



## New possibilities for ICOLD

This year, ICOLD has given itself new means for making hit message known. The new homepage of our website, along with technical improvements, will finally give the National Committees the possibility to upload all the technical bulletins for free, as discussed during the Hanoi Executive Meeting. This will give hopefully much more impact to the work of our Technical Committees, through the National Committees.

The other way to make more impact with our work is to increase the readership of our publications. ICOLD is fundamentally a place for the exchange of knowledge and experience about dams. I therefore urge every ICOLD member to assist the Central Office in its effort for the dissemination of the publications. You have received (or will soon receive) a letter from Secretary General Michel de Vivo about that.

The next important dates for our organization are ICOLD 79th Annual Meeting in Lucerne, next June, and ICOLD 24th Congress, which will take place in June 2012 in Kyoto. The Congress is one of the most important parts of ICOLD life since it is the best place for technical and scientific exchanges of ideas. The four questions selected and voted for the Kyoto Congress are of importance for the future of dams and for their correct management.

It is clear that there is no future for dams without taking into account the environ-

ment (Question 92 : Environmental friendly techniques for dams and reservoirs) or without safety (Question 93). Both those subjects have been preoccupations for ICOLD for a long time but it is always necessary to bring in and to discuss new elements of knowledge. Question 95 bears on "ageing and upgrading". Although this concerns works from the past, it is also essential for the future, since incidents or mismanagements on old dams have an impact on the perception of dams in general. Finally, Question 94 is more technical, and reflects the permanent quest for improvement of dam's technology. I therefore call every ICOLD member to participate and to submit papers on one or more of those questions during this year (the deadline for the submission to the Central Office is September 2011).

More than ever, ICOLD has to continue its work for human sustainable development : by making better known the successful experiences in dams construction and in hydropower operation, by increasing the exchange of knowledge between dams specialists from all over the world.

Finally, I wish everyone of you a happy and fruitful year !

Jia JinSeng



### CONTENTS:

**Editorial** P.1

**Mountains under threat** P.2

**ICOLD** P.5

represented at Shanghai Expo 2010

**Global compact** P.6

ICOLD and Global Compact : communication on progress

**Energy in a new light** P.7

Unconventional gas

**Kyoto 2012** P.10

call for papers for international symposium

**China-Africa** P.11

successful workshop and tour

# Mountains U

Hydraulic regimes from all big European rivers are changing. Most of those rivers have their source in the mountains, which play a fundamental role in the basin water management. This role is now endangered by the first effects of climate change. This article bears on European rivers but the considerations are the same for most of the big rivers of the world.

All big European rivers (Ebra, Rhone, Po, Rhine, Dabube, etc.) and their main influents have their source in the mountains. Their hydraulic regime is marked by storage of the water during the cold period in the form of snow, which enables a natural protection against floods in autumn and winter. During the warm period, the snow and the glaciers melt and supply the rivers during a time when there are not many precipitations.

Thus, if we take the example of the Rhine, although only 11% of the Rhine basin is situated in the Alps, those mountains provide 34% of the annual discharge, but more than 50% during the summer, when water is specially demanded, including by the irrigating farmers. For the Po or the Rhone, the figures are still larger: mountains bring respectively 53% and 41% of the discharge.

It is no exaggeration to say that mountains are Europe's water towers. The first signs of climate change affecting them are therefore alarming. Mean temperature has increased during one century, more strongly in the Alps than in other places on Earth: +1.7°C rather than +1.2°C in Europe and 0.8°C globally. Of course the models results need to be taken with caution, but the IPCC predicts a temperature increase in the Alps of 2.6 to 3.9°C. The glaciers have already lost between 20 and 30% of their volume since 1980 and they could lose up to 70% in 2050. That would mean that the smallest will disappear.

IPCC also predicts a diminution of the number of days with snow cover in the Alps ranging from 40% in the North-West to 70% in the South-East. It is easily understandable that the threshold beyond

which the precipitations are falling by raining and not by snowing, is critical. This threshold is of course modified by the temperature raise. In return, this affects the transformations of snowy precipitations in rains and has a significant influence on the surface run-off and the water storage in altitude. Therefore on the summer restituted runoff.

With the diminution of snow cover and the glaciers melting currently in progress, the hydraulic regimes of the large European rivers are modified.

**The runoffs will be significantly modified.** Even if the summer runoffs will initially increase, with glaciers melting, they will eventually decrease. IPCC is predicting a 17% diminution in spring and until 55% diminution in summer, especially in Center and South Alps regions.

**Frequency and intensity of autumns and winter floods will increase,** as well as summer dry episodes.

**Hydroelectric production could decrease up to 15%.**

Other consequences of the climate change in mountains include :

- Stronger erosion with accompanying landslides
- Lower river quality
- Water temperature increase (making cooling for nuclear and thermal fossil fuel plants more difficult and more demanding in water quantity)
- Competition between different water use will be more intensive (more water for artificial snow, increased irrigation to compensate a stronger evapotranspiration of plants)

All those changes and their consequences must be quickly identified, basin by basin. The International Network of River Basins organization has



# Under threat

called for such a rapid adaptation program during its European conference which took place in the Alps City of Mégève, in September 2010. 600 people from 41 countries participated and concurred on the fact "it is not time anymore to discuss the reality of climate change, especially in mountains, but to launch urgently differentiated programs for adaptation, mainly as regards the water resources management".

