



HYDRO

YOUR GLOBAL PARTNER FOR HYDRO SOLUTIONS

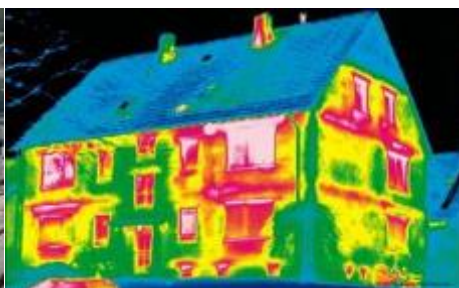
COMPANY PRESENTATION

JUNE 2019

ANDRITZ

ENGINEERED SUCCESS

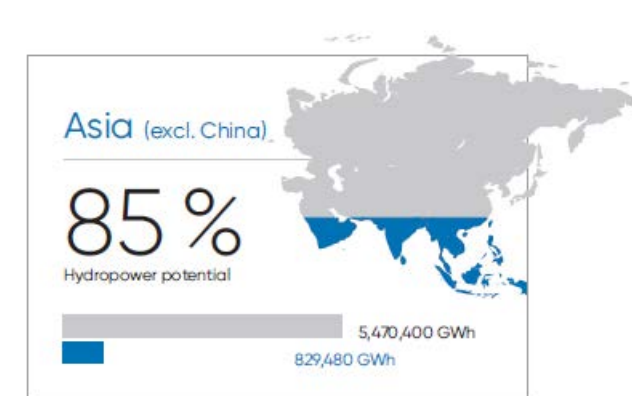
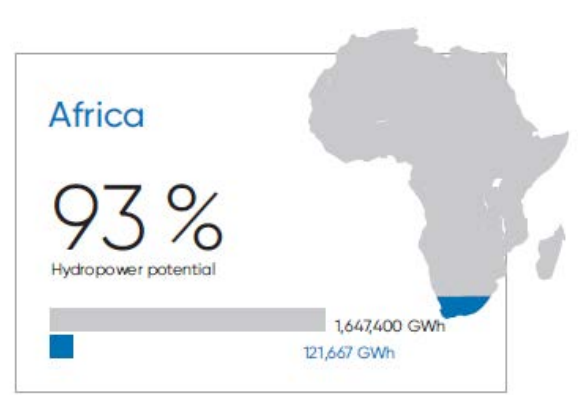
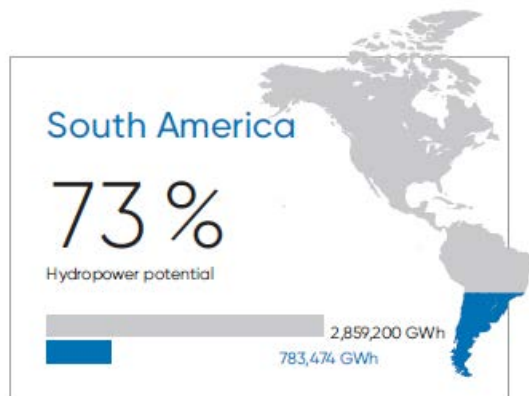
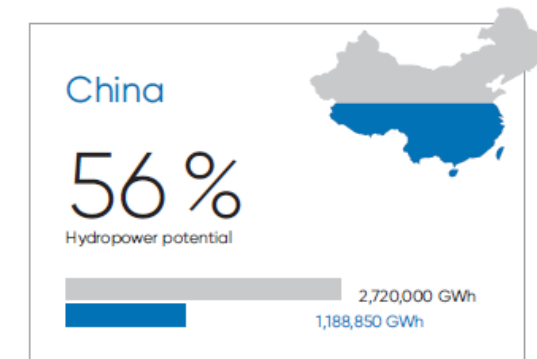
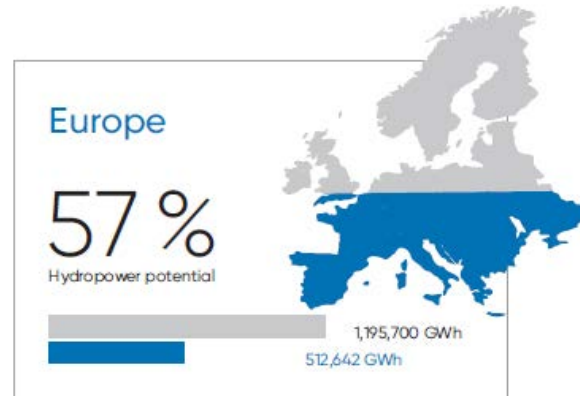
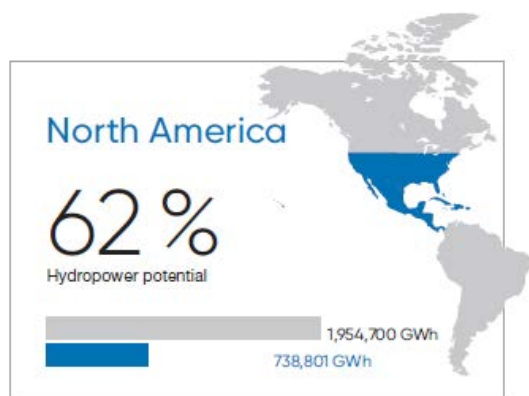
THE MULTIPLE ROLES OF HYDROPOWER IN THE WATER AND ENERGY INDUSTRY



