



# Yokogawa's challenges in power generation plants in Poland

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Power Systems Department  
Global Business Headquarters  
Yokogawa Electric Corporation

# Yokogawa's challenges in Poland

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We help power generation plants in Poland achieve the followings through Control & Instrumentation:

1. Improve operation efficiency & safety
2. Reduce emissions for eco-friendly society
3. Minimize cost and maximize profit

# Product Profile for Industrial Automation & Control

## Yokogawa Field Proven Solutions

Corporate Management (ERP\*)  
Integrated business operation systems

CPM Collaborative Production System

Real-time Production Organizer™

Production Management  
(MES\*)

Systems for advanced control,  
simulation, production  
management, and scheduling

APC & OWA Advanced Process Control &  
Operational Work Assistance

**Exasmoc**  
**Exarqe**  
**Exaplog**  
**Exapilot**



CAMS for HIS

Asset  
Management



PIMS Process Data  
Acquisition &  
Management



Production Control System  
Production control systems

DCS Integrated Production  
Control System



**CENTUM VP**

Network Based  
Control System



**STARDOM**

Safety Instrumented  
System



**ProSafe RS**

Differential Pressure  
Transmitter



EJA  
/EJX

Magnetic  
Flowmeter



AXF

Digital Vortex  
Flowmeter



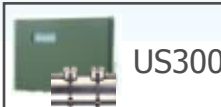
DYF

Zirconia Oxygen  
Analyzer



ZR

Ultrasonic  
Flowmeter



US300

Process Gas  
Chromatograph



GC8000  
MKII

Advanced Valve  
Positioner



YVP

Temperature  
Transmitter



YTA50/  
70

YTA100/300

YOKOGAWA



Field Instruments

Field instruments, sensors, measuring  
instruments, analyzers and other equipment

\* ERP = Enterprise Resource Planning

\* MES = Manufacturing Execution System

**vigilantplant.**

The clear path to operational excellence

<YEI Power>

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<June 28<sup>th</sup>, 2012>

# Example of “3Es” annual returns for coal-fired

## “3Es” estimation

### Efficiency improvement

Approx.

0.3 - 1%

### Emissions reduction (CO<sub>2</sub>)

Approx.