During that conference, many solutions and field experiments were presented. They need to be improved and develop but it is necessary to make them known. Three categories of action can be considered :

- 1) Water saving and recycling. That include fighting the leaks, water re-use, sea water desalination, water sparing techniques, etc.
- 2) Rethinking the management of lakes, water and soils in mountains by taking into account, more so than today, the strategic constraint of water supply for populations, agriculture, industry and tourism downstream.
- 3) Finally, a better recognition of the role of mountains for the whole society. That means helping the mountains populations with basin integrated policies, so that they may continue to ensure the flood protection and water supply for downstream.

It is important to remind that this phenomenon does not affect only Europe. All great rivers of the world and their main influents have their source in mountains. Himalaya is, after Arctic and Antarctic, the first fresh water reservoir of the planet and supplies the main Asiatic rivers: Ganges, Indus, Brahmaputra, Salween, Mekong, Yellow River, etc. A report by the Asian Development Bank estimates that more than 1.6 billion people will be affected by the impact on water of climate change in Himalaya.

Despite the strategic importance of those mountains, the collection of hydrological and meteorological information is still sparse, because of the weak population density, their location in border zones. The World Meteorological Organization has recommended developing a better observation network in the mountain zones that it calls "the blackest of the black boxes in the world hydrological cycle".

## Strategic hydroelectric production

Mountain water is a strategic source for electricity production generally, but especially in Europe.

There are 554 plants above 10 MW capacity installed in the Alps, with a total of 45.833 MW. Although the total amount of power produced annually is not huge, that capacity plays a crucial role for ensuring the stability of the power network during the peak period. In France for example, the Alps are producing 20 TWh/year, only 4% of the French total production (535 TWh/year). But the hydropower is strategic since it can be mobilized in a matter of minutes, while it is hours for coal power plants or days for nuclear plants. And other renewable energies like wind or solar cannot be mobilized since their potential is dependent on meteorological conditions. In Switzerland, the government estimates that ●●●



Grande Dixence dam (285 m high) was completed in 1961. It is presently the highest dam in Europe and the highest concrete dam in the world.

This concrete gravity dam, which crest is at elevation 2365 m above sea level, is situated in the Swiss Alps. It is the key structure of a huge hydropower scheme including more than 100 km of water transfer tunnels, 75 intakes on mountain streams, 4 other dams for water transfer, 4 underground powerhouses with a total installed capacity of 2100 MW and 5 pumping stations. A perfect example of the strategic importance of hydropower in the mountains.

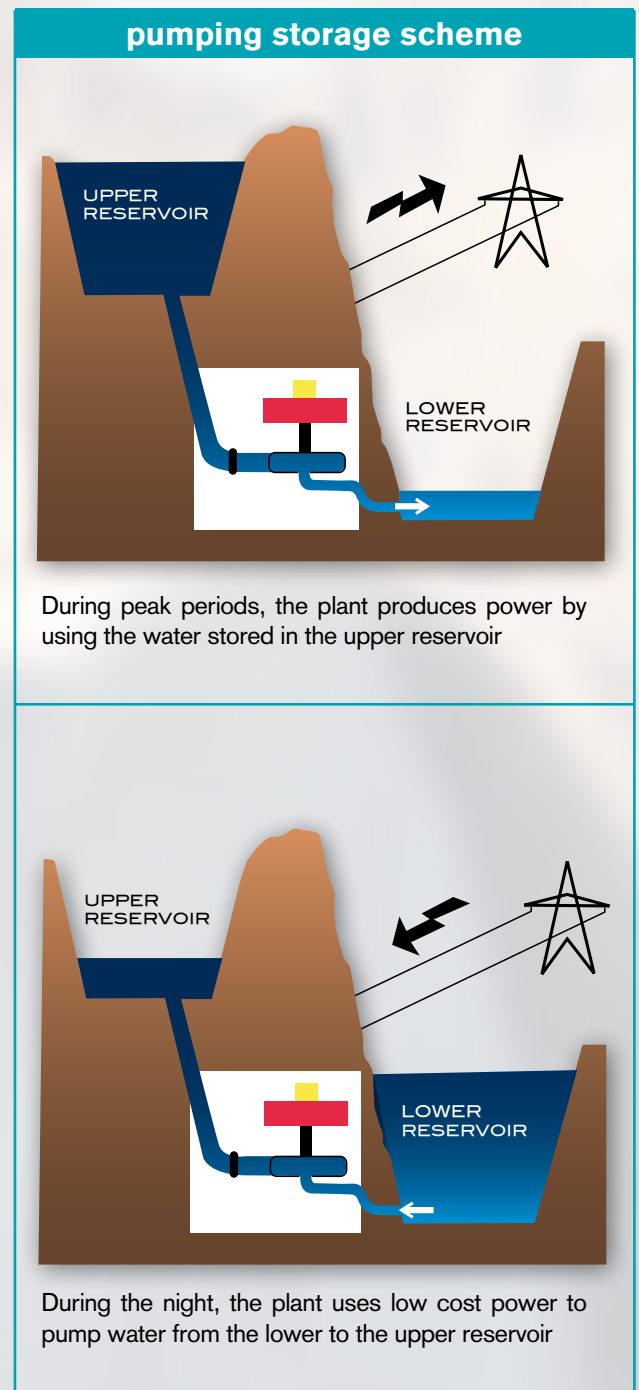
- the hydropower production will fall by 7% in 2035, by 11% in 2050 and by 22% in 2100 (compared to 1990), because of climate change.

