Promotion of geothermal energy in Switzerland: a recent programme for a long-lasting task

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Abstract

In 2001, a 10-year programme called "SwissEnergy" was initiated by the Swiss Federal Office of Energy, mainly devoted to a more efficient use of energy, with specific tasks such as energy saving, reduction of CO_2 emission and a distinctly increased contribution of the renewable energies. Hence, the Swiss Geothermal Society (SGS) was entrusted with the mandate to promote the application of geothermal energy at a national level.

The main objectives of this programme are to create a sound image of geothermal energy in general, to inform about the various technologies already in use all over the country and to show their potentials for the future. The strategy deployed should consider a full collaboration between all energy actors, namely the Federal Office of Energy, local utility companies and energy agencies as well as the different networks present in the field of renewable energy (geothermal, sun, wind and biomass).

This promotion programme is considering the various types of geothermal resources and technologies available in Switzerland, such as borehole heat exchangers, groundwater wells, foundation piles, thermal springs, deep aquifers and warm tunnel drainage waters.

The said promotion programme is organised around five activity modules:

- Module 1 Information
- Module 2 Basic and continuous education
- Module 3 Marketing
- Module 4 Quality insurance
- Module 5 Consulting services.

Moreover, four Regional Promotion Centres (RPC) have been established, corresponding to the different linguistic regions of Switzerland: two RPC in the German speaking region and one in the French speaking region as well as one in the Italian part of the country, respectively.

The staff working for this programme consists of 13 part-time specialists. The strong interest and the favourable reception given to all aspects of this Swiss geothermal promotion programme during its first two years of activities have confirmed the real need to inform a wide range of persons involved in the energy scene.

Keywords

Promotion programme, information, education, marketing, Switzerland.

1. Introduction

Due to a preceding 10-year action programme called Energy2000 (1990 to 2000), the total Swiss energy consumption was reduced by 4.3% in 2000. This reduction, however, was considered insufficient to stabilise overall energy consumption. As a matter of facts, the latter continued to grow, with a consequent increase of CO_2 emissions. As a continuation of Energy2000, a new energy policy follow-up programme called **SwissEnergy** was initiated in 2001 under the auspices of the Director of the Federal Department of Environment, Transport, Energy and Communications (DETEC). Its multiple goals will be to enforce the recent Energy and CO_2 Laws, and to achieve a sustained impact and public acceptance in view of the long lifespan of the energy supply and demand structures [1].

2. The SwissEnergy programme

This programme aims to exert a positive influence on the environment, the climate, the safety of the energy supply and on the competitive position of the Swiss industry. Over a time span of 10 years, SwissEnergy will endeavour to reduce, until 2010, the consumption of fossil energies by 10%, thereby achieving the Swiss target of reducing CO_2 by 10% below the 1990 level (Table 1). Other main targets are to combat the emission of other pollutants (e.g. NO_x) and to reduce Switzerland's persistent substantial dependence on oil supplies from abroad. By promoting innovative and future orientated technologies with high market potentials, the SwissEnergy programme shall contribute to strengthen economy and to create additional employment opportunities.

Table 1: Objectives of SwissEnergy [1]

Sector	**Percentage net energy consumption (1999)**	**Objectives 2010 (compared to 2000)**	
		Status quo policy (Energy2000)	**Intensified policy (SwissEnergy, CO_2 Law)**
Energy efficiency			
- Consumption of fossil energies	72.3%	+2%	-10%
- CO_2 emission (from 1990) :		stable	-10%
from heating fuels		–8%	-15%
from motor fuels		+12%	-8%
- Electricity consumption	21.4%	+10%	≤+5%
Renewable energies			
- Hydroelectric power	13.0%	stable ?	stable
- Other renewable energies :	9.5 TWh		
Electricity	(3.1%)	+0.37 TWh	+0.5 TWh
Heat		+2.10 TWh	+3.0 TWh

The emphasis of SwissEnergy is on strengthening of voluntary measures for an efficient use of energy and on the promotion of renewable energies. Both targets shall be based on partnership and on a decentralised and market-oriented approach. Because of the good long-term potential of renewable energies, they have to be supported by research, development, and the realisation of pilot and demonstration plants. A suitable strategy has been prepared by

a working group of the Swiss Confederation, supported by the cantons and representatives of renewable energy organisations.

