperative, which results in a balanced year-end result.

Operating income amounted to CHF 76.3 million (2021: CHF 116.1 million) and project expenditure amounted to CHF 51.2 million (2021: CHF 90.9 million). The decrease in project expenditure is due to the completion of the deep borehole campaign. The Bachs borehole was the ninth and final borehole to be drilled during the three-year campaign.

The net proceeds from sales of goods and services decreased despite a high number of orders on hand, and staff costs as well as other operating costs, depreciation and the financial result are comparable to those of the previous year.

Further information can be found in the notes on the annual financial statements.

Wettingen, 16th March 2023



Dr. Matthias Braun, CEO

INCOME STATEMENT

Note	1.1.-31.12.2022	1.1.-31.12.2021
	CHF	CHF
C1		
Net proceeds from sales of goods and services		
Net proceeds from services for third parties	2 770 996	4 575 140
Research contributions from third parties	198 622	–
Net proceeds from services for Cooperative members	62 587	386 117
Total net proceeds from sales of goods and services	3 032 205	4 961 256
C2		
Contributions of members of the Cooperative		
Contributions to administration costs	700 000	700 000
Contributions to project expenditure	72 165 833	109 875 578
Total contributions of members of the Cooperative	72 865 833	110 575 578
Other operating income	435 417	587 707
Total operating income	76 333 456	116 124 542
C3		
Cost of materials (project expenditure)	51 233 787	90 926 902
C4		
Staff costs	21 872 351	21 900 002
C5		
Other operating costs	2 865 671	2 901 941
C10		
Depreciation and value adjustments on fixed assets	177 481	236 010
Operating result	184 166	159 687
Financial income	–62 284	–79 391
Financial costs	116 099	89 122
Ordinary result	130 352	149 956
Extraordinary, non-recurring or prior-period income	–	–
Annual profit before taxes	130 352	149 956
Direct taxes	130 352	149 956
Annual result	–	–

BALANCE SHEET

Note	Assets	31.12.2022	31.12.2021
		CHF	CHF
	Current assets		
	Cash and cash equivalents	2 586 659	11 386 254
C6	Trade receivables	3 511 749	1 574 347
	Due from third parties	374 448	1 365 172
	Due from members of the Cooperative	3 137 301	209 175
C7	Other current receivables	82 217	893 633
	Towards third parties	82 217	893 633
C8	Non-invoiced services	1 818 486	3 086 668
C9	Accrued income and prepaid expenses	8 955 848	4 693 820
	Total current assets	16 954 958	21 634 722
	Capital assets		
C10	Tangible fixed assets	1 388 612	1 484 070
	Total capital assets	1 388 612	1 484 070
	Total assets	18 343 570	23 118 792
	Equity and liabilities		
	Current borrowed capital		
C11	Trade payables	4 888 750	9 945 514
	Due to third parties	4 884 209	9 927 833
	Due to members of the Cooperative	4 541	17 681
	Other current liabilities	1 599 042	1 822 265
	Due to third parties	1 599 042	1 822 265
C12	Advance payments received	5 305 589	4 304 484
C13	Deferred income and accrued expenses	6 410 189	6 906 529
	Total current borrowed capital	18 203 570	22 978 792
	Total liabilities	18 203 570	22 978 792
C14	Equity		
	Cooperative capital	140 000	140 000
	Annual result	-	-
	Total equity	140 000	140 000
	Total equity and liabilities	18 343 570	23 118 792

CASH FLOW STATEMENT

Note		1.1.-31.12.2022	1.1.-31.12.2021
		CHF	CHF
	Annual result	-	-
C10	Depreciation and value adjustments on fixed asset items	177 481	236 010
	Change in net current assets		
C6	Decrease (+) / increase (-) trade receivables	-1 937 402	-767 362
C7	Decrease (+) / increase (-) other current receivables	811 416	-28 932
C8	Decrease (+) / increase (-) non-invoiced services	1 268 182	-516 739
C9	Decrease (+) / increase (-) prepaid expenses	-4 262 028	-4 238 520
C11	Decrease (-) / increase (+) trade payables	-5 056 764	2 547 432
	Decrease (-) / increase (+) other current liabilities	-223 223	312 943
C12	Decrease (-) / increase (+) advance payments received	1 001 105	455 795
C13	Decrease (-) / increase (+) deferred income and accrued expenses	-496 339	-13 059 108
	Cash flow from operating activities	-8 717 572	-15 058 481
C10	Investments in fixed assets	-82 023	-87 586
	Cash flow from investment activities	-82 023	-87 586
	Cash flow from financing activities	-	-
	Change in cash and cash equivalents	-8 799 595	-15 146 067
	Change in cash and cash equivalents	2022	2021
	Cash and cash equivalents as of 1st January	11 386 254	26 532 321
	Cash and cash equivalents as of 31st December	2 586 659	11 386 254
	Net increase/decrease in cash and cash equivalents	-8 799 595	-15 146 067

