SFW's Service Project Execution Model and Lessons Learned collected during CFB Boiler and AQCS Technologies Modernization Project.

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ENERGETIKA A ŽIVOTNÍ PROSTŘEDÍ 2023

04-06 September 2023

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Agenda

SFW – Who we are ?

SFW’s project execution model - how can we cooperate together?

CFB Boiler and AQCS Technologies Modernization Project

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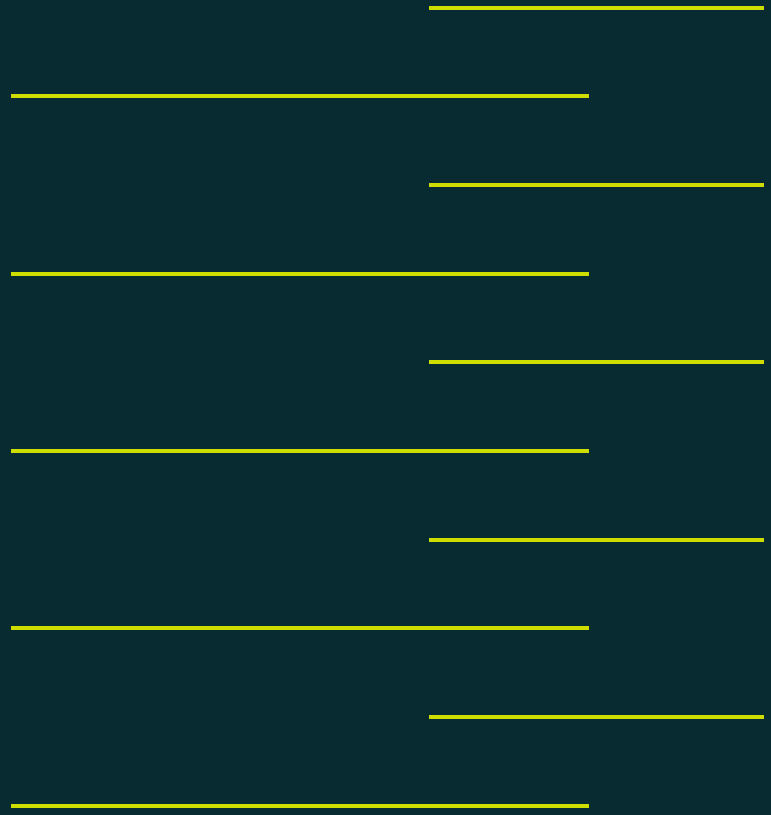
SFW – Who we are?



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Heritage

Over 130 years of excellence in delivering complex energy and environmental solutions and services around the world.

