Segurança de Barragens
A experiência suíça

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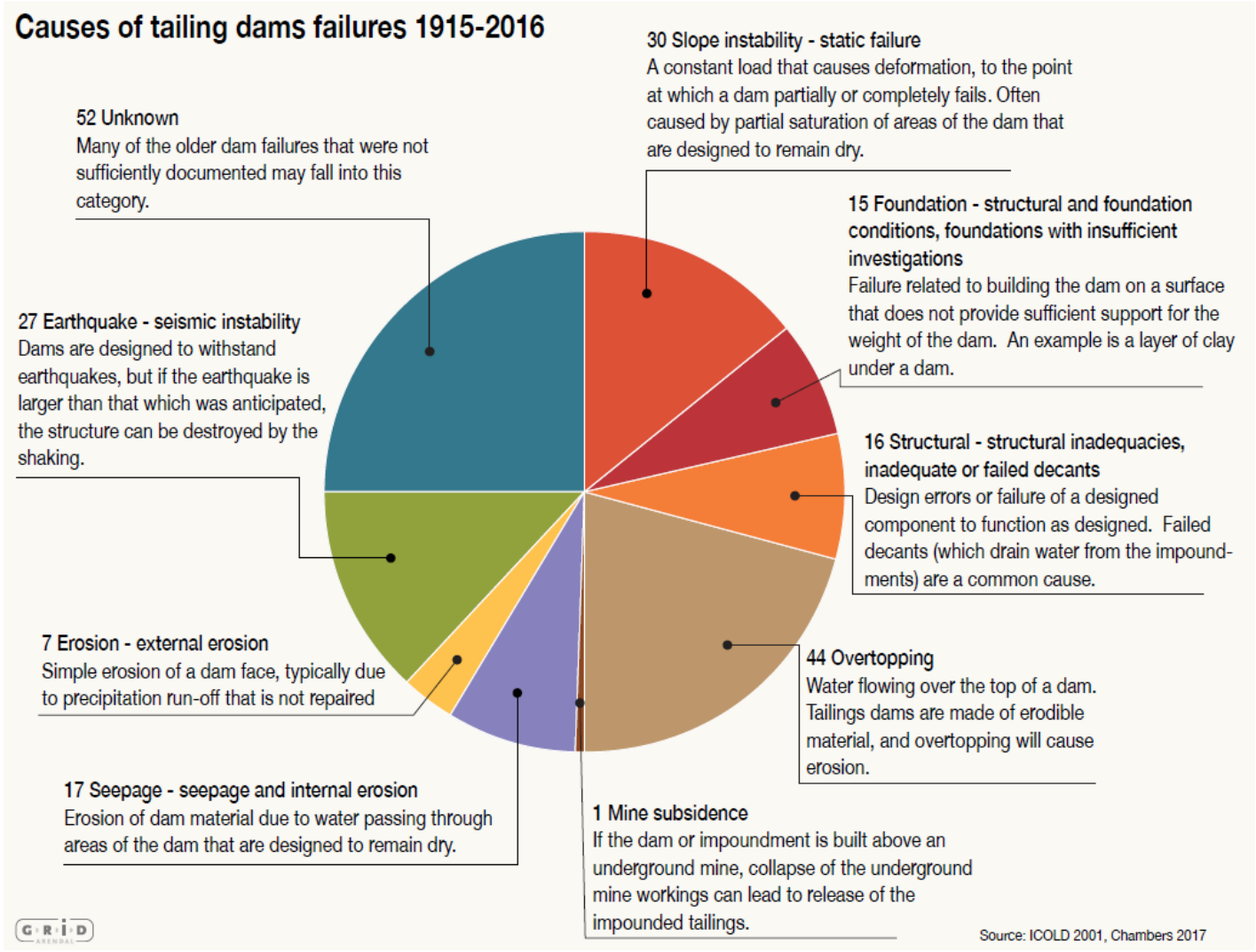
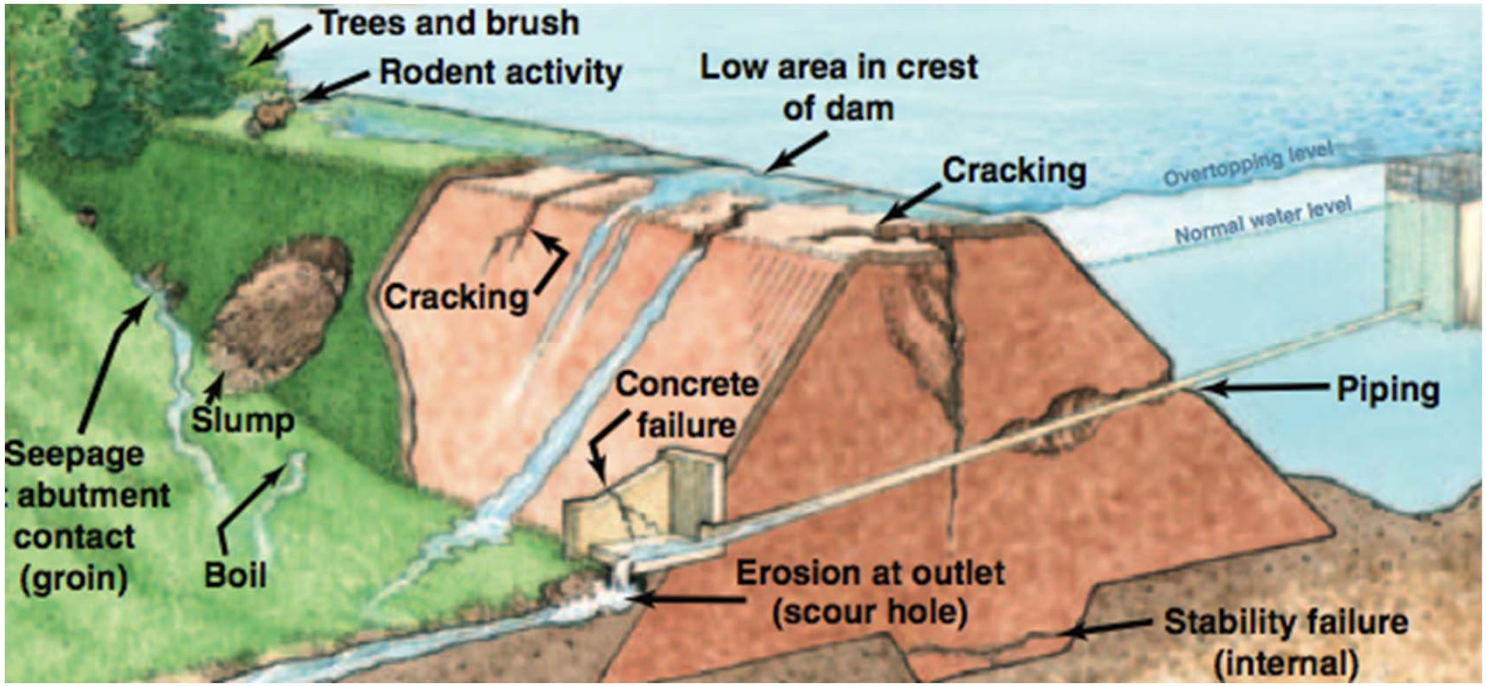
Belo Horizonte, 06/06/2019

Contexto



Fonte: Roche, C., Thygesen, K., Baker, E. (Eds.) 2017.
Mine Tailings Storage: Safety Is No Accident

Contexto



ENGENHARIA

SEGURANÇA DE BARRAGENS

Quem somos ?

> A **Stucky** Ltd é uma empresa líder em engenharia especializada nos setores de barragens e energia hidrelétrica desde sua fundação em 1926.

> **Segurança de barragens** sempre está no DNA da empresa. Historicamente a **Stucky** sempre esteve implicada na concepção, realização e reabilitação, alteamento e reforço das maiores e mais complexas barragens do mundo.

> Em 2013, a **Stucky** tornou-se membro do **Grupo Gruner** (estabelecido em 1862), o maior grupo de engenharia da Suíça, com mais de mil engenheiros altamente especializados.

Quem somos ?

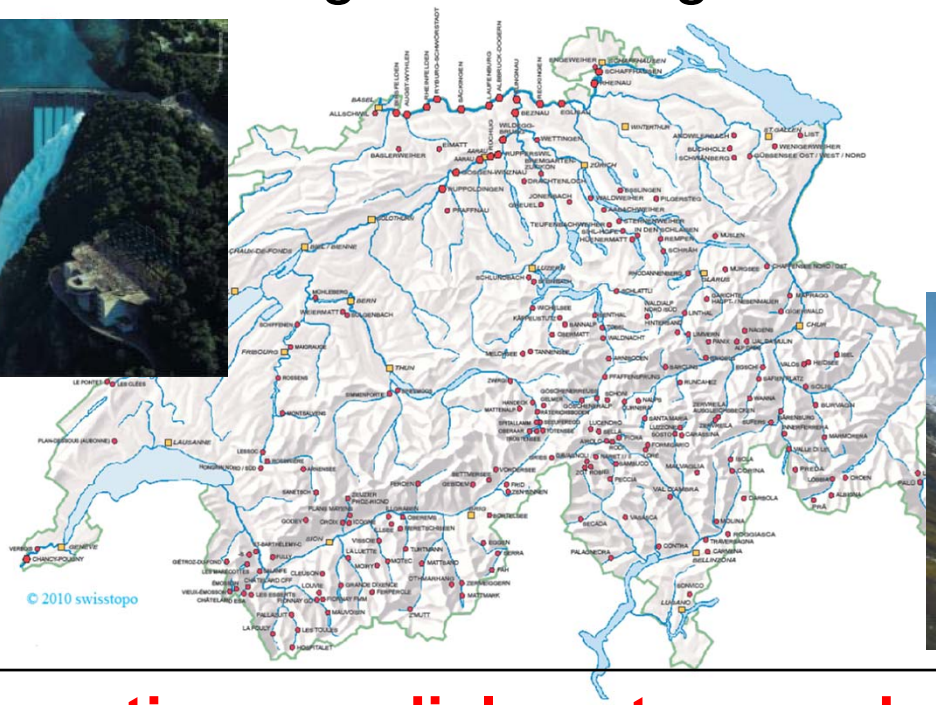
- A **HE Consultoria de Engenharia** foi constituída em 1996 com a finalidade de prestar serviços técnicos qualificados nas áreas de Recursos Hídricos e de Energia, com forte atuação na área de barragens para usinas hidrelétricas e de usos múltiplos, para os principais agentes públicos e privados no Brasil, e alguns no exterior.
- Seu experiente **corpo multidisciplinar** atua em conjunto há mais de 20 anos, acumulando vasta e diversificada experiência técnica.
- Sua missão é alicerçada na competência, ética, qualidade, coerência e a transparência, valores comuns aos da **Stucky**, o que levou à aproximação entre as empresas, que se identificaram na valorização da **Engenharia**.