POSSIBILITIES AND OPPORTUNITIES OF THE GLOBAL HYDROPOWER MARKET



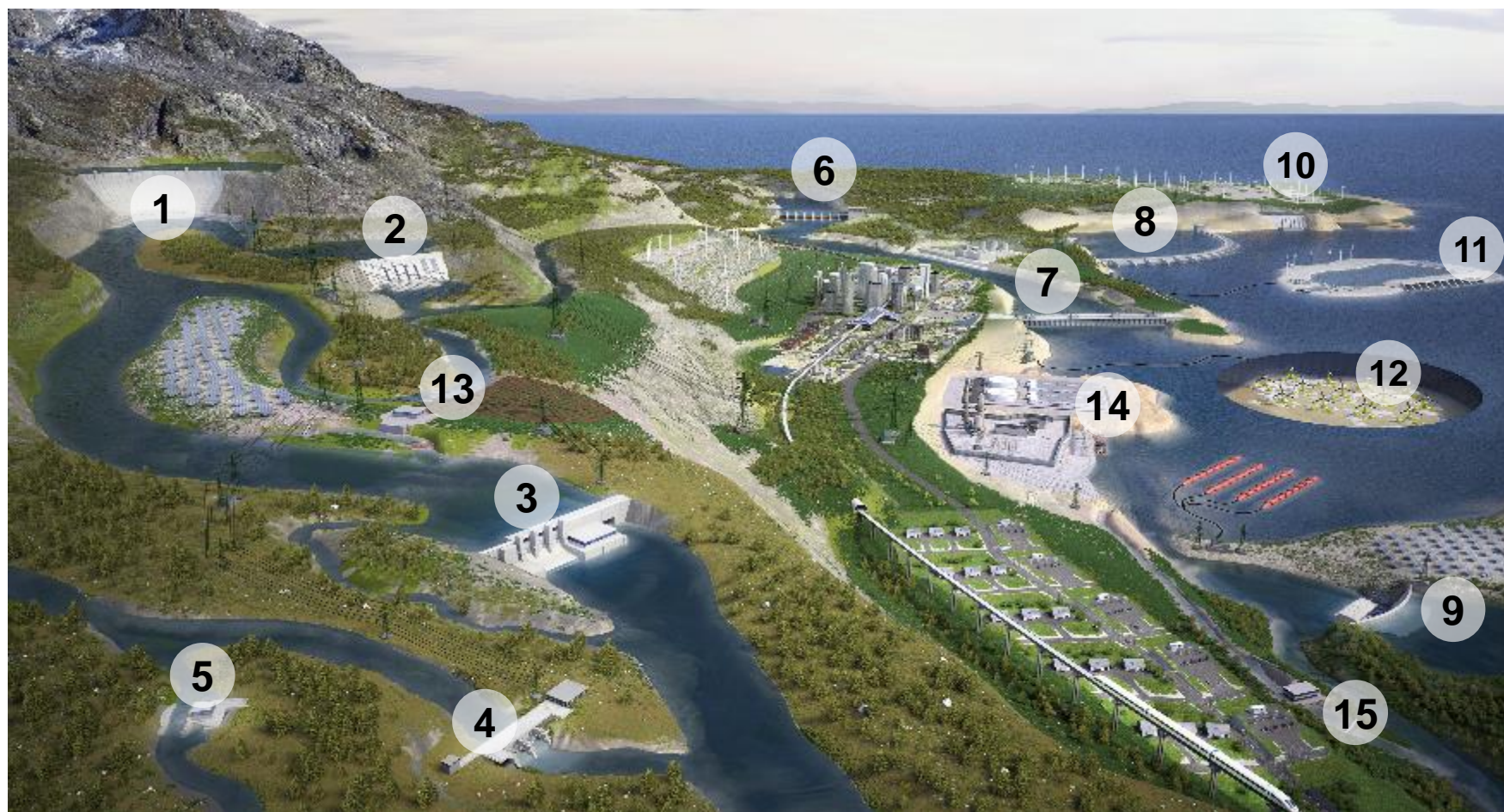
Technically feasible potential: ~ 15,800 TWh/year | Hydropower generation: ~ 4,180 TWh/year



