

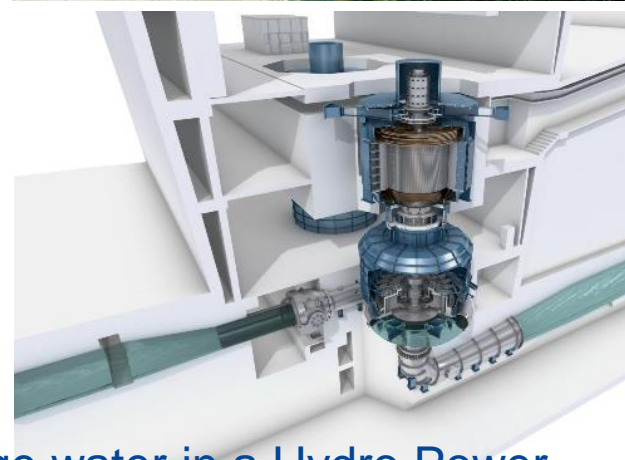
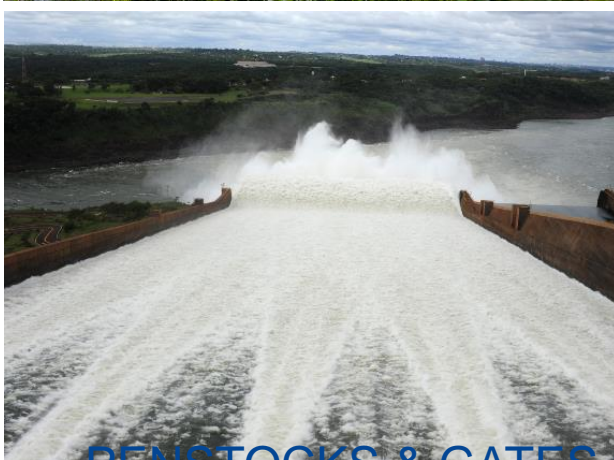


Hydromechanical Equipments - Generalities

Imagination at work

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Hydromechanical Equipments - Generalities



PENSTOCKS & GATES manage water in a Hydro Power Plant



Hydromechanical Equipments - Generalities

Agenda

- Functions of HydroMechanical products
- Overview of typical products
- Trashracks
- Gates
- Penstocks
- Erection tools of a penstock



Functions of HydroMechanical products



➤ SURFACE GATES

- ❑ Protection against flood
- ❑ Control the water level
- ❑ Removing floating material

