The role of water for producing electricity in the conventional power plants of the Canary Islands

Saúl Barrio Ortega

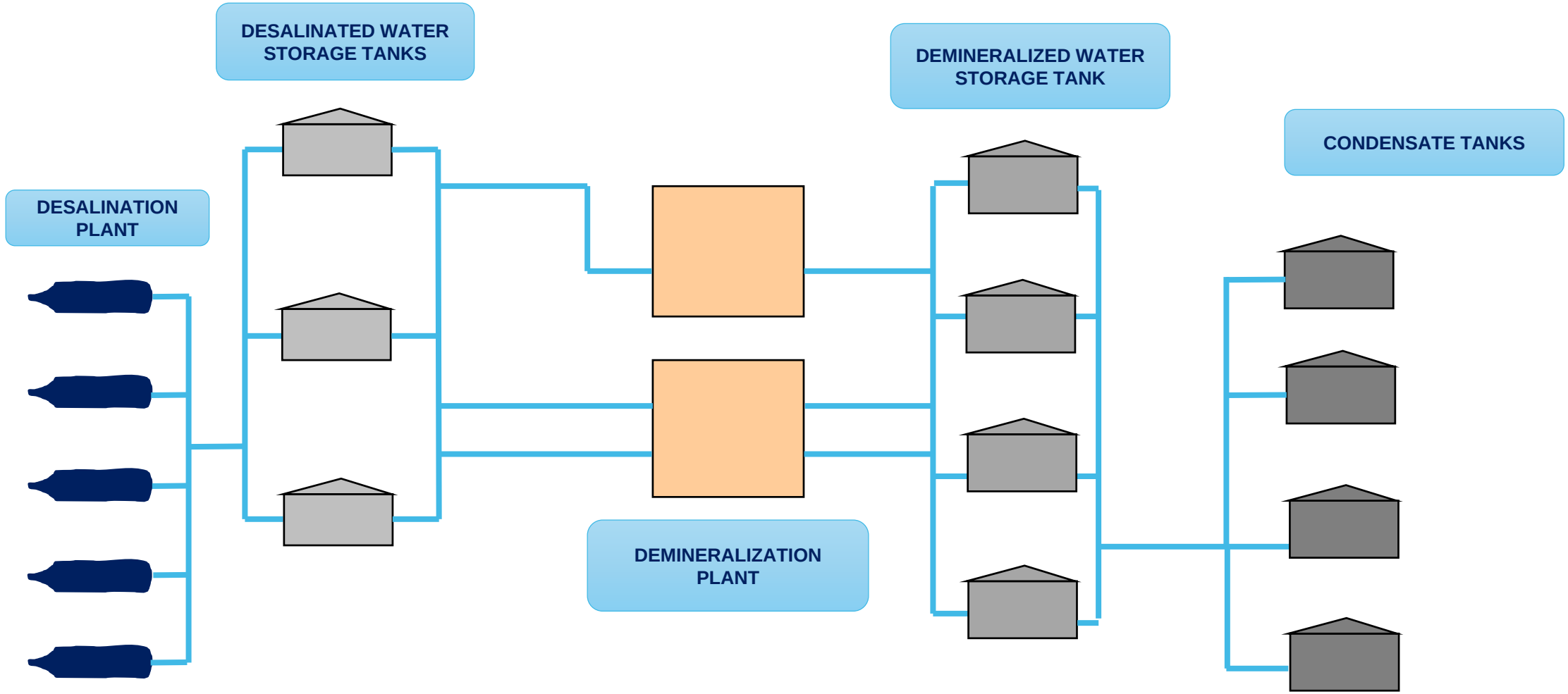
Water and Energy

- **Water management**
- **Power**
- **Cooling/Heating**
- **Environment**
- **Safety**