Source: Hydropower & Dams World Atlas, 2018

- Technically feasible hydropower potential (GWh/year)
- Hydropower generation in 2017 (GWh/year)

POWER GENERATION FROM HYDROPOWER IN THE FUTURE - SCENARIO 2050



- 1) Annual storage reservoir
- 2) Short-term storage reservoir
- 3) Conventional river power plant
- 4) Small hydropower plant
- 5) Mini hydropower plant
- 6) Urban river power plant
- 7) Low-head hydropower plant
- 8) Tidal power plant
- 9) Pumped storage power plant (fresh water); energy storage for solar power plant
- 10) Pumped storage power plant (salt water); energy storage for wind park
- 11) Energy island; off-shore pumped storage power plant for wind/solar/tidal
- 12) Tidal stream power array
- 13) Irrigation System
- 14) Desalination plant
- 15) Flood control pump station

COMPREHENSIVE EXPERTISE OF ANDRITZ HYDRO



We are a global supplier of electro-mechanical systems and services (“from water-to-wire”) for hydropower plants and a leader in the world market for hydraulic power generation.

More than 175 years of turbine experience (1839)

Over 31,600 turbines (more than 434,600 MW) installed

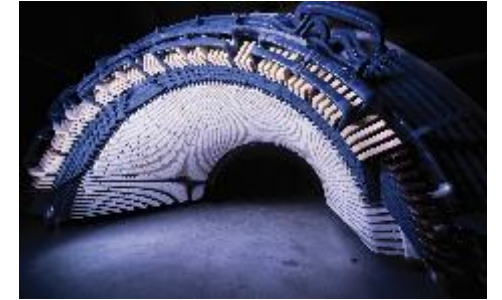
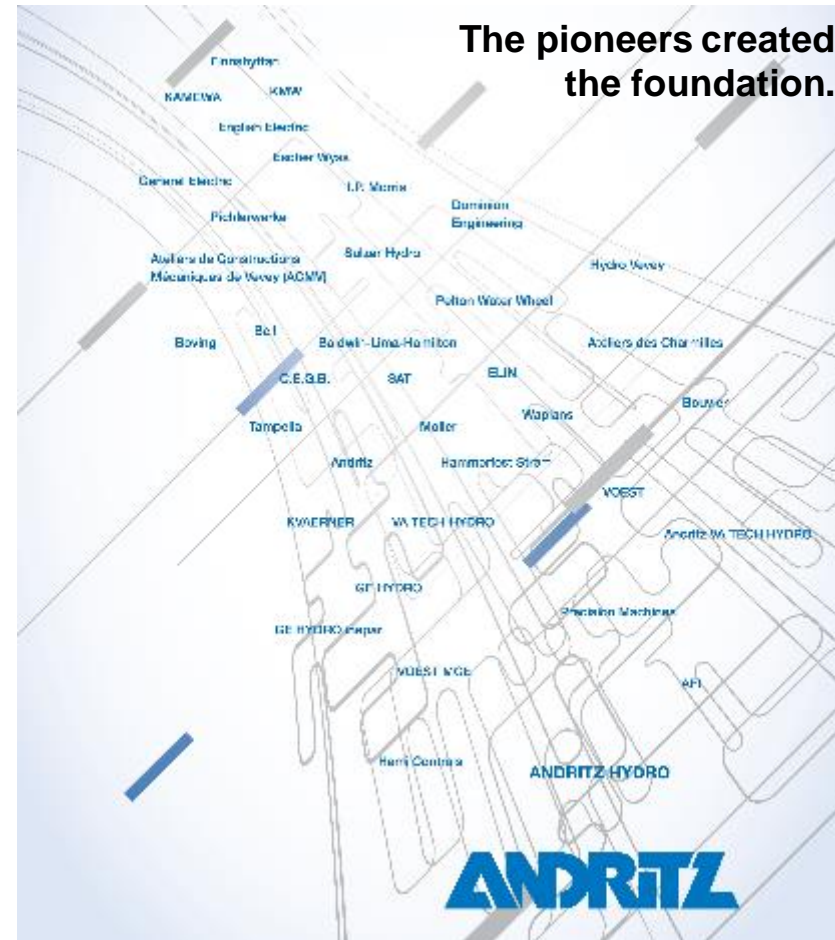
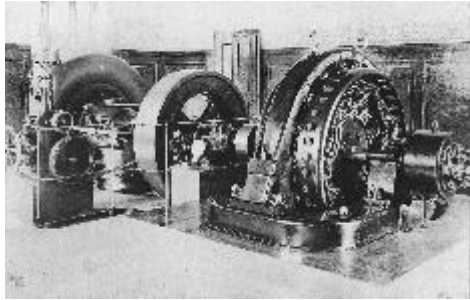
Complete range up to more than 800 MW