➤ TRASH RACKS

- ❑ Prevent the entry of foreign bodies into the penstock

➤ WATER INTAKE GATES

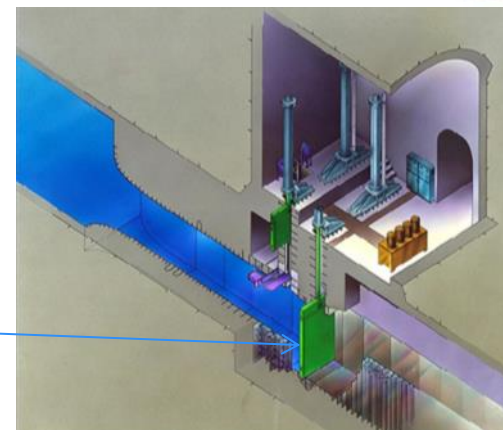
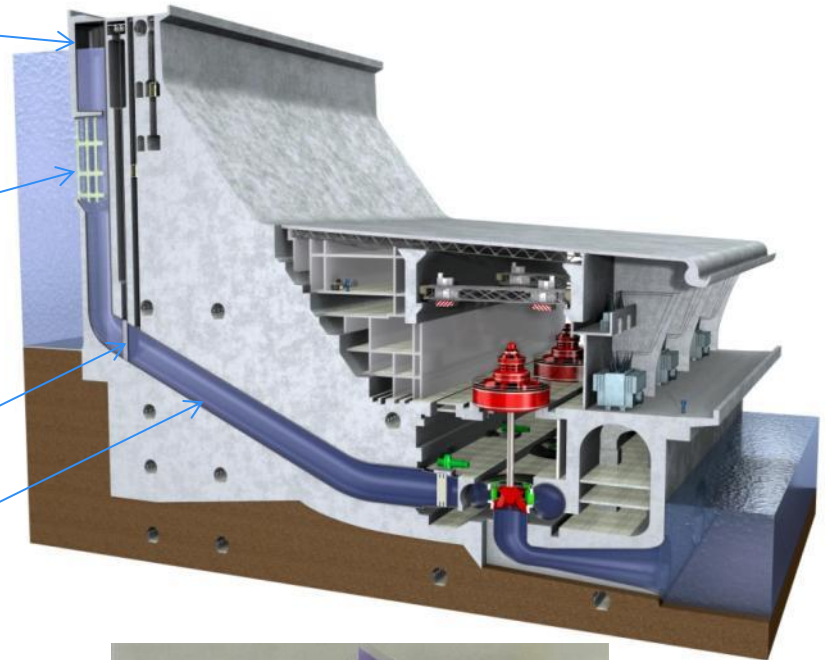
- ❑ Cutting the flow