But mountains are important for power production not only because of hydroelectricity and dams installed on mountain's rivers. Plants using gas, oil or coal are also often situated in the mountains areas: that is the case for 75% of the Greek fossil fuel production, 80% in Bulgaria and 50% in Austria. That is because there is plenty of water available for the cooling process. The same is true for nuclear plants: six out of ten Spanish nuclear plants are in the mountains and two out of three for Switzerland.

Mountains are not only water towers, but they are also the privileged place for the only mean available for mass electricity storage. First, with the natural storage of snow: as long as it is covering the mountains, the snow is a potential energy. That potential is transformed in actual power when the snow melts and the water so produced flows through the turbines. Second, the storage of water in the reservoirs created by dams may be qualified as storage of virtual electricity. That is storage for months. Finally, the storage capacity may be increased with the different "Pumping-Storage" projects which are being built in Europe (see figure). Power produced during the night, while the demand is low, is used to pump water up to the higher reservoir. That water is then used during the peak demand period to produce electricity. This system constitute storage for several hours.

With climate change, the role of hydropower and dams will thus be threatened (with the diminution of the snow cover) and all the more crucial, with the storage role. Key words are anticipation and adaptation. That is the message conveyed by the International Network of River Basins organization's 600 experts who met in Mègeve.

"Water management is still only considered in the international institutions as a secondary under-objective of sustainable development and of the fight against poverty; in developed economies, it is a simple component of environmental protection. It must become a policy priority of its own, given the stakes for mankind's future" they state in the final statement.



# ICOLD represented at Shanghai Expo 2010

Through its membership in the World Water Council, ICOLD has been able to participate in the World Expo in Shanghai, China.

The World Water Council had a Pavilion during the whole Expo. Its contribution focused on the role of water in creating Better Cities for a Better Life, the general theme of the Expo. The 54m<sup>2</sup> World Water Pavilion promoted the theme of "Water for Life and Development", close to ICOLD preoccupations. It included four learning areas along a virtual river and a Kids' Corner dedicated to hands-on activities for children. During six months, from May 1st to October 31st 2010, 70 million people visited the Expo, that is 400 000 persons a day!

For those visitors, the World Water Pavilion explained and showcased successful ways of managing water within cities. It was also a visionary for sound water management in the cities of the future, within their local and basin contexts. The aim was to bring together generations to learn about water's role and to work towards a water-secure world.

ICOLD is an active member of WWC, with a permanent presence in the Board of Governors since WWC inception. Secretary General Michel de Vivo did not miss the opportunity to use that occasion to share ICOLD's experience on dams for sustainable development. For one week ICOLD held the booth as a Guest member of the World Water Pavilion. It shared the booth with International Water Resources Association, an organization also member of the Governing Board of WWC. A lot of newsletters and pamphlets about ICOLD were distributed and there was real interest shown by the young Chinese who visited the booth.

A Board meeting also took place during that period, one day in Beijing and the next day in Shanghai. In Beijing, ICOLD's members of the Board were received by the vice-minister for Water and by the President of the Institute of Water Resources and Hydropower Research. They also took the occasion to visit the Institute and its installations. ●

世界水展





# ICOLD and Global Compact :

In August 2007, ICOLD joined the UN Global Compact, a strategic policy initiative for businesses and organizations that are committed to aligning their operations and strategies with ten universally accepted principles in the areas of **human rights, labour, environment and anti-corruption**.

Structured as a public-private initiative, the Global Compact is policy framework for the development, implementation and disclosure of sustainability principles and practices. It offers participants a wide spectrum of specialized workstreams, management tools and resources, and topical programs and projects — all designed to help advance sustainable business models and markets in order to contribute to the initiative's overarching mission of helping to build a more sustainable and inclusive global economy. Today, there are 7700 corporate participants and stakeholders from over 130 countries around the world.

**The UN Global Compact has two main objectives:** first to mainstream the ten principles in business activities around the world; second, to catalyze actions in support of broader UN goals, including the Millennium Development Goals (MDGs).