Over 120 years electrical equipment experience (1892)

Leading in service and rehabilitation

More than 120 Compact Hydro units per year

FROM THE HISTORIC PIONEERS OF TECHNOLOGY TO A MODERN MARKET LEADER



ANDRITZ HYDRO – FACTS AND FIGURES IN SHORT



LARGE HYDRO



hydro- and electro-mechanical equipment for large turn-key / expansion projects; as well as modification of existing plants

COMPACT HYDRO



world's leading provider for small and mini hydropower plants - providing the full spectrum of electro-mechanical equipment

SERVICE & REHAB



solution oriented state-of-the-art service and rehabilitation solutions to increase profitability and extend plant life span

PUMPS

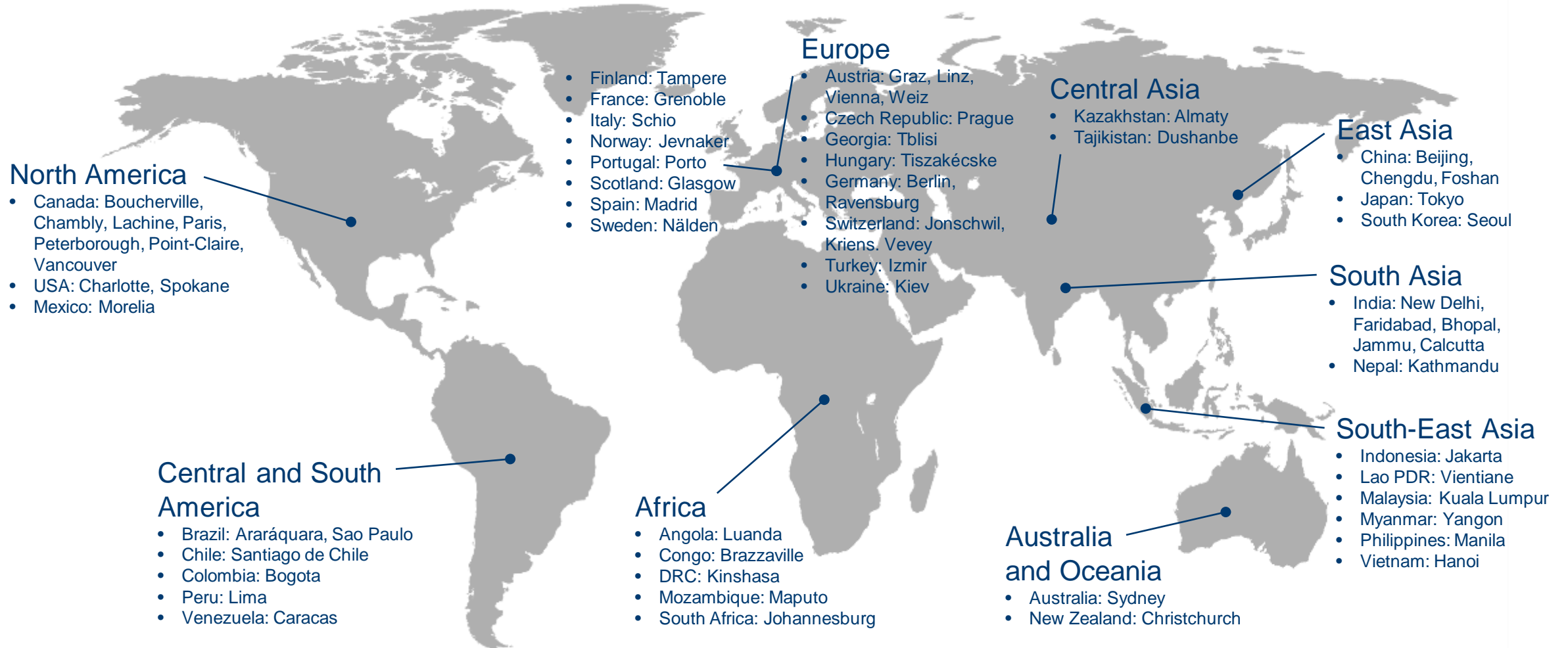


pumps that meet the demand for ever-larger, higher performance units, whether for low flow rates or wear-resistant applications

KEY FINANCIAL FIGURES 2018:

Order intake	1,445.8 MEUR
Order backlog	2,667.9 MEUR
Sales	1,517.5 MEUR
EBITA	113.8 MEUR
Employees (without apprentices)	7,002