1891
Foster Wheeler founded

1995
Foster Wheeler acquires Ahlstrom-Pyropower

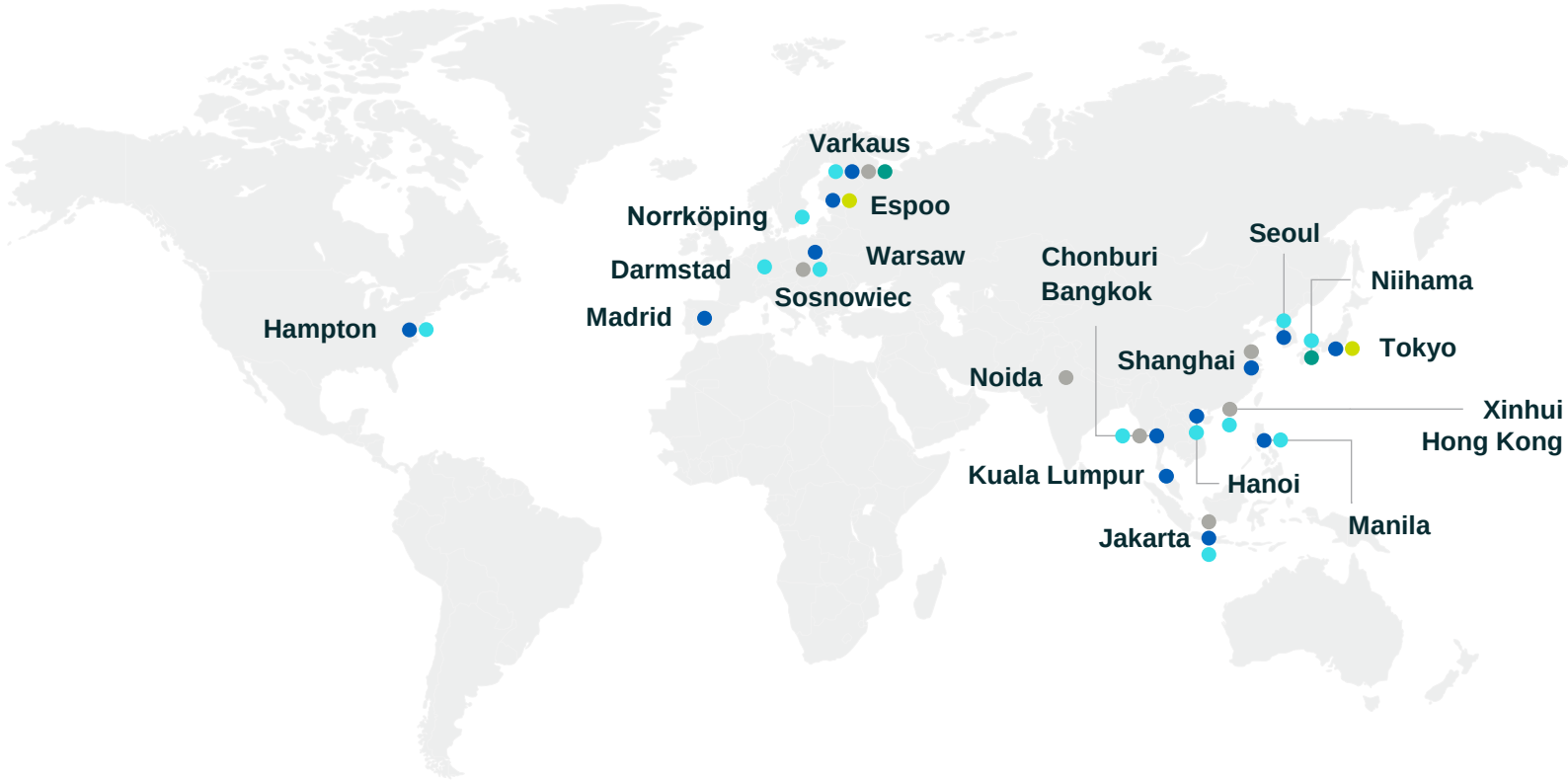
2014
Amec acquires Foster Wheeler

2017
SHI acquires Amec Foster Wheeler's energy technology/services business now known as SFW

Global reach with

1,800

highly skilled people



- Head office
- Engineering centers
- Sales offices
- Factories and after-sales service offices
- Research and development centers

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130 Years of history

1,800 Skilled experts

20+ Locations worldwide

800+ Successful projects

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SFW Service generally

Global operator in energy market services

Products and services

Boiler Maintenance (BM)

- Maintenance (outages, hourly rated works, condition monitoring, emergency services)
- Pressure equipment and pressure part replacements
- Steampipes and condensate pipes
- Auxiliary equipment services and renewals
- Spare parts
- Inspection and specialist services
- EIC-services
- Process-, EIC and mechanical designing

Technology, Modification and Upgrade (TMU)

- Replacement projects with technology change
- Capacity increases and process improvements/changes
- Gasifiers
- Fluidized bed boiler retrofits
- Enviromental retrofits
- Process-, EIC and mechanical designing

Air Quality Control Systems

- Design, delivery, erection of new equipment including:
  - Acid pollutants removal with Dry Sorbent Injection (DSI);
  - Acid pollutants removal with Semi Dry Circulating Fluidized Bed Scrubber (CFBS);
  - Bag Filters for dedusting;
  - Mercury and dioxins removal with Active Carbon Injection (ACI)
  - SNCR & SCR’s for DeNOx
- Feasibility studies for upgrading existing AQCS systems following boiler modernizations or optimizing OPEX
- Spare parts and repair works
- Maintenance (outages, hourly rated works, condition monitoring, emergency services)

LTSA (Long Term Service Agreement)

Digital Services

METLab laboratory service

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SFW’s project execution model

