SPANCOLD CNEGP

GOBIERNO DE ESPAÑA
MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO

caminos Colegio de Ingenieros de Caminos, Canales y Puertos

JORNADA SOBRE EL ALMACENAMIENTO HIDRÁULICO DE ENERGÍA

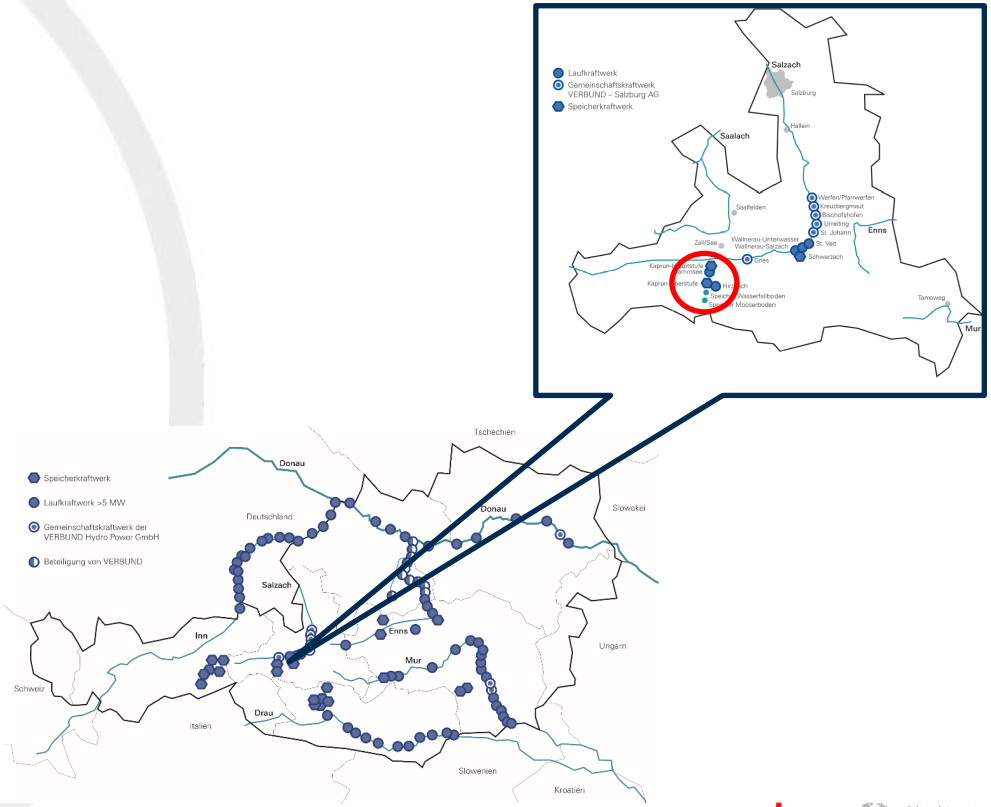
PUMPED STORAGE PLANT LIMBERG III

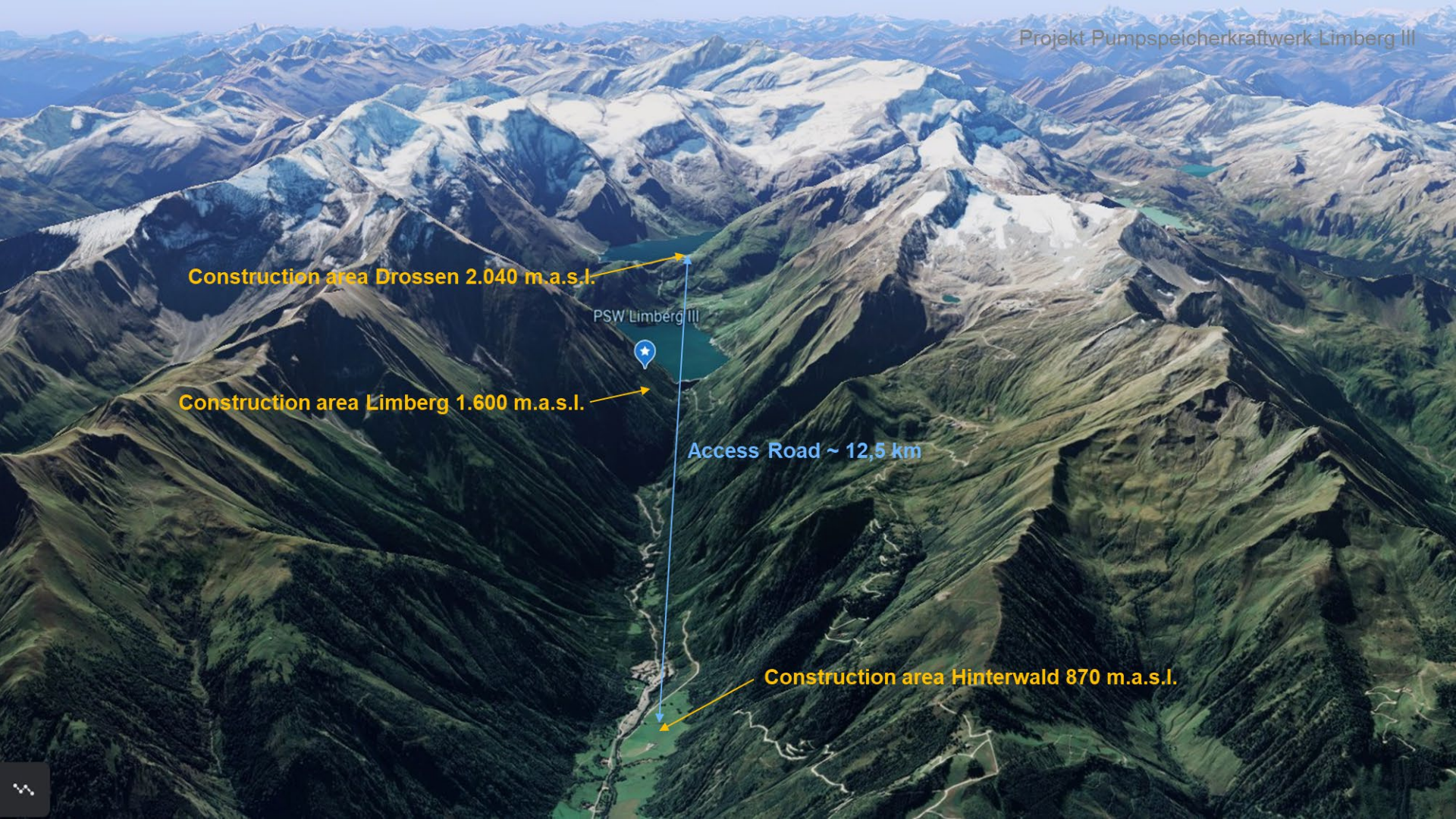
Thomas Etzer, Verbund Hydro Power GmbH, Austria