Water Management

Water management - Water storage and pumping system

Oil&Gas Technology - Main Aspects



Water management - Water storage system

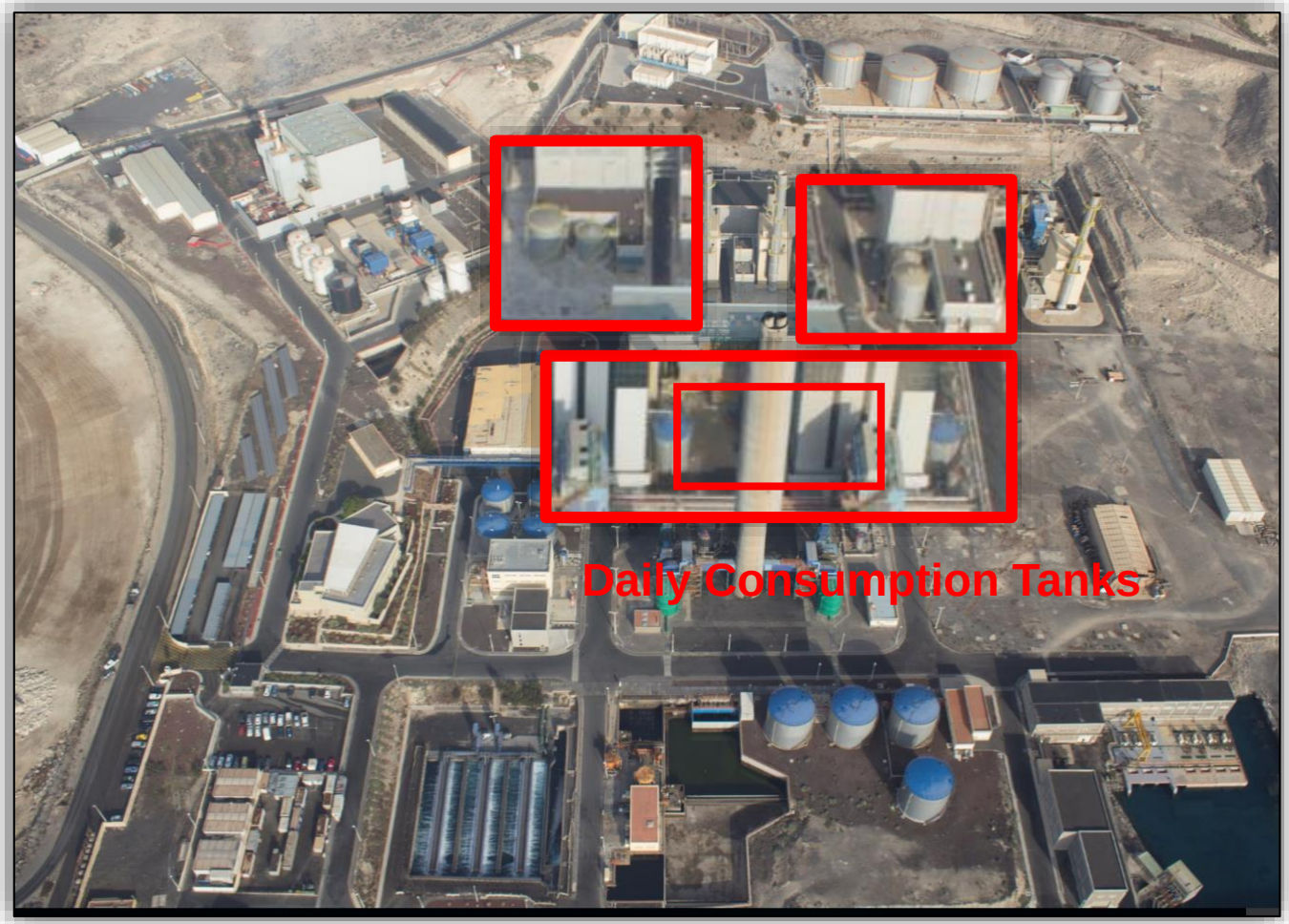
Oil&Gas Technology - Main Aspects

Water management - Water storage system

Oil&Gas Technology - Main Aspects

Water management - Water storage system

Oil&Gas Technology - Main Aspects



Desalination Plant

Desalination Plant

Oil&Gas Technology - Main Aspects

Desalination Plant

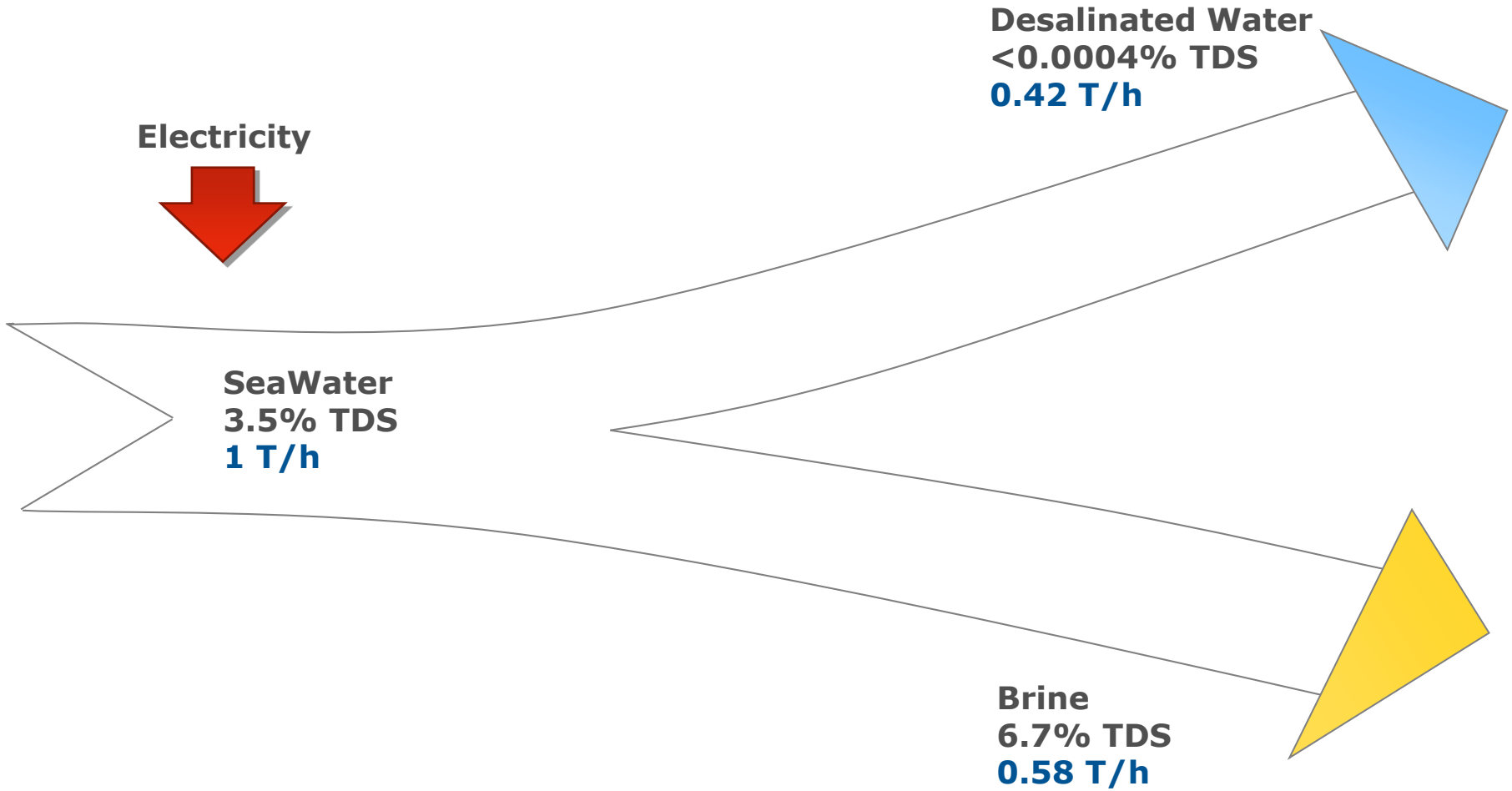
Oil&Gas Technology - Main Aspects

Water desalination processes separate dissolved salts from seawater intake by evaporating seawater