3 – 10  
K tons/year

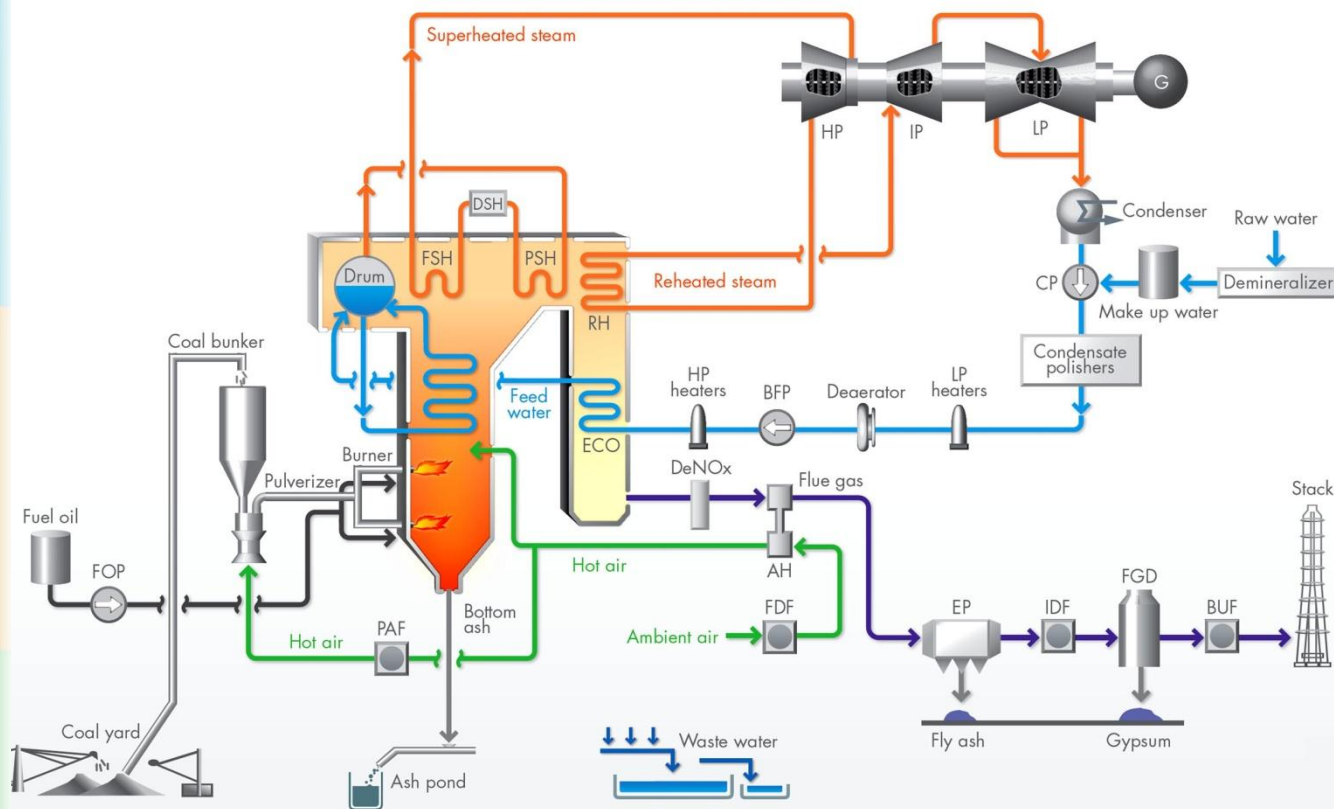
### Economic returns

Approx.

0.3 - 1.1  
M US\$/year

300 MW case

## Area 1: Boiler efficiency



## Area 2: Turbine & BOP efficiency

## Area 3: Plant output

## FGD (Flue Gas Desulfurization) experiences

### 1. Turceni FGD, Romania

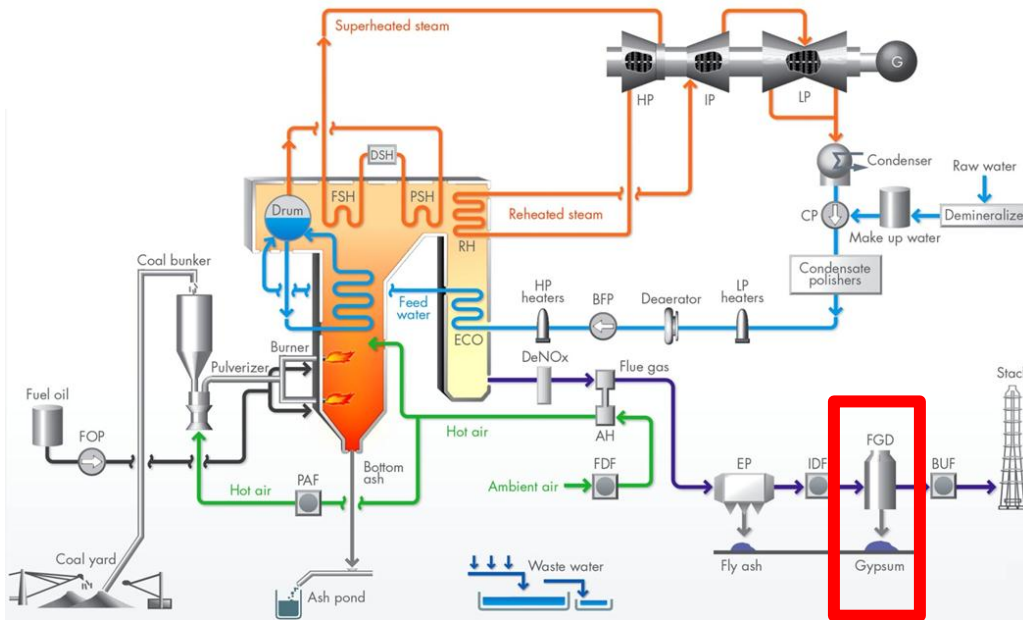
- FGD plant for 4x 300 MW
- Contract with AE&E Austria