NOTES ON THE ANNUAL FINANCIAL STATEMENTS

A) General information

Accounting legislation

The current financial statements were prepared in line with the provisions of Swiss law, in particular the articles on commercial accounting and financial reporting of the Code of Obligations for individual financial statements (Articles 957 to 962).

Company, name, legal form and registered office

Nagra, National Cooperative for the Disposal of Radioactive Waste,
Hardstrasse 73, Postfach, 5430 Wettingen, Switzerland

Type of audit

According to legal requirements (Art. 727 Item 2 of the Code of Obligations), the annual financial statements of Nagra are subject to an ordinary audit.

Currency used for the accounting

The accounting is in the national currency (Swiss Francs, CHF).

Cash flow statement

The cash and cash equivalents form the basis for the presentation of the cash flow statement. Cash flow from operating activities is calculated using the indirect method.

Approval of the annual financial statements

The Board of Directors approved the annual financial statements on 16th March 2023 on behalf of the annual general meeting.

B) Information on the principles applied in the annual financial statements

The main positions in the annual financial statements are assessed as follows:

Cash and cash equivalents

Cash and cash equivalents comprise petty cash and credit balances on bank accounts. They are carried at nominal value. Foreign currency positions are carried at the exchange rate on the reporting date.

Trade receivables

Trade receivables are reported at the invoiced amount minus allowance made for the bad debts provision. Allowance is formed based on the maturity structure and recognisable credit risks.

Receivables and payables towards involved parties

These positions are exclusively receivables and payables towards involved parties (i.e. the members of the Cooperative).

Non-invoiced services

The capitalised work in progress and the received advance payments result exclusively from contracts for third parties. For the ongoing projects, all expenditure is capitalised as work in progress, and all advance payments received are booked as a liability.

Fixed assets

Fixed assets are reported at acquisition cost minus the accumulated depreciation over the estimated useful lifetime of each asset category. Investments in hardware below CHFk 20 (one-off) and software below CHFk 100 (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

Expenditure on repairs and maintenance that does not add value is debited directly to the income statement. Renewals that change the useful lifetime of assets are capitalised.

Assets removed from operation or sold are written off on the assets account at their acquisition values and the accumulated depreciation. The resulting profits or losses are entered in the income statement.

Payables

All payables are carried at nominal value. Services received and incurred liabilities are deferred according to the period.

Provisions

Provisions are formed when, based on events that have occurred in the past, the company has a legal or factual obligation, the extent and due date of which are unknown but can be estimated.

C) Information, breakdowns and notes on the annual financial statements

C1) Net proceeds from sales of goods and services

Net proceeds from sales of goods and services decreased in the reporting year, but there is a high order backlog for future work.

C2) Contributions of the members of the Cooperative

The contributions of the members of the Cooperative were invoiced on a quarterly basis according to the budget approved by the Board of Directors. As of 2022, the contributions are invoiced on a monthly basis. A deviation from the budget leads to an additional charge or a credit that is booked in the year of accounting as prepaid expenses or deferred income. This has an annual result of CHF 0.

The 2022 accounting year resulted in an expenditure excess of CHF 7.9 million (2021: CHF 4.5 million), mainly due to higher expenditures for the deep borehole campaign. This excess will be additionally invoiced to the members of the Cooperative.

C3) Cost of materials (project expenditure)

The project expenditure is made up as follows:

External services for:	2022	2021	2020
	CHFk	CHFk	CHFk
Projects: – deep borehole campaign	17 958	53 006	57 020
– scientific basis, studies, work related to the L/ILW and HLW programmes	21 484	26 970	29 112
Communication	2 158	1 631	895
Fees (ENSI, SFOE)	9 062	8 987	8 743
Travel expenses	572	333	453
Project-related external services	51 234	90 927	96 223

C4) Staff costs

At CHF 21.9 million, staff costs, including social contributions, remained stable compared to the previous year. The average staffing level in 2022 was 114.7 full-time positions, 6.1 temporary positions and 1.0 apprenticeships (2021: 109.5 full-time positions, 10.1 temporary positions and 1.4 apprenticeships).