➤ PENSTOCKS

- ❑ Guiding water to the turbine

➤ BOTTOM GATES

- ❑ Emptying the reservoir



Overview of typical products



Gates located on the dam

➤ SURFACE GATE



➤ INTAKE GATE AND TRASHRACKS

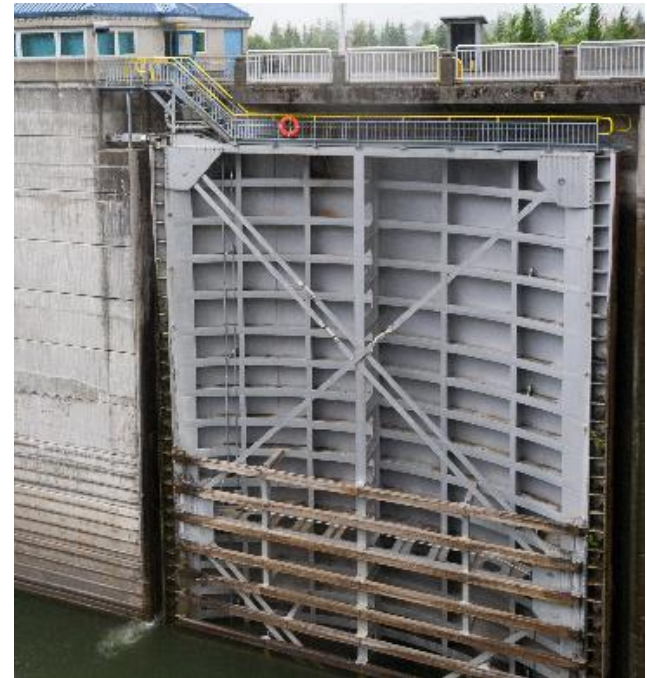


From dam to turbine and from turbine to river

➤ PENSTOCKS



➤ DOWNSTREAM GATES



From dam to river

➤ BOTTOM GATE



From dam to river

➤ BOTTOM GATE



Trashracks



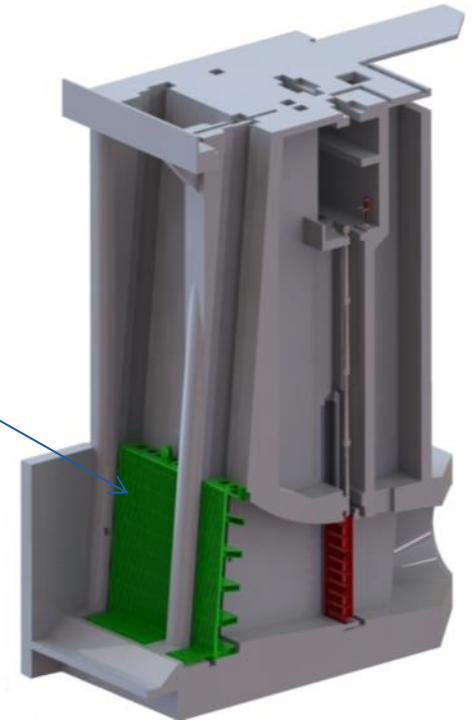
Trashracks

- Location: water intakes
- Function: prevent the entry of foreign bodies that could damage the turbines



- Spacing of the bars

- ❑ Pelton: 30 to 40 mm
- ❑ Kaplan: 100 to 180 mm
- ❑ Francis: less than the spacing of the guide vanes



Trashrack.pps

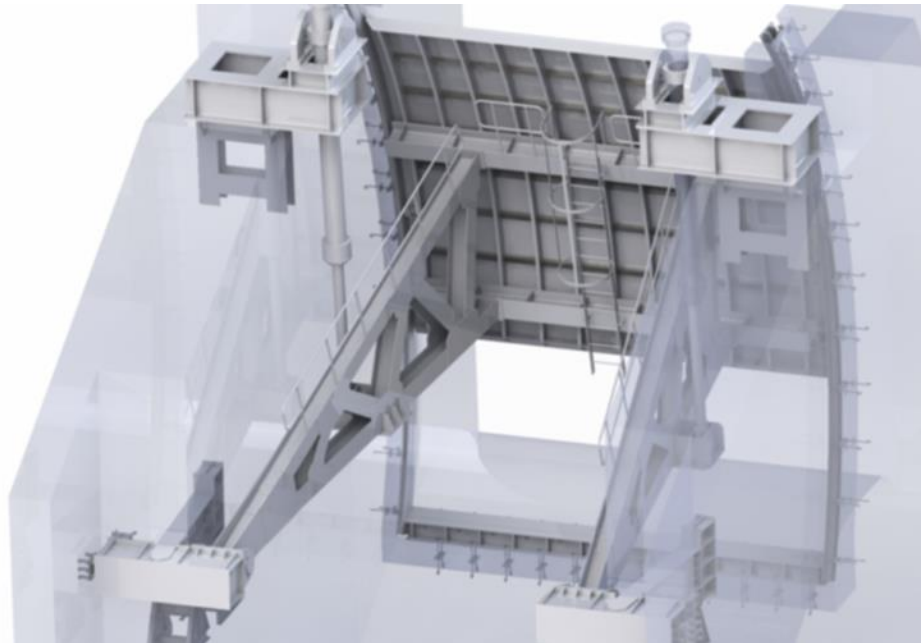
First equipment which protects the turbines

Gates



Gates: definition

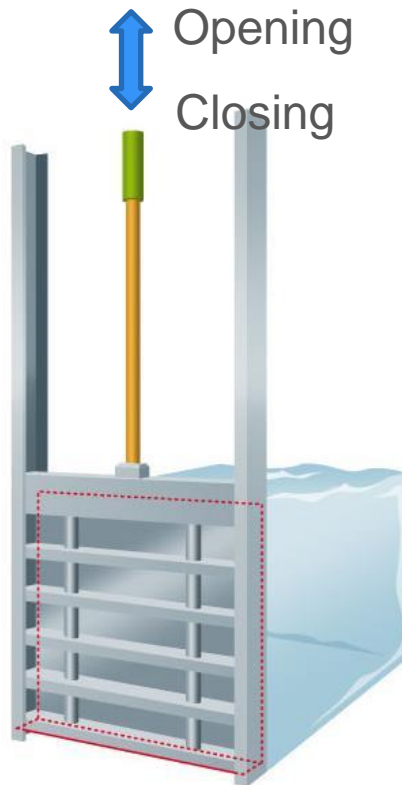
- A gate is a mechanical equipment
 - which cuts the flow → GATE
 - or does not cut the flow (maintenance) → STOPLOG or BULKHEAD



