

**SERVING
POWER INDUSTRY**



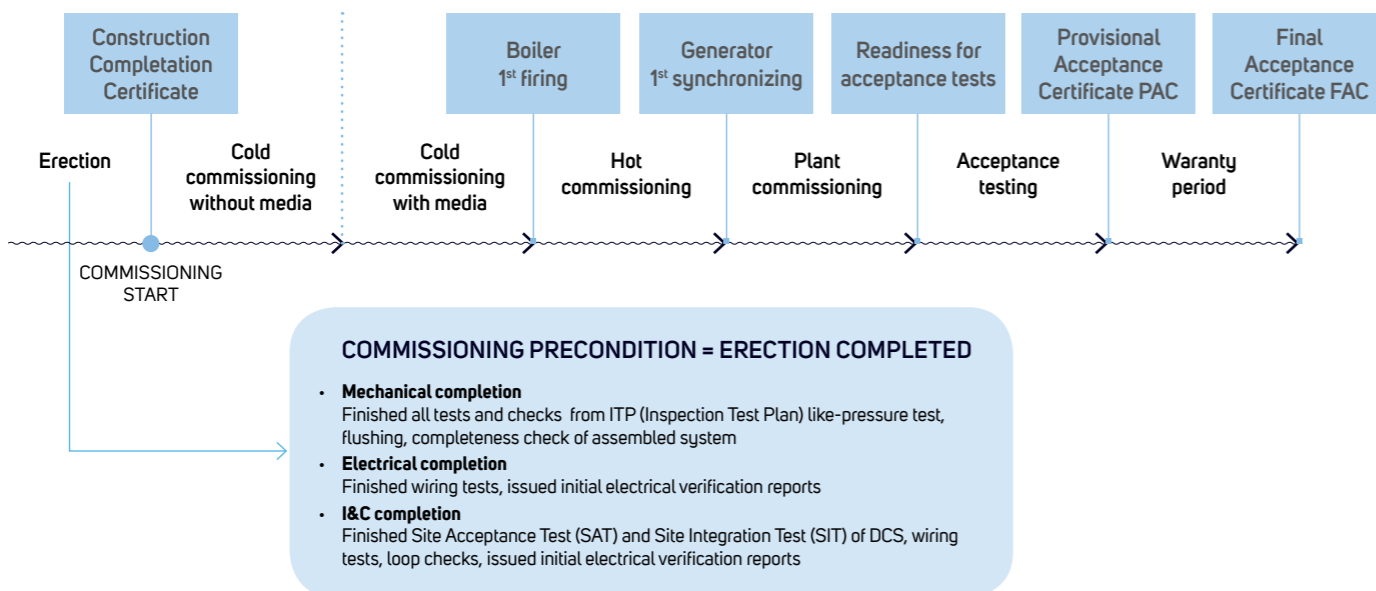
**COMMISSIONING
SERVICES**



WE ARE THE LARGEST CZECH EPC CONTRACTOR ABLE TO DELIVER POWER GENERATION PROJECTS ON TURNKEY BASIS. WE PROVIDE COMPLEX COMMISSIONING SERVICES CONTAINING BOTH COMMISSIONING ON SITE AND PREPARATION OF COMMISSIONING DOCUMENTATION.

4x 200 MW Thermal Coal Power Plant Tušimice, Czech Republic

COMMISSIONING PROCEDURE ON SITE



COMMISSIONING PHASES DESCRIPTION

Cold commissioning	Hot commissioning	Plant commissioning	Acceptance testing	Warranty period
Commissioning of equipment and single process systems / function groups	Commissioning of multiple process systems together, first steam to the turbine	Commissioning of overall plant, operation optimizing	Verification of plant design	Plant operation supervision
Cold Com. without Media <ul style="list-style-type: none"> System checks-completion of a single erected system Turning tests Actuators and valve adjustments Uncoupled motors runs Interlock checks Algorithms checks Cold Com. with Media <ul style="list-style-type: none"> Tests of single process systems / function groups operation with media Cleaning and flushing of main systems Chemical cleaning 	<ul style="list-style-type: none"> Boiler protection tests First firing and refractory drying Steam turbine on turning gear Steam blow Turbine protection tests Bypass operation to achieve steam purity First steam to turbine - run up to rated speed, over speed tests Generator protection tests 	<ul style="list-style-type: none"> First synchronization Power output successive increasing up to 100 % load Firing and plant control loops adjustment and optimizing Run-down operation-load limiting-slow load reduction Run-back operation-quick load reduction after a failure Main pump stand by tests Load rejection tests 	<ul style="list-style-type: none"> Trial Run Grid Code Test Performance Test 	<ul style="list-style-type: none"> Surveillance of plant routine operation Fine tuning of plant control loops Technical assistance to solve any plant failures