Barragens suíças

> País com a maior densidade de barragens no mundo

> Pioneiro em **engenharia** e **segurança de barragens**

> Mais de 1.000 barragens / 195 «grandes barragens»



Expertise mundialmente reconhecida em concepção e segurança de barragens

O que fazemos ?

> Planos diretores
> Estudos de Viabilidade / Projetos Básicos
> Documentos para concurso
> Assistência para aquisição e gestão de contratos

> Projetos Executivos
> Supervisão de Obras
> Assistência Técnica
> Engenharia do Credor / Engenharia do Proprietário

> Diligenciamento técnico/econômico
> **Expertise independente / Avaliação de riscos**
> **Segurança de barragens / Enquadramento regulatório**

Algumas referências em Segurança de Barragens

> Envolvimento da **Stucky** na preparação de procedimentos para a segurança de barragens do Banco Mundial (Procedure 4.37)

> Envolvimento da **Stucky** na preparação e implementação de muitos planos de gestão de segurança de barragens em países diversos como China, Myanmar, Irã, Geórgia e Quênia.

Dam Safety Enhancement Program: A Cooperation Project between Switzerland and China

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Y. Cai & J. Sheng
Nanjing Hydraulic Research Institute, Dam Safety Management Center, MWR, Nanjing, China

Seventh International Conference and Exhibition on Water Resources and Renewable Energy Development in Asia

Dam Safety and Hydro Asset Management: Capacity building in Asia

Dr Patrice Droz
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Rue du Lac 33
1020 Renens
Switzerland

Mr U Min Khaing
Ministry of Electricity and Energy
Department of Hydro Power Implementation
Building No 27
Nay Pyi Taw – Myanmar

Dr Federico Ferranti
Stucky Asia
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TH-10110 Bangkok
Thailande

Dr Stefan Muetzenberg
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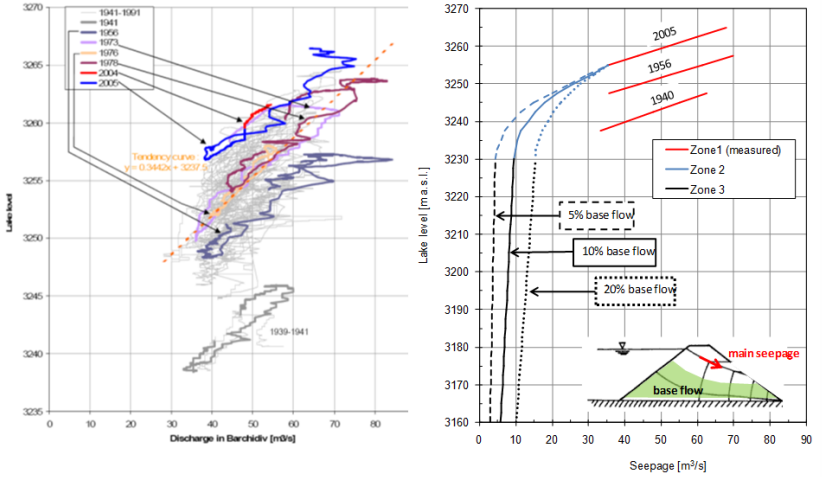
Switzerland

Algumas referências em Segurança de Barragens

> A **Stucky** está projetando e acompanhando a construção da barragem de Rogun no Tajikistão (H=335 m). Os serviços incluem a elaboração do PAE.

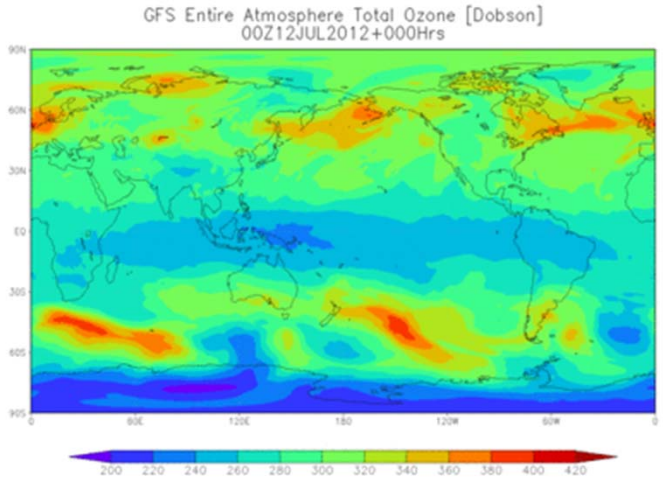
> Participação da **Stucky** no “Lake Sarez Risk Mitigation Project - Tajikistão” (barragem / obstrução formada por um deslizamento de terra que criou uma barragem de 650 m de altura).

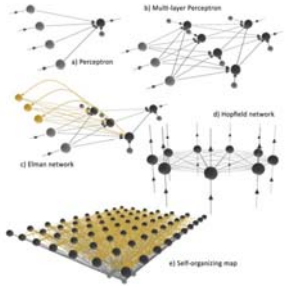


Figure·2-16:·Left:·Measured·discharge·in·Barchidiv·(seepage)·as·a·function·the·lake·level.·Right:·Extrapolated·seepage·at·low·lake·levels·for·different·infiltration·scenarios·in·the·middle·and·lower·part·of·the·dam.¶

Algumas referências em Segurança de Barragens

> Modelagem hidrológica para previsão de cheias baseados em aprendizagem iterativa (AI - **inteligência artificial**)





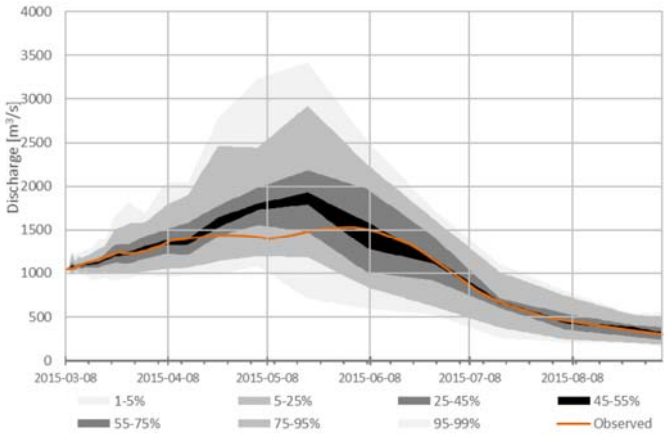
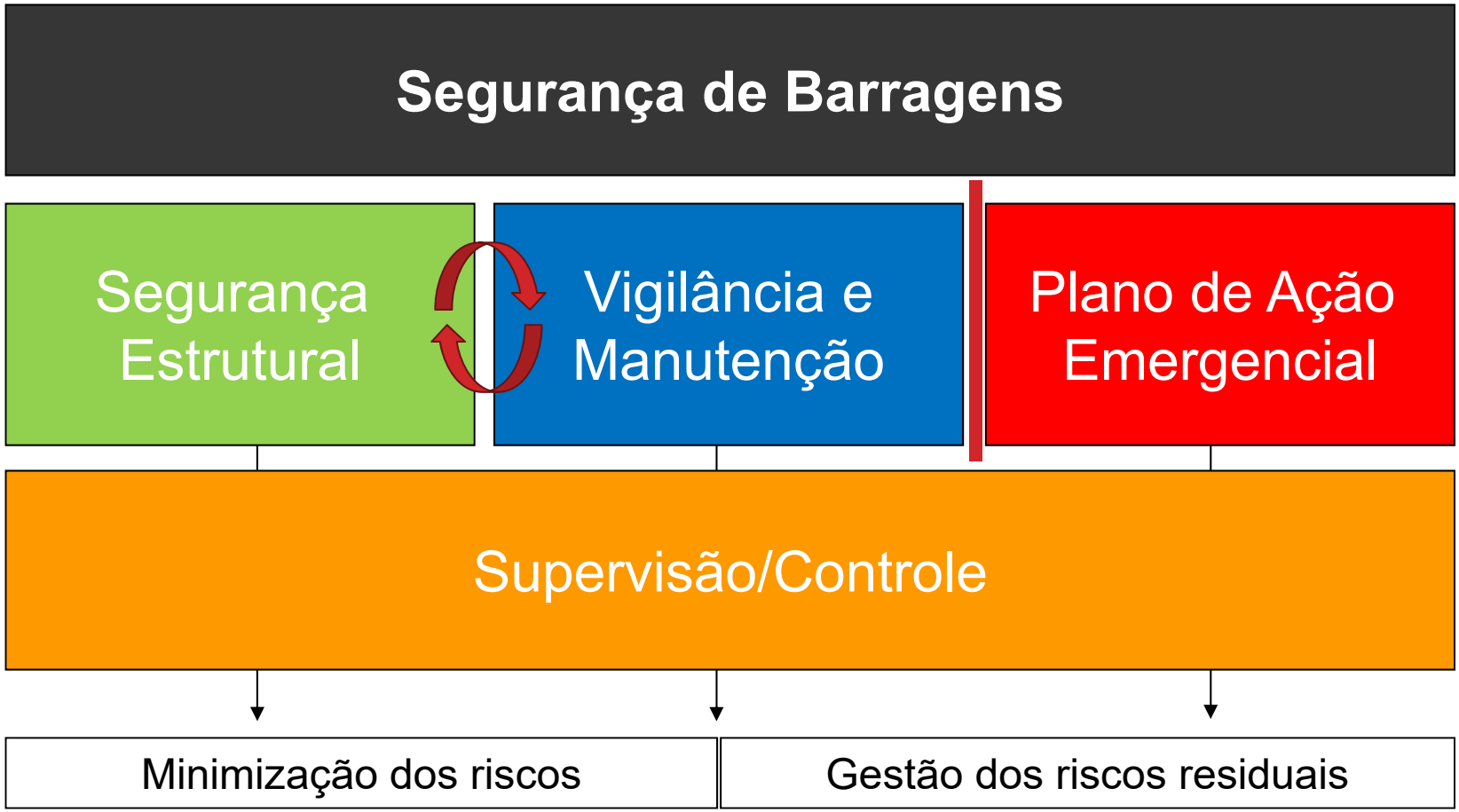


Figure 3.6: Tethys 6-month lead-time probabilistic hindcast of discharges made for Victoria Falls departing from mid-March 2015 and covering the unusually dry flood season of 2015.