Desalination Plant

Oil&Gas Technology - Main Aspects

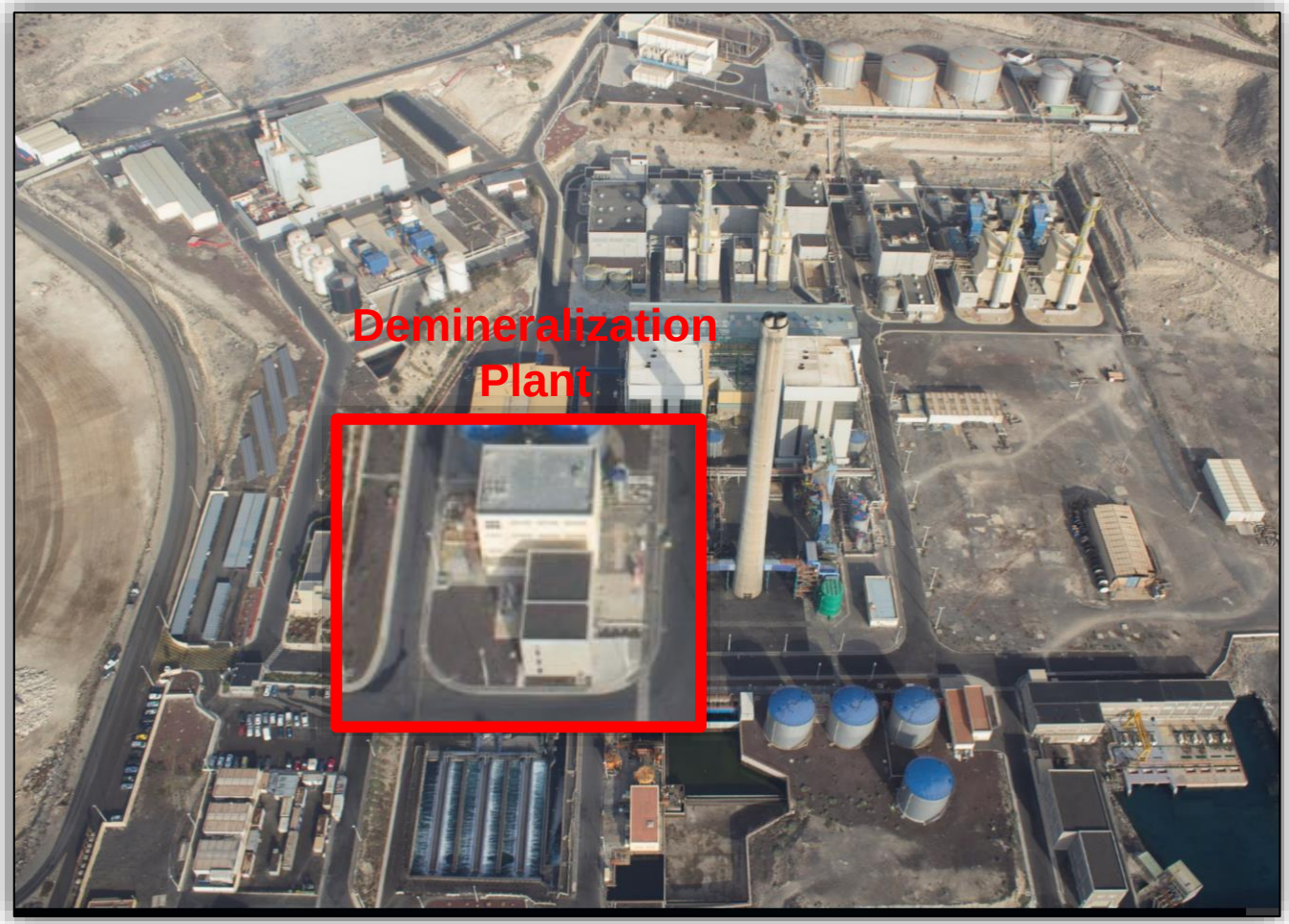
Production Ratio



Demineralization Plant

Demineralization Plant

Oil&Gas Technology - Main Aspects



Demineralization Plant

Oil&Gas Technology - Main Aspects

Process of removing mineral salts from water by using the ion exchange process

MIXED BED EXCHANGER

ACID TANK

CAUSTIC SODA T ANK

Demineralization Plant

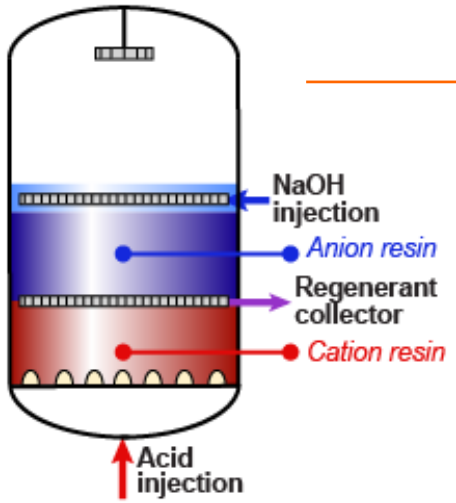
Oil&Gas Technology - Main Aspects

CT Granadilla:

3x DEMINERALIZATION WATER TREATMENT PLANTS:

PT 1 – Two Cation and Anion Bed Exchanger
PT 2 – Two Mixed Bed Exchanger
PT 3 – One Mixed Bed Exchanger

NOMINAL CHEMICAL VALUES	
Sodium	*<3 ppb*
Chlorine	*<3 ppb*
Iron	*<10 ppb*
Suphates (SO4)	*<3 ppb*
Silica (SiO2)	*<10 ppb*
Conductivity	*<0,1 mS/cm*