### 2. Maritsa East 2, Bulgaria

- FGD plant for 4x 200 MW
- Contract with IHI Japan

### 3. FGD Experience in Japan

- 60% of all Japanese FGD plants are controlled by Yokogawa



Turceni in Romania



Maritsa East 2, in Bulgaria

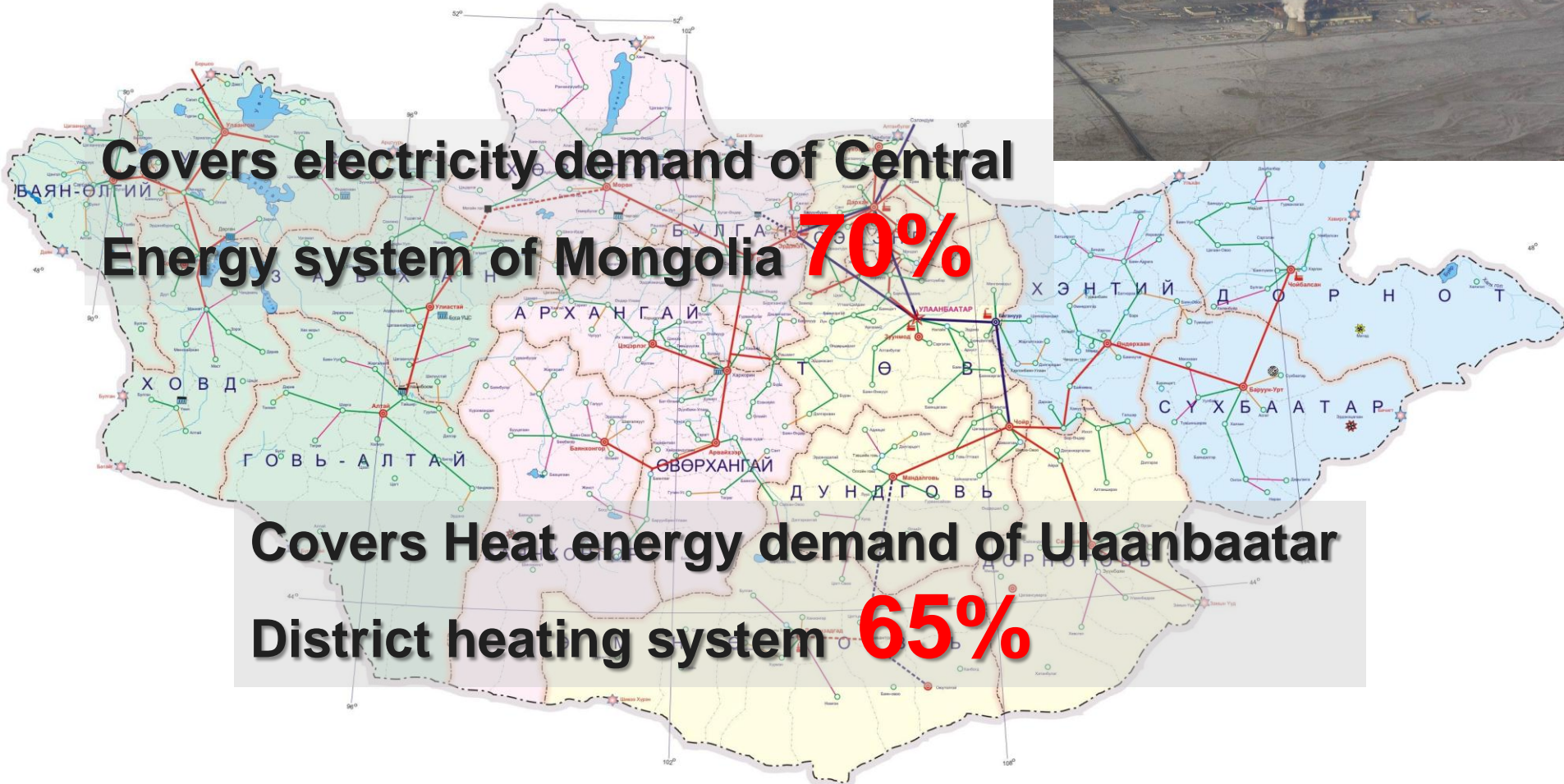
# One of success stories

## Thermal Power Plant No.4 Project (TES4), Ulaanbaatar, Mongolia



# THERMAL POWER PLANT NO.4 SSHC

TES4 Plant View (Winter)