> A **HE** vem atuando na área de Segurança de Barragens desde sua fundação, como parte intrínseca do projeto, construção e garantia da qualidade das barragens durante sua operação. A partir da PNSB, adequou os estudos e projetos às regulamentações instituídas pelos órgãos fiscalizadores.

Segurança de Barragens



Segurança de Barragens

Segurança Estrutural (Projeto / Execução)	Vigilância e Manutenção	Plano de Ação Emergencial
➢ Análise de alternativas ➢ Materiais / metodologia /custo / riscos / cronograma ➢ Cálculos de estabilidade – fundação, apoios, corpo da barragem (estático / dinâmico) ➢ Sistema de monitoramento ➢ Metodologia construtiva ➢ Execução ➢ Controle de qualidade ➢ Testes operacionais ➢ Primeiro enchimento ➢ O&M ➢ Reabilitação / Reforço / Alteamento / Descomissionamento	➢ Monitoramento ➢ Inspeção ➢ Testes } Avaliação Global *Expertise*	➢ Escopo e responsabilidade das Instituições ➢ Processo PAE (Identificação / Avaliação / Classificação) ➢ Ações preventivas ➢ Sistema de alarmes (testes sistemáticos) ➢ Treinamento ➢ Ruptura de barragem / cenários de ruptura / mapas de inundação
Antecipar		**Reagir**

Segurança de Barragens

Peculiaridades da metodologia Suíça que podem ser adaptadas para o Setor de Mineração Brasileira:

Nível	Resp.	Atividade	Periodicidade
1	Operador	Inspeção visual, leituras e verificação de plausibilidade, testes de equipamentos	Diária
2	Engenheiro	Controle dos dados e análise	Anual
3	«Expert»	«Expertise»	5 anos
4	Autoridade	Controle dos procedimentos e aprovação dos experts	Contínuo

> Indicação/aprovação de um **responsável técnico independente** (indivíduo) para cada grande barragem.

> Garantia de uma **continuidade** na análise da segurança das barragens por profissionais qualificados.

Segurança de Barragens

Peculiaridades da metodologia Suíça que podem ser adaptadas para o Setor de Mineração Brasileira:

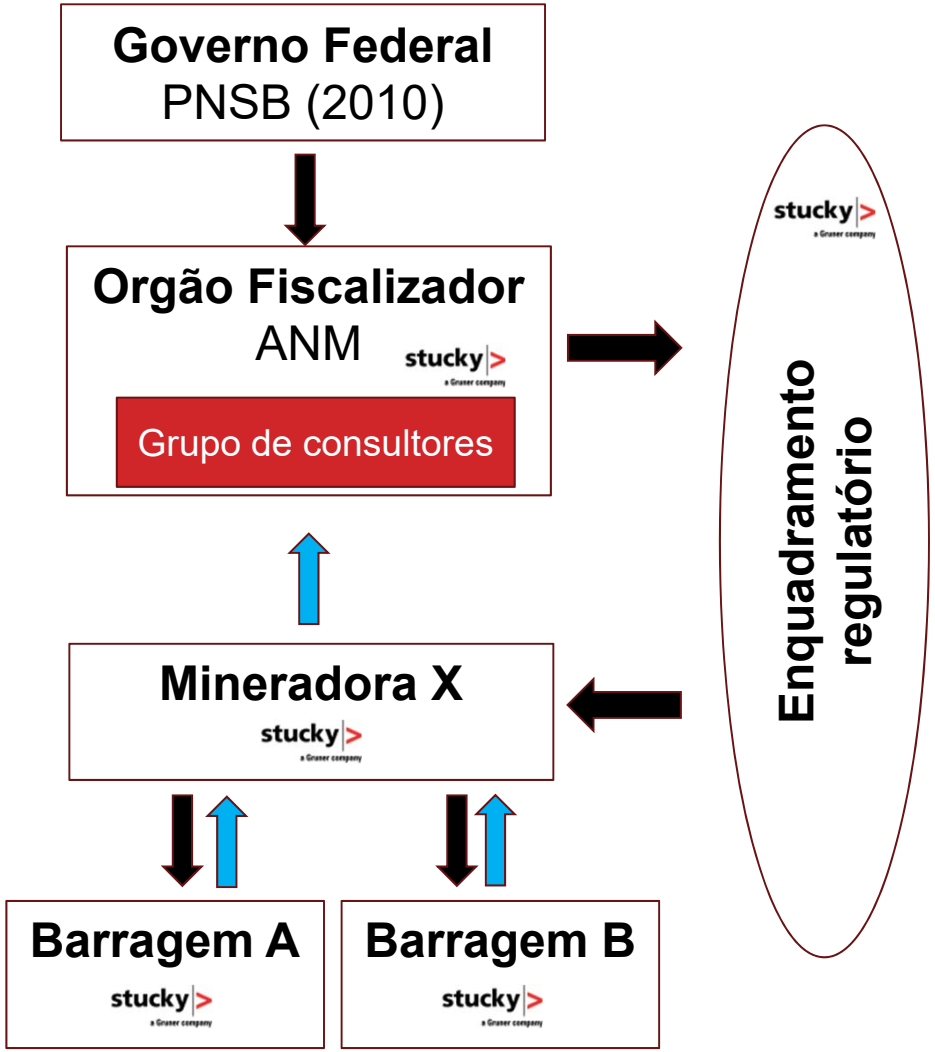
> Conceito dinâmico.

> Transferência da responsabilidade de vigilância das **barragens** e **entornos** (reservatório, encostas, etc…) ao proprietário.

> Limite da responsabilidade da autoridade reguladora ao desenvolvimento de normas e controle das atividades do proprietário.

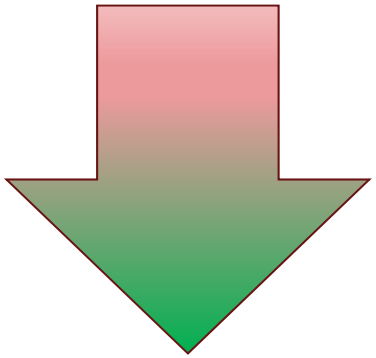
> Promoção do uso da análise do **comportamento** das barragens.

O que oferecemos?



- **Apoio à ANM**
  - Elaboração / atualização do enquadramento regulatório atual
  - Formação técnica
  - Avaliação relatórios de inspeção / projeto
- **"Engenharia do proprietário" da Mineradora**
  - "Enquadramento próprio"
  - Revisão de serviços internos / externos
  - Formação técnica
  - Diligenciamento técnico
  - Projeto de reabilitação / reforço / descomissionamento
  - Análise do comportamento
  - Revisão de serviços internos

Quão perigosas são as barragens ?



Quão seguras são as barragens ?

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Brasil

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CH-1020 Renens VD 1
Suíça

BACKUP SLIDES

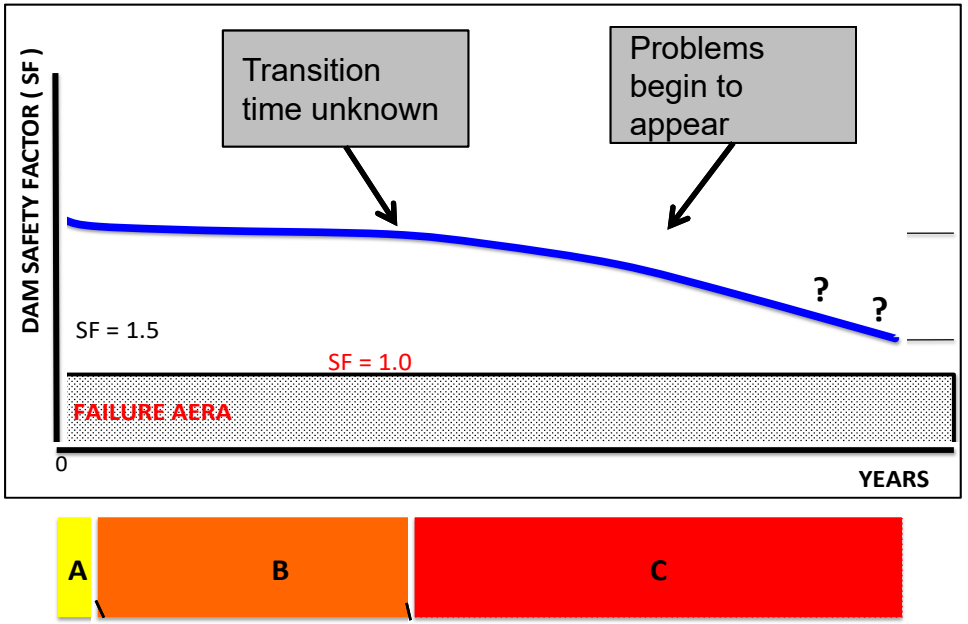
Dam life-span characteristics

- From a safety point of view, the dam life-span presents 3 intervals:

A
- **youth**: commissioning time and first water filling.

B
- **adult-time,** numerous years of normal behavior

C
- a**ging-time**, beginning of the decay, trends of abnormal behavior, degradation of safety.