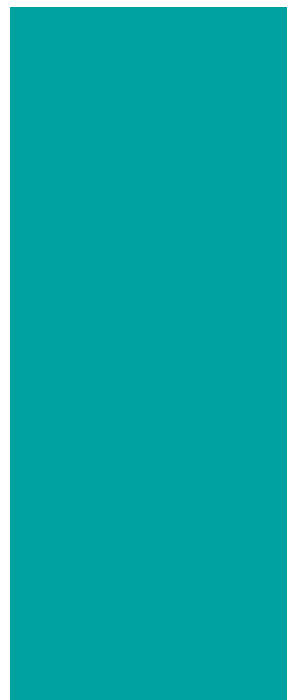
The UN Global Compact's ten principles in the areas of human rights, labour, the environment and anti-corruption enjoy universal consensus and are derived from:

- The Universal Declaration of Human Rights**
- The International Labour Organization's Declaration on Fundamental Principles and Rights at Work**
- The Rio Declaration on Environment and Development**
- The United Nations Convention Against Corruption**

The UN Global Compact asks companies to embrace, support and enact, within their sphere of influence, a set of core values in the areas of human rights, labour standards, the environment and anti-corruption:

## Human Rights

**Principle 1:** Businesses should support and respect the protection of internationally proclaimed human rights; and



**Principle 2:** make sure that they are not complicit in human rights abuses.

## Labour

**Principle 3:** Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining;

**Principle 4:** the elimination of all forms of forced and compulsory labour;

**Principle 5:** the effective abolition of child labour; and

**Principle 6:** the elimination of discrimination in respect of employment and occupation.

## Environment

**Principle 7:** Businesses should support a precautionary approach to environmental challenges;

**Principle 8:** undertake initiatives to promote greater environmental responsibility; and

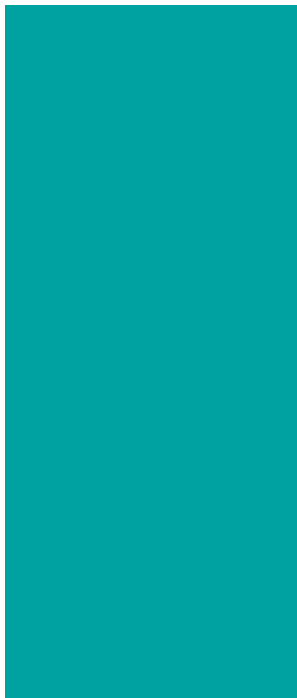
**Principle 9:** encourage the development and diffusion of environmentally friendly technologies.

## Anti-Corruption

**Principle 10:** Businesses should work against corruption in all its forms, including extortion and bribery.



# communication on progress



Being not an employer, except for the four persons in the Central Office, ICOLD is not directly concerned by principles 1 to 7 but supports the core values they promote.

Nevertheless, ICOLD's Technical Committee on Environment is working on a soon-to-be-published bulletin titled "Dams and Resettlement - Lessons learnt and recommendations", which will bear upon the fundamental human rights of displaced people. The 4th chapter of this bulletin is devoted to the recommended strategies. Noting that implementation sometimes reveals major planning deficiencies that make resettlement components technically or socially unacceptable, it declares : "The policy for involuntary resettlement operations needs to be based upon a number of fundamental principles related to government responsibility, resettlers' rights and participation, protection of the interests of host populations, and clear explanation of the objectives of resettlement. These considerations and objectives must be embodied in resettlement plans".

This 146<sup>th</sup> bulletin is already available in a rough format on ICOLD website.

**On principle 7 :** the precautionary approach to

environmental challenges has long been a pre-occupation of ICOLD.

The 136<sup>th</sup> Bulletin (The Specification and Quality Control of Concrete Dams) was published in 2009. Two other Bulletins, soon to be published, are bearing on the subject of precautionary approach to extreme environmental conditions. These are the 137<sup>th</sup> (Reservoirs and Seismicity) and the 142<sup>nd</sup> (Report on Safe Passage of Extreme Floods)

**On principle 8 :** the environmental responsibility is a principle which is at the heart of the work of ICOLD since at least 40 years, when the first Position Paper on Dams and Environment appeared. At that time, ICOLD committed itself to bring all its influence to bear on its members to encourage and assist them with regard to environment-conscious planning and construction, adequate environmental impact assessments, and the implementation of mitigating measures.

The 132<sup>nd</sup> Bulletin (Shared Rivers : Principles and Practices), published in 2008, and the 138<sup>th</sup> Bulletin (General Approach to Dam Surveillance), are but the latest examples of this constant preoccupation.