3. Duties of the new "geothermal network"

In the framework of SwissEnergy, the Swiss Geothermal Society (SGS) was entrusted with the mandate to promote the application of geothermal energy at a national level. Under the guidance of the SGS, a working group ("network" or "centre of competence") was created, comprising various specialists and scientists from universities and private companies. A clear organisation structure was set up for this network in order to achieve the various objectives of the said promotion programme (Figure 1).

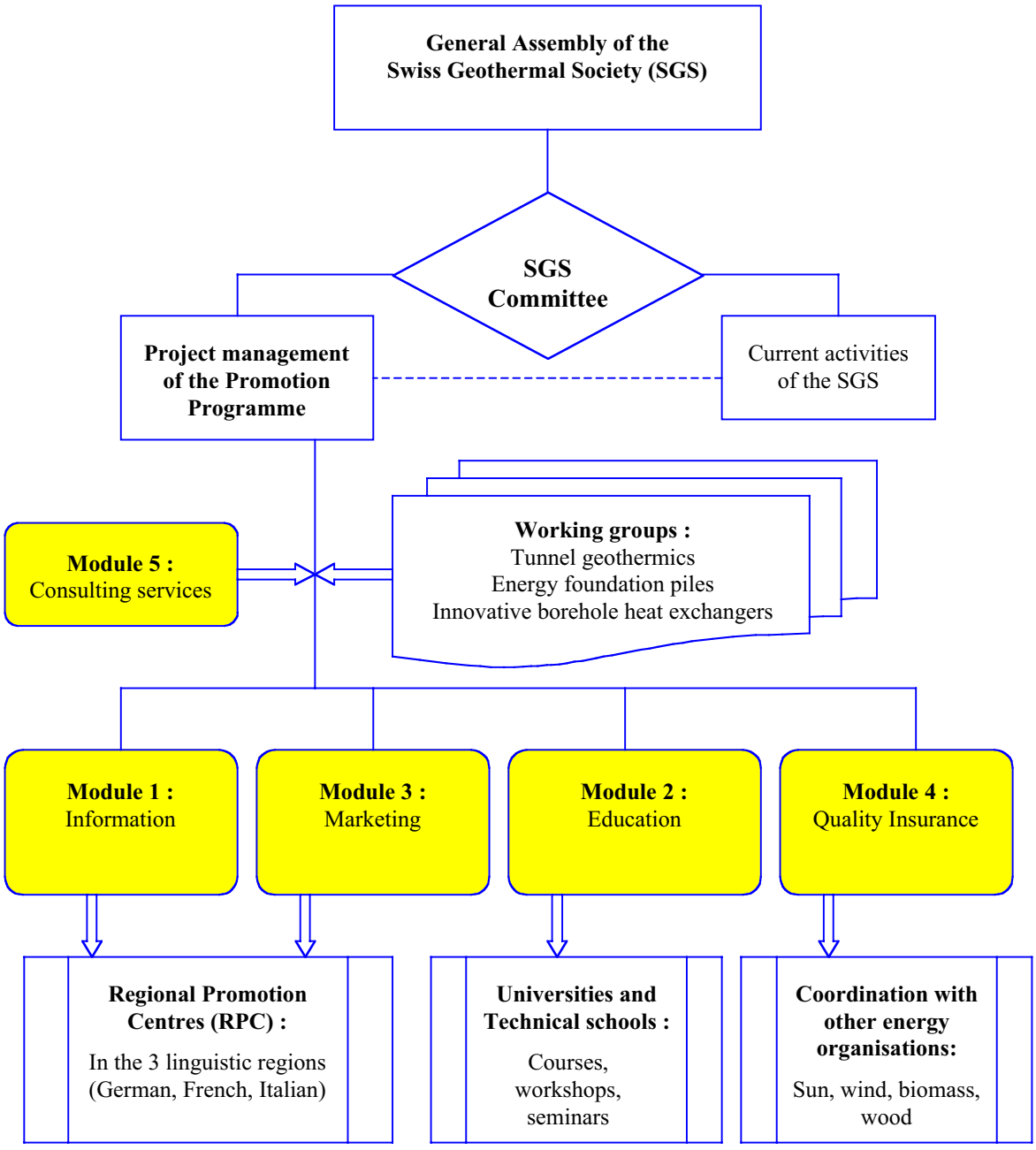

Figure 1: Organisational scheme of the Geothermal Promotion Programme

The main goals are to widen the knowledge in the appropriate utilisation of geothermal energy in Switzerland, and to create a positive and profound image of this renewable and clean energy.