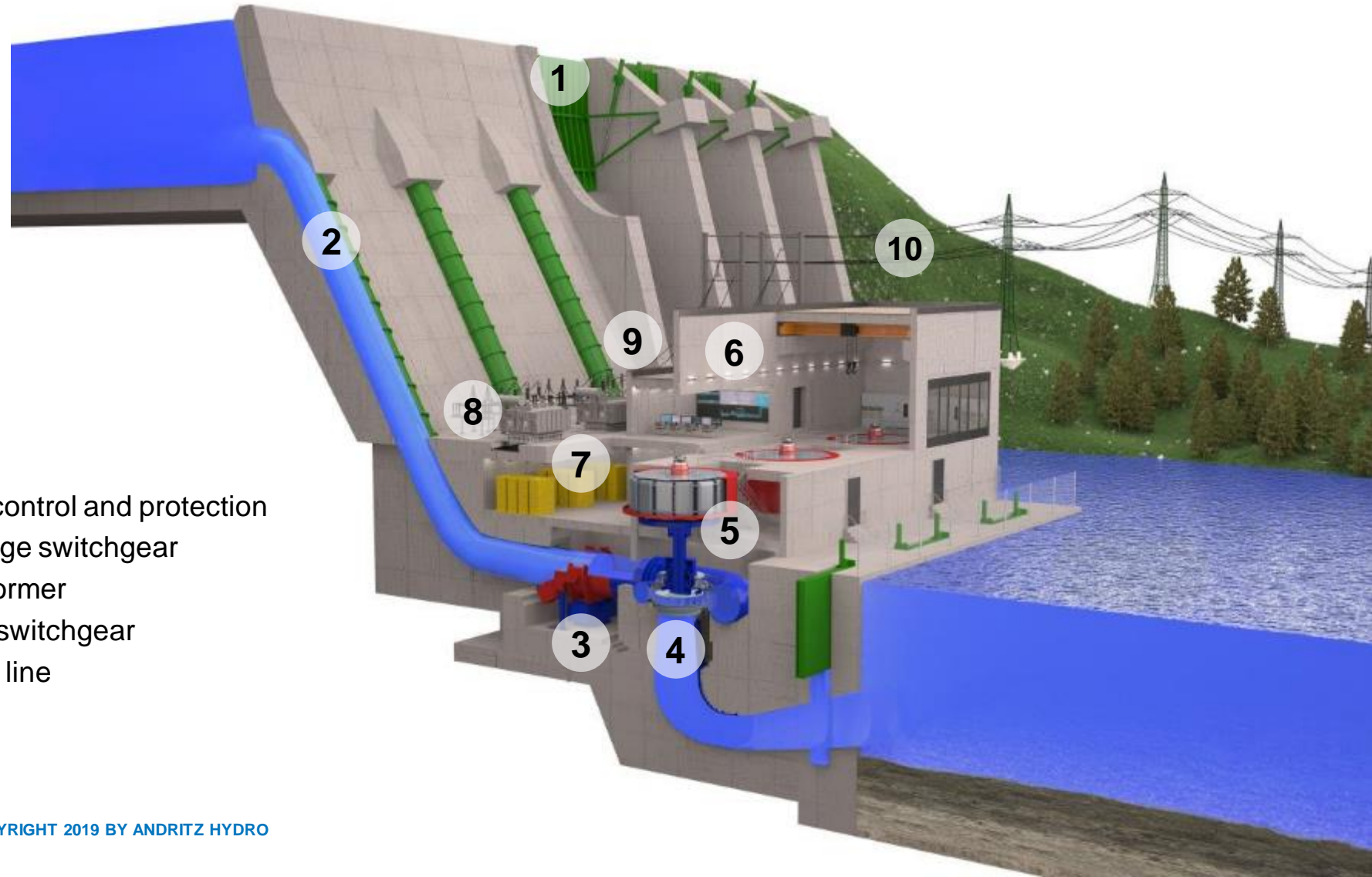
THE GLOBAL PRESENCE OF ANDRITZ HYDRO – CLOSE TO OUR LOCAL CUSTOMER



OUTSTANDING SOLUTION – “FROM WATER-TO-WIRE”



- 1) Gates
- 2) Penstocks
- 3) Inlet valve
- 4) Turbine
- 5) Generator
- 6) Automation, control and protection
- 7) Medium voltage switchgear
- 8) Power transformer
- 9) High voltage switchgear
- 10) Transmission line



LEADING TECHNOLOGY BY GLOBAL RESEARCH AND DEVELOPMENT



- Global test facilities
 - 14 hydraulic test rigs
 - 5 generator laboratories
 - pump laboratory
- Advanced numerical calculation methods
- Highlights
 - Turbine test facilities for all types:
 - High heads up to 2,000m
 - Low head Bulb turbines
 - Pump turbines
 - Generator test fields for:
 - Large rotating electrical machines up to 850 MVA
 - Bearings
 - Electrical insulation



OPTIMIZED SOURCING BY GLOBAL MANUFACTURING CAPABILITIES



- Main Products
 - Hydro-mechanical components
 - Turbines and turbine components
 - Hydro and turbo generators
 - Electrical components
- Locations
 - Europe, Asia, North and South America
- Capacities
 - In-house manufacturing capacity
 - ~ 2,500,000 hours/year
 - On-site assembly capacity
 - ~ 800,000 hours/year
 - Total manufacturing area
 - > 170,000 m²



LARGE HYDROPOWER SOLUTIONS TO SECURE ELECTRICAL ENERGY PRODUCTION



Large Hydro

- Scope:
 - Turnkey electro-mechanical package for hydropower plants “from water-to-wire” (W2W)
 - New hydropower plants
 - Large rehabilitations and upgrades