- The transition from interval B to C is critical for the dam Owner:
  - unknown time of occurrence
  - unknown aging factors
  - unknown severity of aging process

Dam surveillance management

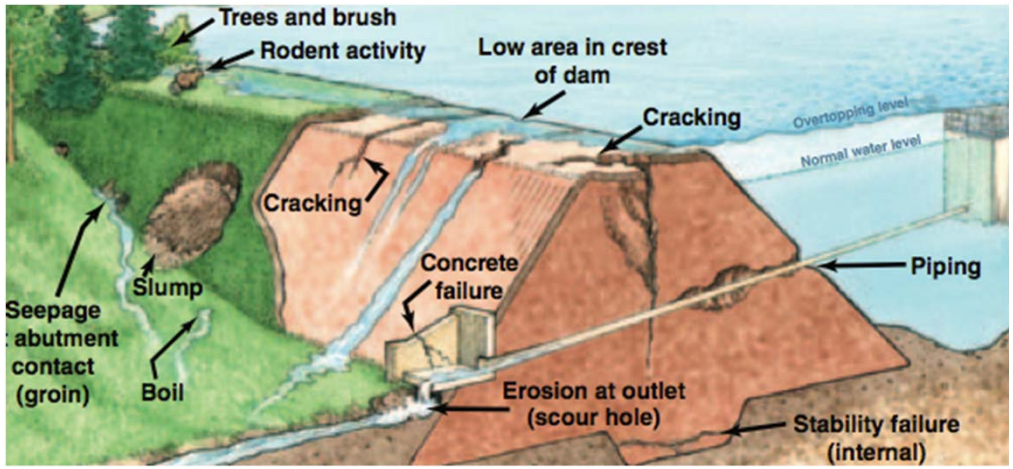
On site staff must be **trained** to understand the purpose of dam surveillance

Understand dam components functions

Detect safety threats in order to cure them in advance

Identify dam failure modes

Look for pre-warning events and monitor them



Analyze the monitoring data

Compare current data with past records and initial design values

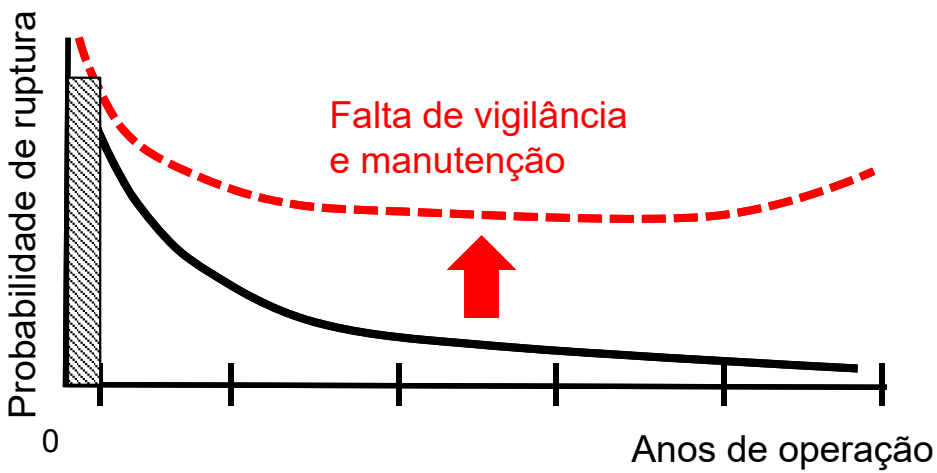
If unusual data are detected, verify the current measures

Report and inform

Seguras para sempre?

> Uma barragem **bem dimensionada** que "sobrevive" a seus 5 primeiros anos somente terá um risco de ruptura decrescente se tiver um **sistema de vigilância eficiente e bem cuidado.**

> **A falta de vigilância e manutenção** leva à um **aumento da probabilidade de ruptura** com o tempo.



> Incentivos para a constituição de fundos para reabilitação e descomissionamento de barragens

Fonte:
Fry J.-J., Risks of Internal Erosion and Earthquakes on Embankments, ICOLD; Research and Development on Dams, Proceedings 1995, p.38

Ações Reativas x Proativas

Ações reativas

> Perigo da rotina

> Medidas são tomadas tarde

> Medidas são tomadas em emergência

> Gestão não ótima dos ativos

> Ainda pior para a gestão de um portifólio de barragens "velhas"

Quão perigosas são as Barragens ?

Ações proativas

> Identificação antecipada

> Planejamento possível

> Medidas são tomadas antecipadamente

> A antecipação é de menor custo

> "Antecipação" como ferramenta para a gestão dos ativos

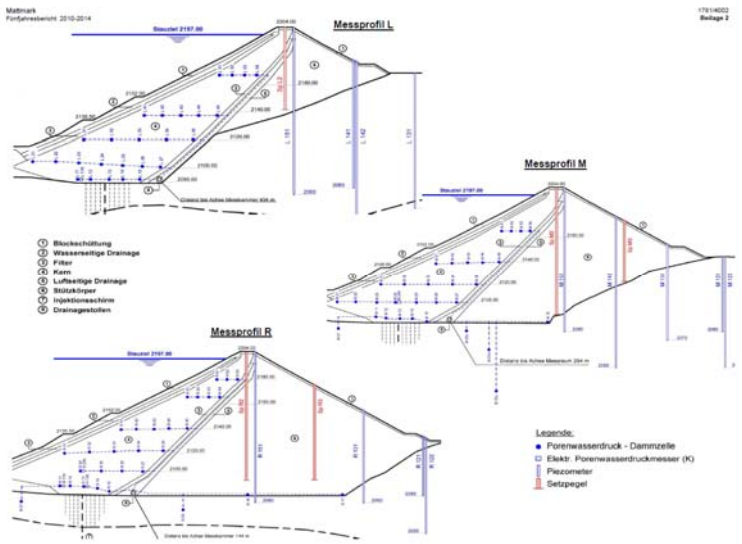
Quão seguras são as Barragens ?

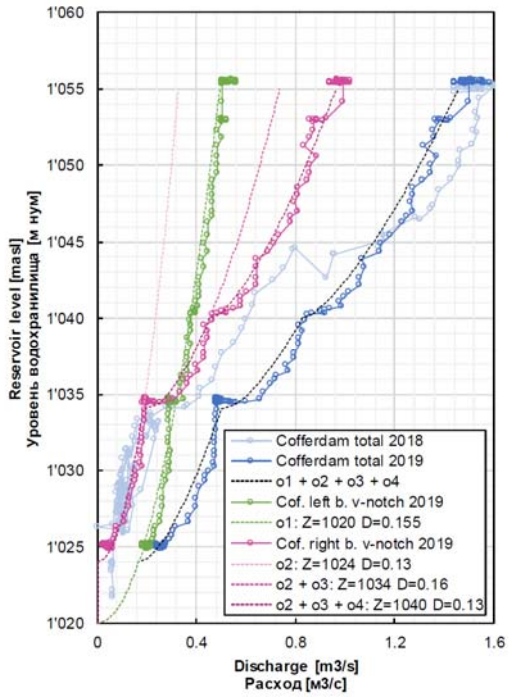
Algumas referências em Segurança de Barragens

he consultoria de engenharia

> A **Stucky** contribuiu e contribui ativamente no desenvolvimento e aperfeiçoamento das diretrizes para a segurança de barragens na Suíça.

> A **Stucky** conta no seu efetivo 6 Experts, nomeados pela OFEN (= Ministério de Energia), responsáveis pela segurança de 35 grandes barragens na Suíça





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a Gruner company

92 YEARS OF EXPERIENCE

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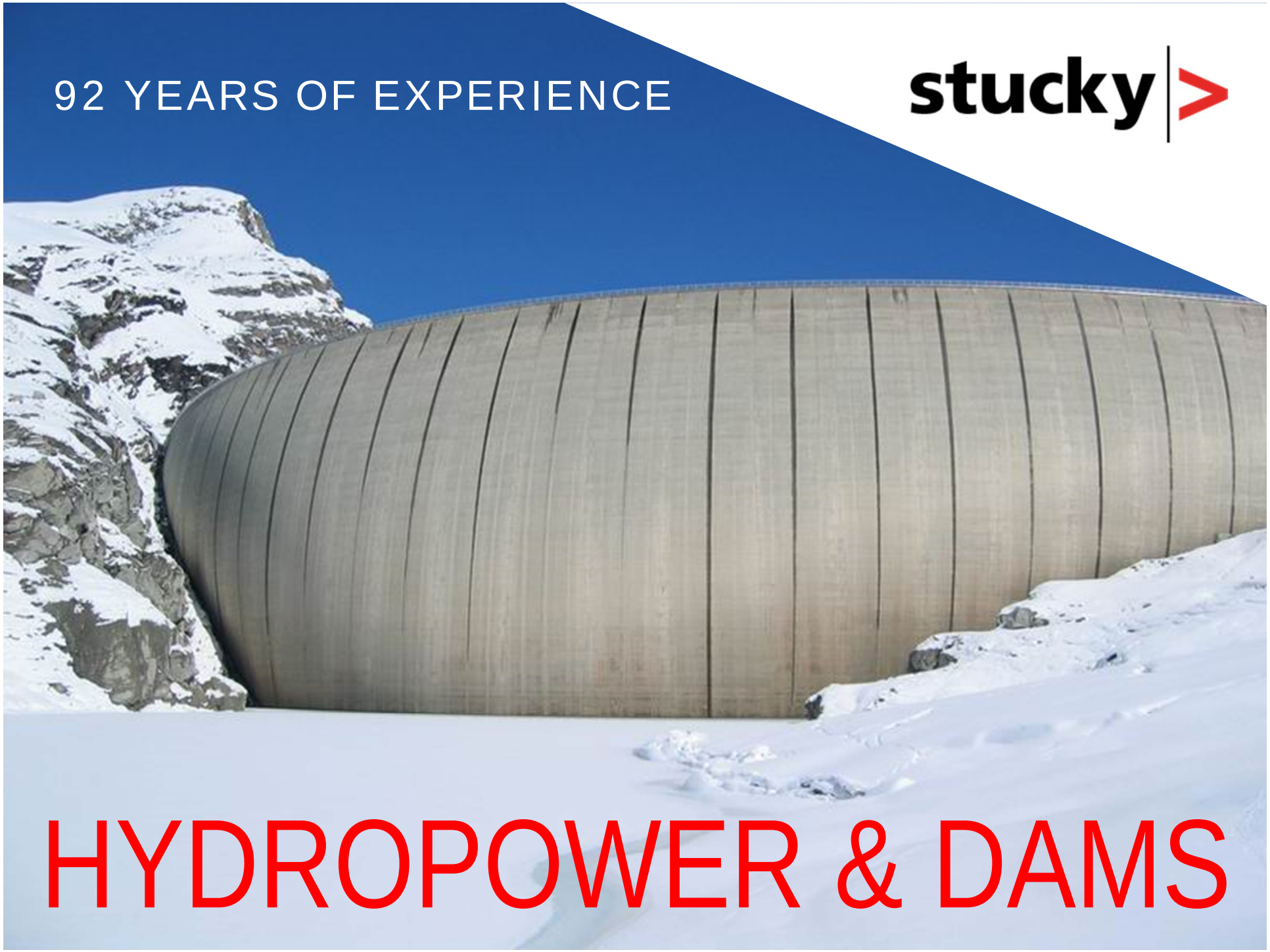

HYDROPOWER & DAMS

HISTORY

ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Alfred Stucky

(1892 – 1969)

Founder

STUCKY was founded in 1926 in Lausanne, in Switzerland, by Alfred Stucky. He was professor and research fellow in hydraulic works at the Ecole d'Ingénieurs de Lausanne, which became the Ecole Polytechnique Fédérale de Lausanne or the Swiss Federal Institute of Technology of Lausanne in 1969.