Therefore, it is of utmost importance to inform about the advantages of various geothermal applications already used all over the country, and to show their potentials for the future. The variety of audience to be addressed is considerable: i.e. general public, students at universities and technical schools, civil and electrical engineers, architects, professional associations, environmental organisations, energy specialists, political parties, financing groups, including decision makers either of administrative, financial or technical background.

As shown in figure 1, the activities of the geothermal network are split up into the following five modules:

Module 1 : Information

This module will provide up-to-date documentation on the various technologies (see Section 4), type of installations and on the geothermal potential available in different regions. All information material is provided in German, French and Italian , and are handed out free of charge.

Detailed information can also be downloaded from the SGS - Web site (http://www.geothermal-energy.ch).

Material thus created and distributed comprises the following (Figures 2, 3 and 4):

- Newsletter: "The Heat of the Earth: A Clean and Sustainable Energy for All" [2].
- Technical Notice: showing the different types of geothermal resources and applications.
- A PowerPoint™ presentation of the various aspects of geothermal energy (available on CD).
- Database of photos and images focused on geothermal energy (FileMakerPro™).
- Address Database of persons and organisations in Switzerland concerned with geothermal activities (Access™).
- Geothermie-CH: the journal of the Swiss Geothermal Society, since 1990 [3].

Module 2: Education

Regular courses of applied geothermics will help to increase the knowledge among people involved in geothermal research, implementation and in marketing. This educational task is accomplished at technical schools and universities, but is also organised within seminars, which are dedicated to one specific technology. Furthermore, lectures are also given during special events such as forums and exhibitions, including field trips and visits of technical sites.

For each activity, teaching materials and workshop proceedings are produced and distributed accordingly [4].

Module 3: Marketing

The principal tasks of the marketing module are:

- Co-ordination of the marketing activities of the Regional Promotion Centres.
- Development of new marketing strategies.
- Promotion of innovative applications of geothermal resources such as heating of greenhouses, including aquaculture, laundries, etc.
- Market stimulation of "Heat Contracting".
- Launching of new techniques for a "cascade-type of use" of deep aquifers resources.

- Market studies for large or complex geothermal heating installations.
- Support to the Deep Heat Mining project during the search of potential investors (Section 4).

Module 4: Quality insurance

This module essentially provides the quality measures to be observed for an optimum implementation and maintenance of geothermal installations. A sound collaboration is needed with other professional organisations to help establishing adequate guidelines (e.g. together with the Swiss Heat Pump Association). The following aspects are to be covered:

- Monitoring of the different project phases: assistance and consulting as well as "second opinion" expertise.
- Quality control of materials and equipments used in geothermal installations (establishment of quality labels).
- Validation of the performance of geothermal installations: by so-called "geothermal response tests".
- Checking of legal aspects: review and standardisation of the numerous and complex administrative (cantonal) regulations concerning the use of geothermal energy.
- Quality control of the professional staff itself: by continuous education, seminars, registry of companies (equipment and services).

Module 5: Consulting services

Consulting services are made available to all modules as well as to the Regional Promotion Centres. These activities comprise technical advices for project planning, the identification of suitable professionals or equipments, and also to answer legal queries. Another important task is the lobbying among politicians, and to keep them informed at local, regional and national levels about the possibilities and potential of applying geothermal energy.

Regional Promotion Centres (RPC)

Four RPC have been created in different areas of Switzerland: north-west and north-east region (both German speaking), western region (French speaking) and southern region (Italian speaking), respectively.

The main objective of each RPC is to render technical services to local and cantonal authorities, to companies and consumers interested in geothermal applications, to promoters and potential investors. Thus, seminars and exhibitions are organised, consulting services are provided whereever required, and articles are published in the local press on a regular basis.

4. Available geothermal application technologies

The geothermal network has to promote the following geothermal technologies:

- **Combined heat / cold production and storage for heating and cooling purposes in shallow underground systems.**

The use of these rather shallow resources is neither linked to geological nor to topographical constraints. The highest density of these installations can be found on the Swiss Plateau between the Alps and the Jura Mountains, mostly in Quaternary sediments.

- **Deep borehole heat exchangers, fields of borehole heat exchangers, shallow groundwater wells**

Deep borehole heat exchangers are not yet very common in Switzerland. However, several installations composed of a field of borehole heat exchangers are already being used for heating and cooling purposes of large buildings.