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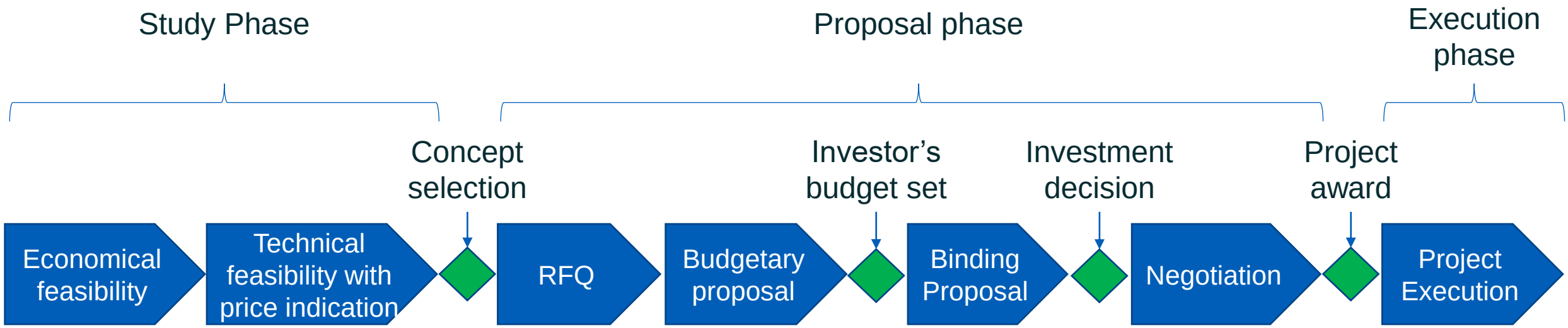
SFW's project execution model

From business need identification through concept development and budgeting stage up to project execution



Customer identifies the need and business justification

Customer may develop RFQ without study also

Paid study by SFW identifying viable technology concept

Customers develop RFQ based on study

Commercial cond.
Guarantees
Scope & limits
Design Basis
Evaluation Criteria
Project business justification and alternatives

Budgetary proposal stage

Could be skipped

Commercial cond.
Guarantees
Scope & limits
Design Basis
Schedule
Evaluation Criteria
Project business justification and alternatives reevaluation

Private procedure:
Typically scope and solution changes due to price
Public procurement:
possible procedure termination and renewal

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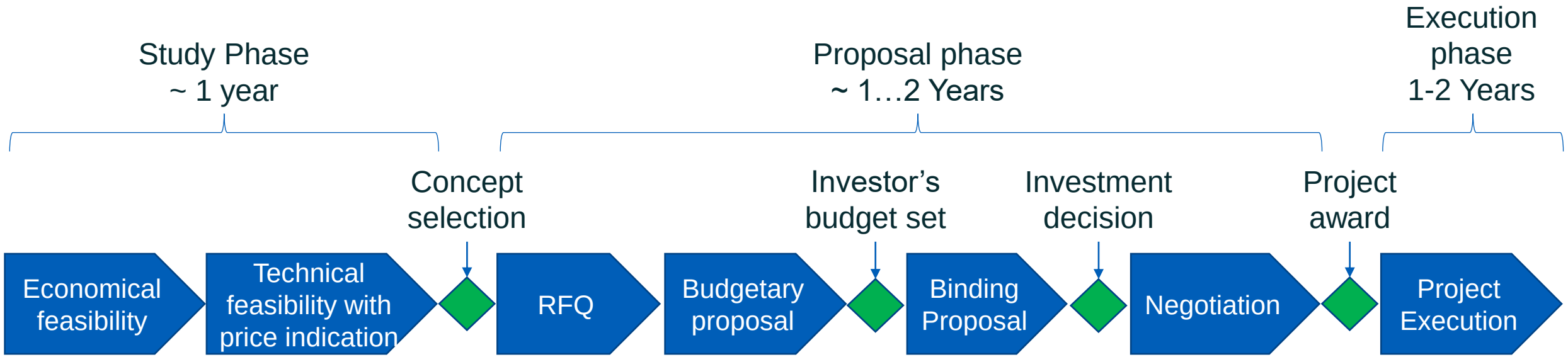
Fuel conversion project development

Project development milestone schedule



Preconditions for smooth modernization/technology upgrade project progressing:

- Known and well recognized project business justification and conditions/alternatives;
- Let technology provider(s) develop the concept as early as possible;
- Set project deliverables & desired guarantees, clear bid evaluation criteria;
- Specify design basis and division of work;
- Agree commercial conditions

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CFB Boiler and AQCS Technologies Modernization Project

