DOOSAN

DOOSAN ŠKODA POWER s.r.o.

CONTENTS

DOOSAN SKODA POWER AT-A-GLANCE

Top 3
Largest steam turbine provider in the world (1-1000MW), Speed range 1500-12000 rpm

Patented technology
Developed and built for 100+ years

Tailor-made solution for our Clients

~ 920 qualified employees
(44 % with master degree)

54 GW+ to 63 countries provided to date since 1960s

Decarbonization product portfolio
(CHP, Nuclear, Biomass)

~ 40 turbine casings annual capacity

In house R&D

SOLUTION BASED ON UPCOMING MARKET NEEDS

GREEN ENERGY PORTFOLIO

Applications with CO2 neutral / minimal emissions

BIOMASS & WASTE

CCPP WITH HIGH EFFICIENCY

NUCLEAR

CLEAN COAL – USC SOLUTION, AMMONIA COFIRING & CHP

CSP SOLAR

DOOSAN SKODA POWER HISTORY

Skoda Turbines became proud part of Doosan ENERBILITY in **2009**.

Emil Škoda found the engineering workshop

1869

23 MW Reheating Steam Turbine

1911

220 MW Turboset (Nuclear)

1932

USC unit 660 MW

1966

DOOSAN

Doosan acquisition of Skoda

1976

300 MW Bio

1992

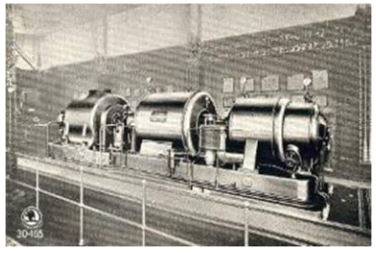
2006

2009

2014

2021

Rateau turbine system replaced by turbines own design Škoda

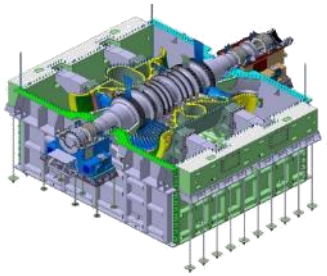


200 MW Turboset

1 000 MW Turboset (Nuclear)

R&D Center of excellence for steam turbine Doosan Group

1 100 MW Turboset (Nuclear)

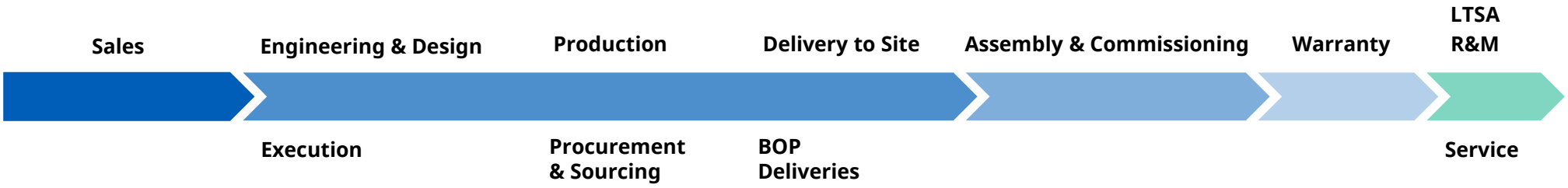


CONTENTS

3. BUSINESS PORTFOLIO

END-TO-END SERVICE DELIVERY

Business proces overview



TURBOGENERATOR DELIVERY AND PACKAGE SERVICES

Complete machine hall / turbine island
EP/EPC solutions

Turbogenerator & related
BOP/auxiliaries delivery

SERVICES
(OWN AND NON-OEM)

Service activities
(including LTSA or R&M)

STEAM TURBINE AFTERMARKET / SERVICE PORTFOLIO

All our products are supported by a wide range of services through our advanced technologies, enabling us to offer complete life cycle care for their turbine.