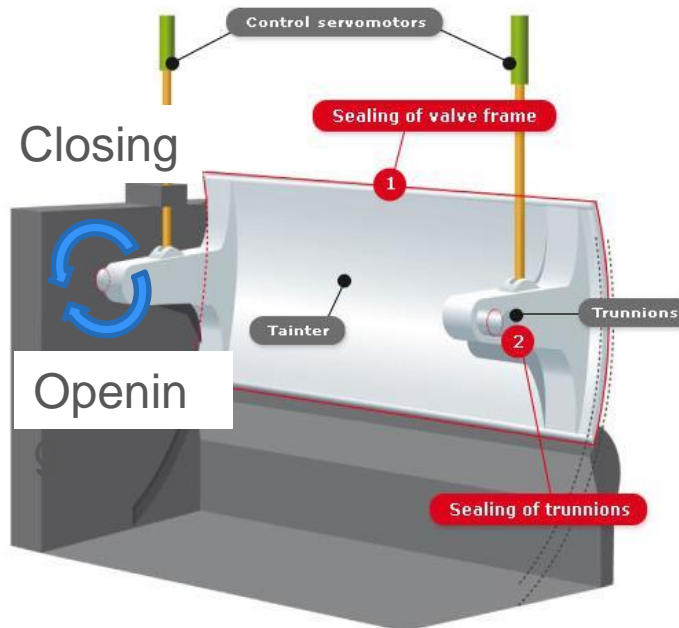
Gates: geometries

➤ FLAT GATES

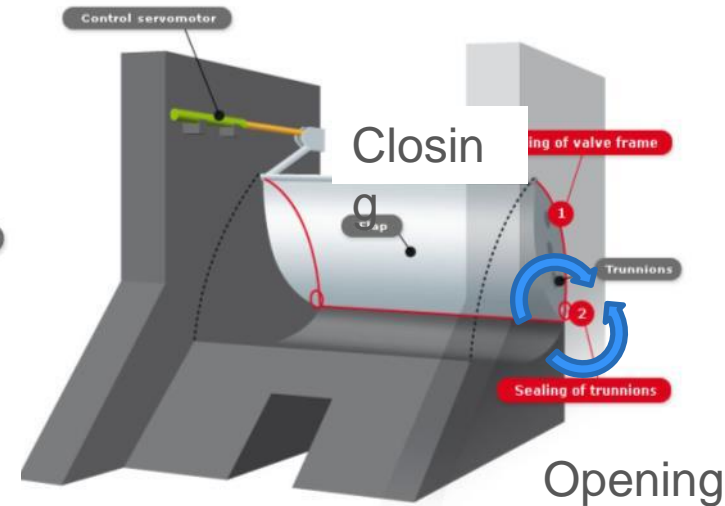
- SLIDING GATE
- ROLLER GATE



➤ RADIAL GATES (TAINTER GATE)