POWER PLANT GROUP KAPRUN - SALZACH

Technical Details Power Plant Group Kaprun - Salzach*		
Kaprun upper stage	160 MW	156 GWh
Limberg II	480 MW	
Kaprun main stage	260 MW	549,5 GWh
7 additional plants	165,3 MW	653 GWh
2 Reservoirs	166 Mio.m³	

- Maximal output: 1.018 MW-T, 610 MW-P
- Yearly power production: 1.355 GWh
- Kaprun upper stage, Limberg II and Kaprun main stage:
  - Combined output: ~850 MW-T
  - Standard capacity (RAV): 700 GWh/a




Construction area Drossen 2.040 m.a.s.l.
PSW Limberg III
Construction area Limberg 1.600 m.a.s.l.
Access Road ~ 12,5 km
Construction area Hinterwald 870 m.a.s.l.

PROJECT OVERVIEW – LIMBERG III

Implementation into the existing infrastructure Kaprun:

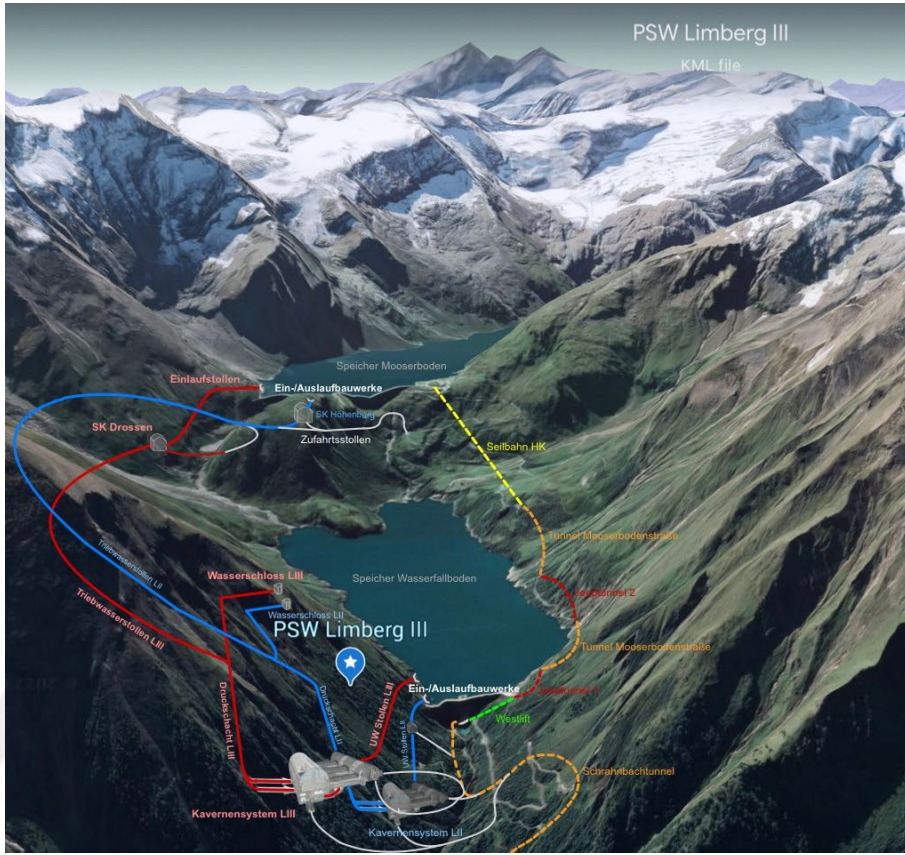
- Annual storage Mooserboden & Wasserfallboden
- Power discharge Limberg II
- Long standing operating site of Verbund

Plant Concept similar to Limberg II:

- Additional operation modes:
  - 100 MW & 240 MW in pump-mode (depending on hydraulic head)
  - 20 MW & 240 MW in turbine-mode (depending on hydraulic head)