Żerań Project

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Schedule

Milestone	PLAN	ACTUAL
NTP		11.12.2019
Start site works with KFA	21.06.2020	21.06.2020
Building Permit received	27.07.2020	27.07.2020
KFA Readiness for boiler firing	10.10.2020	10.10.2020
Works completion (SNCR, DSI, ACI, BH)	10.10.2020	10.10.2020
KFA Trial Run Readiness	5.04.2021	5.04.2021
KFA and (SNCR, DSI, ACI, BH) Take Over	1.07.2021	**30.06.2021**
KFB Start site works	1.04.2021	1.04.2021
KFB readiness for boiler firing	4.08.2021	4.08.2021
KFB Readiness for Trial Run	27.08.2021	27.08.2021
KFB, SNCR, DSI, ACI, BH Take Over	20.10.2021	20.10.2021
PAC	5.11.2021	**3.11.2021**

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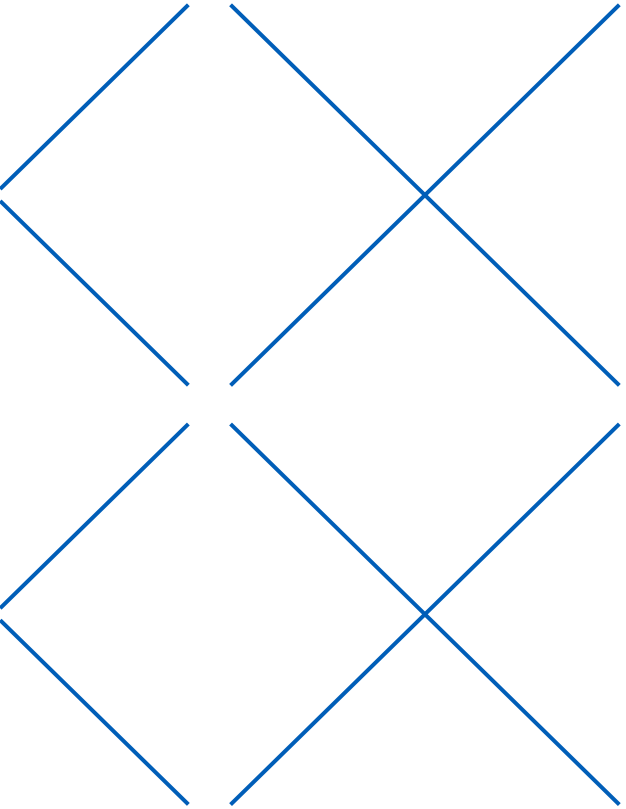
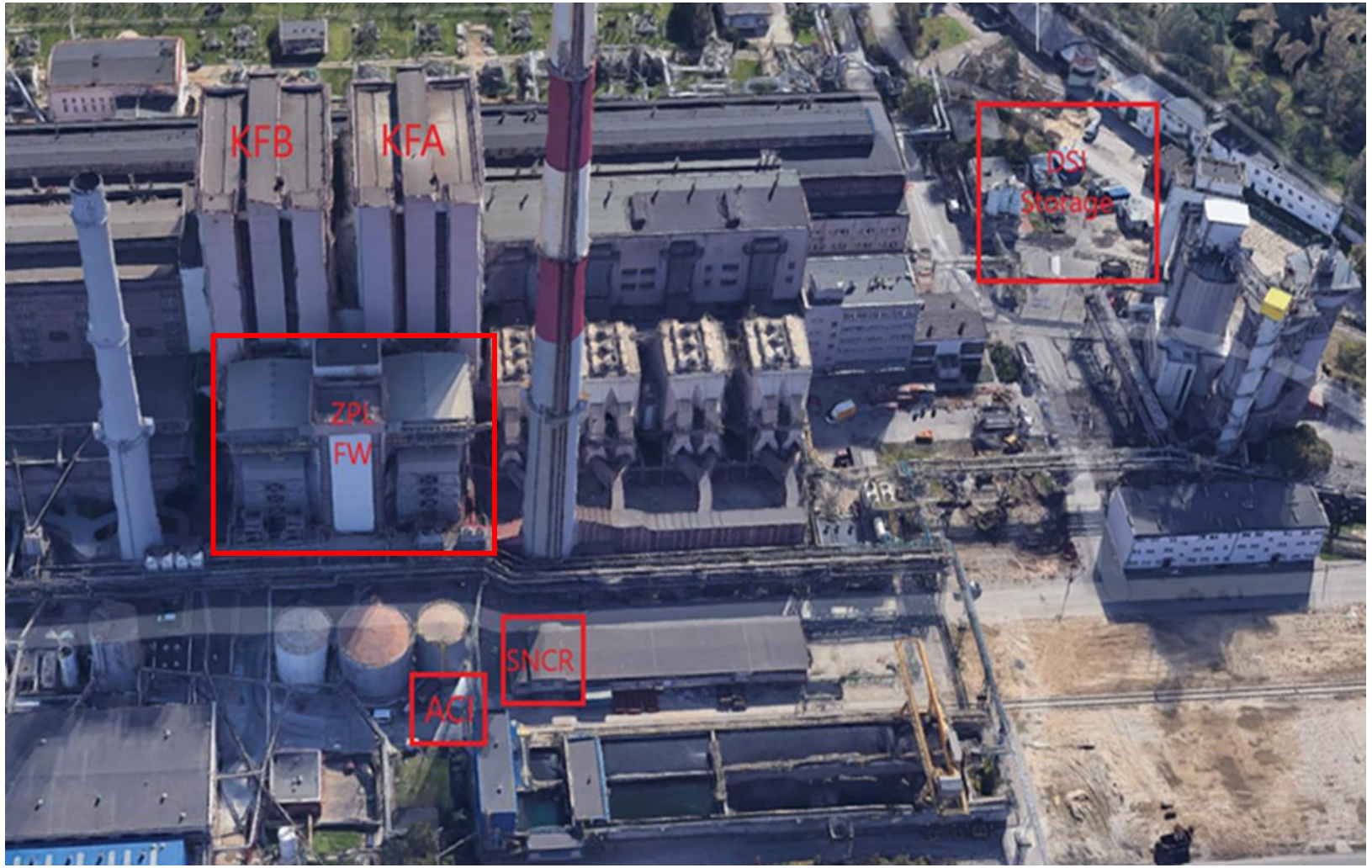
Project Metrics