The heat of shallow aquifers is being extracted for the heating of small one- or more family houses. The amount of this type of heat production within Swiss cantons is subject to their respective groundwater protection laws.

- **Energy foundation piles and walls**

The application of piles and other foundation structures for a combined heat/cold production is particularly suitable for regions with poor geotechnical foundation conditions, e.g. alluvial and lacustrine sediments requiring special foundation support. With little extra cost, such structures can then be easily equipped as heat exchangers (e.g. so- called “energy- piles”).

This market sector is very promising, especially for heating of large industrial or office buildings. Instead of using air conditioners during summer months, such buildings can very economically be cooled by running only a circulation pump in the system (so-called free cooling).

- **Direct use of deep aquifer resources**

Even though Switzerland is not gifted with strong geothermal anomalies, a variety of deep geothermal resources are already being exploited (e.g. thermal water for spas and doublets for urban heating plants).

The presence of this type of resource is strongly linked to favourable geological and tectonic structures. Unfortunately, the complexity of the Swiss geology limits the success rate of exploration boreholes.

- **Tunnel waters**

Already six installations are using warm drainage waters from tunnels for heating of public and private buildings located in vicinity of tunnels portals.

Furthermore, two very long base tunnels are at present under construction (AlpTransit tunnels of Loetschberg and Gotthard). During and after their completion, a considerable amount of groundwater will be drained off at each portal. Cooling ponds would be necessary to decrease water temperatures prior to disposal into a river. In order to avoid this “energy dissipation”, projects studies are being carried out to determine technical and economical utilisations of this valuable energy resource, e.g. for greenhouse heating, district heating, etc.

- **Enhanced Geothermal Systems (EGS): the Deep Heat Mining project (DHM)**

The Deep Heat Mining project represents the main geothermal project of the Federal Office of Energy. Contrary to other deep geothermal resources, EGS projects depend much less on favourable geological structures and on the geothermal gradient.

Two sites are at present under investigation: one in Basle, where a 2.7 km hole was drilled into the crystalline basement, and was recently equipped as a seismic monitoring station. The second is located in Geneva, where detailed project planning, including various surface investigations, will lead to the siting of the first exploration borehole.

Conclusions

Since its beginning in 2001, the promotion programme of geothermal energy has successfully met most of its goals. This due to the involvement of a group of 13 dedicated specialists and thanks to the continuous financial support of the Swiss Federal Office of Energy. The total annual budget of this programme reached 250’000 CHF (170’000 EUR) in 2001 and 450’000 CHF (310’000 EUR) in 2002. For 2003, the budget is similar to 2002.

A strong and increasing interest as well as a favourable reception has been given to all aspects of promotion during the first two years. This confirms the real need for a promotion programme, to inform a wide range of persons involved in the energy scene including energy consumers.

References

1. Swiss Federal Office of Energy, SwissEnergy, The follow-up programme to Energy 2000. Report of the Federal Department of Environment, Transport, Energy and Communications, Bern, Jan. 2001, 27 p.
2. Info-Geothermie, 3 issues yearly, in German, French and Italian, Ed. Swiss Geothermal Society, Biel, since 2001, 4 p.
3. GEOTHERMIE-CH, 2 issues yearly, in German and French, Bulletin of the Swiss Geothermal Society, Ed. Swiss Geothermal Society, Biel, since 1990, 16 p.
4. Proceedings Workshop on Geothermal Response Tests. Swiss Federal Institute of Technology Lausanne, Oct. 2001, Lausanne, 132 p.
5. Website http://www.geothermal-energy.ch