➤ FLAP GATES



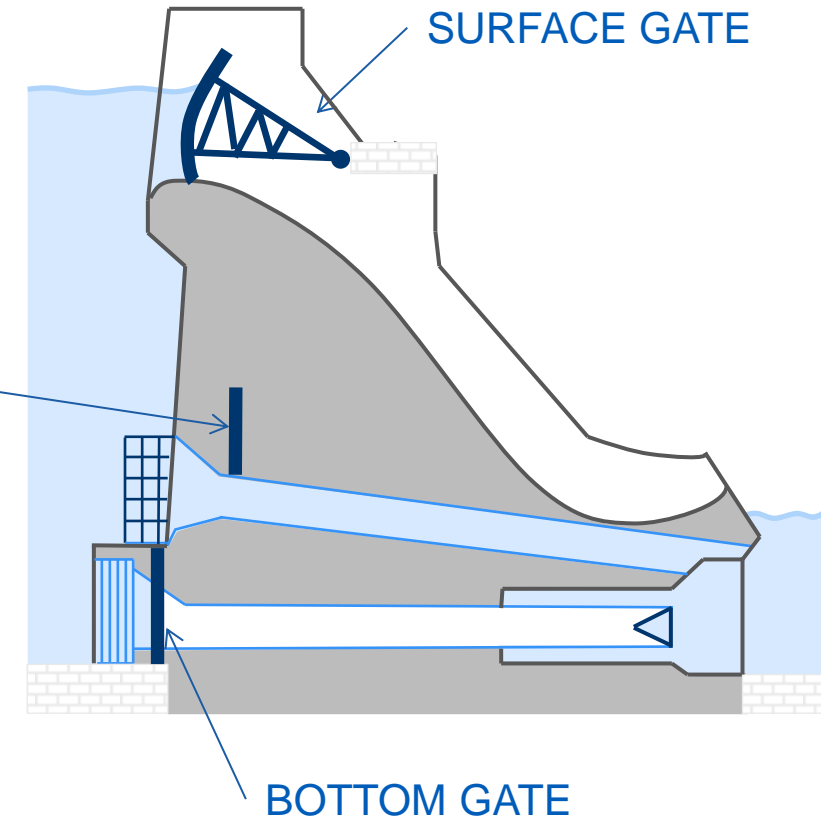
Gates: typical operation conditions of dam gates

➤ SURFACE GATE AND BOTTOM GATE

- ☐ Normal position
 - ☐ Opening
 - ☐ Closure
 - ☐ Security
- closed
- with the water pressure
stop the flow
- ➔ opening and closure

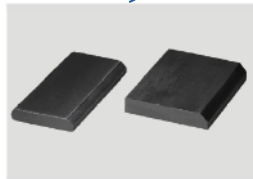
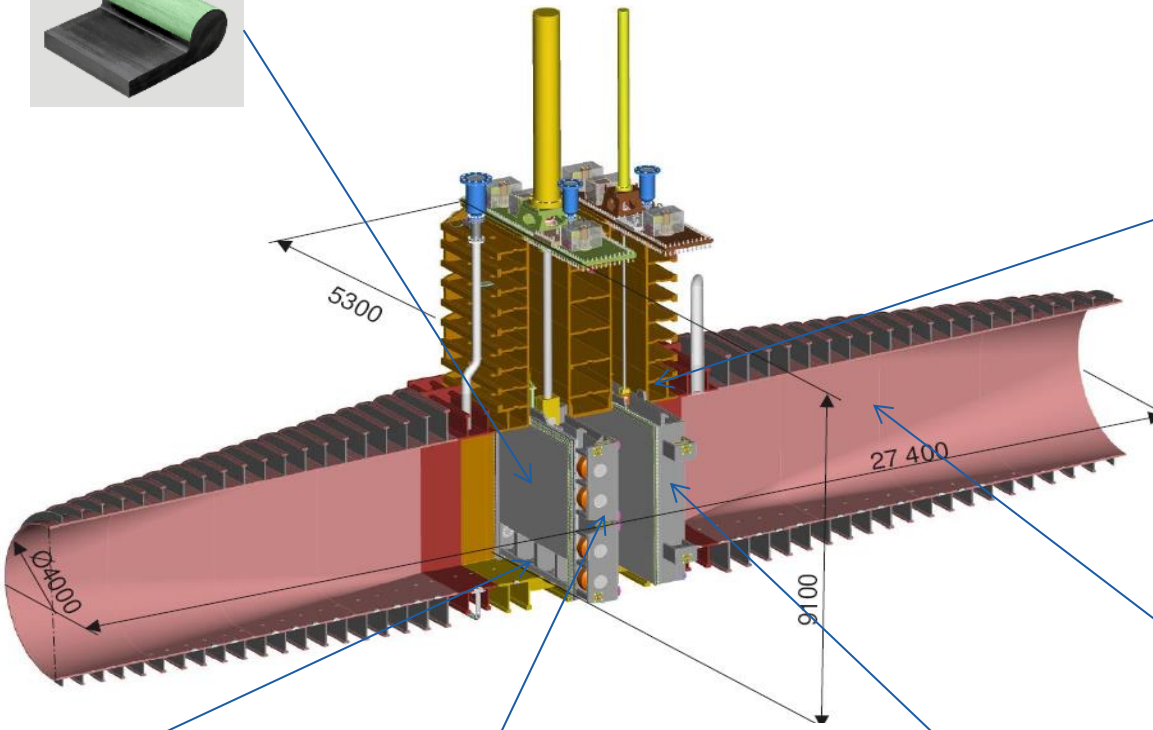
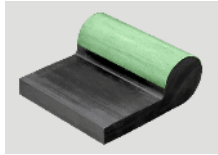
➤ INTAKE GATE