At the same time, Alfred Stucky founded the Hydraulic and Geotechnical Laboratory and then the "Research Centre for the Study of Dams".

OUR TEAM

Multidisciplinary competence:

- Civil engineering
- Mechanical engineering
- electrical engineering
- Project management
- Geotechnics, geology and rock mechanics
- Economical and financial studies
- Applied hydraulics
- Project development
- Hydrology

Stefan Mützenberg - CEO

Management

Brendan Quigley
COO

Gérard de Montmollin
CFO

Antoine Dubas
Development Director

Patrice Droz
Technical Director

Bertrand Levrat
HR Director

Departments

Marcelo Leite Ribeiro

Hydropower schemes

Alessio Salerno

Buildings

Yann Favrel

Electrical Networks and Power plants

Alexandre Wohnlich

Dams

Jean-Michel Burnier

Hydraulic Works

Stéphanie André

Water and Environment

Cane Cekerevac

Project Management Major Projects

Jean-François Wavre

Structures and Civil Engineering Underground Works and Geotechnics

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OUR CURRENT PROJECTS

WE HAVE RECENTLY WORKED IN THESE COUNTRIES

Algeria
Angola
Armenia
Australia
Austria
Benin
Bosnia Herzegovina
Bulgaria
Cameroon
Chile
China
Colombia
Democratic Republic of Congo
France
Georgia
Germany
Guatemala
Haiti
India
Iran
Italy
Jordan
Kazakhstan
Kyrgyz Republic
Lebanon
Madagascar
Malaysia
Mali
Morocco
Mozambique
Myanmar
Nepal
Nigeria
North Macedonia
Peru
Portugal
Republic of Congo
Russia
Rwanda
Sao Tomé & Principe
Saudi Arabia
Serbia & Montenegro
Switzerland
Tahiti
Tajikistan
The Philippines
Togo
Turkey
Uganda
United Arab Emirates
Uzbekistan
Zambia
Zimbabwe

STUCKY / GRUNER GROUP

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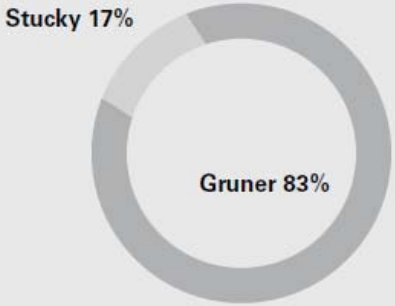
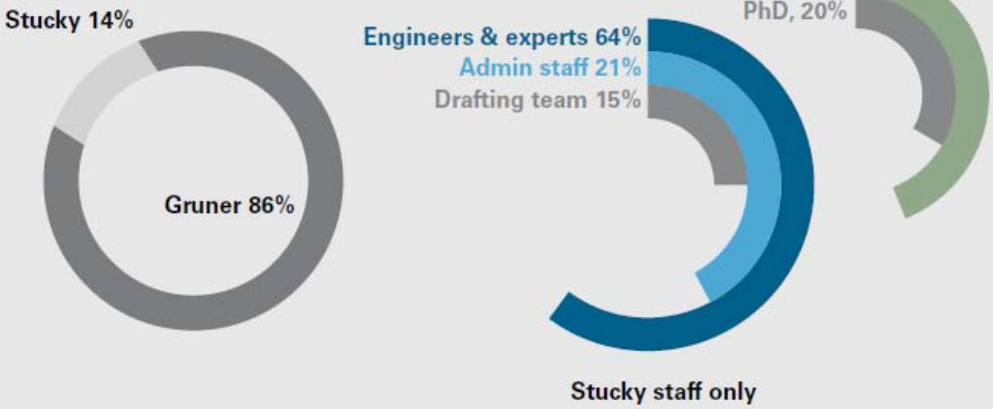
OUR STATS

SECTORS OF ACTIVITY

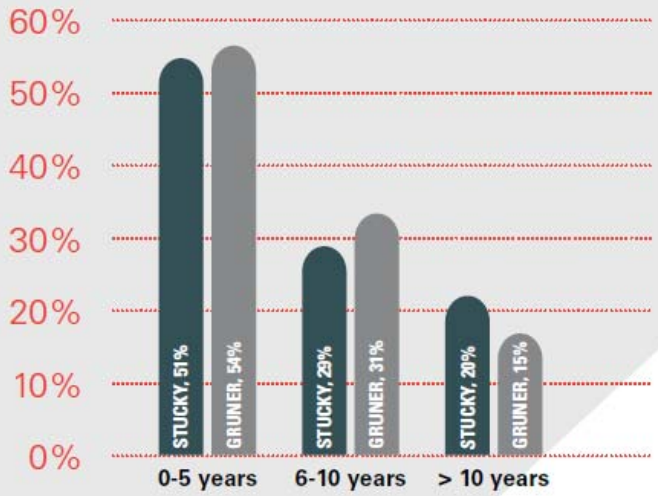
TURNOVER IN 2017 - TOTAL OF 138 MILLION CHF



GROUP HUMAN RESOURCES 2017
998 ENGINEERS AND SPECIALISTS –
OVER 18 DIFFERENT NATIONALITIES



SENIORITY AT GRUNER AND STUCKY



WE BELIEVE THAT BETTER DESIGN MAKES FOR BETTER LIVING
WE BELIEVE THAT QUALITY IS PARAMOUNT & WE BELIEVE IN SUSTAINABLE DEVELOPMENT

stucky

SERVICES

- Masterplans
- Feasibility Studies
- Concession and construction permits
- Tender design and tender documents
- Procurement assistance and contract management

- Construction design
- Construction supervision
- Technical assistance
- Lender’s and owner’s engineer

- Due diligence
- Independent expertise
- Safety assessment and risk analysis

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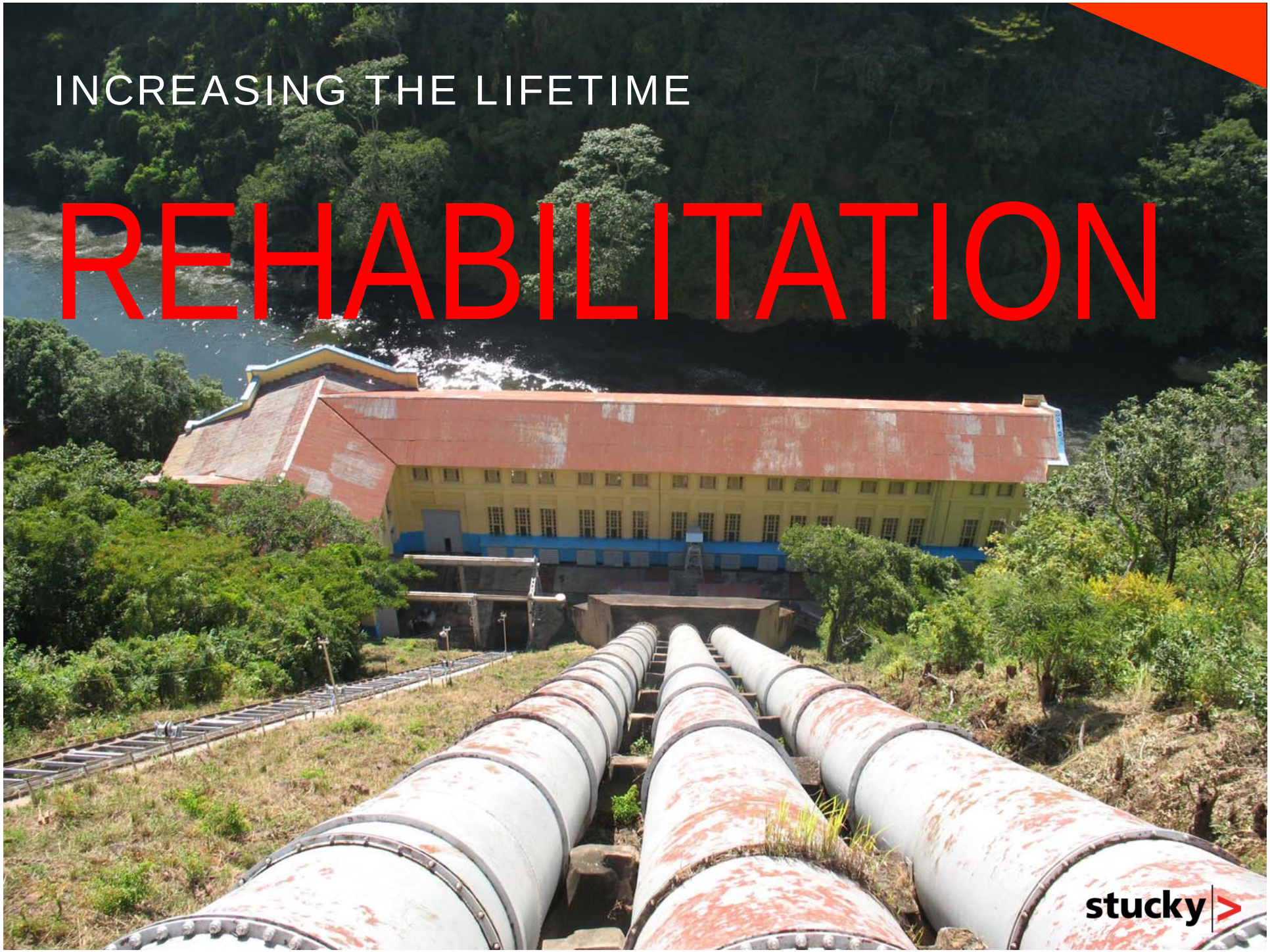
FOCUS ON SAFETY
DAMS &
HYDROPOWER
stucky