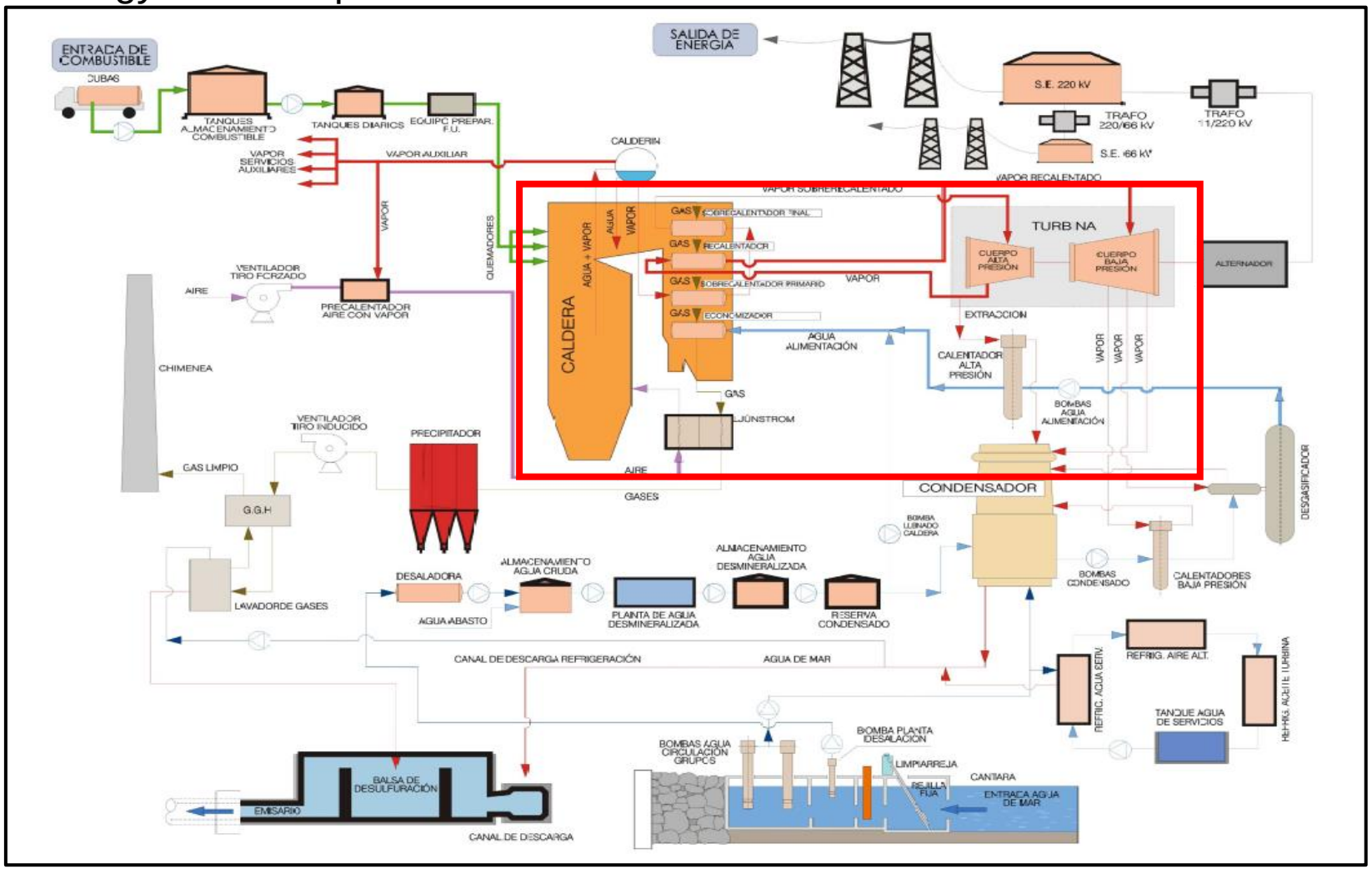
Mixed Bed Exchanger

Resins

Power

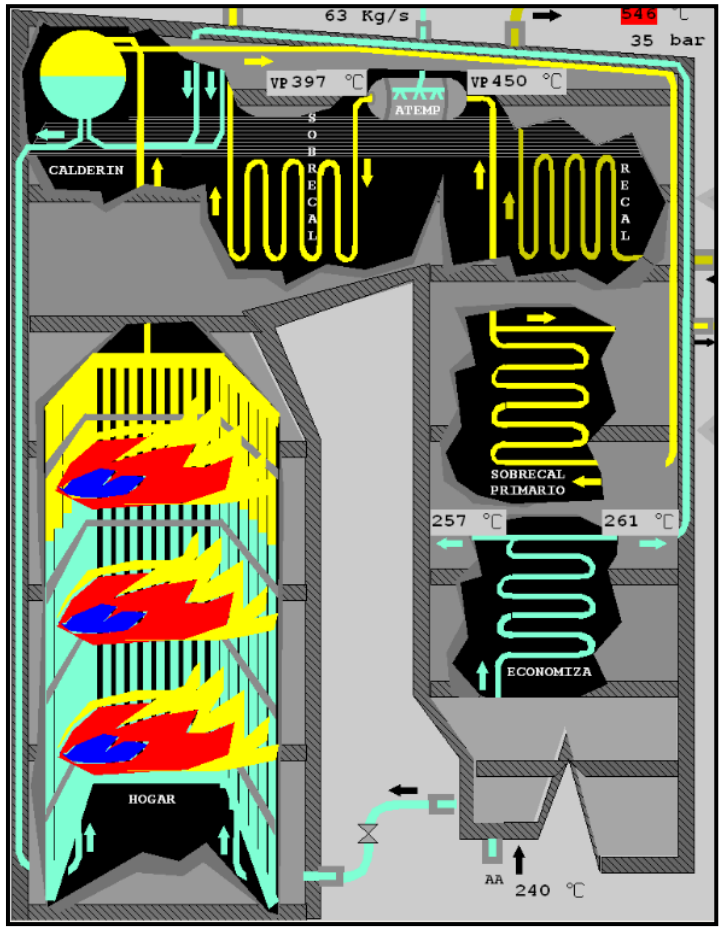
Fuel System

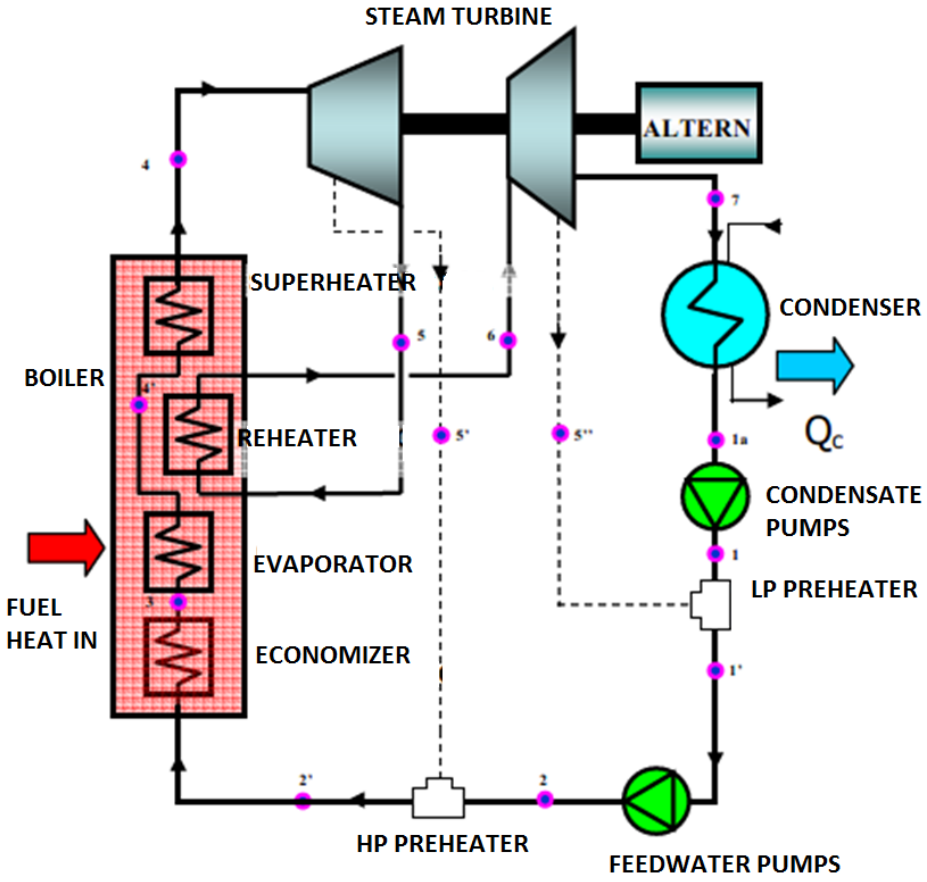
Oil&Gas Technology - Main Aspects

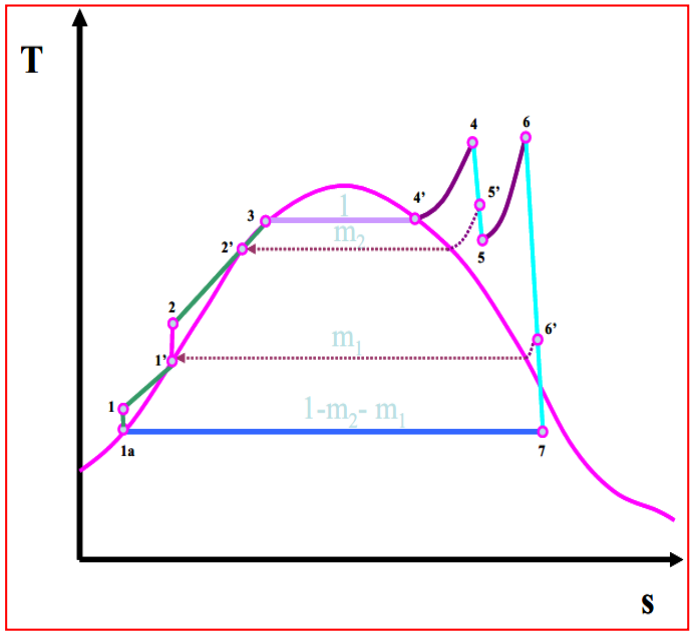


Boiler

Oil&Gas Technology - Main Aspects



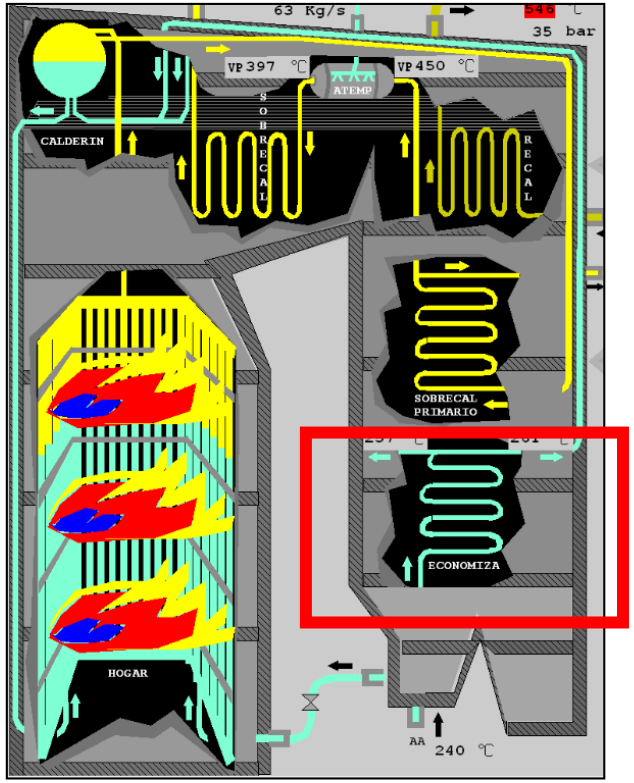




Boiler – Economizer

Oil&Gas Technology - Main Aspects

Economizers are heat exchange devices that heat water, but not beyond it boiling point. Transferring heat from the flue gas to incoming feedwater.