- Highlights:
 - Market leader in Pelton turbines
 - Bieudron / Switzerland: 423 MW, 1,874 m (2 WR!)
 - Large Francis turbines
 - Guri II / Venezuela: 770 MW
 - Market leader in Bulb turbines
 - Santo Antônio / Brazil: 76.55 MW
 - Large hydro generators
 - Three Gorges / China: 840 MVA



STRONG HYDRO-MECHANICAL STRUCTURES TO GUIDE THE WATER



Penstocks and Gates

- Scope:
 - Steel structures for hydropower plants, water supply and irrigation
 - Penstocks, pipe bridges, steel tunnel linings, manifolds and bifurcations, gates, hydraulic steel constructions
- Highlights:
 - Large gates:
 - Pimental / Brazil
 - Large penstock
 - Tarbela Dam 3 / Pakistan: Ø 13.26 m
 - Large manifold
 - Tarbela Dam 3 / Pakistan: 16 m height
 - High head
 - Cleuson-Dixence / Switzerland: 2,070 m



MODERNIZATION OF HYDROPOWER PLANTS TO EXTEND THE LIFETIME



Service & Rehabilitation

- Scope:
 - Solutions, products and services over the entire life-cycle of a hydropower plant
 - General overhaul, rehabilitation, uprating, upgrading, modernization, plant assessment, technical studies, residual life analysis, risk assessment
- Highlights:
 - 40% uprating
 - Ambuklao/Philippines: + 40% Electricity production
 - Simon Bolivar II / Venezuela: + 400 MW more production
 - Replanting and uprating (unit replacement - 12 by 5)
 - Lochaber / UK: + 20% (5x 17.3 MW)
 - Rehabilitation of largest single phase hydro generator
 - Langenprozelten / Germany: 94 MVA, 34 t pole weight