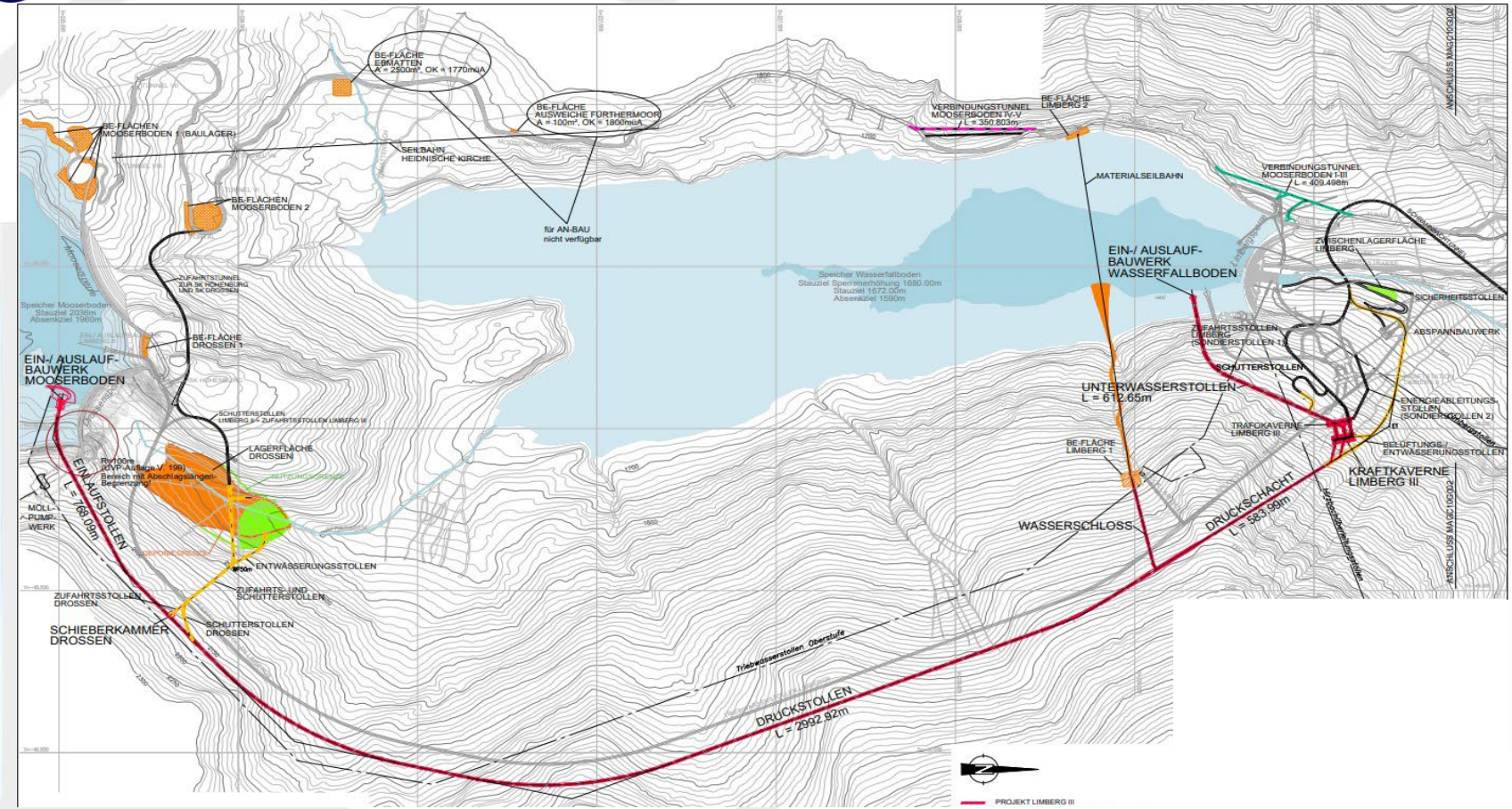
Technical Details	
Bottleneck capacity	480 MW
Construction span	2021 - 2025
Total project costs*	€ 572 Mio.