**On principle 9 :** ICOLD considers that dams are an environmentally friendly technology. So, the whole mission of ICOLD ("to advance the art, science and engineering techniques for the planning, design, construction, operation and maintenance of safe dams to ensure the sustainable development and management of the world's water resources") is pertaining to this 9<sup>th</sup> principle. Of course, dams can have a negative environmental impact. But they also offer huge positive environmental benefits like clean electricity production or water storage for maintaining biodiversity in dried rivers. ICOLD is thriving to make the net outcome still more positive. That means of course to maximize the positive impact and to minimize the negative impact. One such example of minimization is given by the problem of sediment deposition, which is particularly crucial in the tropical zones. The 140<sup>th</sup> Bulletin (Sediment Transport and Deposition in Reservoirs) will present the best solutions to date to deal with that problem and positive cases of dams successfully dealing it. ●

Energy in an new light

# The incredible adventure

**This is the major event in the world of energy: unconventional gas, especially shale gas, whose huge reserves are now exploited, is revolutionizing the planet's energy balances and the choices for electricity production.**

The most prominent sign of the ongoing revolution is the fate of a new nuclear power plant at Calvert Cliffs, in the USA. Two years ago, everybody was betting on a nuclear revival in the USA: natural gas was becoming exceedingly expensive, worries about climate change induced by greenhouse gases, those factors seemed to favor hydroelectricity, renewable energies and nuclear power. Constellation Energy and EDF were busy preparing an enormous 3<sup>rd</sup> Generation nuclear plant in Calvert Cliffs on the Chesapeake Bay. But the \$9 billion project became less and less certain over the last two years, leading EDF's CEO to declare: "Gas prices' fall makes nuclear power uncompetitive" in the US. What motivated this change of mind?

The fact that the very economics of nuclear, hydro, clean coal, offshore wind and almost all power sources, has been changed irrevocably by shale gas' apparition. The failures of Copenhaguen and Cancun world climate summits to lead to greenhouse gas reduction commitments may also have played a role, but economy probably remains the key.

## Shale gas, unconventional gas... Let's define the terms.

Unconventional gas is a generic term for gas that does not come from classical reservoir-rocks. There are three main types of unconventional gases. The main one is the shale gas, half of the reserves. The other two are firedamp in old coal mines and tight gas, respectively 28 and 23% of the reserves.

Shale gas is natural gas stored in organic rich rocks such as dark-coloured shale; wherein the recoverable gas is interbedded with layers of shaley siltstone and sandstone. Gas shales are formed from the mud of shallow seas that existed about 350 million years ago. Shale is a very fine-grained sedimentary rock that may be easily broken into thin layers, and though it is a very soft rock, it does not disintegrate when it becomes wet. These shales often contain natural gas, when two thick black shale deposits 'sandwich' a thinner area of shale. Shale gas may also be produced through

naturally-occurring fractures in shale, which allows gas to flow through the rock.

Coalbed methane, quite simply, is natural gas contained in coal. Coalbed methane consists primarily of methane (the gas we use for home heating). This form of natural gas is primarily stored through absorption by the coal itself rather than within the pore space of the rock, like most "conventional" gas.

Tight gas is gas that is «stuck» in a very tight formation underground, stored within low porosity and low permeability rock formations. A great deal of effort has to be put into extracting gas from a tight formation, such as fracturing and acidizing.

## A revolution is coming

Now, why were those resources ignored a few years ago? First, the technology to mine them was not yet developed. Then the big raise of electricity prices makes them interesting to operate. Those two factors explain the unconventional gas revolution which has changed the resource situation dramatically. During last World Energy Congress in Montreal last September, Shell's CEO declared that "it's not exaggerated to say that a revolution in natural gas offer is on its way".

Globally the reserves for conventional gas are estimated at 187 Tcm (1000 cubic meters), whereas shale gas is estimated with 456 Tcm. Consequently, shale gas prices will determine the prices on the world gas market for a long time to come.