SECONDARY EQUIPMENT – THE HIDDEN HEART OF THE POWER PLANT

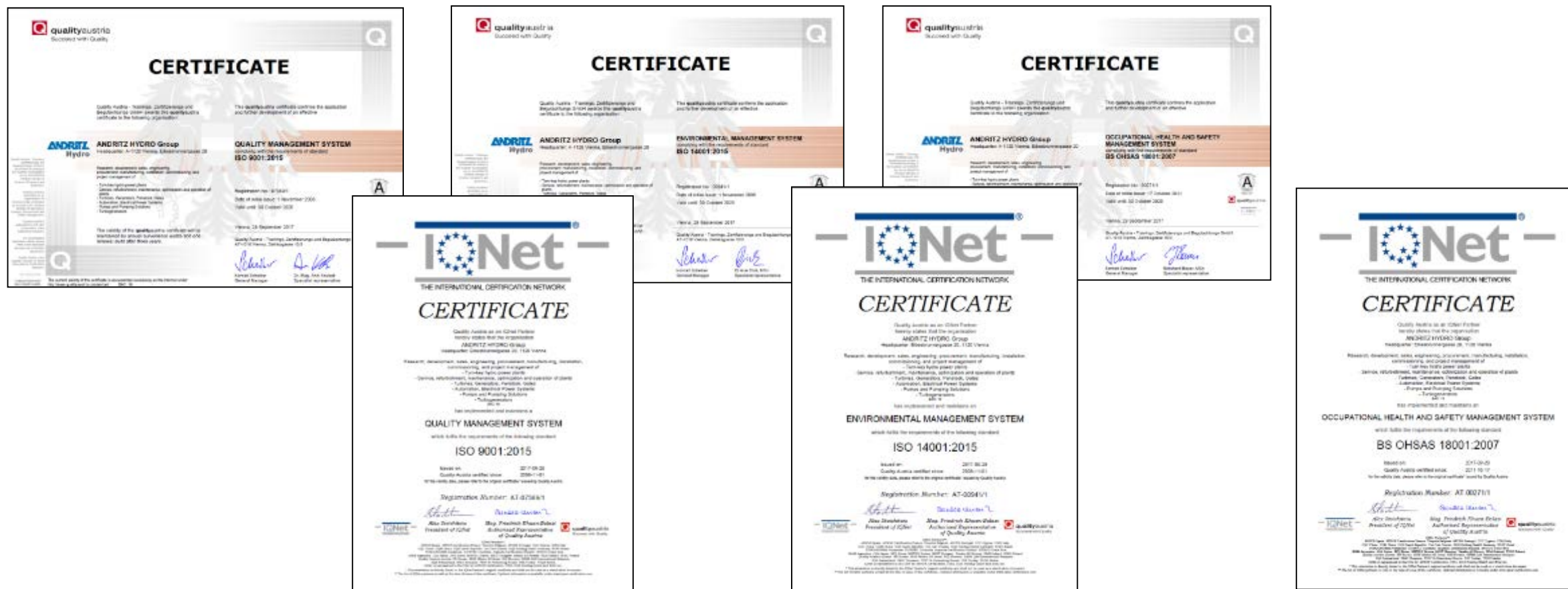


Automation

- Scope:
 - Complete automation solutions for
 - all sizes of power plants
 - new, rehabilitated or upgraded power plants
 - integration of existing systems
- Highlights:
 - Large excitation
 - Simon Bolivar II / Venezuela: field current 3,200 A (generators 10x 850 MVA)
 - Integrated platform HIPASE
 - protection, excitation, turbine governor and synchronization
 - Large dispatch center
 - Landshut / Germany: Regional dispatch center for 110 HPP's of EON
 - Statkraft / Norway: Dispatch center for Norway



ANDRITZ HYDRO - QUALITY YOU CAN RELY ON.



All operational divisions and subsidiaries worldwide are certified according to the standards ISO 9001, ISO 14001 and OHSAS 18001.