* Pumped Storage Plant Limberg III incl. Dam Expansion

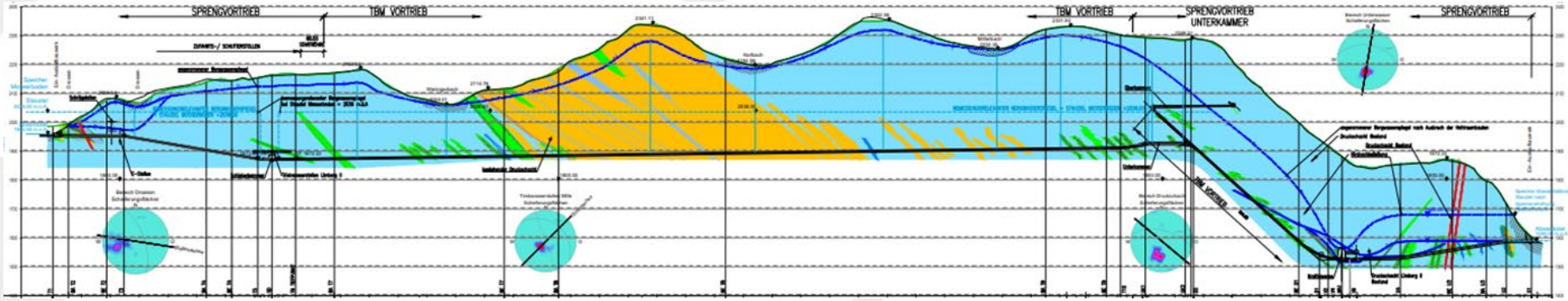


CONSTRUCTION SITE

- Landscaping
- Protected nature reserve
- Tourism region


BE-FLÄCHE
EBMATTEN
A = 2500m², OK = 1770müA
BE-FLÄCHE
AUSWEICHE FURTHERMOOR
A = 100m², OK = 1800müA
BE-FLÄCHEN
MOOSERBODEN 1 (BAULAGER)
SEILBAHN
HEIDNISCHE KIRCHE
für AN-BAU
nicht verfügbar
BE-FLÄCHEN
MOOSERBODEN 2
ZUFAHRTSTUNNEL
ZUR SK HÖHENLAU
UND SK DROSSEN
BE-FLÄCHE
DROSSEN 1
EIN-/ AUSLAUF-
BAUWERK
MOOSERBODEN
SCHUTTERSTOLLEN
LIMBERG II + ZUFAHRTSTOLLEN LIMBERG III
LAGERFLÄCHE
DROSSEN
EINLAUFSTOLLEN
L = 769.09m
MOLL-
PUMP-
WERK
ENTWÄSSERUNGSSTOLLEN
ZUFAHRTS- UND
SCHUTTERSTOLLEN
ZUFAHRTSSTOLLEN
DROSSEN
SCHUTTERSTOLLEN
DROSSEN
SCHIEBERKAMMER
DROSSEN
Triebwasserstollen Oberstufe
DRUCKSTOLLEN
L = 2992.82m
VERBINDUNGSTUNNEL
MOOSERBODEN IV-V
L = 350.803m
BE-FLÄCHE
LIMBERG 2
MATERIALSEILBAHN
VERBINDUNGSTUNNEL
MOOSERBODEN I-III
L = 409.498m
ZWISCHENLAGERFLÄCHE
LIMBERG
EIN-/ AUSLAUF-
BAUWERK
WASSERFALLBODEN
SICHERHEITSSTOLLEN
ABSPANNBAUWERK
ZUFAHRTSSTOLLEN
LIMBERG
(SONDERSTOLLEN 1)
SCHUTTERSTOLLEN
UNTERWASSERSTOLLEN
L = 612.65m
ENERGIEABLEITUNGS-
STOLLEN
(SONDERSTOLLEN 2)
TRAFOKAVERNE
LIMBERG III
BE-FLÄCHE
LIMBERG 1
BELÜFTUNGS-/
ENTWÄSSERUNGSSTOLLEN
KRAFTKAVERNE
LIMBERG III
WASSERSCHLOSS
DRUCKSCHACHT
L = 583.99m
Speicher Mooserboden
Stauziel 2036m
Absenkziel 1960m
Speicher Wasserfallboden
Stauziel Sperrenerhöhung 1680.00m
Stauziel 1672.00m
Absenkziel 1590m
PROJEKT LIMBERG III

WATERWAY

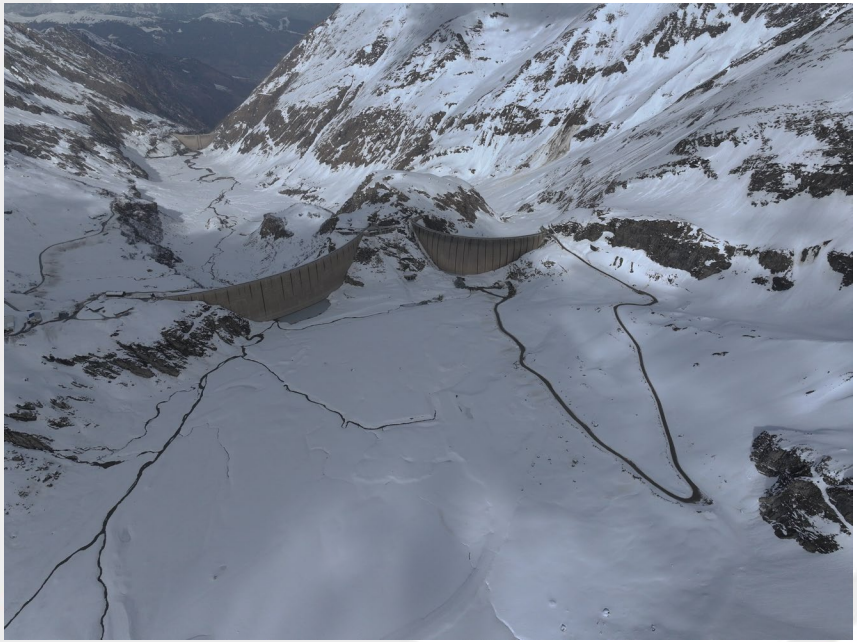


Gliederung des Gebirges in Gebirgsarten

Tektonische Einheit	Serien-gliederung	Zone		Gebirgsart	Beschreibung	
ennin	nerfacies)	fer	GA 1	Marmore	Glimmermarmor	
			GA 2/1	Kalkglimmerschiefer i.A. unverwittert	Bankige- massige Kalkgesteine, ca 15-30% Glimmeranteil, dunkelgrau, mit Übergängen zu Marmorlagen und plattigen bis schiefrigen Einschaltungen bis einige Meter Mächtigkeit.	
			GA 2/2	Kalkglimmerschiefer i.A. angewittert	wie GA 2/1 aber angewittert mit limonitischen Kluftverfärbungen, teilweise offenen Klüften mit Lehmfüllung, z.T. graphitische Beläge.	

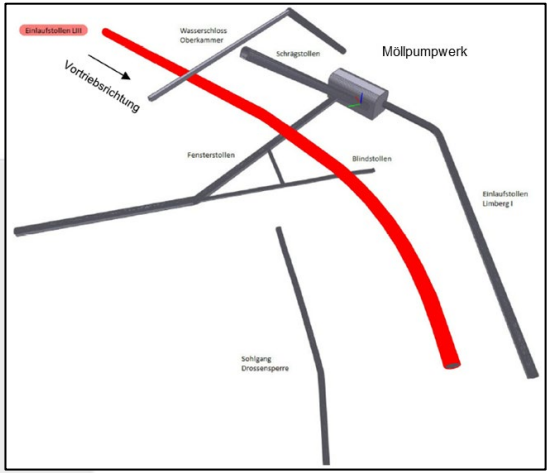
Tauernfenster - P	Glocknerdecke (Glock	Bündner Schief	GA 3	dunkle Glimmerschiefer, Granatmuskovitschiefer und vereinzelt Phyllite	blättrige dünnplattige, teilweise graphitische Gesteine, z.T. graphitische Beläge.	
			GA 4	Dolomit mit vereinzelt Einschaltungen von Gips + Rauwacke	harte aber kleinstückig zerlegte Gesteine.	
			GA 5/1	Prasinit - Grünschiefer inkl. Serpentinite	feinkörniges Grüngestein, massig, häufig asbestführend.	
			GA 5/2	Prasinit - Grünschiefer inkl. Serpentinite	engständig geschieferte, blättrig-dünnplattige Ausformung der Grüngesteine, z.T. talkige Beläge, häufig asbestführend.	
			GA 6	Gneis	teilweise granatführend, bankig - massig.	
				Hangschutt und Ausbruchmaterial von Drossensperre		