POWER SERVICE

- Service expertise for OEM & Non-OEM Equipment
- Repairs
- Field Services
- Unplanned Emergency Services
- Spare parts delivery
- On-site machining
- Rotor High Speed Balancing
- Other services
- Gas Turbines Service

ENGINEERING SERVICE

- Troubleshooting
- 3D Scanning
- Reverse engineering
- Remanufacturing
- Technical Advisory
- Residual Lifetime Assessment
- Steam path audits
- Performance Assessment
- Turbogenerator diagnostics
- Machine hall inspections
- Conventional NDT

RETROFIT & MODERNIZATION

- OEM retrofits
- Non OEM modernization
- Lifetime extension
- Availability improvement
- Reliability improvement
- Thermodynamic efficiency improvement
- Maintenance cost reduction
- Feasibility studies
- TG sets to Machine hall

LTSA

- 24/7 Emergency Hot-line
- Remote Monitoring
- Daily/Predictive Maintenance programs
- Spare parts supply management
- Availability and performance guarantee
- Periodical reporting

CONTENTS

MANUFACTURING EXCELLENCE

Internationally respected and certified manufacturing facility.

1
- Centre of excellence for turbine R&D
  - Direct access to steam

ALL IN ONE MANUFACTURING AND DESIGN

2
- Heavy manufacturing (turbine casings)
- Rotor welding stand

3
- Turbine component machining
- Turbine blade machining
- Rotor machining and assembly

4
- Final assembly and expedition

5
- Turbine balancing tunnel

6
- Engineering, administration

DOOSAN SKODA POWER AT-A-GLANCE

Czech Republic – cost competitive country

Modern Machine hall with latest technology

Georg Ultraturn

Skilled and experienced personnel

Balancing tunnel

Rotor welding

NDT testing, pressure testing

Outstanding safety record

CASINGS PRODUCTION

Gantry milling machine Waldrich Coburg PMC 5000 AG

- table 17 500 x 4 000 mm
- profile 4 850 x 4 000 mm

WELDED ROTORS PRODUCTION

Polysude rotor welding tower, rotating heat treatment oven

- Up to 135 tons and length 12 m
- Welded dia from 400 mm up to 2 200 mm and thicknes up to 135 mm
- Vertical position of rotor on rotating table
- Horizontal welding by 2 narrow gap torches TIG HOT WIRE
- Induction preheating
- Horizontal rotating electrical furnace for stress relieving and stability test

TURBINE BLADES PRODUCTION

Small and medium blades manufacture

- 4x g – Mill 550, 5 axis
- Tajmac H 63, 4 axis
- 2x Variaxis 730-5X II, 5 axis
- 4-axis and 5-axis CNC machining centers for turbine blades manufacture and also for another serial production

TURBINE ROTORS PRODUCTION

Rotor machining center GEORG ULTRATURN

- Complete rotor machining (turning, milling, drilling, grinding, measuring)
- Max. rotor diameter 2,2m
- Max. rotor lenght 12m
- Max. rotor weight 135t

CHECK ASSEMBLY OF TURBINES

Turbine assembly workstations

- 6 possible places for turbine assembly
- Flow part alignment by laser, shaft or wire
- Testing of valves and oil systems
- Pressure test bed available in house