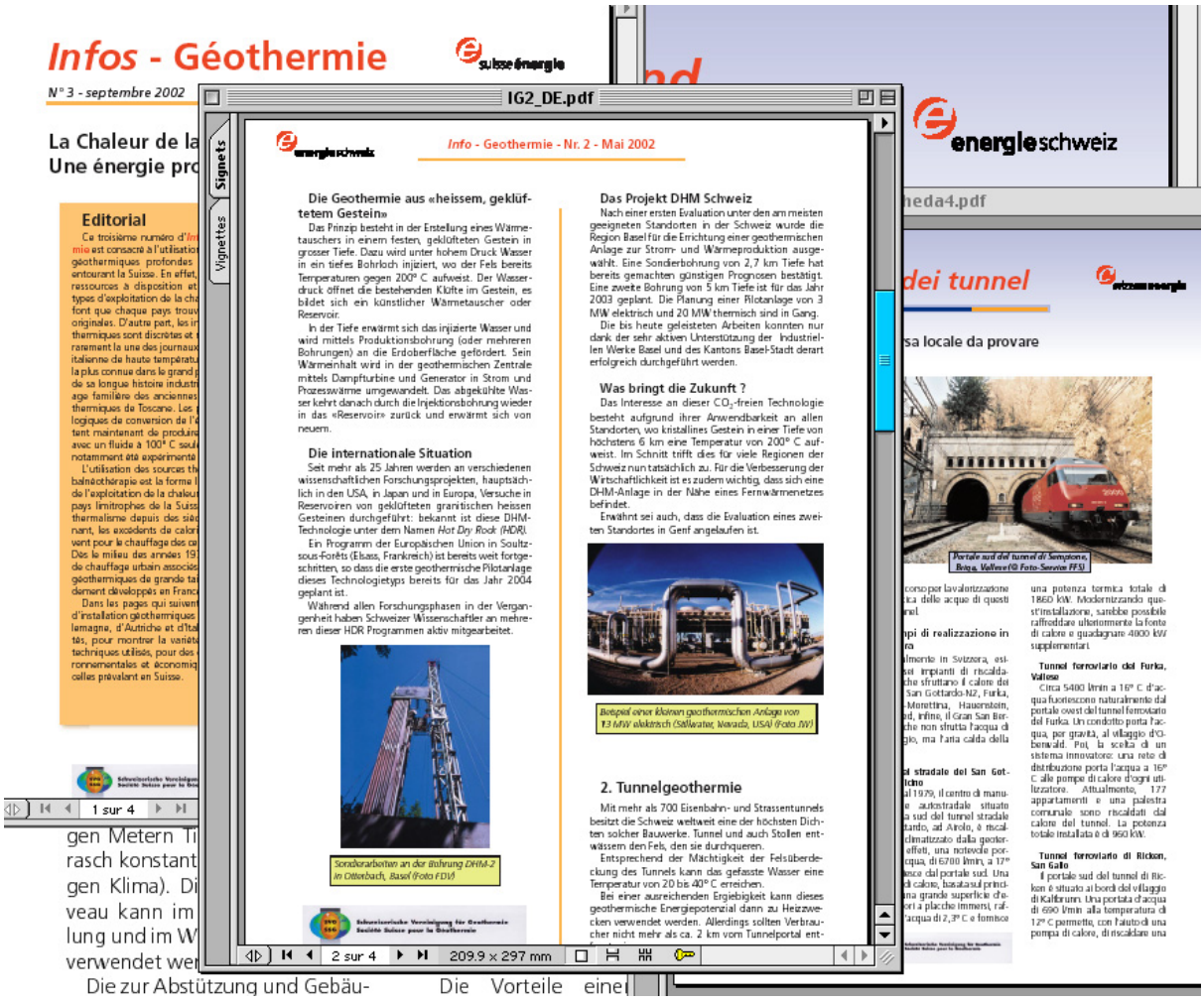

Figure 2: Example of information material : Newsletter and Technical Notices

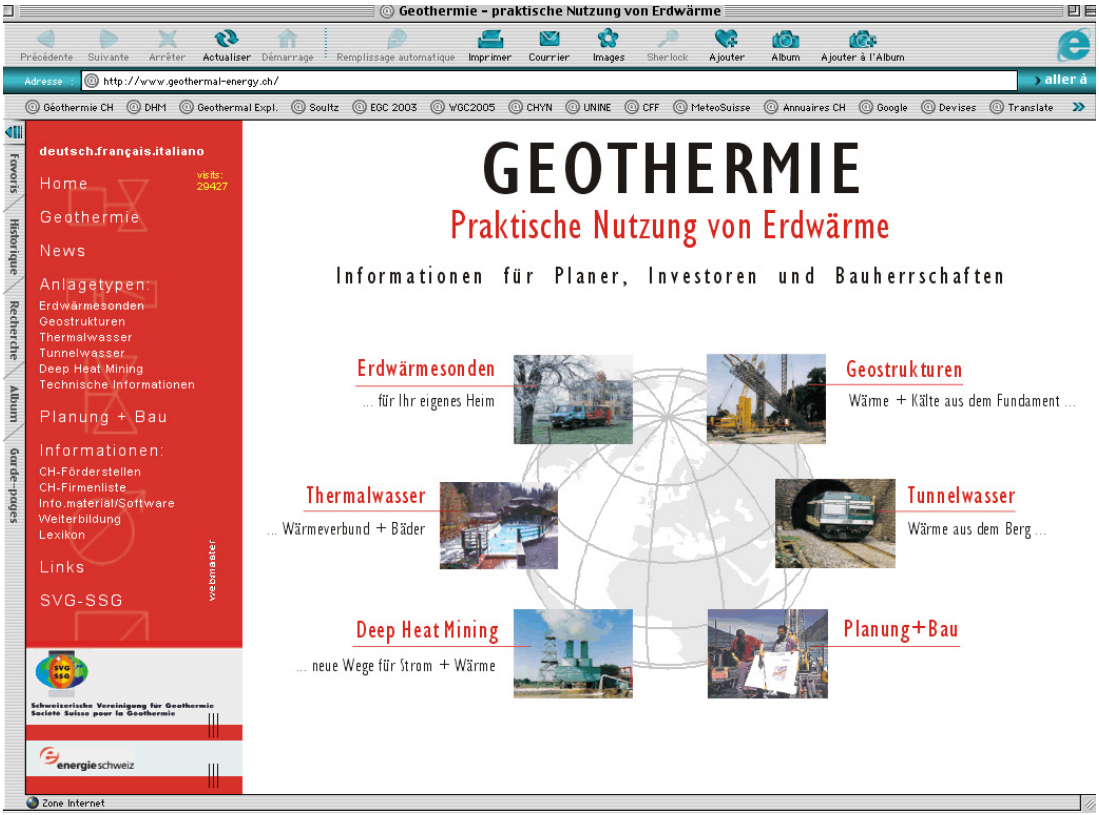