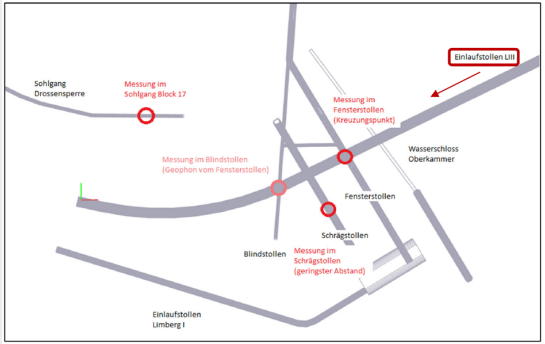
INLET TUNNEL



- Previously built Inlet structure
- Connection works during lowering of the reservoir in winter 2023/2024

INLET TUNNEL



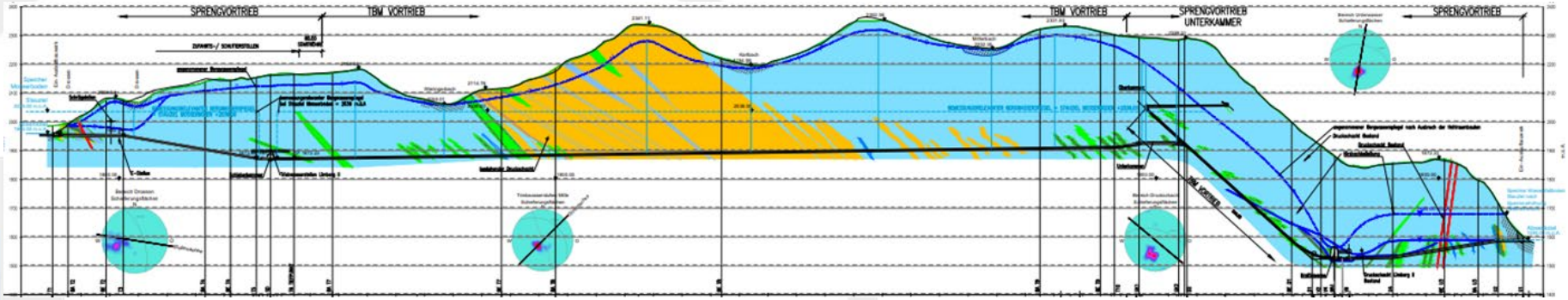


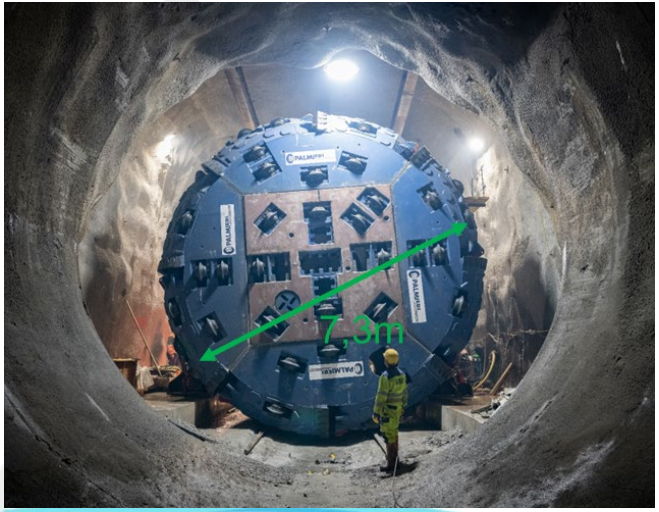
- Existing structures in the immediate vicinity
- Shock measurements & programme of avtivities
- Adaption of blasting scheme & drilling lenght

VALVE CHAMBER

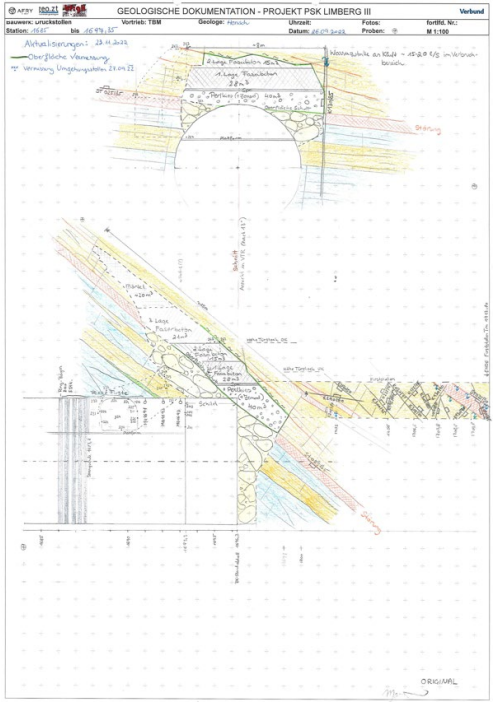
- Redundant butterfly valve
- Diameter 4,9m
- Emergency closure