ROTOR BALANCING

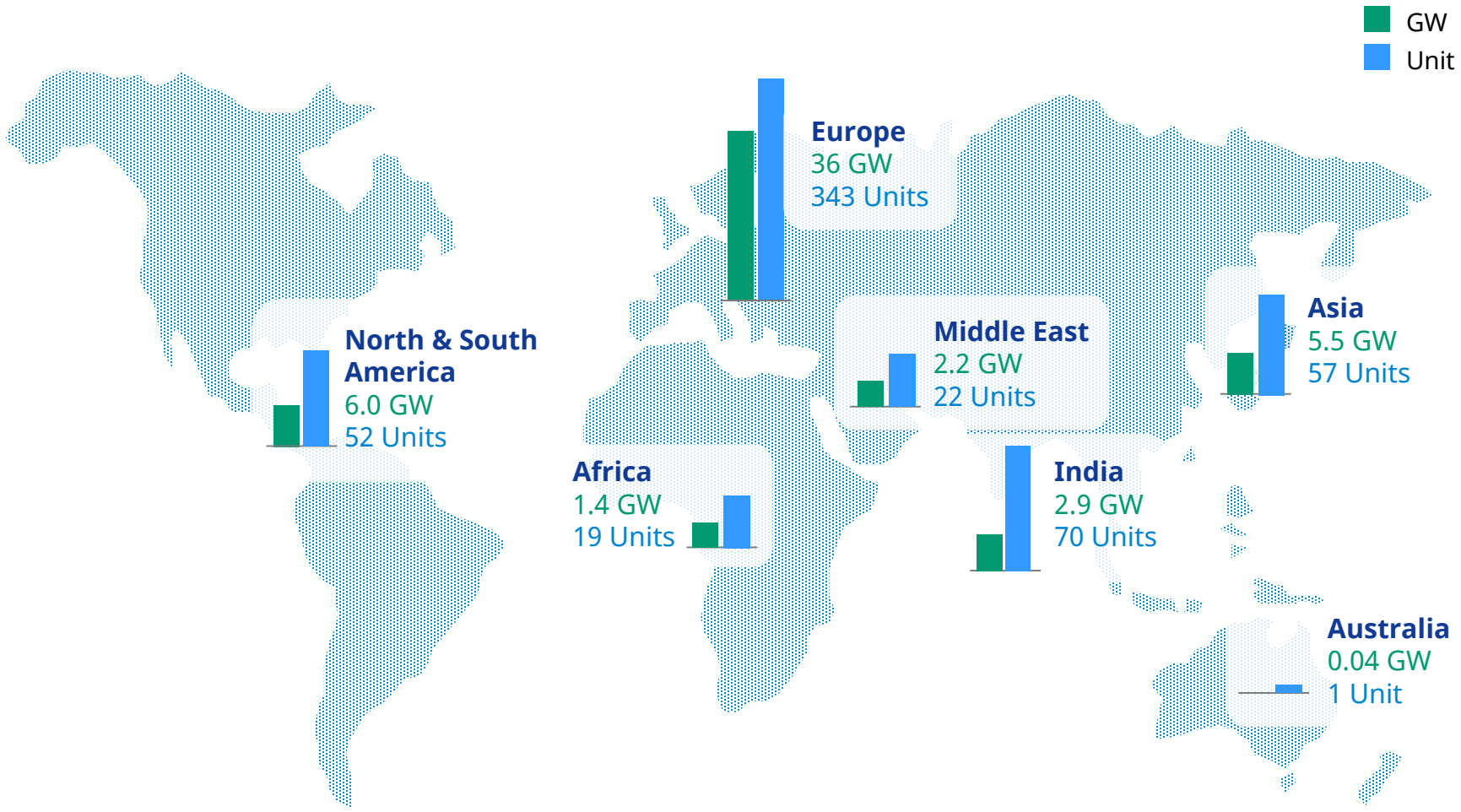
Vacuum balancing and over speed tests tunnel Schenck:

- 10 000 rev/min
- weight 150 t
- length 19 m
- max. dia 4,7 m

CONTENTS

WORLDWIDE FOOTPRINT

Total Record Since 1960s ~ 54 GW = 564 Units = 63 Countries



FIRST CSP UNIT SUPPLIED BY DOOSAN IN CHILE

PROJECT SITE

PROJECT HIGHLIGHTS

- Project name : Atacama I
- Power capacity : 110 MW x 1 unit
- Country : Chile
- Customer : Abengoa / Cerro Dominador
- Plant type : Concentrated solar power
- Steam turbine model : DST-S10
- Steam turbine no. of casing : 2 Casings
- Generator model : DGen-A
- Steam parameter : 130 bar / 550 °C
- Supply scheme : STG equipment
- Commercial operation date : 2021
- Note : Largest CSP project of Doosan Skoda Power

LARGEST FULL SPEED NUCLEAR UNIT IN CZECH REPUBLIC

PROJECT SITE

PROJECT HIGHLIGHTS

- Project name : Temelin Unit 1&2 Nuclear Power Plant
- Power capacity : 1,000 MW x 2
- Country : Czech Republic
- Developer / EPC : CEZ / Skoda Praha Invest
- Plant type : Nuclear power plant
- Steam turbine model : DST-NF
- Steam turbine no. of casing : 4 Casings
- Generator model : DGen-N
- Steam parameter : 58 bar / 274 °C
- Supply scheme : STG equipment
- Commercial operation date : 2003
- Note : 6 more full speed nuclear units supplied by Doosan