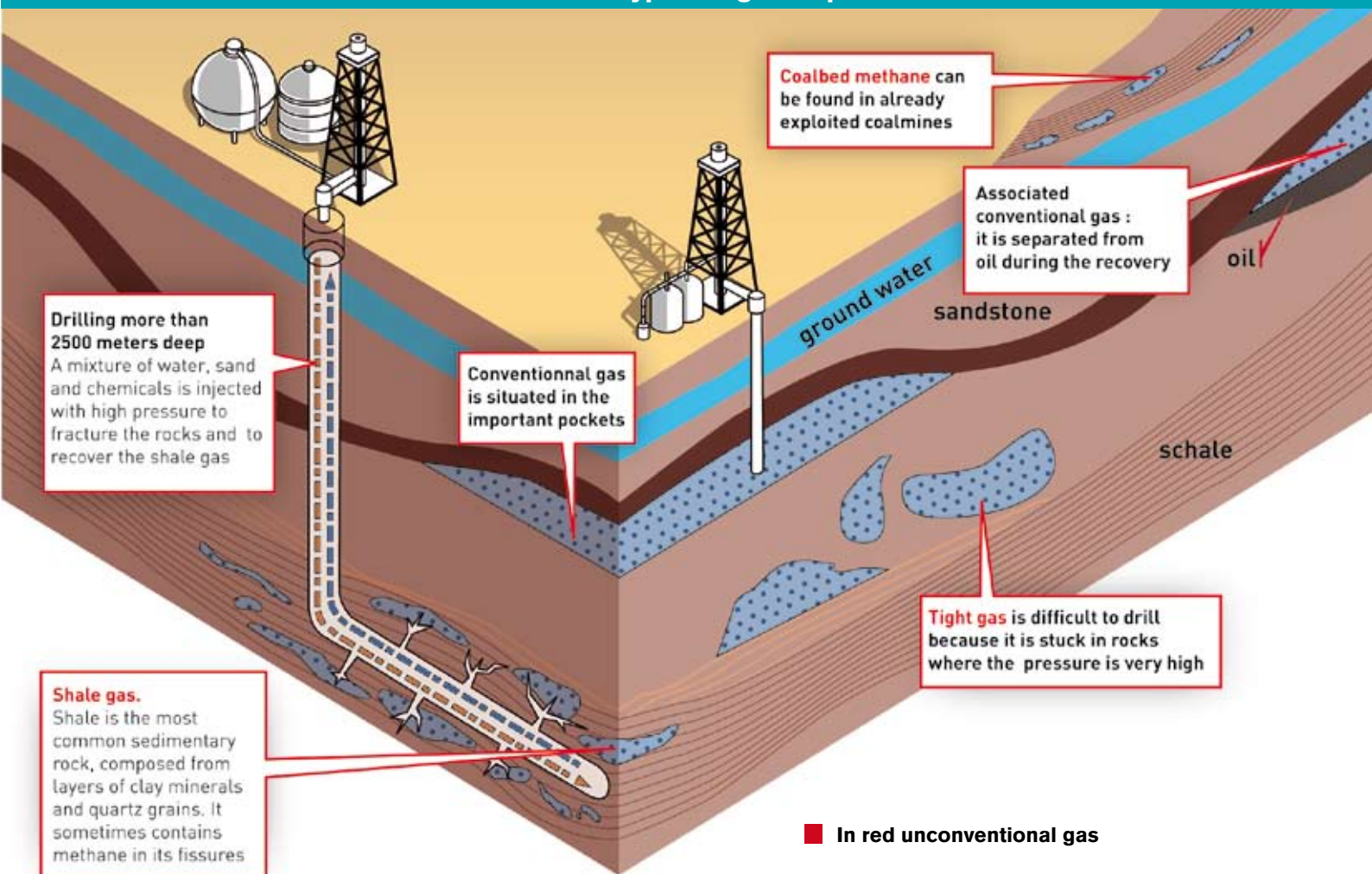
"We believe there is enough recoverable natural gas to last for more than a century", said Peter Voser in Montreal. "Even though we knew those reserves were available, it took many years of technological advances to be able to produce the reserves economically and responsibly", he continued.

The impact on the United States gas market is huge : whereas a few years ago, US reserves were fast declining, leading the country to become a major gas importer, the US are now nearly self-sufficient in natural gas. Because unconventional gas, which was 1% of the production in 2000, grew to 42% in 2007 and is now expected to reach 64% in 2020.



# of unconventional gas

## Different types of gas deposits



### Domino effect on Russian gas, Liquid Natural Gas (LNG), nuclear and hydro

The first significant consequence of this exponential rise of unconventional gas is that Gazprom, the Russian gas giant, has strongly reduced its expectations for the North American market. It expected to supply 20% of that market until 2020. Other large gas-exporters to North America, like Qatar or Australia, are now turning their LNG tankers towards Europe, making the prices fall on the spot market: - 70% in two years !

In the gas producing countries, not a single existing gas liquefaction unit now operates at

full capacity and all projects for new units have been stalled. The same effect can be seen on the gas pipes projects. The Nabucco project, for example, a 3,300 km pipe between Central Asia and Turkey is threatened.

Competitors in power-production will also suffer from a diminution of gas prices. We already cited the nuclear case. It seems hydro-power may be less affected, because reservoirs often have other purposes than power production only. And also because, at least in Europe and North America, most of the potential sites are already equipped.



# INTERNATIONAL SYMPOSIUM

**“The challenges for dams in a changing world –inter-generational and global bridging”**

**The Symposium will be held on June 5 2012 at the ICC Kyoto.**

The CIGB-ICOLD Kyoto Organizing Committee invites professionals, managers and decision makers from the international dam and community to participate in an international symposium organized as part of the 80th Annual Meeting of the ICOLD, which is to be held in Kyoto, Japan, from June 2 to 8, 2012.

Papers are invited on the topics listed below.

- (1) Impacts of Climate Change on Dams and Benefits from Dams
- (2) Benefit from Dams for a growing world population
- (1) Knowledge & Technology Transfer in Dam Engineering
- (4) Advanced Technologies for Construction of Dams and Appurtenant Structures
- (5) New Techniques to prevent and manage incidents and accidents
- (6) Earthquakes

- (7) Geotechnical Aspects of Dam Foundation
- (8) Others

The Symposium will be organized so as to give as much time as possible to speakers for discussions. To stimulate discussion on the oral presentations, experts will be asked to present the latest developments in their field of expertise and to give his/her views on the key issues raised.