# TES4 CCR View



**Before Replacement**

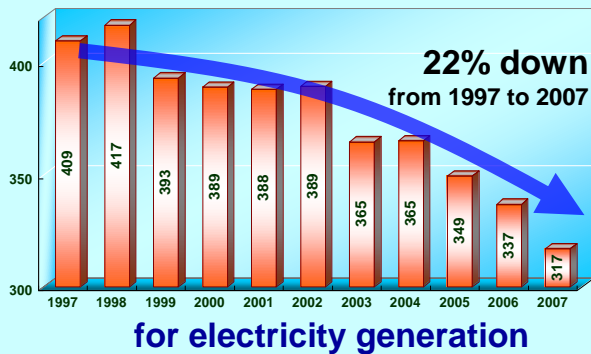
**After Replacement**



# Yokogawa's achievements

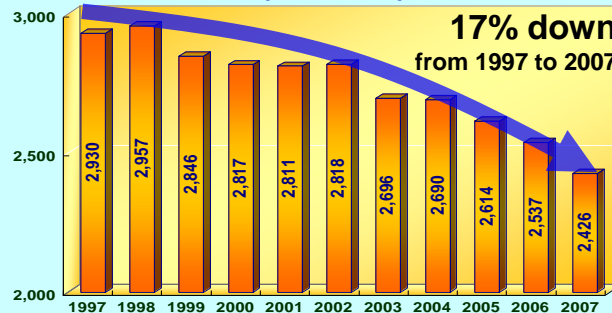
## Power Efficiency Improved 22%

Coal consumption rate  
(g/kWh)



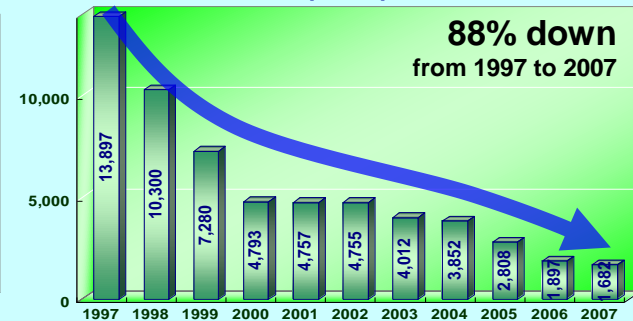
## CO<sub>2</sub> Emissions Improved 17%

Total CO<sub>2</sub> emissions amount  
(kilo tons)



## Oil Reduction Improved 88%

Total heavy oil consumption  
(tons)





# Yokogawa Power/Water Business

# ❖ Integrated Control and Monitoring System for Power Plant

## Integrated plant resource management



- PRM
- Integrated field device management
- HART
- Foundation Fieldbus
- Wireless

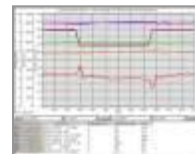


## Total Plant Operation

- Power generating unit / steam collection



## Plant Information Management



- Long-term data storage, data & alarm logging, performance calculation



## Sequence of Event



- Trip analysis by 1ms time stamp



**Vnet/IP: 1Gbps**

## Boiler Controller



## BOP Controller



## Turbine Controller



- 5ms servo control
- 5-10ms turbine protection
- True integration on DCS

## Turbine Control

## Boiler/ Turbine Protection System



## Safety System

- Prosafe-RS
- SIL3 certified Safety System
- Integrated system to DCS

## DCS

- CENTUM VP
- Large application in a single architecture.
- "Pair & spare" non-stop controller.

Remote I/O



## Operator Training Services

## Plant Simulator

Instructor system



Turbine run up system



Ethernet

Operator station



Input/Output system



Main computer system



## Field Instruments

- EJA/X transmitter
- High performance, durability & reliability
- Field-proven silicon resonant sensor
- HART, Foundation Fieldbus, Wireless
- Against H2S gas

## Integration of 3rd party equipment

- Vibration monitoring system
- Electrical equipment IEC61850, Profibus
- Grid SCADA/RTU

GW

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<October 17<sup>th</sup>, 2011>