Figure 3: Example of information material : Website homepage

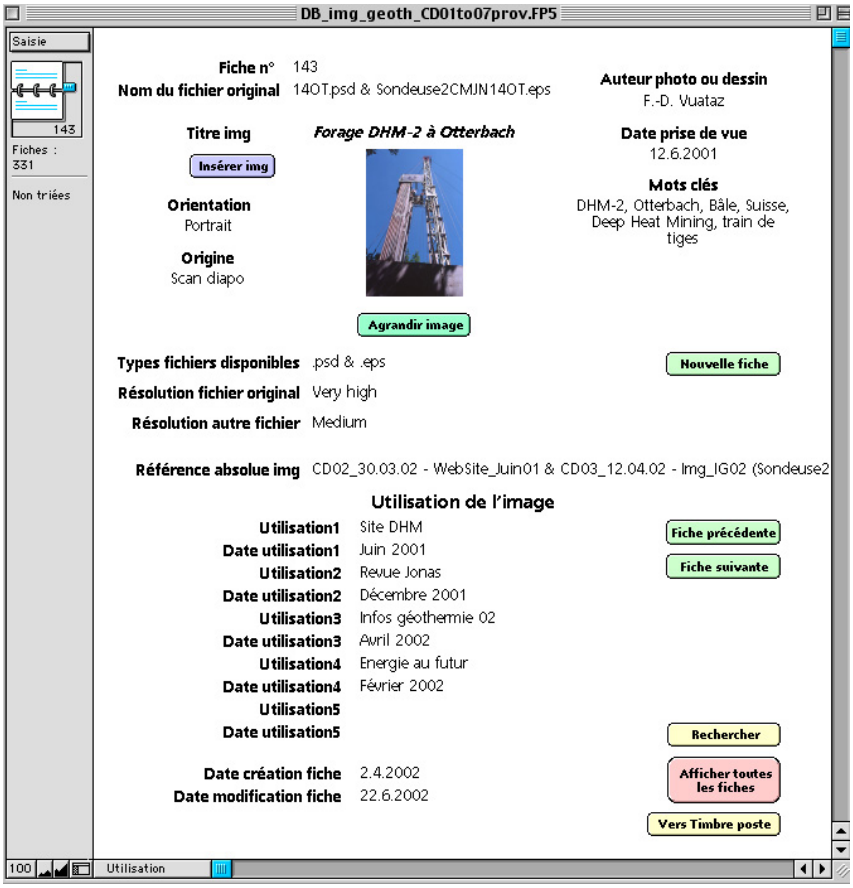

Figure 4: Example of information material : Database of images and photos