INVESTMENTS FOR THE NEXT GENERATION
CONSTRUCTION
stucky


INCREASING THE LIFETIME
REHABILITATION
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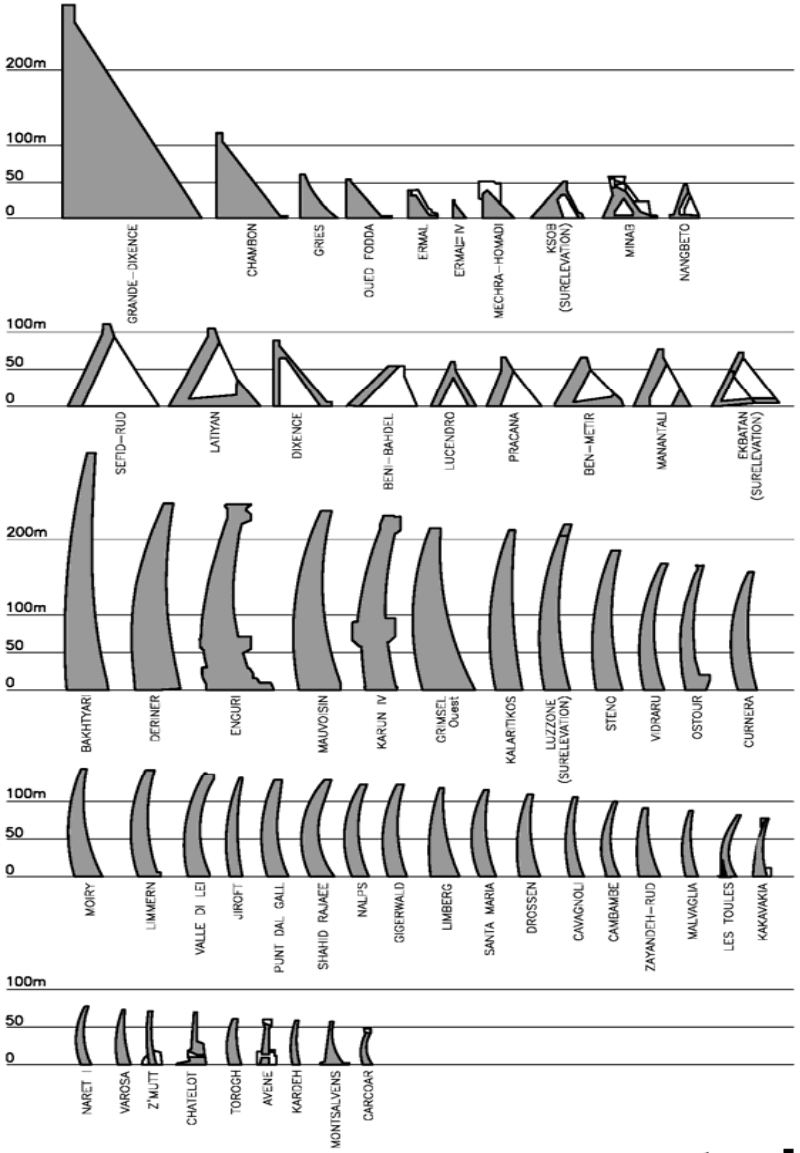
GUARANTEED RELIABILITY

SUBSTATIONS & TRANSMISSION LINES

stucky


PRECISION FOR HIGHEST PERFORMANCE
EXPERTISE
stucky

TRACK RECORD



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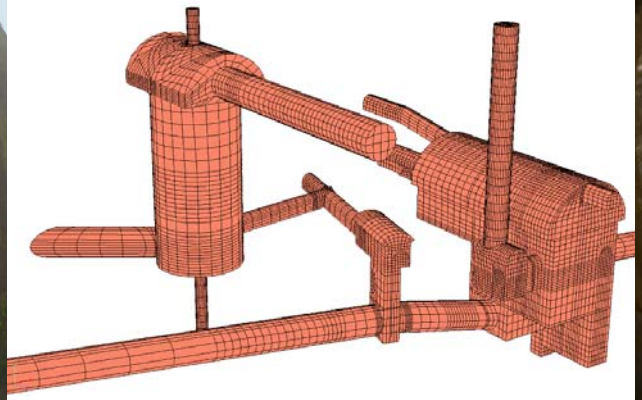
PROJECT REFERENCES

Pumped hydro energy storage projects

Feasibility Study of Alimit pumped storage & Hydropower project, Philippines

Client:
SNAP



Alvito RCC Dam and Pumped Storage Scheme Portugal

Client:
EDP – Energias de Portugal

Capacity increase of the Hongrin-Leman Pumped Storage Scheme (P = 240 MW), Switzerland

Client:
Forces Motrices Hongrin-Léman SA (FMHL)

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PROJECT REFERENCES

Dam heightening and strengthening projects

Heightening from 55 to 76.5 m of Vieux Emosson Dam, Switzerland

Client:

Nant de Drance SA

Rehabilitation and heightening by 28 m of Cambambe Arch Dam (H = 60 m), Angola

Client:

Odebrecht SA Construction Company

Strengthening of the Les Toules Arch Dam (H = 86 m), Switzerland

Client:

Forces Motrices du Grand-St-Bernard SA

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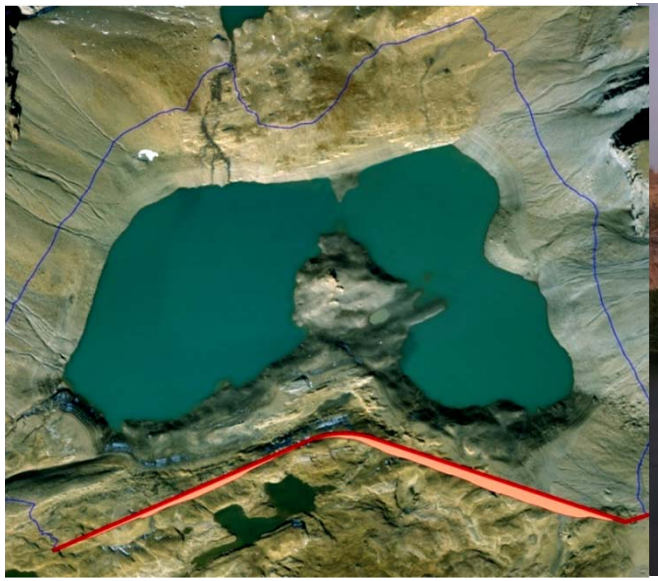
PROJECT REFERENCES

Dam & hydropower construction projects



Linthal 2015 – Muttsee Dam (H = 36 m),Upper Reservoir, Switzerland

Client:

Kraftwerke Linth-Limmern, c/o AXPO

Rehabilitation and heightening by 28 m of Cambambe Arch Dam (H = 60 m), Angola

Client:

Odebrecht SA Construction Company

Kef Eddir Earthfill Dam (H = 95 m), Algeria

Client:

Agence Nationale des Barrages et Transferts (ANBT)

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PROJECT REFERENCES

Dam & hydropower construction projects

Deriner Dam & HEPP (H = 249 m), Turkey

Client:
General Directorate of State Hydraulic Works (DSI)

Ilisu Dam & HEPP (H = 141 m), Turkey

Client:
DSİ (General Directorate of State Hydraulic Works)

Rogun Dam & hydropower scheme (H = 335 m), Tajikistan

Client:
Salini Impreglia SA

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PROJECT REFERENCES

Dam safety studies

Seismic assessment of Moiry Dam (H = 148 m), Switzerland

Client:

Forces Motrices de la Gougra SA

DaSEP (Dam Safety Enhancement Project), China

Client:

Swiss Agency for Development and Cooperation, Ministry Water Resources , Nanjing Hydraulic Research Institute

KWPA – Monitoring of 5 dams – Dam safety, Iran

Client:

Khuzestan Water and Power Authorities Company (KWPA)

stucky

PROJECT REFERENCES

Dam & Hydropower construction projects

Ilisu Dam & HEPP
(H = 141 m), Turkey

Client:
DSİ (General Directorate of State Hydraulic Works)

Deriner Dam & HEPP
(H = 249 m), Turkey

Client:
General Directorate of State Hydraulic Works (DSI)

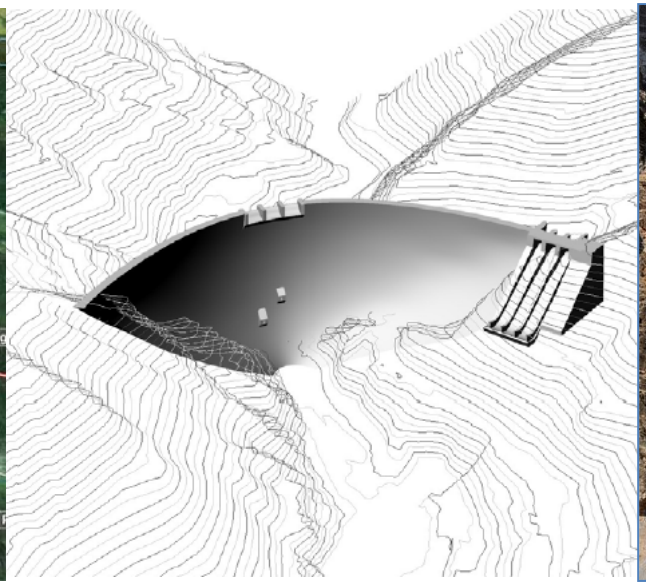
Shahryar (Ostour) Arch dam and hydropower scheme (H =135 m), Iran

Client:
Tablieh Construction Company

stucky

PROJECT REFERENCES

Dam & hydropower construction projects



Construction of Nenskra Hydropower Project (P = 280 MW), Georgia

Client:
JCS Nenskra Hydro

Khudoni HEPP Development, Construction and Commissioning (P = 700 MW), Georgia

Client:
Continental Construction Corp. Ltd

Construction of Bakhtyari Dam & Hydroelectric Power Plant (P = 1500 MW), Iran

Client:
Iran Water and Power Resources Development Co.