Key milestones and information during project execution

- Contracting according to public procurement law
- NTP 12.2019
- Project interruptions due to Covid-19
- Project handed-over to operation acc to contractual schedule;
- Zero safety incidents during project (LTIR / TRIR);
- Only 28 punch items during handing-over to operation;
- UDT/TDT: 66 pressure vessels; 3 cranes; 5 unloading equipment.

Turn key modernization project of existing KFA and KFB (2xCFB boilers) to meet BAT emissions requirement:



- New Dry DeSOx system including:
  - DSI storage (1400m3), dousing and pneumatic feeding;
  - Existing Bag Houses modernization allowing for meeting DeSOx technology design criteria (PCS incl.)
- New SNCR system
  - Unloading, storage 2x60m3, feeding and dousing, HSE equipment
- KFA: Flue gas ducts, Flue gas recirculation fan,
- KFA &KFB: Secondary air nozzles relocation
-
- Hg reduction system including:
  - PAC storage (60m3), dousing and feeding; ATEX certificated
- Compressed air treatment station
- Fly ash handling system
- Boiler’s and AQCS technologies optimization

OEM technology supplier: RAFAKO Sumitomo SHI FW

Turn key modernization project of existing KFA and KFB (2xCFB boilers) to meet BAT emissions requirement:

- Project management
- Obtaining permits:
  - Demolition, Relocation, Building, Operational,
- Excavations & foundations
- Demolition, relocations, erection works;
- Building fire detection and explosion protection
- HVAC for selected buildings/areas
- Structural steel, supports, service platforms
- Insulation and noise protection
- Process instrumentation for delivered systems
- Developing control logics and DCS upgrade
- HAZOP, explosion risk analysis
- O&M update, Explosion Safety Instruction update

Exclusions:
- Integrated environmental permit
- CEMS
- Stack
- ID Fan

Consortium partner scope:
- New emission monitoring system at boiler outlet
- New emission monitoring system at fabric filter outlet
- Cable routes,
- Electric switching stations,
- Electrical installation and equipment compatible with existing,
- Instrumentation devices adapted to existing DCS system,
- DCS system expansion,
- CCTV,
- Disassembly,
- Relocations of cable routes collisions,
- Mechanical assembly,
- Commissioning