EB CAMPBELL – PROJECT SCHEDULE

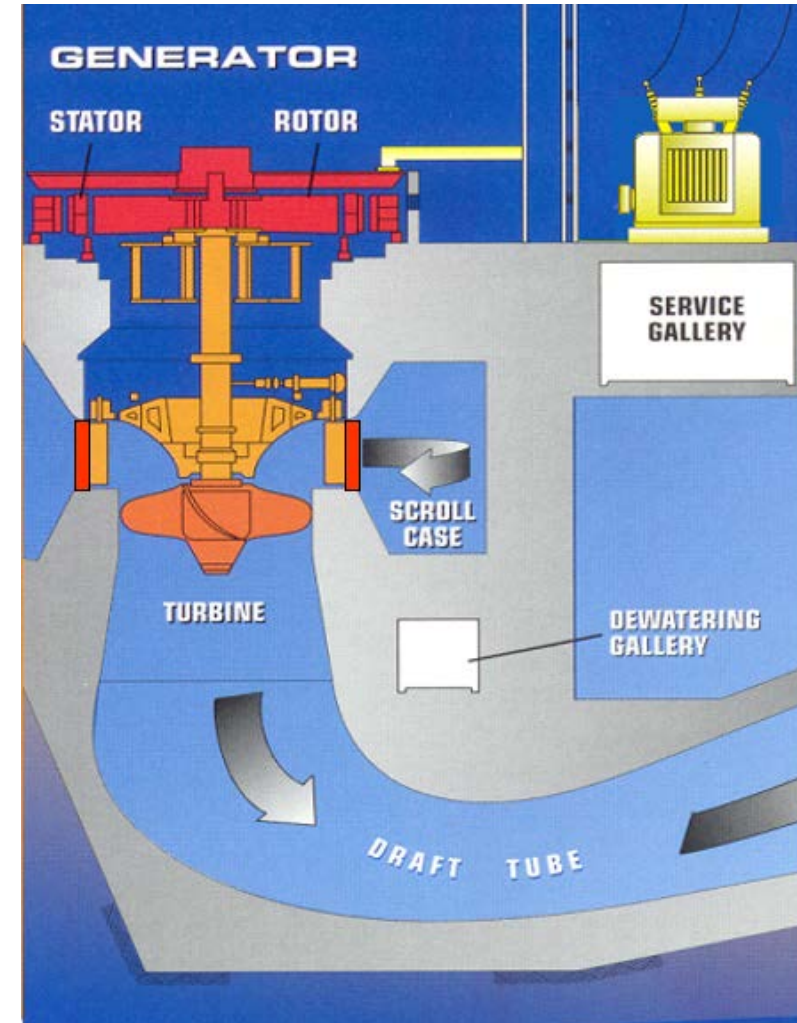


- The Project was approved by SaskPower Board in Dec 2016
- The Turbine Generator Contract was awarded in April 2017- Detail Engineering started
 - The Unit # 3 construction starts in August 2019 and concludes in April 2020
 - The Unit # 4 construction starts in August 2020 and concludes in April 2021
 - The Unit # 6 construction start in August 2021 and concludes in April 2022
 - The Unit # 5 construction start in August 2022 and concludes in April 2023
 - The Unit # 1 construction start in August 2023 and concludes in April 2024
 - The Unit # 2 construction start in August 2024 and concludes in April 2025

EB CAMPBELL SCOPE OF WORK



- New generator winding
- Refurbishment and inspection of generator components
- Rotor pole refurbishment
- Turbine shaft and coupling refurbishment
- New turbine covers and operating mechanism
- New turbine
- Discharge ring and draft tube improvements



SKILLS REQUIREMENTS



- Skills required during construction for Turbine Generator and Head gates work (to be performed by Andritz Hydro Canada Inc.):
 - Millwrights – Between 1 and 18 – Average of 5 – 33 weeks per outage
 - Electricians – Between 1 and 10 – Average of 2 – 16 weeks per outage
 - Pipe Fitters – Between 1 and 4 – Average of 2 – 21 weeks per outage
 - Carpenters – Between 1 and 2 – Average of 1 – 22 weeks per outage
 - Painters – Between 1 and 3 – Average of 1 (very sporadic) – 3 weeks per outage
 - Iron Workers – Between 1 and 8 – Average of 2 – 33 weeks per outage
 - Labourers – Between 1 and 6 - Average of 1 – 37 week per outage
 - Crane Operators – Between 1 or 2 – Average of 1 – 36 weeks per outage

PURCHASING REQUIREMENTS



- Purchased items required during construction for Turbine Generator and Head gates work (to be performed by Andritz Hydro Canada Inc.):
 - Safety supplies
 - Propane
 - Wood
 - Small tools, miscellaneous hardware and small parts
 - Scaffolding supply or services
 - Painting services (on site or off site)
 - NDT services
 - Asbestos abatement services
 - Divers services
 - Mobile crane location



- We are interested in knowing the local skilled workers inventory and local subcontractor that could fulfill portion of the scope to be performed.
- Andritz is committed to hire aboriginals resources throughout the project.

This information will help us to plan our work better and encourage involvement of local resources (Labour and Businesses)

- Questions



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