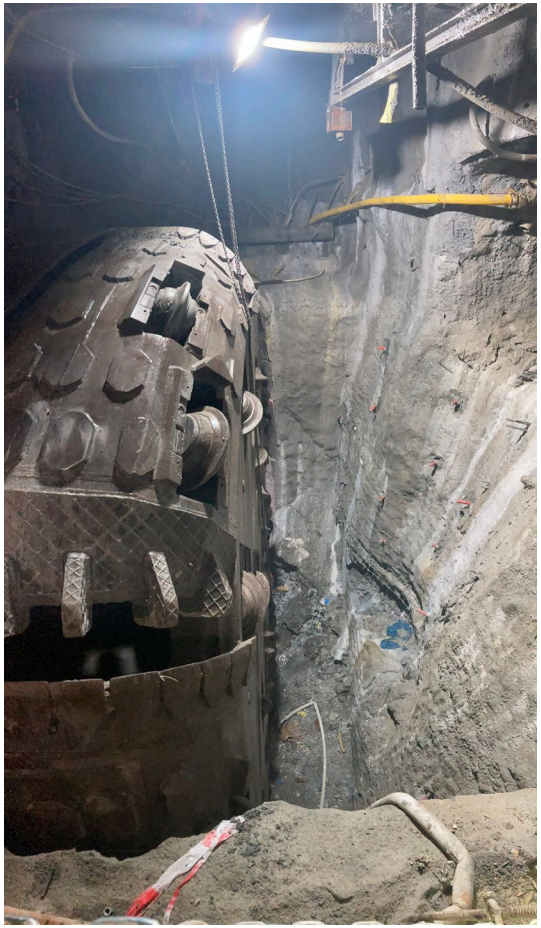
HEADRACE TUNNEL





HEADRACE TUNNEL



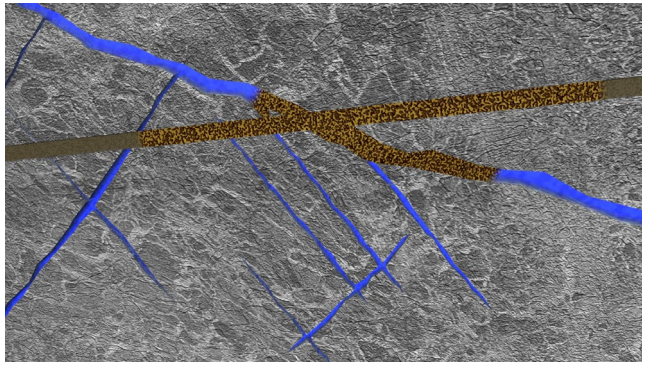


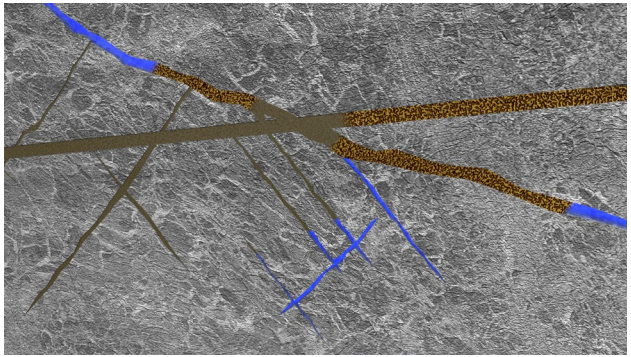
- Bypass in drill and blast excavation
- Uncovering of the cutting head by hand

HEADRACE TUNNEL

- Hybrid grouting to seal off water inlets
- 45 cm passive pre-stessed concrete lining

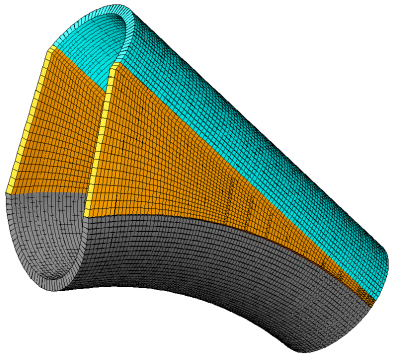
HEADRACE TUNNEL

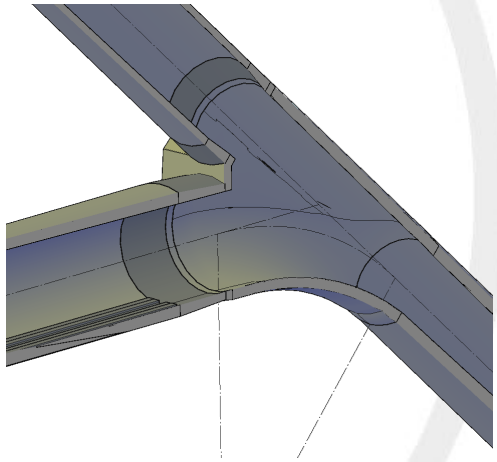




- Containment of the injection process only to the region where required
- Flexibility in the grout design
- Short- and long-term mechanical properties