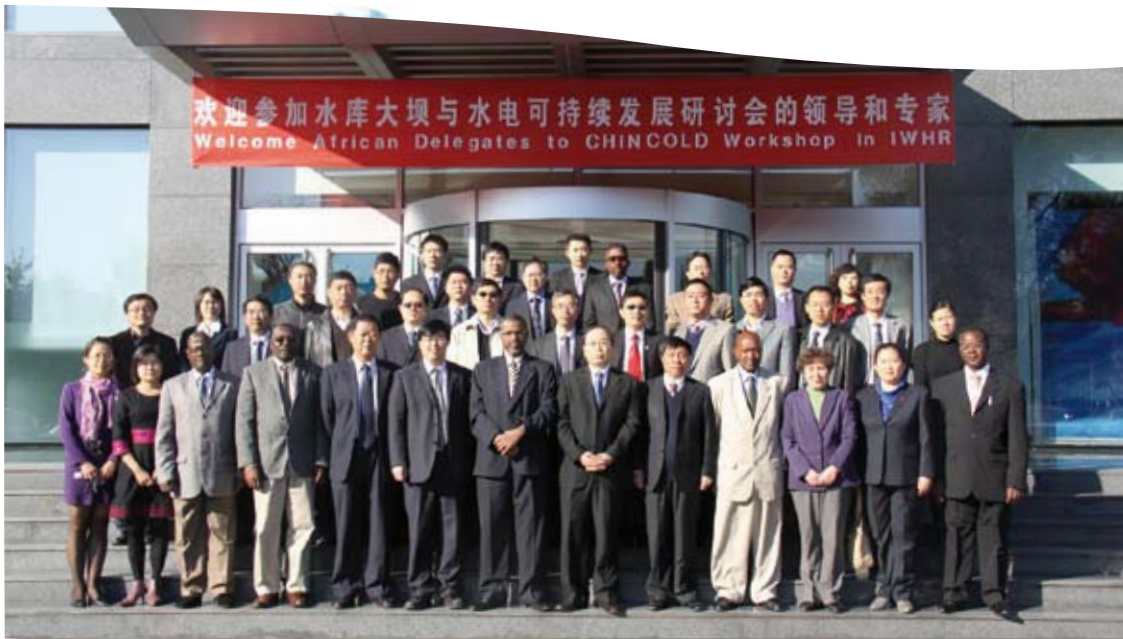
Papers will be presented orally by authors or posted in the lobby adjacent to the meeting room.

The official language will be English only. The participants are required to register to the 80th ICOLD annual meeting and/or the 24<sup>th</sup> ICOLD congress.

## Key date

Abstract submission deadline: June 30, 2011  
 Notification of acceptance: July 31, 2011  
 Full paper submission deadline: October 30, 2011  
 Final notification of paper acceptance: February 28, 2012