C5) Other operating costs

Other operating costs include rents and expenditure on property of CHF 1.2 million, expenditure on information technology of CHF 0.7 million and further operating costs of CHF 1.0 million. In total, these costs are comparable to those of the previous year.

C6) Trade receivables

Compared to the previous year, trade receivables increased by CHF 1.9 million. Due to the holidays at the end of 2022, individual project cost contributions from members of the Cooperative were not received until early January 2023.

C7) Other current receivables

Other current receivables include guarantee and cash contributions. The completion of the deep borehole campaign made it possible to reclaim the guarantee deposit from the Swiss Directorate General of Customs (ZAZ) and the rental deposit for the temporary drill-core storage facility in Würenlingen.

C8) Non-invoiced services

Non-invoiced services consist of accrued internal services and third-party services for various projects. Verification is provided on a project-specific basis.

C9) Accrued income and prepaid expenses

Accrued income and prepaid expenses are primarily made up of the balance of the year-end result (CHF 7.9 million).

C10) Tangible fixed assets

	Land and buildings	Office and workshop	Vehicles	Total
	CHFk	CHFk	CHFk	CHFk
Acquisition value as per 01.01.2021	1 825	1 298	761	3 884
Additions		15	72	88
Disposals		-568		-568
Acquisition value as per 31.12.2021	1 825	745	833	3 404
Additions	33	9	40	82
Disposals			-114	-114
Acquisition value as per 31.12.2022	1 858	754	759	3 372
Accumulated depreciations as per 01.01.2021	555	1 108	589	2 252
Additions	30	119	87	236
Disposals		-568		-568
Accumulated depreciations as per 31.12.2021	585	659	676	1 920
Zugänge	33	80	64	177
Disposals			-114	-114
Accumulated depreciations as per 31.12.2022	618	739	626	1 983
Carrying value as per 01.01.2021	1 270	190	172	1 632
Carrying value as per 31.12.2021	1 240	87	157	1 484
Carrying value as per 31.12.2022	1 240	16	133	1 389

C11) Trade payables

Compared to the previous year, trade payables decreased by CHF 5.1 million to CHF 4.9 million, mainly due to fewer commitments from the deep borehole campaign.

C12) Advance payments received

Advance payments received are for accrued internal services and third-party services for various projects. Verification is provided on a project-specific basis. Due to the higher volume of third-party contracts, the advance payments received as per 31st December 2022 rose by CHF 1.0 million to CHF 5.3 million.

C13) Deferred income and accrued expenses

Deferred income primarily consists of outstanding settlements for services rendered. Additional important deferrals include fees of the SFOE for the 4th quarter of 2022 (CHF 0.9 million) and of ENSI (CHF 0.8 million) as well as remuneration for services provided by the University of Bern (CHF 0.8 million). The deferral for the head office amounts to CHF 0.8 million and for outstanding vacation time and overtime to CHF 1.7 million.

C14) Equity

The Cooperative capital is unchanged with CHF 140k and is divided into 140 share certificates of CHF 1,000 each, with 7 certificates of 20 shares each being distributed.

ACCUMULATED ACCOUNTS INCLUDING ADJUSTMENTS

D) Further information

Liabilities towards pension schemes

	31.12.2022	31.12.2021
As of 31st December, there were the following liabilities towards pension schemes:	CHF	CHF
Contribution statement December	262 643	271 218

Contingent liabilities

Nagra is not involved in any legal actions, legal disputes, regulatory or tax investigations, inquiries or other legal procedures that could have financial consequences for the annual financial statements for 2022.

As of 31st December 2022, there were no guarantee obligations.

Risk report 2022

On 30th June 2022, the Board of Directors approved Nagra's risk report for 2022.

Remuneration disclosure of the Statutory Auditor (in accordance with Article 961a of the Code of Obligations). The Statutory Auditor claimed the following remuneration:

	2022	2021
	CHF	CHF
Audit of the annual financial statements	25 500	24 000
Additional audits	3 200	8 500
Total	28 700	32 500

(excluding expenses and VAT)