BENEFITS

CAN INCREASE OVERALL HEAT RECOVERY AND STEAM SYSTEM EFFICIENCY

PREVENT THERMAL STRESSES ON THE DRUM

PROBLEMS

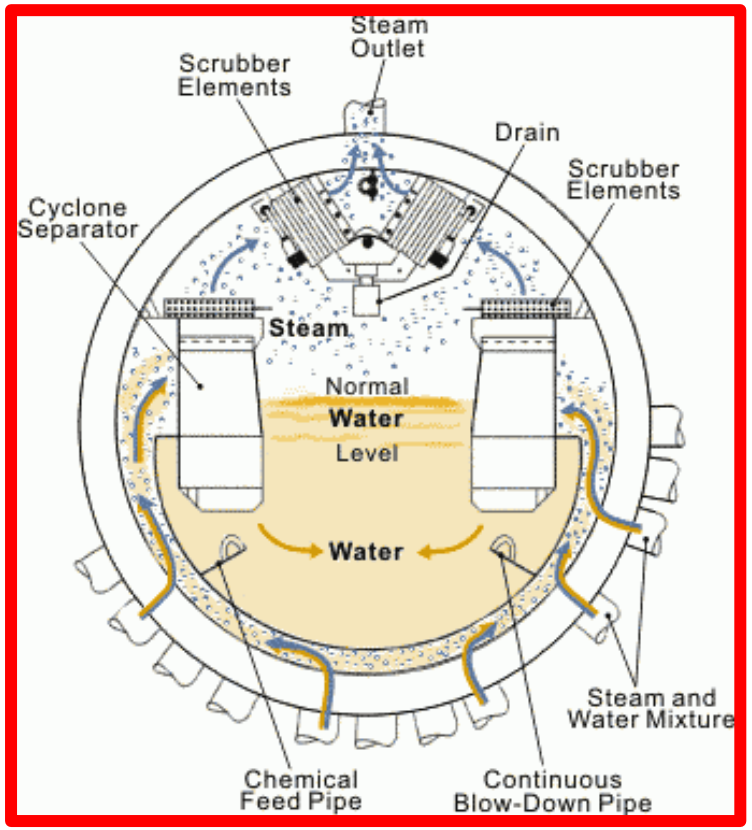
INTERNAL CORROSION: FEEDWATER WITH PH 8-9

EXTERNAL CORROSION: DEPENDS ON SULPHUR ANT FUEL HUMIDITY

Boiler – Drum

Oil&Gas Technology - Main Aspects

It is a reservoir of water/steam at the top end of the water tubes



FEATURES

THE DRUM STORES THE STEAM GENERATED IN THE WATER TUBES AND ACTS AS A PHASE-SEPARATOR FOR THE STEAM/WATER MIXTURE

ABSORB VARIATIONS IN THE LEVEL OF THE LIQUID SURFACE WHENEVER BOILER LOAD

PROBLEMS

EXCESSIVE SILICA CONCENTRATIONS IN THE WATER CAN HAVE A DRAMATIC IMPACT ON THE POWER PLANT

Boiler – Superheater

Oil&Gas Technology - Main Aspects

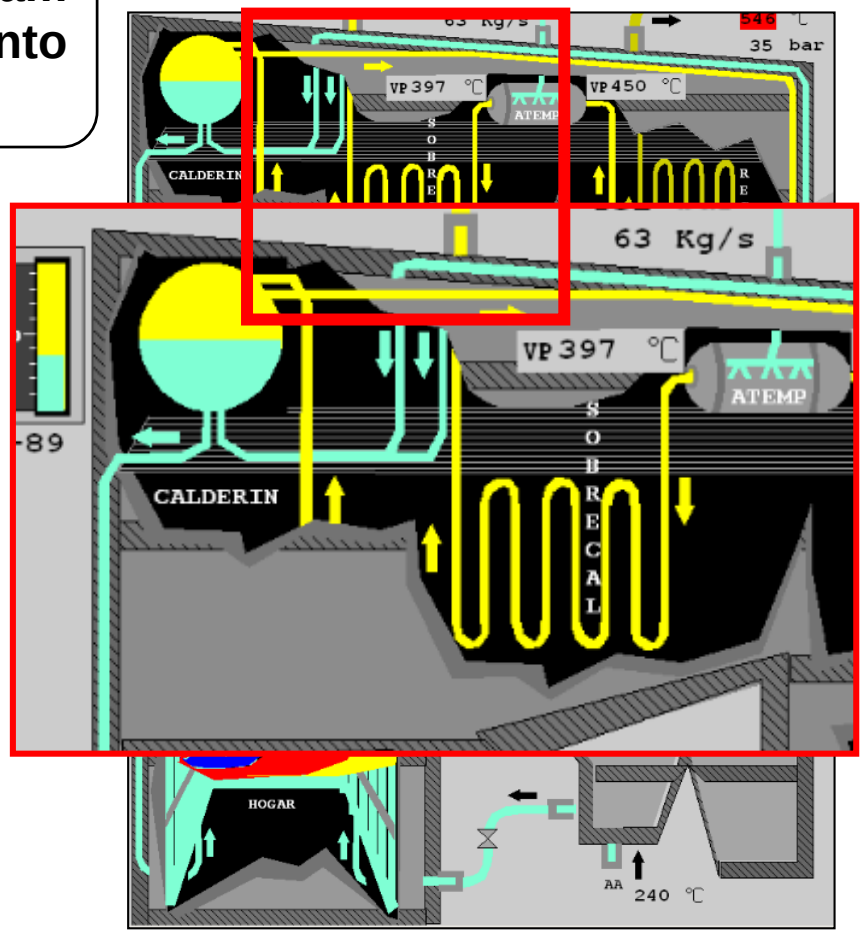
A device used to convert saturated steam from or wet steam from drum into superheated steam or dry steam