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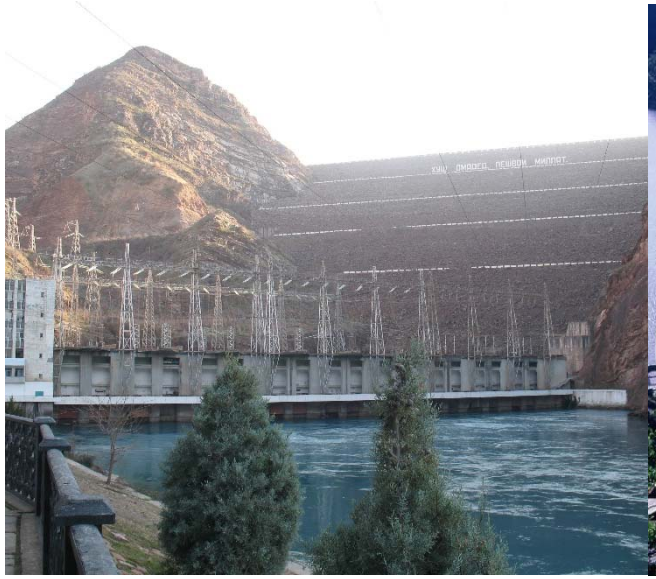
PROJECT REFERENCES

Dam & hydropower rehabilitation projects



Nurek dam & hydropower rehabilitation project H = 300 m, P = 3000 MW),Tajikistan

Client:

Barki Tojik

Kariba Dam Rehabilitation Project (H = 128 m), Angola

Client:

Zambezi River Authority (ZRA)

Qairrokkum dam and hydropower scheme (H = 32m, P = 174MW), Tajikistan

Client:

Tablieh Construction Company

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PROJECT REFERENCES

Dam & hydropower rehabilitation projects

Enguri Dam & HEPP rehabilitation, Georgia

Client:
Engurhesi Ltd

Vardnili Cascade Rehabilitation Project (340 MW), Georgia

Client:
Engurhesi Ltd

Vièze Hydroelectric Powerhouse Rehabilitation / Unit 1, Switzerland

Client:
Cimo Compagnie industrielle de Monthey SA

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PROJECT REFERENCES

Dam & hydropower rehabilitation projects

Maris Reservoir Raising Project, Philippines

Client:

SN Aboitiz Power Group (SNAP)

“Lavey +” Project / Power increase, Switzerland

Client:

Direction des Services industriels (SIL)
Service de l’électricité (SEL)

Cleuson-Dixence HPP (1200 MW) / Pressure Shaft Rehabilitation, Switzerland

Client:

Cleuson-Dixence Construction SA

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PROJECT REFERENCES

Dam & Hydropower rehabilitation projects

Rehabilitation of Chancy Pougny Hydropower Plant (5 x 49MW), Switzerland

Client:

Services Industriels de Genève (SIG) - Alpiq

Rehabilitation of Nzilo I Powerplant (4 x 25MW), DR Congo

Client:

Société Nationale d'Electricité (SNEL)

Rehabilitation of Mwadingusha Hydropower Plant (71MW), DR Congo

Client:

Société Nationale d'Electricité (SNEL)

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PROJECT REFERENCES

Dam & Hydropower rehabilitation projects

Rehabilitation of Koni Hydropower Plant (42 MW), DR Congo

Client:

Société Nationale d'Electricité SNEL

Rehabilitation of At-Bashi Hydropower Plant (4 x 10 MW), Kyrgyzstan

Client:

State Secretariat for Economic Affairs SECO

Zorlu / Rehabilitation and upgrading of 7 Hydropower Plants, Turkey

Client:

Zorlu Dogal Elektrik Üretimi A.Ş.

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PROJECT REFERENCES

Substation & Transmission line projects

Chamoson
400/220/16kV
Substation, Switzerland

Client:
Alpiq Réseau SA

Romanel 125kV
Substation, Switzerland

Client:
Energie Ouest Suisse (EOS)

220/400 kV GIS Chavalon
Substation, Switzerland

Client:
Energie Ouest Suisse (EOS)

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PROJECT REFERENCES

Substation & Transmission line projects

New SF6 50/11 kV (GIS) Switchgear at Expo, Switzerland

Client:
Service de l'électricité de la Ville de Lausanne (SEL)

Tlemcen-Zahana & Tlemcen-Ghazaouet 220 kV Transmission Lines, Algeria

Client:
BATICIM SPA

National Integrated Power Projects (NIPP) Project Consultancy Services, Nigeria

Client:
NDPHC

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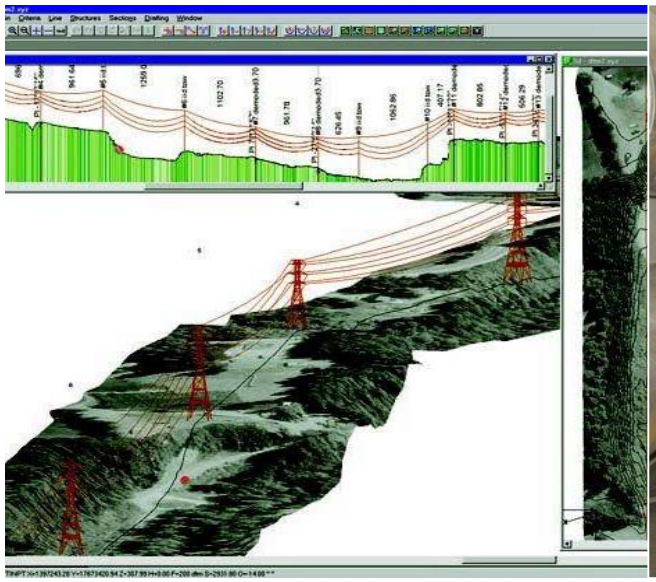
PROJECT REFERENCES

Substation & Transmission line projects

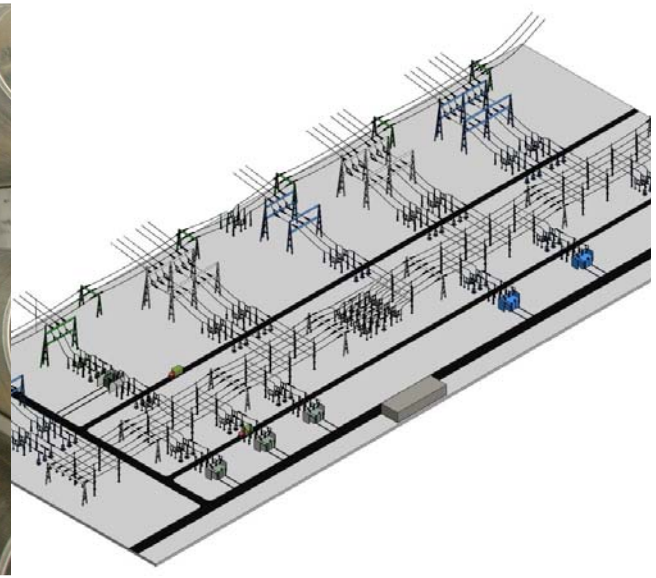


400 kV El Affroun – Hassi Ameur overhead Transmission Line, Algeria

Client:
GRTE Spa – CEEG Spa

Foretaille-Verbois 220 kV underground line at Palexpo, Switzerland

Client:
Energie Ouest Suisse SA



New Kamoa Substation 220/120 kV and new 220/120 kV Transmission Lines, DR Congo

Client:
Société Nationale d'Electricité SNEL

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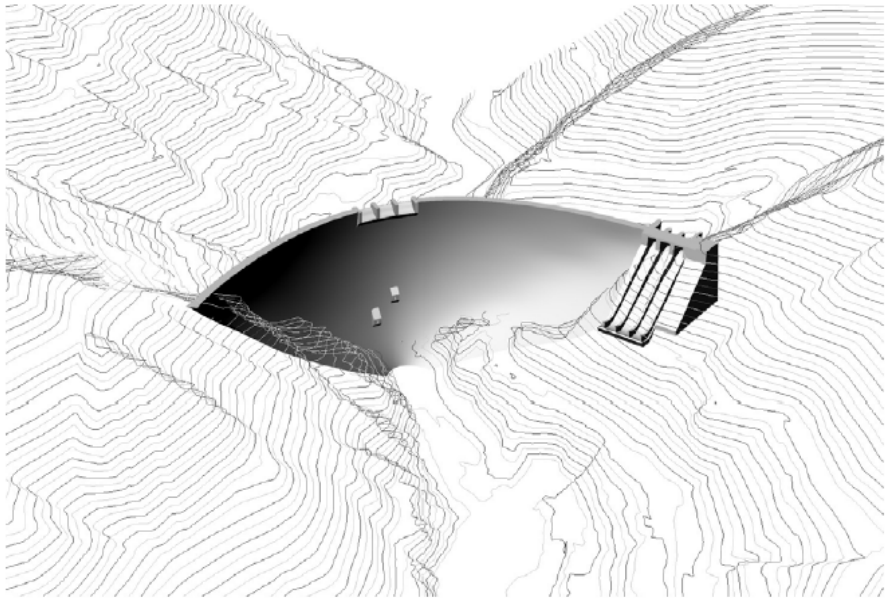
KHUDONI HPP FEASIBILITY STUDY



Client: Ministry of Energy for Georgia
Dates: 05/2007 - 02/2011

Technical Data:
202.5m high double curvature arch dam
Capacity: 702 MW
Annual production: 1477 GWh
Powerhouse : Francis turbines (3x 234 MW)

STUCKY SERVICES

Phase I : Assessment of the Existing Khudoni HPP
Phase II : Khudoni HPP Project Definition
Phase III : Feasibility Study Report including design of the selected Project scheme

Geophysical, geological and geotechnical investigations / Civil and electro-mechanical design and drawings / Detailed ESIA / Updated economic and financial modelling / Complementary Studies

GEORGIA

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LAVEY DAM – 2D HYDROLOGICAL MODELING

Final bed elevation [m]

Client: Service Electrique de Lausanne (SEL)
Dates: 06/2004 - ongoing

Technical Data:
The study aimed :

- **to assess the actual capacity of the River Rhône at the dam;**
- **to identify and propose alternative measures to improve the hydraulic capacity of the dam;**
- **to define solutions for a sustainable sediment management;**
- **to identify means to reduce sediment entrainment in the water intake.**

STUCKY SERVICES

Two-dimensional numerical modeling coupled hydraulic & bed load;
Definition of alternative measures;
Comparison of alternatives;
Follow-up of a physical model at LCH/EPFL