Note	Total income	Excluding interest:		As per 31.12.2021 CHF	Excluding interest:		As per 31.12.2022 CHF
		Increase 2021 CHF	adjustment payments 2021 CHF		Increase 2022 CHF	adjustment payments 2022 CHF	
	Swiss Confederation	8 336 235	–	153 321 237	6 323 867	–	159 645 104
	Axpo Power AG	23 546 224	–	363 719 184	15 267 705	–	378 986 890
	BKW Energie AG	11 603 636	–	172 972 180	7 719 456	–	180 691 636
	Kernkraftwerk Gösgen-Däniken AG	29 090 706	–	468 016 530	18 610 073	–	486 626 602
	Kernkraftwerk Leibstadt AG	37 298 777	–	562 319 701	24 244 733	–	586 564 434
	Contributions to project expenditure	109 875 578	–	1 720 348 832	72 165 833	–	1 792 514 666
	Contributions to administration costs	700 000	–	93 070 000	700 000	–	93 770 000
	Contributions of Cooperative members to Nagra	110 575 578	–	1 813 418 832	72 865 833	–	1 886 284 666
	Contributions GNW	–	–	65 265 331	–	–	65 265 331
E1	Total contributions	110 575 578	–	1 878 684 163	72 865 833	–	1 951 549 997

NOTES ON THE ACCUMULATED ACCOUNTS

Note	Total expenditure	Increase	As per	Increase	As per
		2021	31.12.2021	2022	31.12.2022
		CHF	CHF	CHF	CHF
	Geoscientific studies	20 115 460	273 441 375	9 898 164	283 339 539
	Nuclear technology and safety	2 633 116	61 658 597	2 443 995	64 102 593
	Radioactive materials	1 550 205	52 931 346	1 556 623	54 487 969
	Facility planning	2 039 359	40 023 240	2 357 194	42 380 435
	Generic (site-independent) work	2 567 908	124 884 830	3 032 529	127 917 359
	General programme costs	4 373 165	118 923 088	4 895 768	123 818 857
	Fees and compensation	4 493 520	88 087 157	4 530 976	92 618 133
	L/ILW programme	37 772 733	759 949 633	28 715 248	788 664 883
	Geoscientific studies	50 614 131	522 351 159	21 350 163	543 701 322
	Nuclear technology and safety	4 218 533	91 097 099	3 732 058	94 829 158
	Radioactive materials	2 259 845	34 017 760	2 228 679	36 246 440
	Facility planning	3 007 542	37 426 189	3 500 790	40 926 977
	Generic (site-independent) work	3 154 227	146 670 896	2 948 159	149 619 055
	General programme costs	4 355 047	104 293 470	5 159 759	109 453 229
	Fees and compensation	4 493 520	89 807 957	4 530 976	94 338 933
	HLW programme	72 102 845	1 025 664 530	43 450 585	1 069 115 114
E2	Project expenditure for repository programmes	109 875 578	1 785 614 163	72 165 833	1 857 779 997
	Administration and general project expenditure	700 000	93 070 000	700 000	93 770 000
	Total expenditure for L/ILW and HLW programmes, administration and general project expenditure	110 575 578	1 878 684 163	72 865 833	1 951 549 997

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

The structure of the total income is oriented primarily to the operating accounts.

E1) Contributions of the members of the Cooperative

The contributions of the members of the Cooperative towards covering project costs are calculated based on the thermal output, the service-lifetime-weighted output and the expected waste volumes of the individual nuclear power plants of the members.

The contributions of the members in the total amount of CHF 72.9 million (CHF 110.6 million in the previous year) correspond to those in the income statement. A contribution of CHF 0.7 million to administration costs is included.

In the 2022 financial year (as in 2021), no compensation payments were made among the members of the Cooperative.

Contributions of the "Cooperative for Nuclear Waste Management Wellenberg" (GNW) include payments by GNW for contract work on the Wellenberg project. This project is terminated.

E2) Project-specific expenditure for the repository programmes

The two repository programmes (L/ILW and HLW) essentially 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 the deep geological disposal of high-level waste, as well as the processing of geological information for the disposal of low- and intermediate-level waste.

b) Nuclear technology and safety

The work comprises the safety-based evaluation of potential siting regions as well as 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.

REPORT OF THE STATUTORY AUDITOR

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) work

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 from public affairs activities.

g) Fees and compensation

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

Report of the Statutory Auditor to the general meeting of Nagra, National Cooperative for the Disposal of Radioactive Waste

Wettingen

Report on the audit of the annual financial statements for 2022

Audit opinion

We have audited the annual financial statements of Nagra, National Cooperative for the Disposal of Radioactive Waste (the Cooperative), which comprise the income statement, balance sheet as of 31st December 2022 and the cash flow statement for the year ended then, as well as the notes on the annual financial statements, including a summary of significant accounting policies.

In our opinion, the attached annual financial statements comply with Swiss law and the Cooperative's articles of incorporation.