- ☐ Normal position
 - ☐ Opening
 - ☐ Closure
 - ☐ Security
- open
- balanced condition or
crack (partial) opening
- stop the flow
- ➔ closure



TYPICAL LAKE DAM CROSS SECTION

Downstream flat gates (powerhouse protection): 1 rolling gate, 1 sliding gate and their casing



Casing (housing)



Round to square transition

Rolling gate

Sliding gate

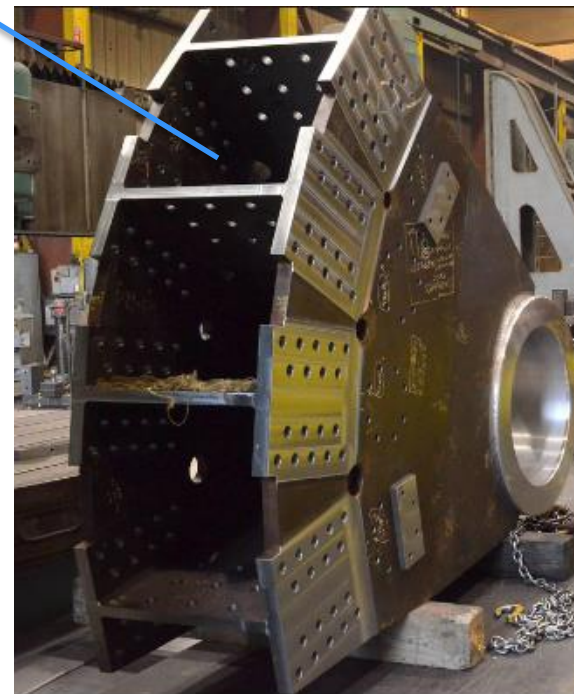
Radial gates: spillway (flood protection)



Skin plate

Arm

Trunnion



Flap gate: spillway (flood protection)