SURGE CHAMBER





- Lower surge chamber by TBM
- 47 cm reinforced concrete lining

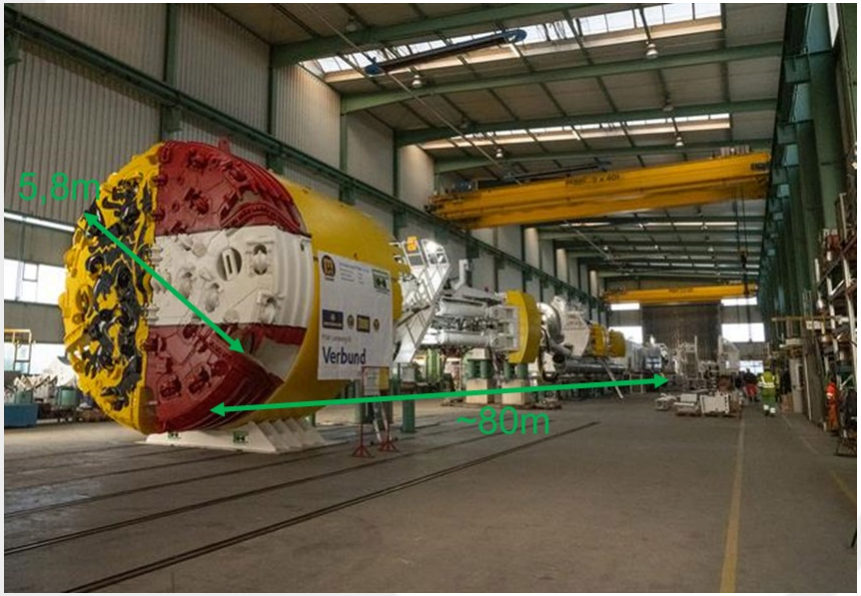
SURGE CHAMBER

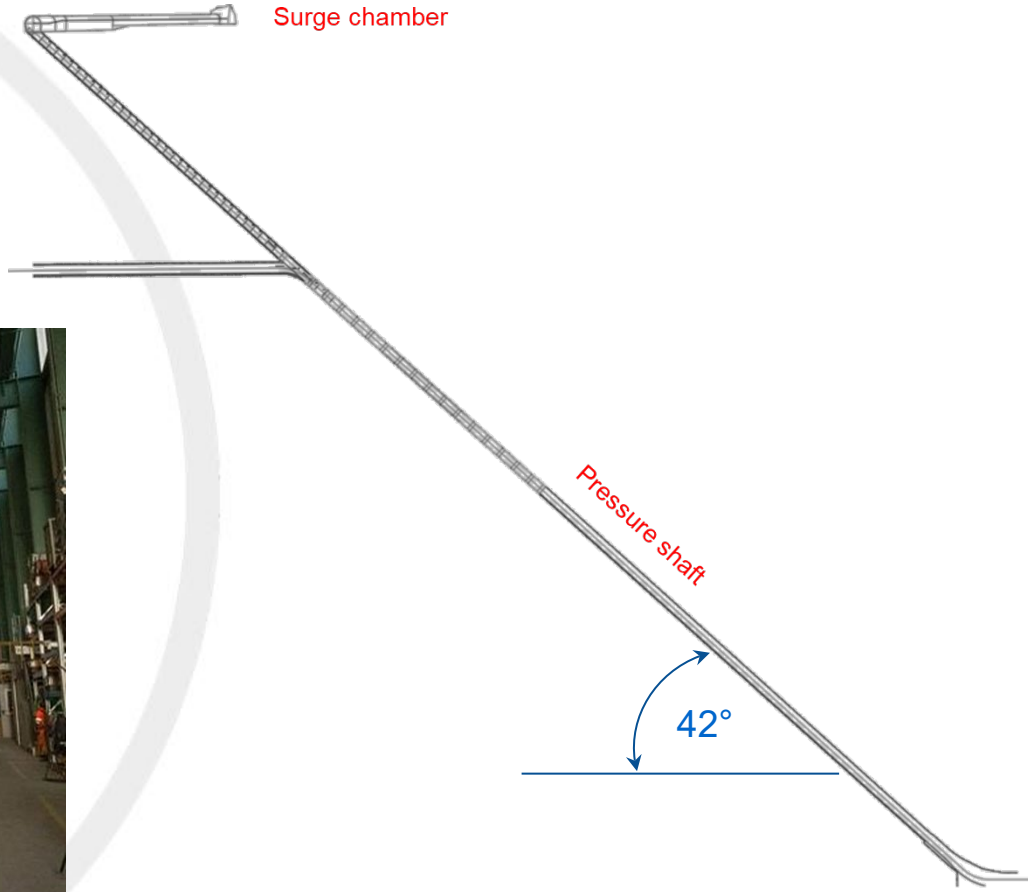
- Upper surge chamber above 2050 müA
- Access only by cable car

SURGE CHAMBER

- Reinforced concrete lining in hydraulically loaded area.

PRESSURE SHAFT





PRESSURE SHAFT

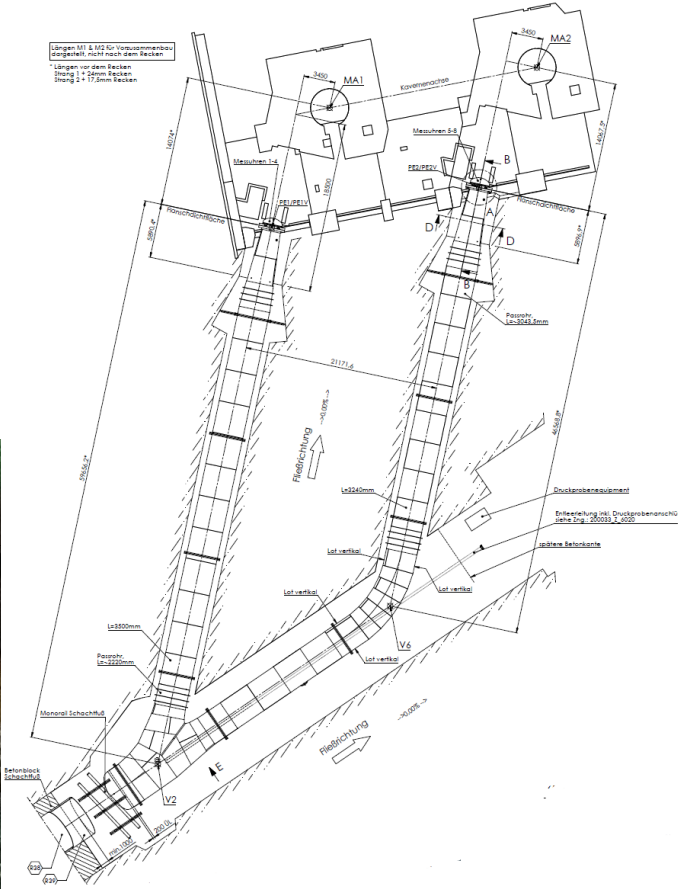
PRESSURE SHAFT

- Composite geomembrane system
- Fullround formwork carriage
- 45 cm passive pre-stessed concrete lining