# Yokogawa's Sales Records



**Coal Firing**



**Central Control Room**



**Gas Firing**



**CCPP**

More than **1,400** systems  
for power plants



**CSP**

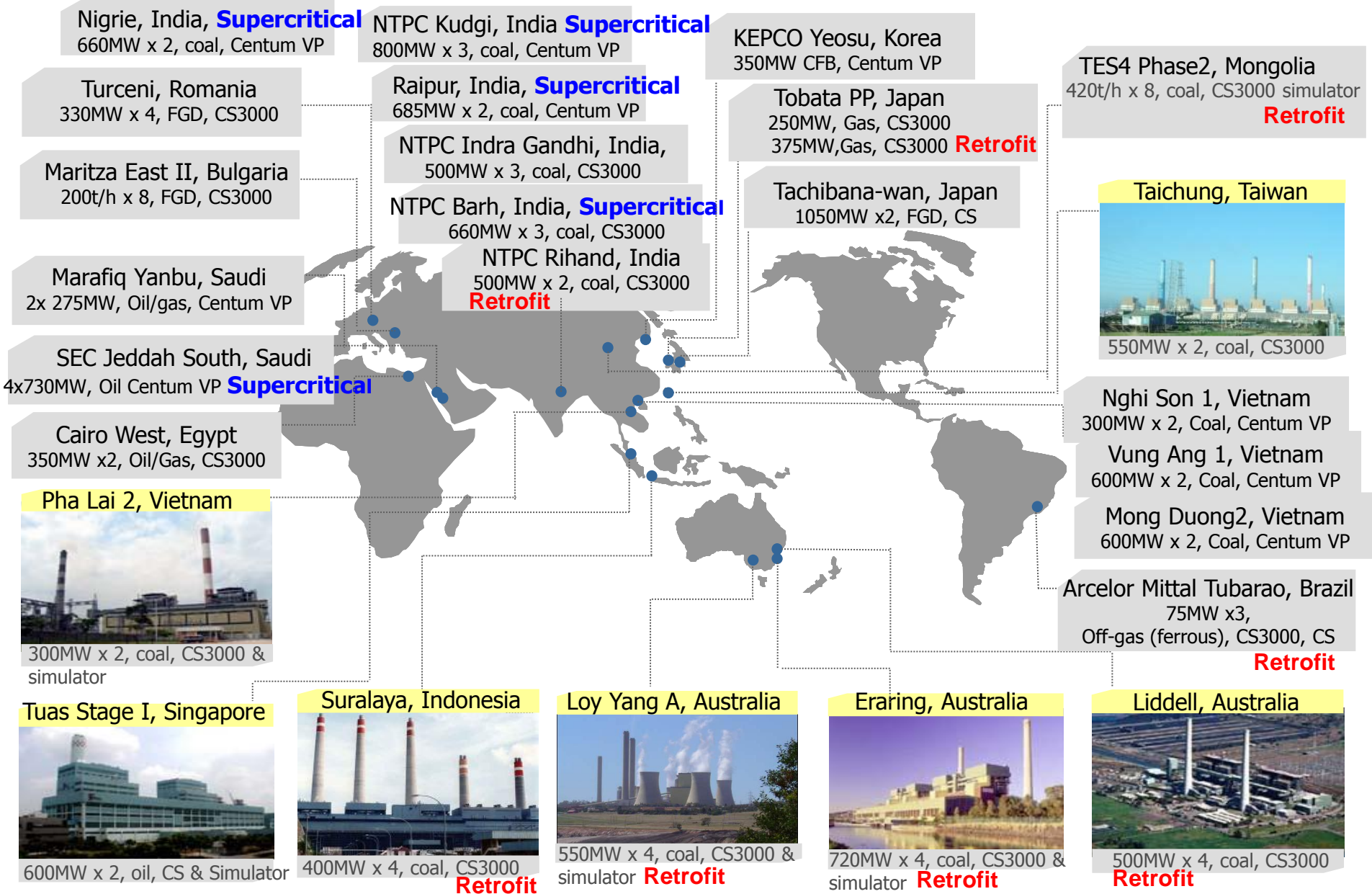


**FGD**



**Wind Farm**

# Recent Fossil Fuel Fired Power Plant Customers



# Recent gas turbine power plant customers

## Enel, St.Barbara, Italy



400MW, CCPP, GT SiemensV94.3A

## BBE, Spain



800MW, CCPP, GE 9FA

Kahraba IWPP, Algeria  
369MW, IWPP, GE 9E

Nubaria CCPP, Egypt  
750MW, CCPP, GE, CS3000

Sidi Krir CCPP, Egypt  
750MW, CCPP, MHI, CS3000

El Atf CCPP, Egypt  
750MW, CCPP, MHI, CS3000

Banha CCPP, Egypt  
750MW, CCPP, GE, VP