Penstocks



Penstocks: guiding water to turbine under pressure



Penstocks: distributor - bifurcation



Penstocks: accessories

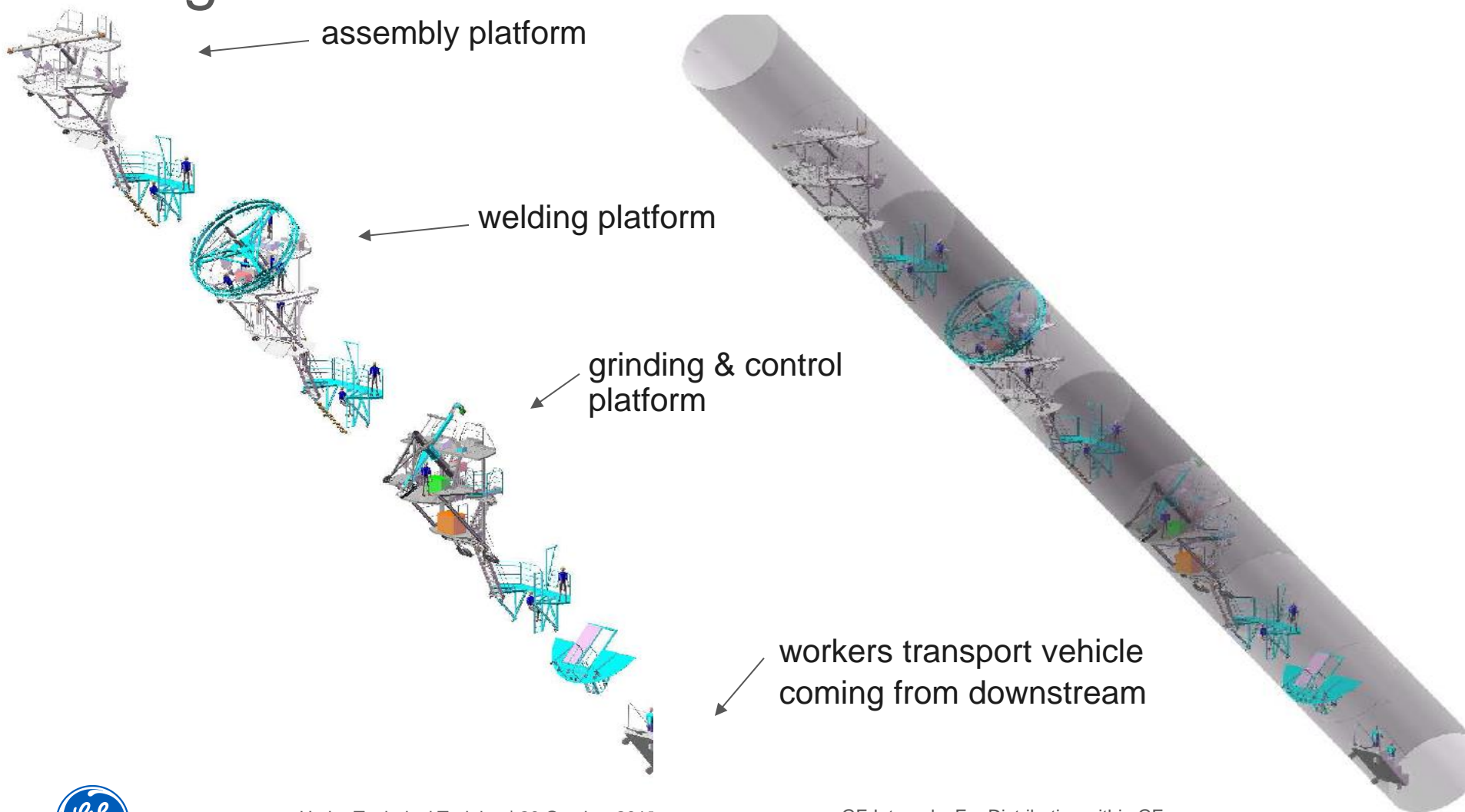


Supports



Manhole

Penstocks: erection methodology for a steel lining



Penstocks: erection methodology for a steel lining