PRIMARY

NEXT TO THE CONVECTION OUTPUT

SECUNDARY

LOCATED NEAR THE furnace



PROBLEMS

FOULING AMOUNT DUE TO ASHES AND SLAGS, REDUCING HEAT TRANSFER COEFFICIENT FROM FLUE GASES

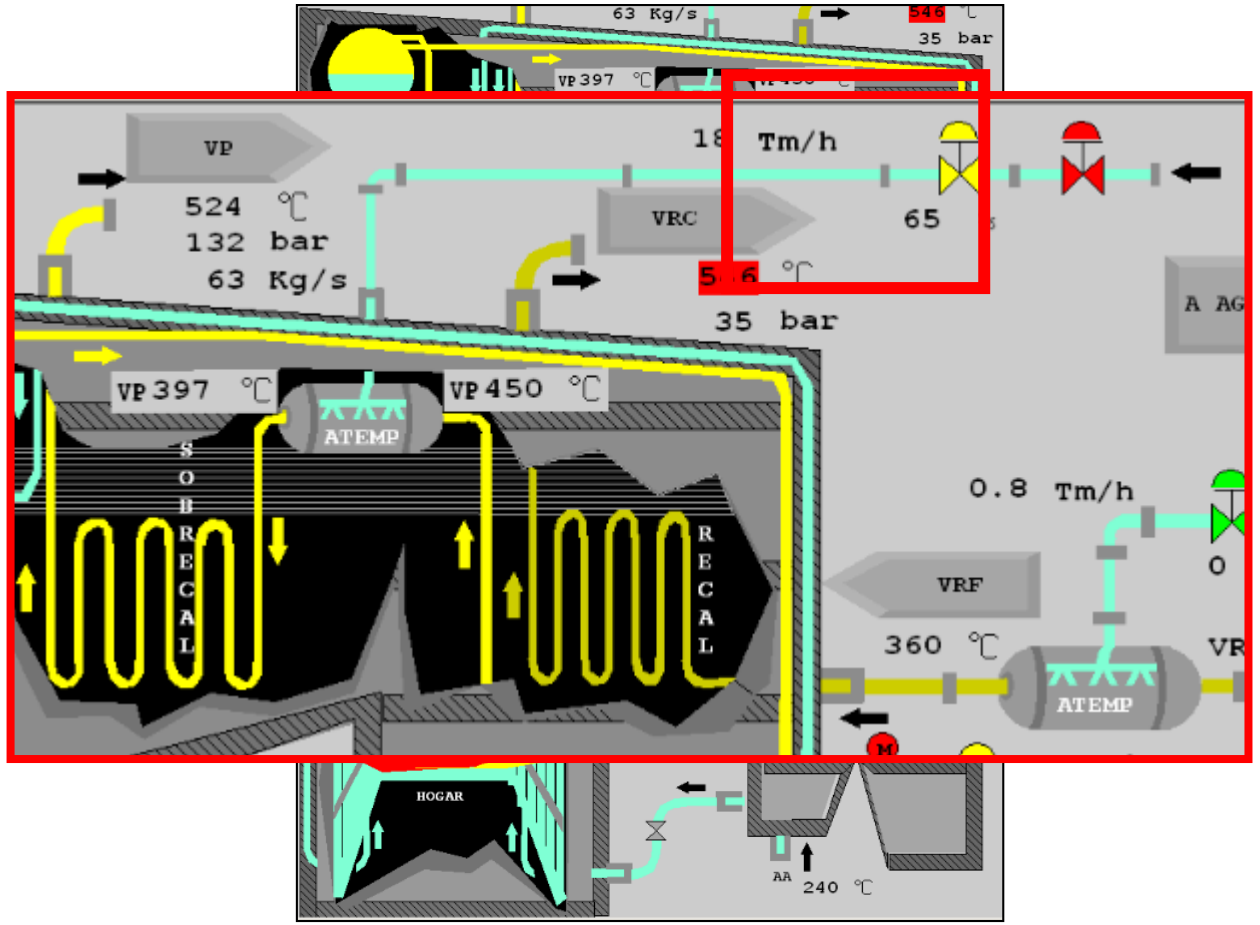
Boiler – Reheater

Oil&Gas Technology - Main Aspects

A set of tubes located in the boiler. Exhaust steam from the high-pressure turbine is guided to the boiler for reheating and from there to the intermediate and low-pressure turbines