Giza North CCPP, Egypt  
3x750MW, CCPP, GE, VP

NIPP Calabar, Sapele, Ihovbor  
Nigeria 560MW, 450MW, 450MW  
, GT GE 9E, CS3000

Bcaresti Vest, Romania  
180MW, CCPP, GE GT&ST

Kemalpasa, Turkey  
130MW, CCPP, GE 6C, CS3000

Vemagiri, India  
3x370MW, CCPP, GE 9FA,  
CS3000

Shoaiba II Saudi Elec, Saudi  
2x 600MW, CCPP, Siemens 2x 5-5-1, VP

Riyadh PP12 Saudi Elec, Saudi  
2x 900MW, CCPP, GE 2x 4-4-1, VP

Thai National Power, Thailand  
110MW, CCPP, GE 6Bx2, CS3000

Bukit Panggal, Brunei  
110MW, CCPP, GE 6Bx2,

Channel Island, Australia  
216MW, CCPP,  
GT GE5 ST MHI, CS3000

Taeon IGCC, Korea  
300MW, gasification, VP

Dongducheon, Korea  
1,900MW, CCPP, MHI 501J, VP

Tokyo Gas, Japan  
100MW, CCPP, GE 6FA, CS3000

JFE China, Japan  
149MW, CCPP, MHI M701, CS

Tront Airport Co-gen, Canada  
117MW, GE 6B, CS3000

## AGL Hallet & Somerton Australia



25MW x 14, GE Frame 5  
37MW x 4, GE Frame 6

## Black Hills Energy, US



100MW, CCPP, GE LM6000

## Front Range, US



480MW, CCPP, GE 7FA

Trinidad and Tobago Elec  
720MW, 6-6-2 CCPP, GT GE  
CS3000

## Termozulia, Venezuela



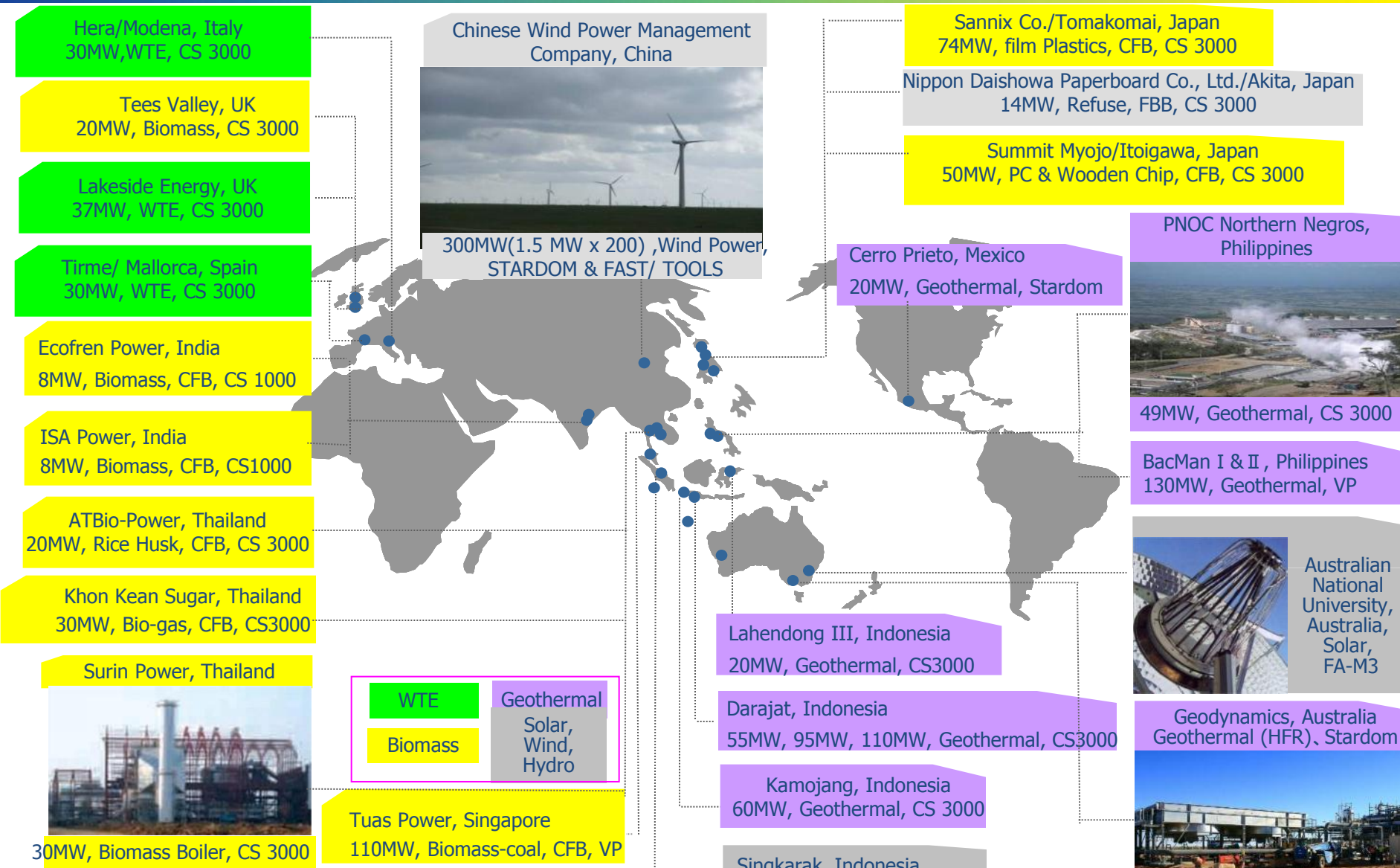
460MW, CCPP, GT GE  
ST Toshiba, CS3000

TermoPernambuco, Brazil  
460MW, CCPP, GT GE CS3000

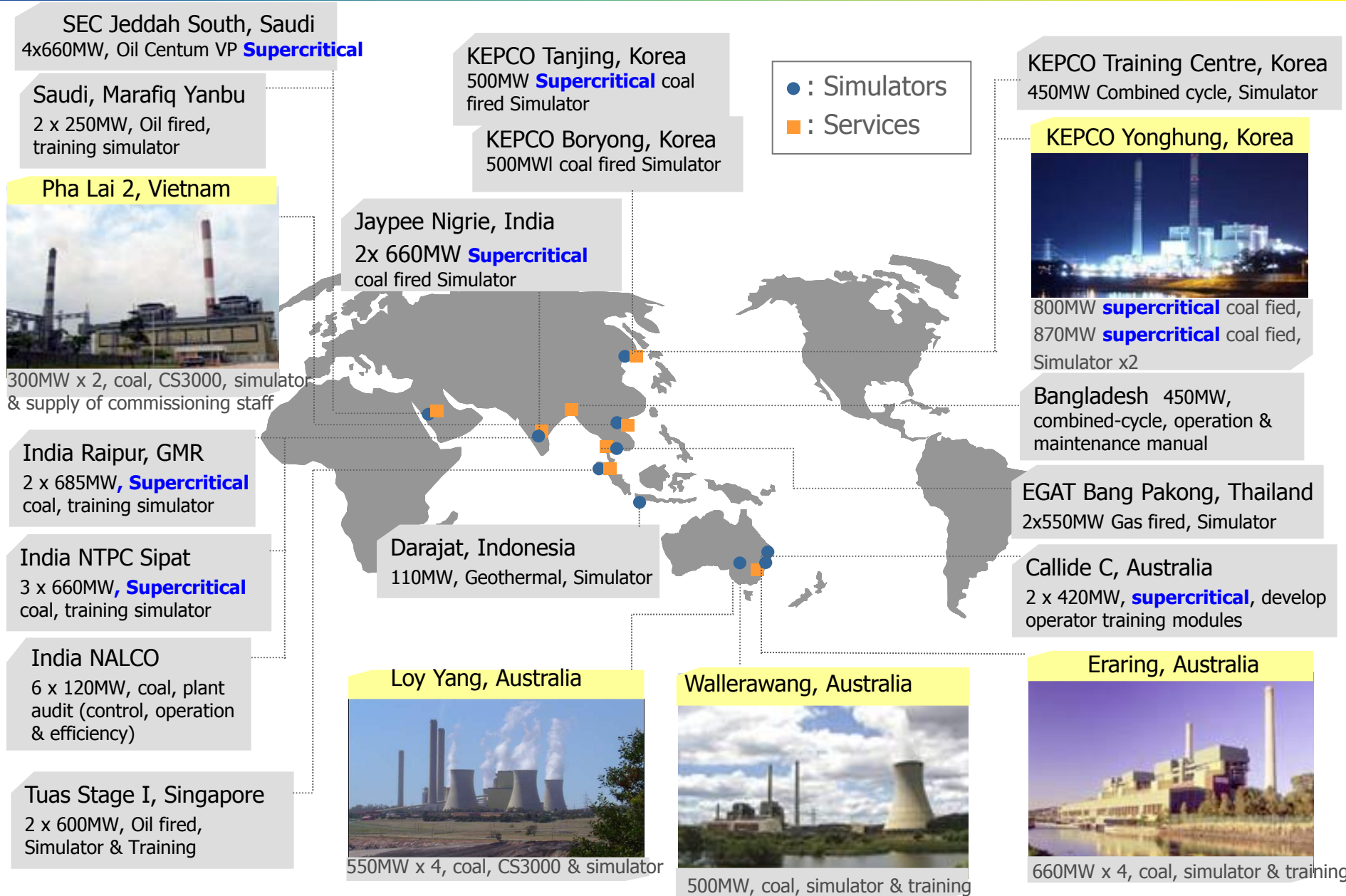
Fenix Power Chilca, Peru  
530MW, CCPP, GT GE CS3000