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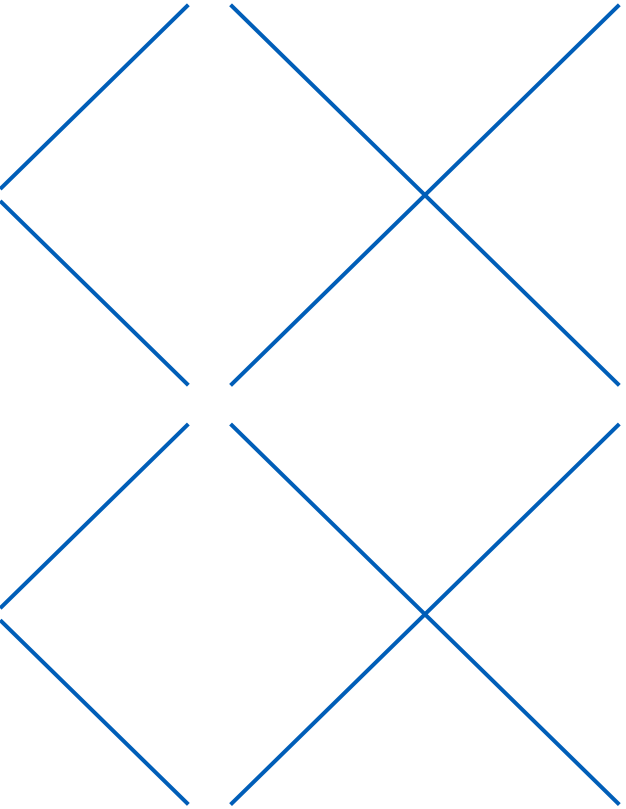
LD Guarantees



LD guarantees, separately for KFA &KFB	Met/Penalized
Aux power consumption	met
Limestone consumption	met
Hydrated Lime consumption	met
Activated carbon consumption	met
Ammonia consumption	met
Demi water consumption	met
Boiler efficiency	met
Availability Y1, Y2,Y3	Y1, Y2 met

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MG Guarantees

MG guarantees, separately for KFA &KFB		
NO_x concentration (NO_x converted to NO_2)	mg/Nm^3	≤ 170
SO_2 concentration	mg/Nm^3	≤ 175
CO concentration	mg/Nm^3	≤ 140
NH_3 concentration	mg/Nm^3	≤ 10
Dust	mg/Nm^3	≤ 12
HCl concentration	mg/Nm^3	≤ 20
HF concentration	mg/Nm^3	≤ 7
Hg concentration	$\mu g/Nm^3$	≤ 4
Dust concentration in the air from silos de-dusting devices	mg/Nm^3	≤ 10
Ammonium salt content in fly ash	mg/kg	≤ 100
Ammonium salt content in bottom	mg/kg	≤ 100
Boiler steam max capacity	t/h	450
Boiler HP steam temperature	°C	510 ±5
Noise		
Vibrations		

ALL MET

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Key challenges

Covid 19 impact: delays due to force majeure:

Milestone	PLAN	ACTUAL	Original date
NTP		11.12.2019	
KFA and (SNCR, DSI, ACI, BH) Take Over	1.07.2021	**30.06.2021**	**20.12.2020**
PAC	5.11.2021	**3.11.2021**	**5.11.2021**