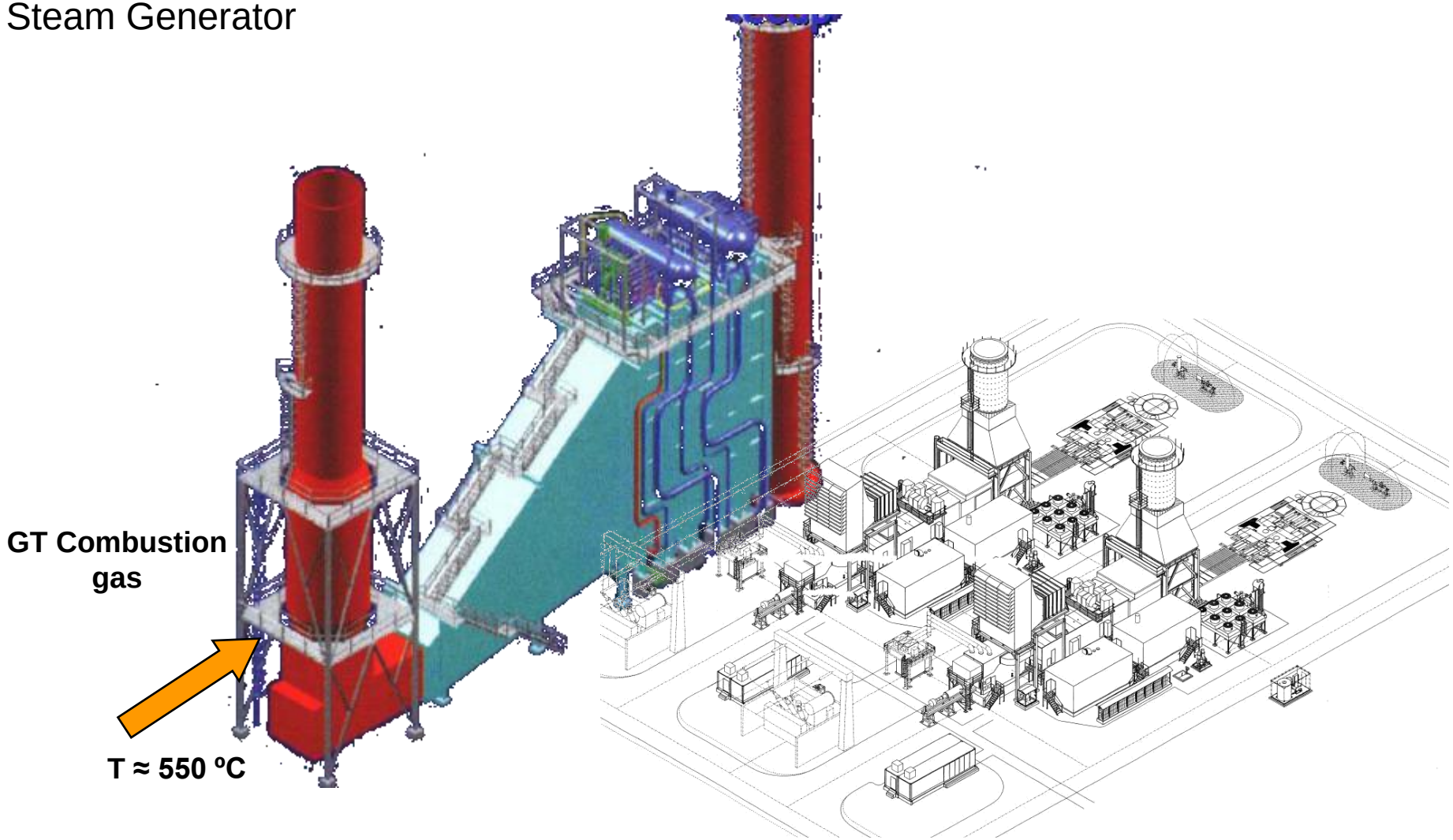
PROBLEMS

FOULING AMOUNT DUE TO ASHES AND SLAGS, REDUCING HEAT TRANSFER COEFFICIENT FROM FLUE GASES



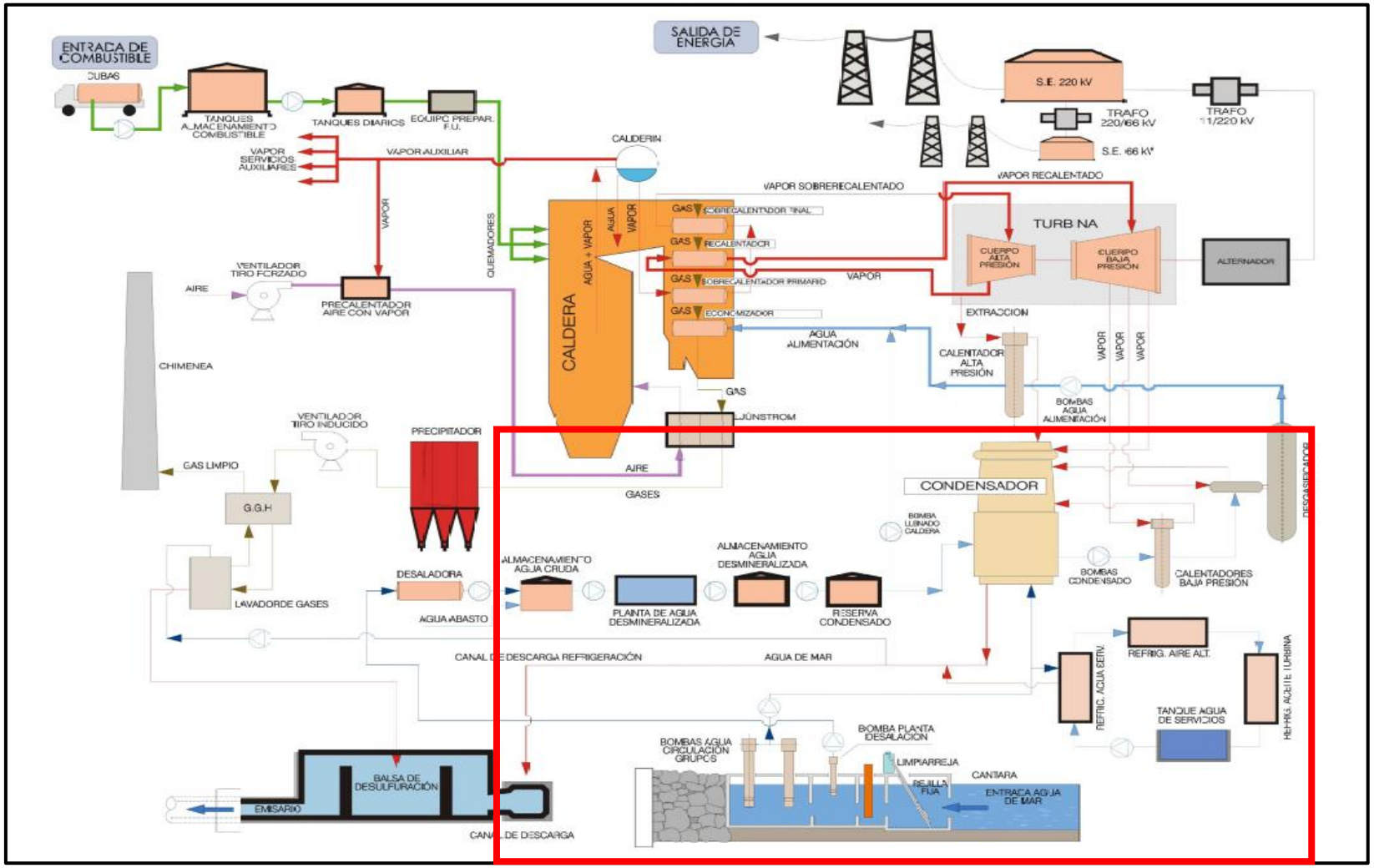
CCGT

Heat Recovery Steam Generator



Refrigeration/Heating

Refrigeration Systems



Fuel oil heating

It provides a determined flow of fuel under normal conditions of pressure, viscosity with the correct degree of filtration

FUEL TEMPERATURE	**65ºC SUCTION** **110ºC DISCHARGE**

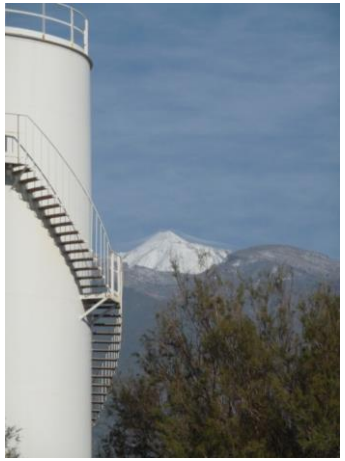
Environment

Enviromental

Oil&Gas Technology - Main Aspects

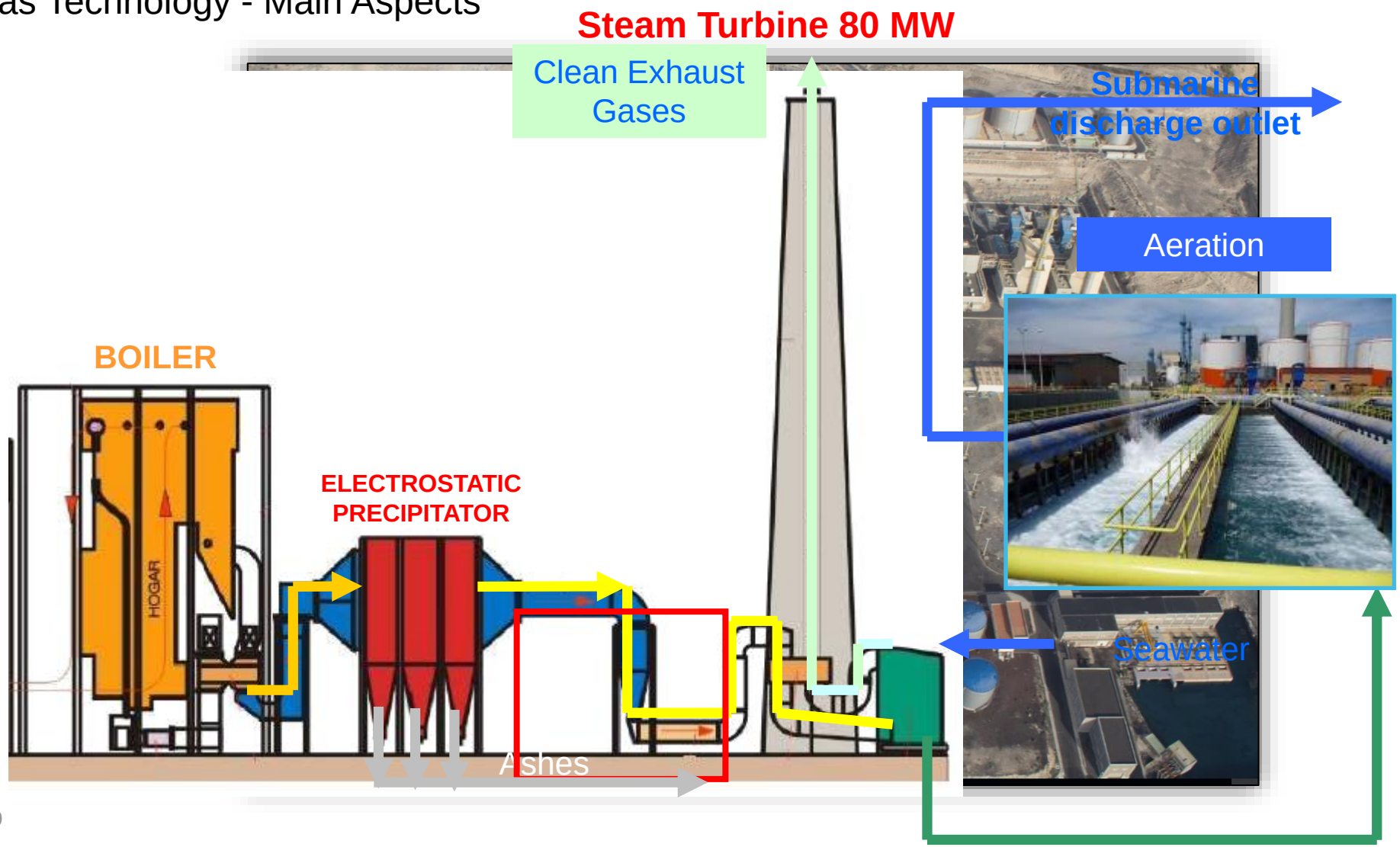
	GD01-GD02	GV01-GV02	GG01-GG02	GG03-GG04-GV03 (CC1)	GG05-GG06 -GV04 (CC2)
Total capacity	24 MW-24MW	80 MW-80 MW	37,5MW–42MW	75,5MW–75,5MW - 75,1 MW	78,4MW–78,4MW - 78,2 MW
Main Fuel	- Gasoil for start-up - Fuel-Oil as primary fuel	- Gasoil for start-up - Fuel-Oil as primary fuel	Gasoil	Gasoil	Gasoil
SO2 Emissions (mg/Nm3)	500	400 (*)	60 (*)	60	60
NOx Emissions (mg/Nm3)	3500	450 (*)	300 (*)	120	120
Ashes (mg/Nm3)	50	50 (*)	50 (*)	20	20