Punta del Tigre, Uruguay  
500MW, CCPP, GT Siemens

# ❖ **Renewable Energy: Recent Reference Map**

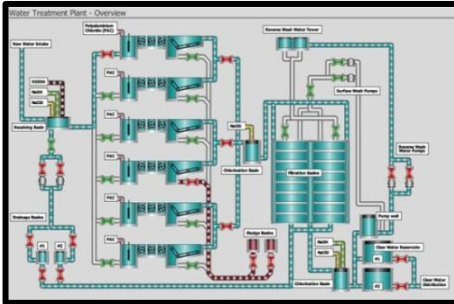


# Recent Simulator / Plant Services Customers

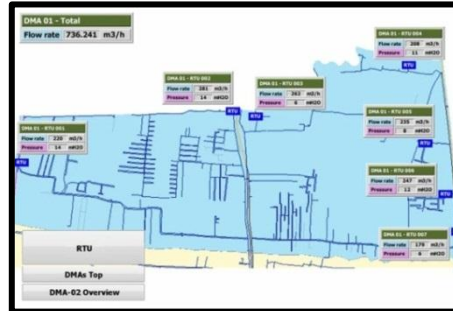


# Yokogawa's Typical Water Application Experience

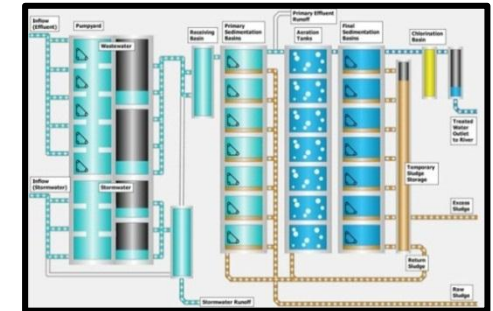
## Water Treatment



## Water Distribution



## Wastewater Treatment



Total Project **870**

## Desalination



## Water Pipeline

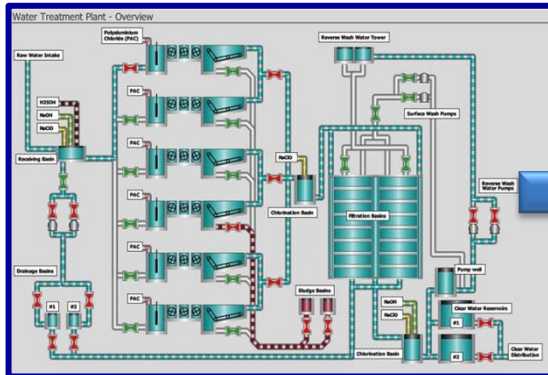


## Industrial W/WW Multi-utility

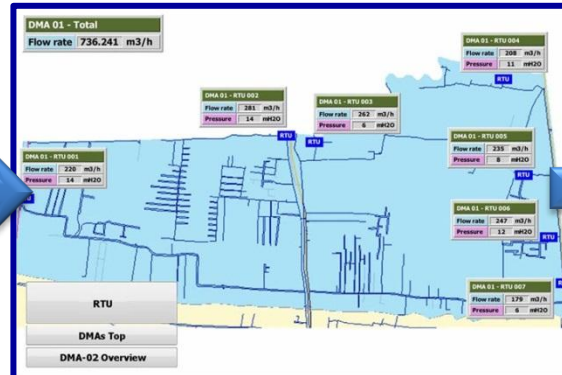


# ❖ Water Operation Value Chain

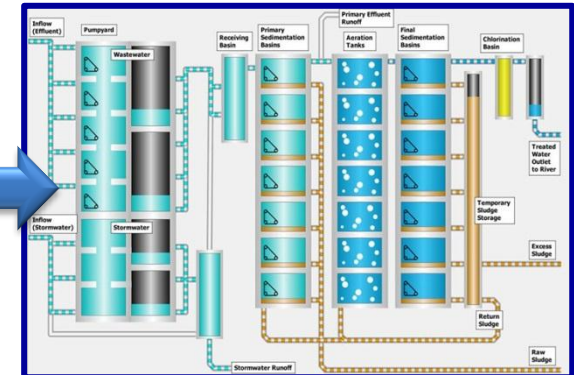
## Water Treatment & Supply



## Water Distribution & Loss Management



## Wastewater Treatment & Sanitary



**SCADA**



**WLM**



**PLC/RTU**



A total control platform can maximize water operation efficiency and minimize water losses.