SWITZERLAND

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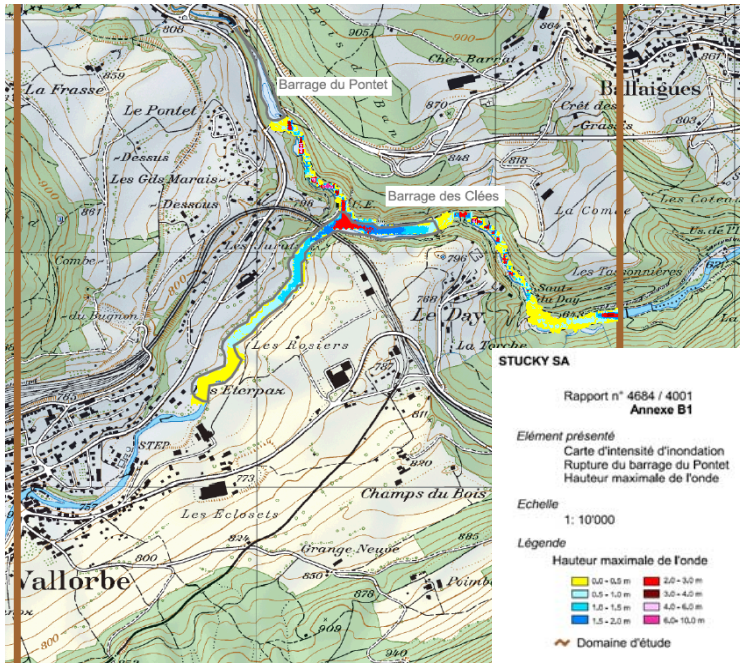
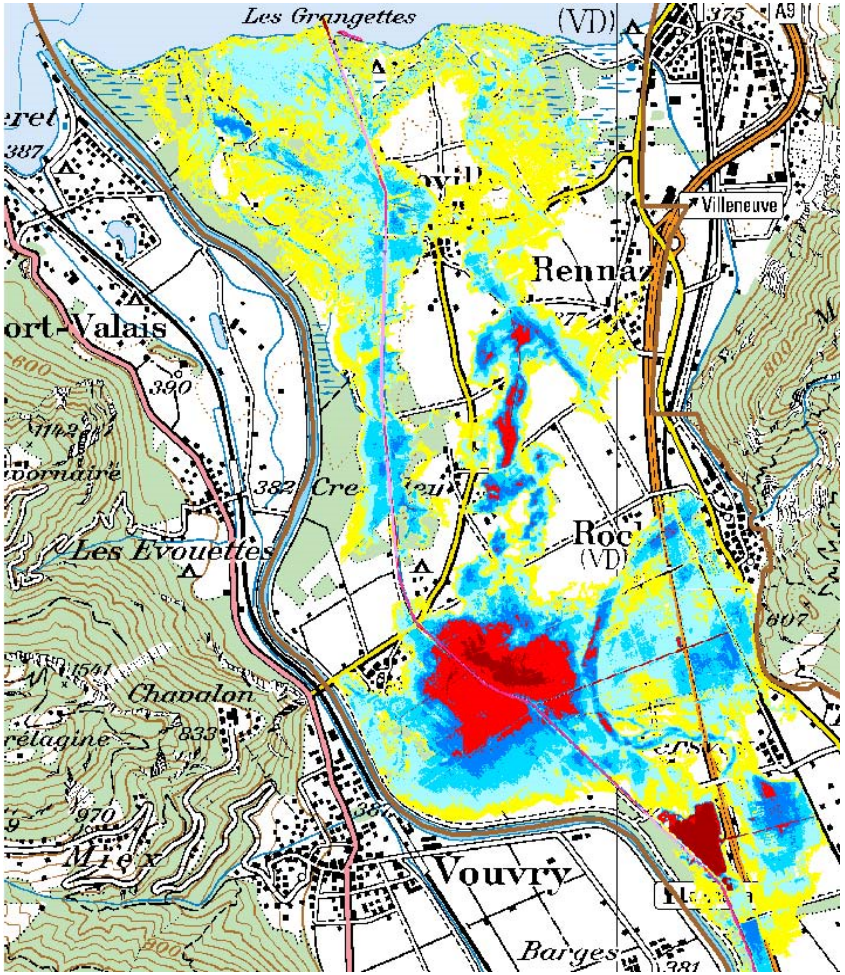
FLOOD AND HAZARD MAPS



Pontet Dam break analysis and hazard map, Switzerland



2 ½ D numerical modeling of flood in Chablais vaudois. Breaching scenario the Rhône embankment. Distinct colors indicate highest level of water.

SWITZERLAND

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Due Diligence Xinglong & Kangyuan HPP

View of the Yanjia dam (Anhui Province).The dam is temporarily topped by an inflatable gate that enables a higher energy production.

Client: International Finance Corp
Dates: 06/2007 -07/2007

Technical Data:
Mini to medium hydropower plants

STUCKY SERVICES

Documents study;

Visit of the eleven projects sites;

Technical review of the project, in particular hydrology, sedimentation, geology, seismicity, design;

Assessment of construction methods, quality and construction material;

Review of the environmental impact study (EIA) and own appraisal;

Review of the social implications of the projects;

Review of the project organisation;

Participation in consultation meetings with stakeholders;

Writing of a mission report, with key findings and recommendations.

CHINA

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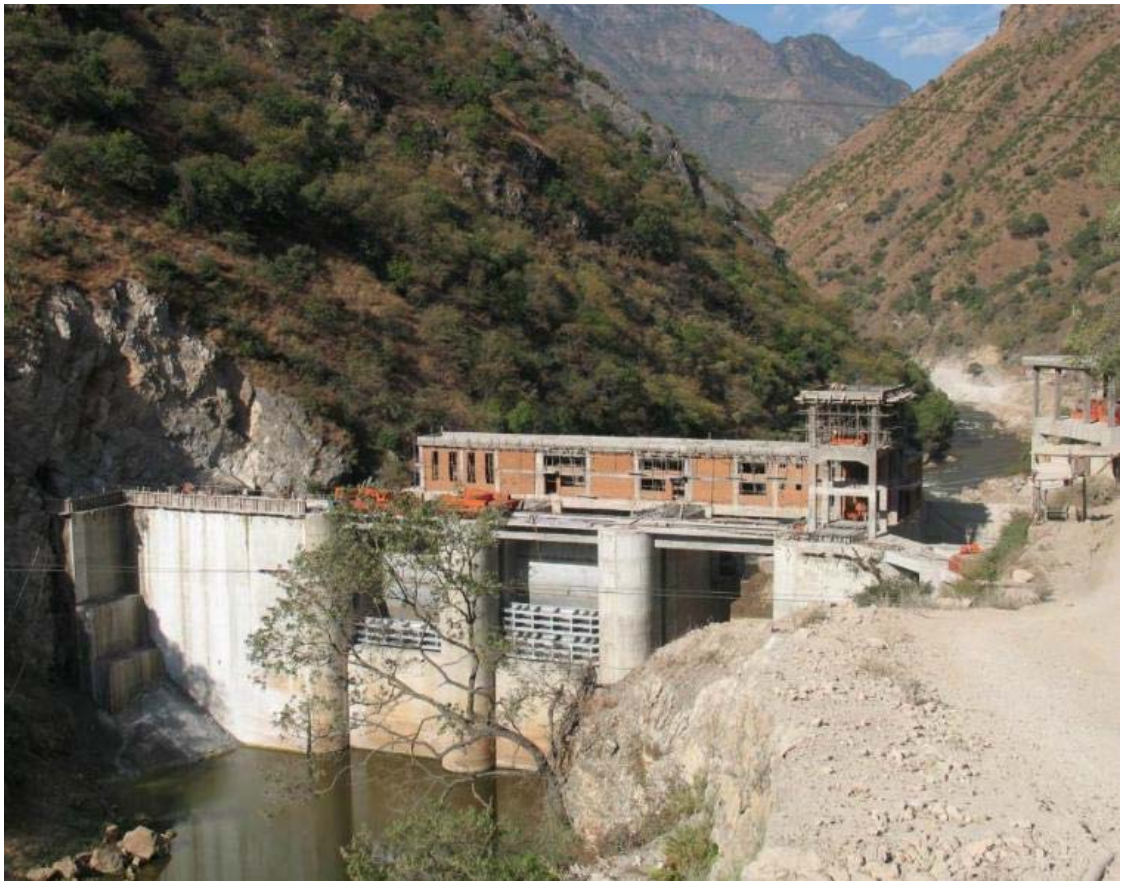
Due Diligence Jiangbian HPP



The dam site on the Pudu River (Yunnan)

Client: Sanchuan Energy Development Co, Ltd.
Dates: 12/2009

Technical Data:
45 MW HPP

STUCKY SERVICES

Task 1: Site visit
Visit of Jiangbian Hydropower Power Plant construction site
Site appraisal and visit of specific project components
Discussion with selected persons and companies involved in the project
Task 2: Desk study and reporting
Technical Due Diligence, with focus on :
Comments on general project layout
Review of water resources and extreme hydrological events
Considerations on sedimentation
Appraisal of civil works and construction methods
Validation of production estimates
Assessment of the equipment
Risk identification and mitigation measures
Environmental considerations
Recommendations
Writing and delivering of a Mission Report

CHINA

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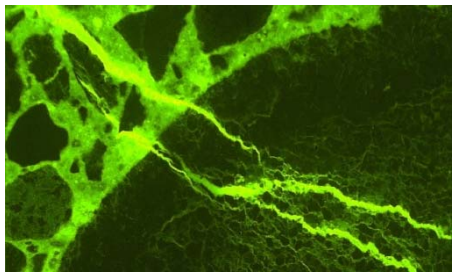
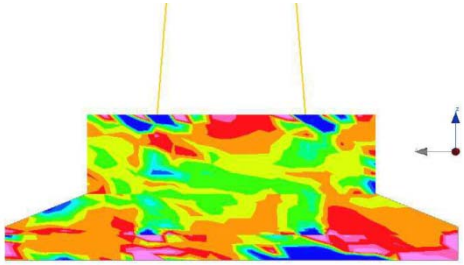
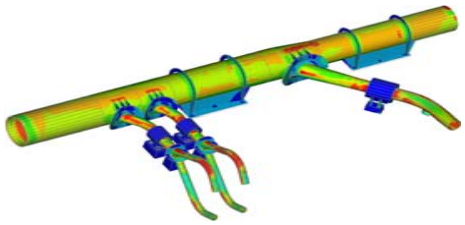
Alkali Aggregate Reaction







Expertise in the fields of:

> Site Evaluation

> Diagnostic

> Modeling

> Intervention

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QUALITY MANAGEMENT AND ETHICS

QUALITY & MANAGEMENT SYSTEM

ISO 9001:2008 - Quality management system
ISO 14001:2004 - Environmental management system
OHSAS 18001:2007 - Occupational Health and Safety management system

Stucky's QESS management policy is taking into account five domains which are Management, Human Resources, Logistics, Services and Measures, Analyses and Improvements.

CODE OF CONDUCT

Our Code of Conduct was developed in 2003, and is included in our quality and management system.
STUCKY and its employees have to respect and implement the following fundamental principles:

- Professional integrity;
- Quality of the services, and the quality management system;
- Sustainable development, social and environmental responsibility;
- Personal liability and obligation to account for;
- Observance of the laws.

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