(*) Corregido al 3% de O2



Steam Turbine Generating Units

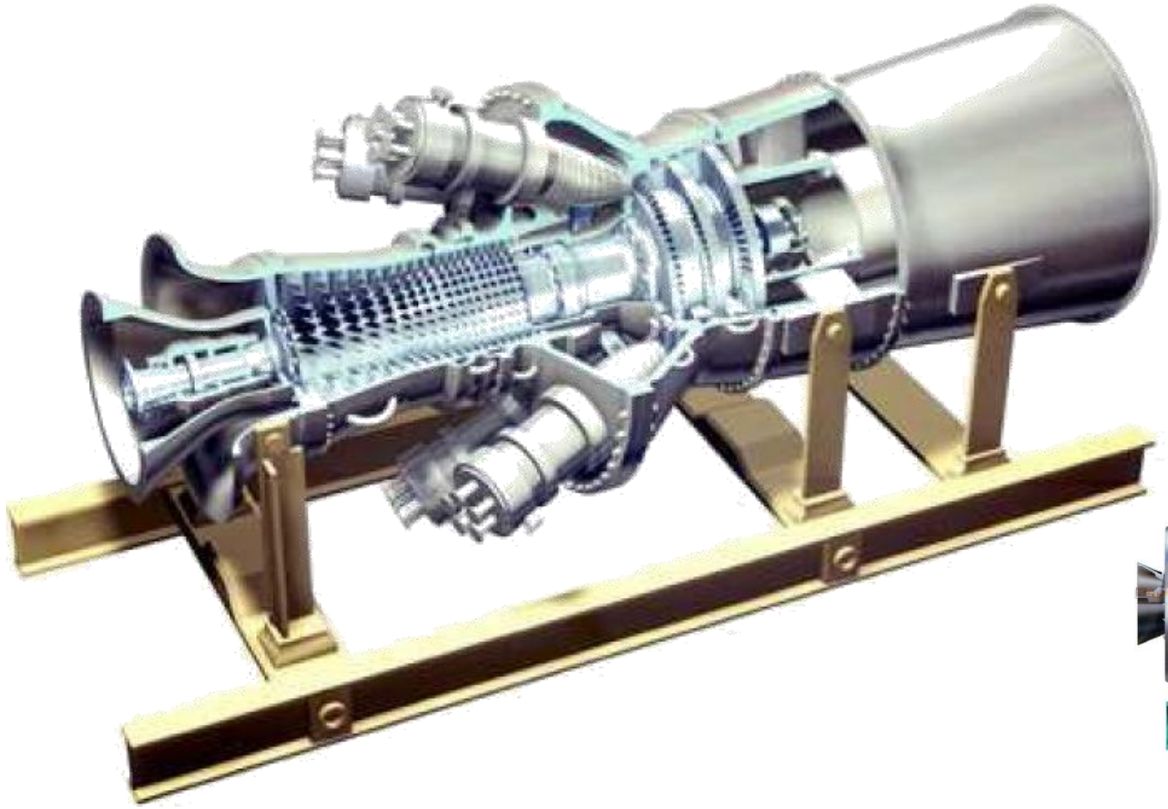
Oil&Gas Technology - Main Aspects

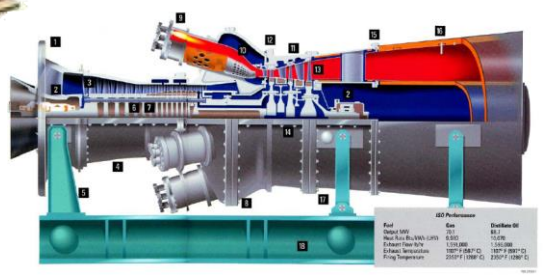


Health & Safety - Zero Leakage

Oil&Gas Technology - Main Aspects

Gas Turbine. Water injection



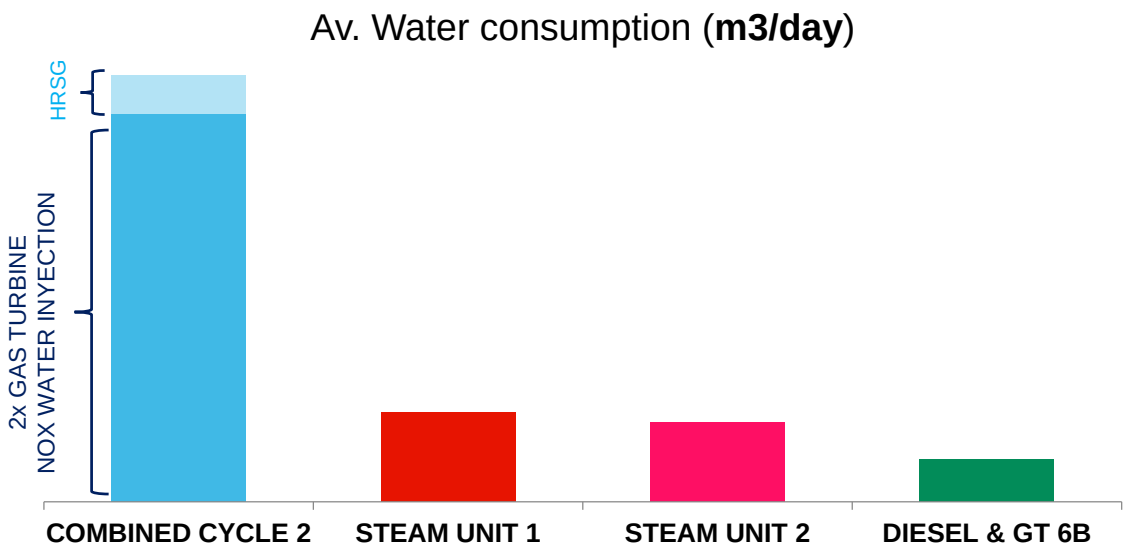


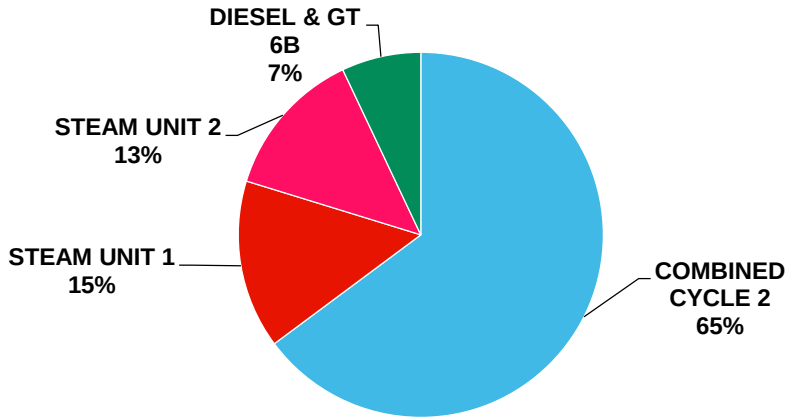
Safety

Fire protection

Water management – Water Balance

Average water consumption per generation technology





Gracias