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Key challenges

Fly ash system leakage

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Key challenges

Ammonia tanks shell damage

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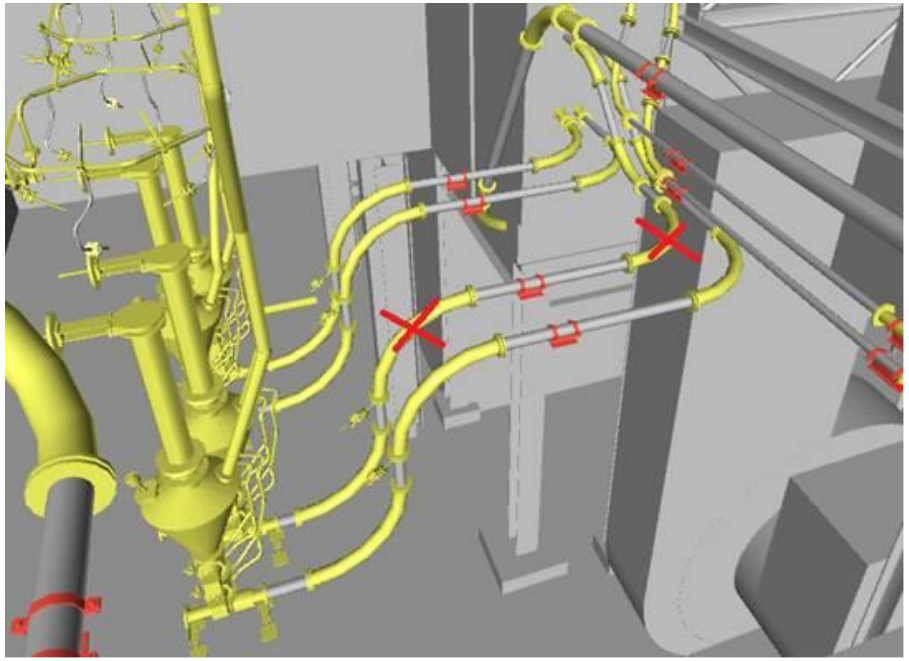
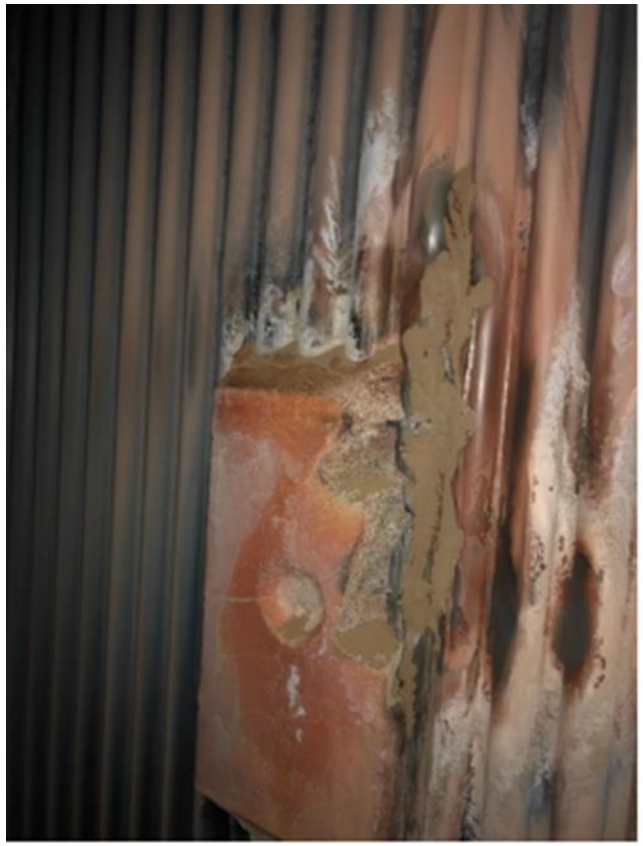
Key challenges

Hydrated lime blockages

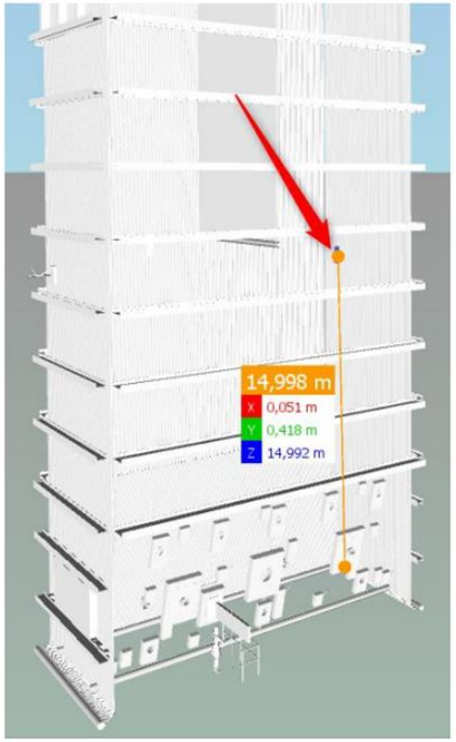


Key challenges

SNCR feeding point (nozzle malfunction)



Nieszczelność rury parownika w rejonie wtrysków wody amoniakalnej do kotła na poziomie +16m od rusztu (poziom +23800 od poziomu 0 w kotłowni) – ściana prawa.



Rys. 1. Lokalizacja punktu wtrysku wody amoniakalnej w okolicy wystąpienia awarii

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Zeran Project

4. Key events, challenges

4.5. Expansion Joints leakages.

Thank you

For more information, please contact:

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