OUR RANGE OF SERVICES

COMMISSIONING DOCUMENTATION ELABORATION

Design, Programs and Manuals

- Commissioning Program
 - > Cold and Hot Commissioning
 - > Plant Commissioning
 - > Acceptance Testing
- Trail Run Program
- Performance Tests Procedure
- Grid Code Tests Procedure (coordination with local authorized entity)
- Overall Plant Operation Manual
- Chemical Cleaning Design
- Steam Blow Design
- Review of vendor commissioning documentation
- Training Program / Manual

Site Tests Documentation

- Test Protocols

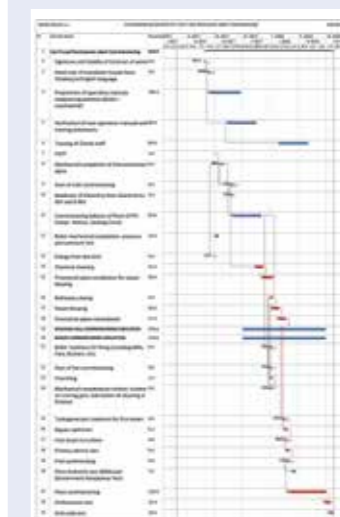


- Commissioning Logbook
- Energization and De-energization Logbook
- Simulation Logbook
- Failure Logbook
- Work Permit Logbook

COMMISSIONING ACTIVITIES ON SITE

Commissioning Management

Commissioning activities are coordinated and managed by ŠKODA PRAHA. Equipment and process systems are operated and tested by others under ŠKODA PRAHA supervision.

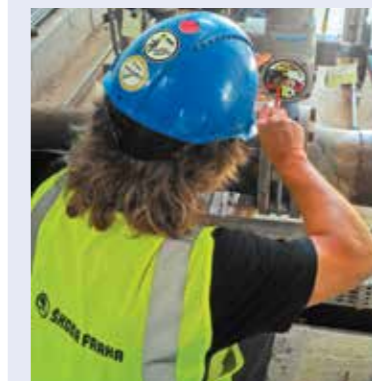


ŠKODA PRAHA staff:

- Commissioning manager
- Shift Charge engineers
- Specialists
 - > mechanical
 - > process
 - > electrical
 - > I&C
 - > chemistry

Commissioning Execution

Commissioning activities are executed by ŠKODA PRAHA. Equipment and process systems are operated and tested by ŠKODA PRAHA staff.



Limited participation of vendor commissioning engineers on site.

ŠKODA PRAHA provides specialist for all different disciplines: mechanical and process, electrical, I&C and chemistry.

Training of Client's Staff

- Classroom training
- On job training

Commissioning Period

Commissioning activities of ŠKODA PRAHA staff start after mechanical, electrical and I&C completion and cover the period till Provisional Acceptance Certificate or till Final Acceptance Certificate of the plant.

MAIN REFERENCES



1 x 330MW THERMAL COAL POWER PLANT CAN (TURKEY) – PLANT RELOCATION

Nominal Output	1 x 330 MWe
Steam pressure	18,4/3,8 MPa
Steam temperature	535/535°C
Live Steam Quantity	928 t/h
Plant was put into operation in Austria 1982, shut down 2006, start dismantling 2011. Rebuild in Turkey 2015, start up 2017	



1 x 660MW THERMAL COAL POWER PLANT LEDVICE (CZECH REPUBLIC) – NEW SUPERCRITICAL PLANT

Nominal Unit Output	660 MWe
Nominal Unit Efficiency	42,5 %
Steam pressure	27,19/4,96 MPa
Steam temperature	600/610 °C
Live Steam Quantity	1684 t/h



1 x 840MW COMBINED CYCLE POWER PLANT POČERADY (CZECH REPUBLIC) – NEW PLANT

Nominal Unit Output	840 MWe
Nominal Unit Efficiency	58,4 %
Steam pressure	13,06/2,8 1/ 0,43 MPa
Steam temperature	552/550 /291 °C
2x GT SIEMENS SGT5-4000F	284 MW
2x HRSG SES Tlmače	



3 x 250MW THERMAL COAL POWER PLANT PRUNÉŘOV (CZECH REPUBLIC) - REFURBISHMENT OF THE PLANT

Nominal Output	3 x 250 MWe
Nominal Unit Efficiency	39,5 %
Steam pressure	18,2/3,5 MPa
Steam temperature	575/580°C
Live Steam Quantity	660 t/he



4 x 200 MW THERMAL COAL POWER PLANT TUŠIMICE (CZECH REPUBLIC) - REFURBISHMENT OF THE PLANT

Nominal Output	4 x 200 MWe
Nominal Unit Efficiency	39,5 %
Steam pressure	18,1/3,9 MPa
Steam temperature	575/580°C
Live Steam Quantity	547 t/h

Part of a/m references was executed together with the sister company ŠKODA PRAHA Invest s.r.o.

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