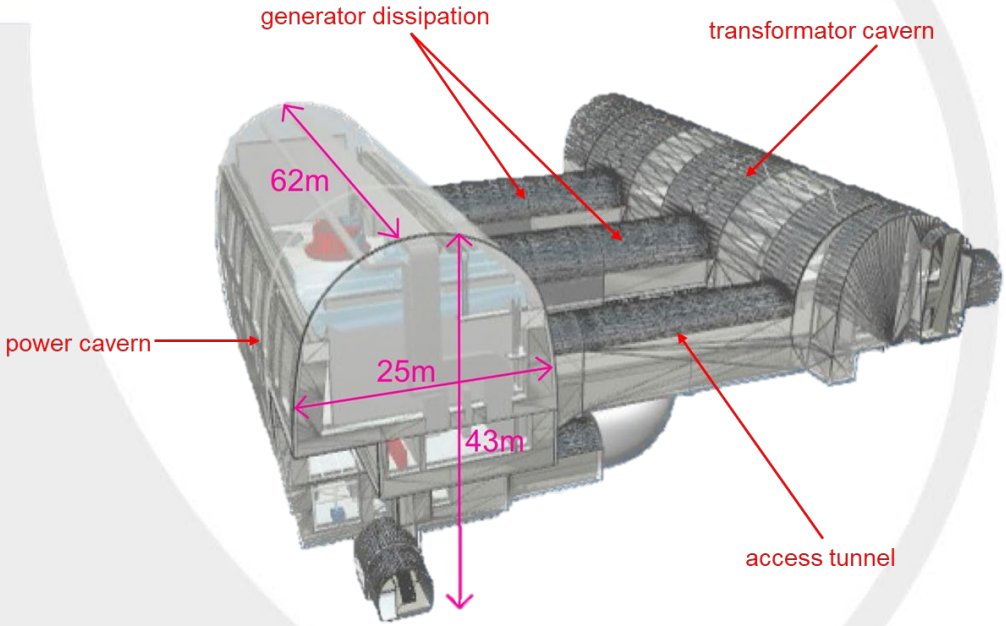
PRESSURE SHAFT

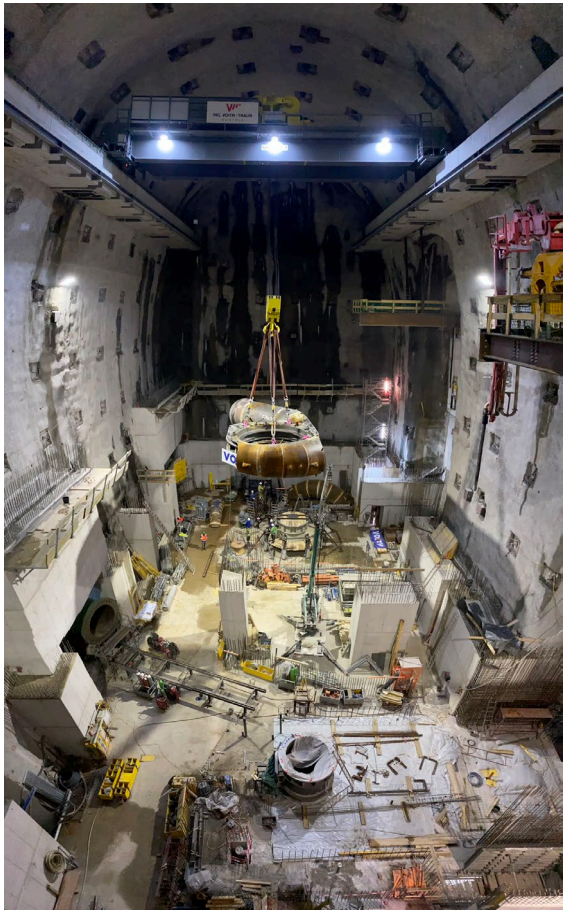
- Steel lining up to 38mm
- Diameter 4,68m

DISTRIBUTION PIPEWORK



CAVERNSYSTEM





CAVERNSYSTEM

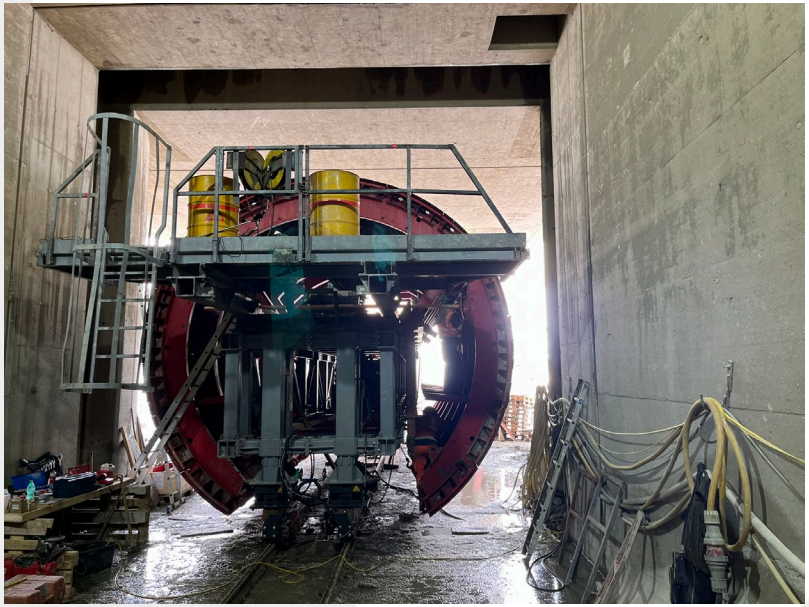
DISTRIBUTION PIPEWORK

- Flap gates 4,5 x 1,6 m
- Emergency closure

TAILRACE TUNNEL

- Composite geomembrane system
- Fullround formwork carriage
- 60 cm passive pre-stessed concrete lining

TAILRACE TUNNEL



- Previously built Inlet structure
- Connection works during lowering of the reservoir in winter 2023/2024


Thank you
for your attention!

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