Erection tools of a penstock



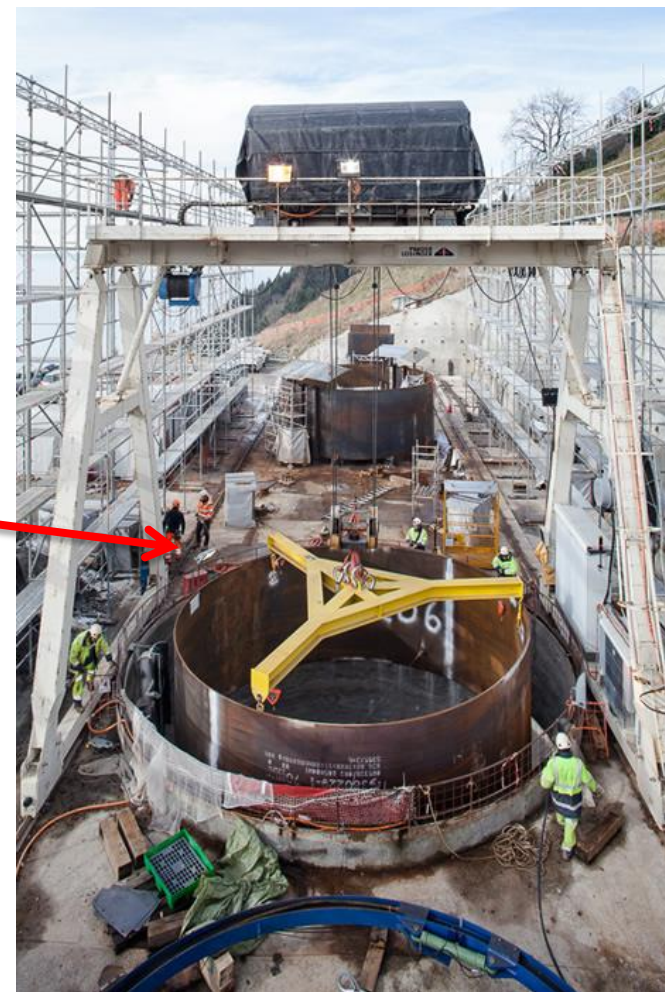
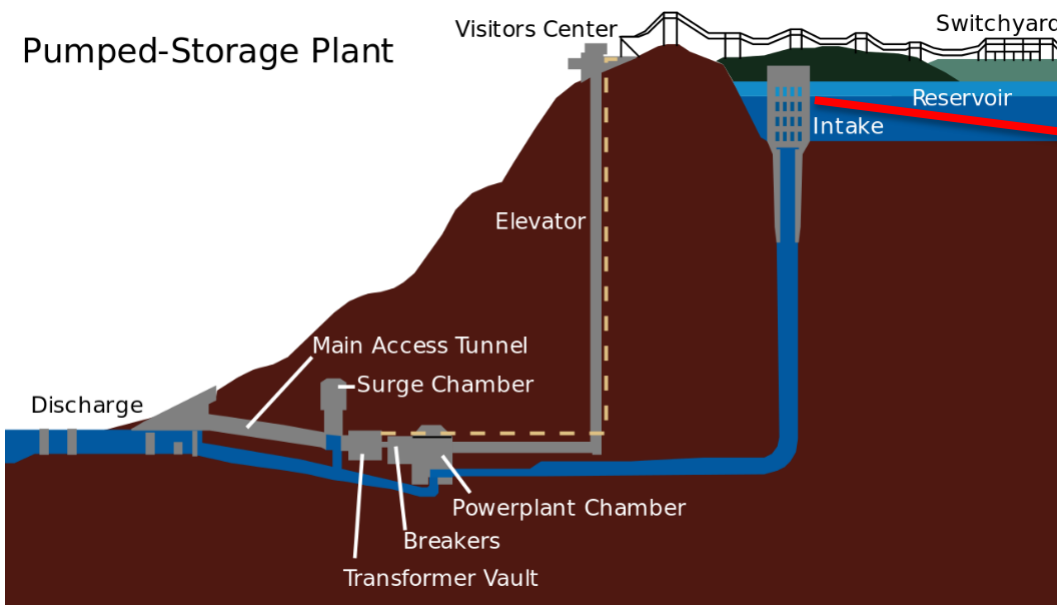
Erection tools of a penstock



On site workshop for a penstock – external / in a cavern



On site workshop for a penstock - top of the surge tank



Transport of gates and special parts