Symposium : **June 5, 2012**



## China-Africa: successful workshop and tour

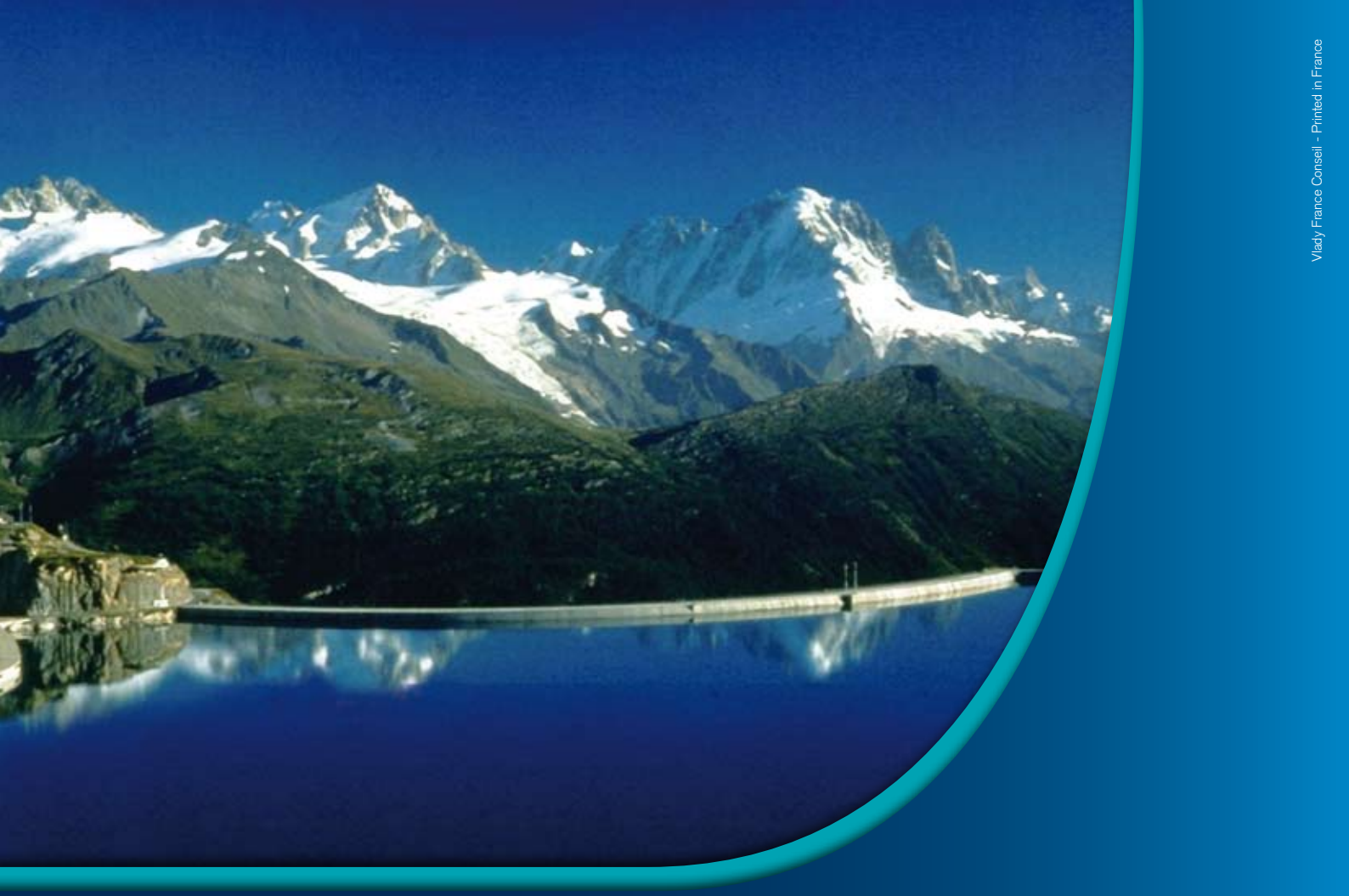
To promote “World Declaration on Hydropower and Dams for African Sustainable Development”, initiated by ICOLD and other relevant international organizations, and to implement the spirit of the CHINCOLD 2010 Annual Board Meeting, CHINCOLD successfully organized a workshop and technical tours for African delegates from 1 to 7 November 2010 in China.

The workshop and technical tours have received since its initiation in June 2010 passionate concern and energetic support from African ICOLD National Committees, CHINCOLD members, and other relevant organizations. The CHINCOLD activity has also drawn attention from African Embassies in Beijing. In total CHINCOLD had invited 12 experts from 12 different African countries to attend the activity. Finally, 9 African delegates joined in the CHINCOLD workshop and technical tour, including Mr. Albert BERE from Burkina Faso, Mr. Emmanuel Dankwa OSAFO from Ghana, Mr. Justino VIEIRA from Guinea Bissau, Mr. Mountaga DIALLO from Mali, Mr. Mohamed Salem Ould MERZOUG from Mauritania, Mr. Carlos Bonete MARTINHO from Mozambique, Mr. Saloum CISSE from Senegal, Mr. Mutaz Musa Abdalla SALIM from Sudan, and

Mr. Joackim JOSEPH from Tanzania. The other 3 African experts didn't join due to the visa and funding problems.

On 2 November 2010, the Workshop and Round Table Meeting on “Sustainable Development of Dams and Hydropower” was successfully held by CHINCOLD in Beijing. More than 50 participants, including African delegates and Chinese high-level officers and experts from government, investors, designers, contractors, etc., joined in and discussed topics related to dam construction and hydropower development. After the Workshop and Round Table Meeting, technical tours to Xiaolangdi Project, Shuibuya Hydropower Project, and Three Gorges Project were arranged by CHINCOLD for African delegates from 3 to 6 November 2010. On 7 November 2010, President Wang Shucheng of CHINCOLD met with African delegates and hosted a Banquet for African delegates. President Wang introduced the current situations and future plans of dam construction and hydropower development in China and discussed with African friends on deepening future cooperation and exchanges in the field of water resources and hydropower development. ●





# 79<sup>th</sup> ICOLD annual Meeting

## Lucerne 2011 (May 29 – June 3)



Lucerne is the historical birthplace of the Swiss Confederation, which was founded here more than seven hundred years ago. Switzerland was in 1928 a founding member of ICOLD : being without fossil fuel resources the country has relied on hydroelectricity for its industrial development. Still today, almost 60% of the electricity consumed in the country is produced by hydropower and many schemes are being built or planned : pumping-storage projects, heightening of old dams and building of new ones.

The symposium on June 1<sup>st</sup> will be devoted to the theme : "Dams and Reservoirs under Changing Challenges". Three technical visits are proposed to the delegates and the accompanying persons on June 2<sup>nd</sup>.

### Come to Lucerne !

Visit our website to prepare your meeting

<http://www.icold2011.ch/en>

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