Basis for the audit opinion

We conducted our final audit in accordance with Swiss law and Swiss Auditing Standards (SA-CH). Our responsibilities according to these legal provisions and standards are described in more detail in the section "Responsibilities of the statutory auditor when auditing annual financial statements" of our report. In accordance with Swiss law and the requirements of the auditing profession, we are independent of the Cooperative and have fulfilled our other professional duties in compliance with these requirements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Responsibilities of the Board of Directors for the annual financial statements

In accordance with the requirements of Swiss law and the Cooperative's articles of incorporation, the Board of Directors is responsible for the preparation of the annual financial statements and for such internal control as the Board deems necessary to enable the preparation of annual financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the annual financial statements, the Board of Directors is responsible for assessing the ability of the Cooperative to continue business operations. Further responsibilities include disclosing, as applicable, matters related to continuing business operations, and applying the accounting policy of continued business operations unless the Board of Directors either intends to liquidate the Cooperative or to cease operations, or has no realistic alternative but to do so.

Responsibilities of the statutory auditor for the audit of the annual financial statements

Our objectives are to obtain reasonable assurance that the annual financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue a report that includes our audit opinion. Reasonable assurance provides a high level of security, but it is not a guarantee that an audit conducted in accordance with Swiss law and Swiss Auditing Standards will always detect potential material misstatements. Misstatements can result from fraud or error and are considered material if, individually or as a whole, they could reasonably be expected to influence the economic decisions of users taken on the basis of these annual financial statements.

A more detailed description of our responsibilities for the audit of the annual financial statements can be found on the EXPERTsuisse website: expertsuisse.ch/wirtschaftspruefung-revisionsbericht (in German). This description forms part of our report.

Report on other legal requirements

In accordance with Article 906 CO together with Article 728a Par. 1 Item 3 CO and Swiss Auditing Standard PS-CH 890, we confirm the existence of an internal control system designed for the preparation of annual financial statements according to the instructions of the Board of Directors.

We also confirm that the register of the members of the Cooperative is kept in compliance with Swiss law and the Cooperative's articles of incorporation. We recommend that the financial statements submitted to you be approved.

PricewaterhouseCoopers AG

Thomas Wallmer
Audit expert
Auditor in charge

Fabian Stalder
Audit expert

Zürich, 16th March 2023

APPENDICES

WASTE INVENTORIES AND VOLUMES

Radioactive waste arises mainly from electricity production in the 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 2022

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 deep geological disposal as of the end of 2022. The table does not contain pre-conditioned raw wastes and waste packages prepared for processing in the Zwiilag plasma furnace, for example.

Conditioned waste (31st December 2022, figures rounded)	Volume (m ³)	Activity (Bq)
Nuclear power plants	2 961	9.5 · 10 ¹⁴
Zwiilag interim storage facility	3 224	6.7 · 10 ¹⁸
Swiss Federal Interim Storage Facility (MIR) (waste from medicine, industry and research)	1 652	1.4 · 10 ¹⁶

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

Predicted waste volumes and inventories for deep geological disposal

Planning the deep geological repository requires information on expected waste volumes. The total volume of waste for disposal will be around 82 000 cubic metres packaged in disposal containers (see table for details). The volume of waste from the nuclear power plants (NPPs) and Zwiilag results from the given operating lifetimes; the volume of waste from medicine, industry and research is based on the end of operation of the L/ILW* repository.

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
Operational waste from the NPPs (from cleaning systems and mixed waste), incl. post-operational phase	11 100	29 691				
NPP reactor waste (activated components)	407	1 436				
NPP decommissioning waste	19 239	24 951	25	25		
NPP reprocessing waste			99	432	114	377
MIR waste	11 762	15 614	165	524	9	11
Surface facility waste Waste from the future surface facilities for the L/ILW & HLW repositories	220	582				
Spent fuel assemblies					1 367	8 892
Total volumes	42 727	72 274	289	981	1 490	9 280
Percentage (rounded)	96.0%	87.6%	0.7%	1.2%	3.3%	11.2%

¹ Basis: Waste Management Programme 2021 (WMP 21)

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

Takes into account a decay storage period of radioactive materials for a maximum of 30 years with subsequent conventional disposal. With the publication of the Model Inventory of Radioactive Materials for the General Licence Applications (MIRAM-RBG), a new model waste inventory will be announced.

* L/ILW = low- and intermediate-level waste; ATW = alpha-toxic waste; HLW/SF = high-level waste/spent fuel

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siting regions that served as the data basis for the siting proposal
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