COMBINED CYCLE UNIT IN COMBINATION WITH H CLASS GAS TURBINE

PROJECT SITE

PROJECT HIGHLIGHTS

• Project name	: Empalme II CCPP
• Power capacity (Plant / STG)	: 791 MW / 300 MW x 1 unit
• Country	: Mexico
• Developer / EPC	: CFE / Duro Felguera + Elecnor
• Plant type	: Combined cycle
• Steam turbine model	: DST-S30
• Steam turbine no. of casing	: 3 Casings
• Generator model	: DGen-H
• Steam parameter	: 130 bar / 600 °C / 610 °C
• Supply scheme	: STG equipment
• Commercial operation date	: 2019
• Note	: Supplied STG unit for Empalme power plant utilized H class GT

LARGEST BIOMASS UNIT IN THE WORLD

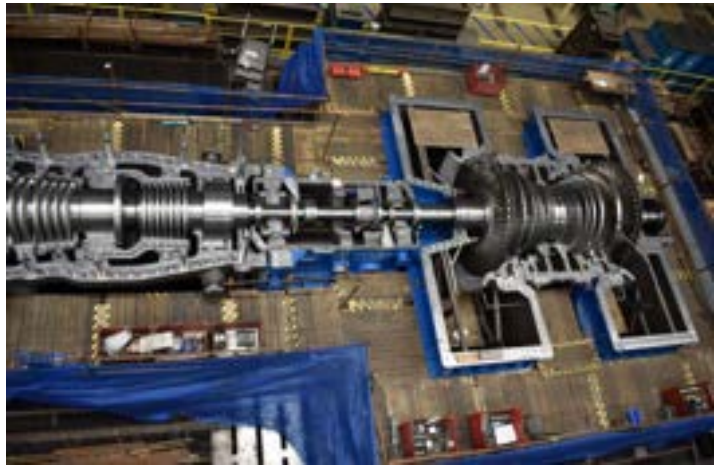
PROJECT SITE

PROJECT HIGHLIGHTS

- Project name : TEES Renewable Energy Plant
- Power capacity : 299 MW x 1 unit
- Country : United Kingdom
- Customer : Samsung C&T + Tecnicas Reunidas
- Plant type : Biomass
- Steam turbine model : DST-S20
- Steam turbine no. of casing : 2 Casings
- Generator model : DGen-H
- Steam parameter : 170 bar / 565 °C / 565 °C
- Supply scheme : Full EPC
- Commercial operation date : 2022
- Note : Largest Biomass project in the world

LARGEST WOOD PROCESSING PLANT IN THE NORTHERN HEMISPHERE

PROJECT SITE



PROJECT HIGHLIGHTS

- Project name : KEMI
- Power capacity : 270 MW x 1 unit
- Country : Finland
- Customer : Metsä Fibre
- Plant type : Biomass
- ST model : DST-S20
- ST no. of casings : 2 Casings
- Steam parameter : 104bar / 505°C
- Project Status : In Production
- Highlights : Largest Wood processing plant in Northern Hemisphere

  1.5 million tones capacity

  2.0 TWh renewable electricity per year

  250 % electricity self-sufficiency

HEAVIEST TURBINE TRANSPORT IN ASSEMBLY STATE

PROJECT SITE

PROJECT HIGHLIGHTS

- Project name : Okpai Phase II
- Power capacity : 150 MW x 1 unit
- Country : Nigeria
- Customer : Servizi Energia Italia
- Plant type : Waste incinerator plant
- ST model : DST-S10-5CA1
- ST no. of casings : 1 Casings
- Steam parameter : 78bar / 500°C
- Project Status : In execution
- Highlights : Heaviest turbine transport

  : 450t of transport set – L: 87m, H: 6,5m, W:6,5m

  (incl. 200t turbine, 70t special frame)

  : From Pilsen to Warri in Nigeria via Lovosice and Hamburg

CONTENTS

DOOSAN ŠKODA POWER: A RESPONSIBLE NEIGHBOR IN PLZEN, CZECH REPUBLIC

Energizing Communities,
Empowering Lives

GENERAL PARTNER OF FC VICTORIA PLZEŇ

COLLABORATION WITH UNIVERSITIES

REMARKABLE EMPLOYER IN THE REGION

CARBON FOOTPRINT REDUCTION

SUPPORT FOR TECHNICAL EDUCATION

DOOSAN

LET´S STAY IN TOUCH!

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