



CIUDEN CARBON CAPTURE TECHNOLOGIES DEVELOPMENT CENTRE

Mr. Tomás Coca Stefaniak
CO₂ Capture Programme

CO₂ Capture and Storage -
Response to Climate Change
Vilnius, 13th-14th April, 2011





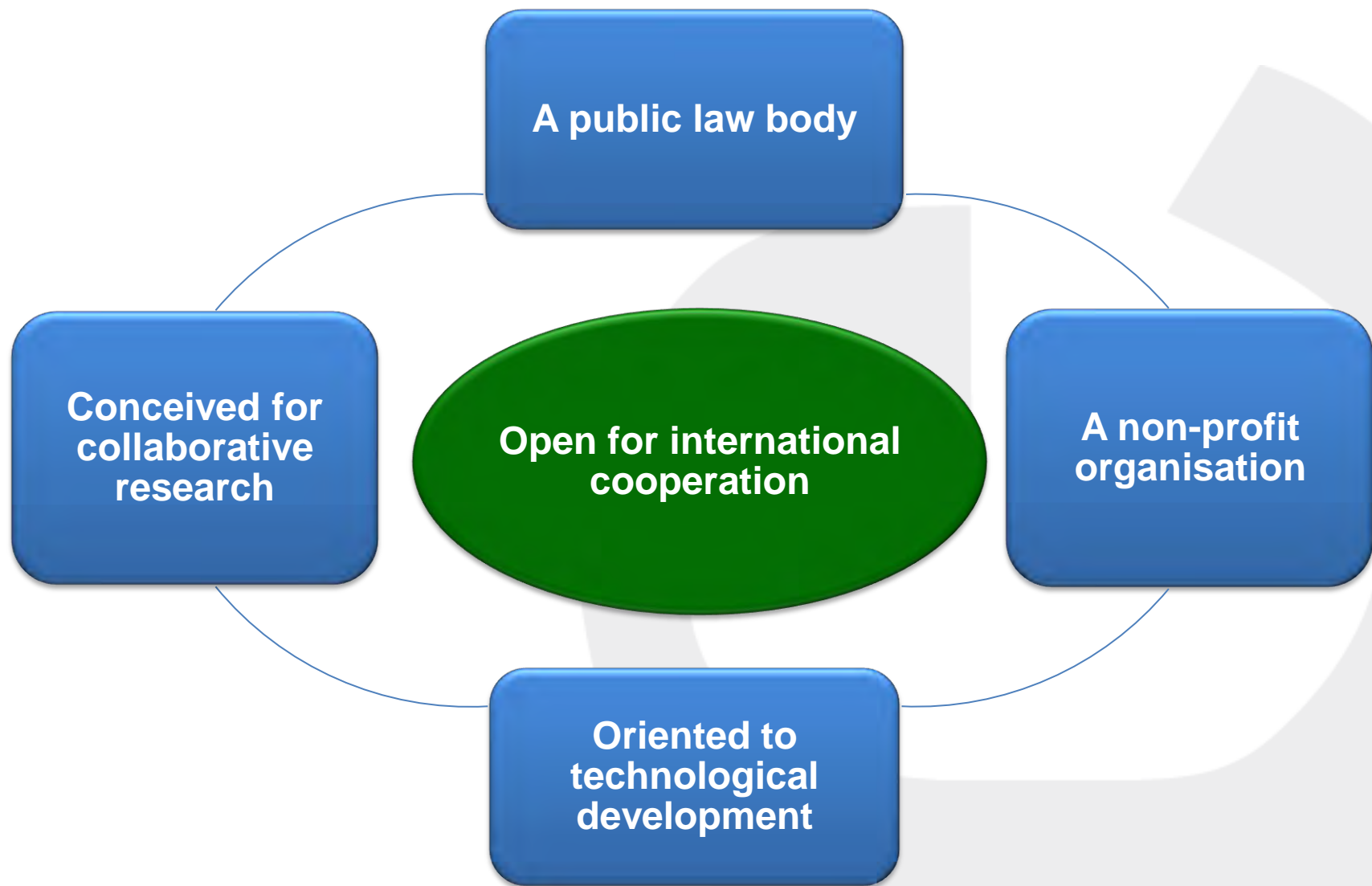
Fundación Ciudad de la Energía **CIUDEN**



An initiative of the Spanish Administration



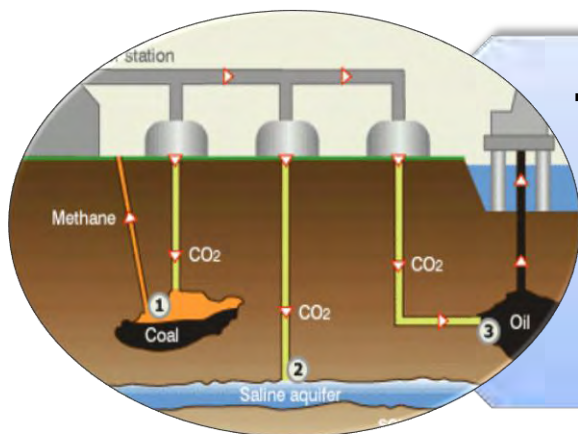
Attributes





To create a world-wide reference centre for CCT and CCS development

THROUGH



Technology Development Plants for CO₂ Capture, Transport and Storage

Activities on CCS



Ciuden has designed, constructed and will operate a Technology Development Centre

Capture

- To validate close-to-market and emerging technologies for application at commercial scale

Transport

- To obtain technical criteria for design, management and safe operation of CO₂ pipelines through long-term runs

Storage

- To develop technologies and processes for injection and monitoring in saline aquifers to support industrial-scale activities



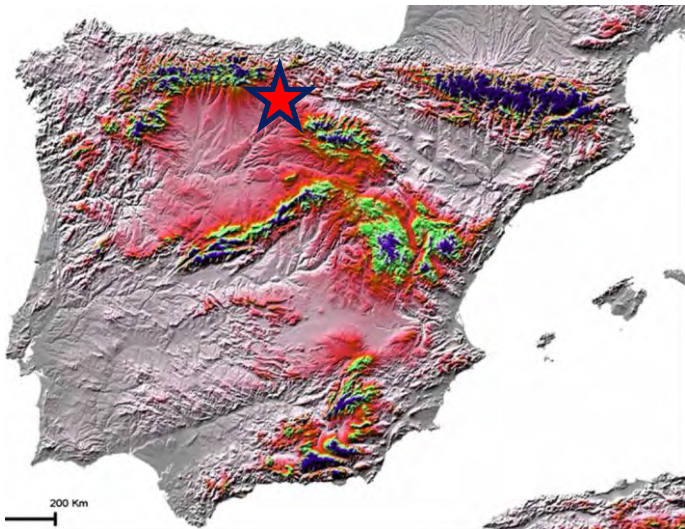
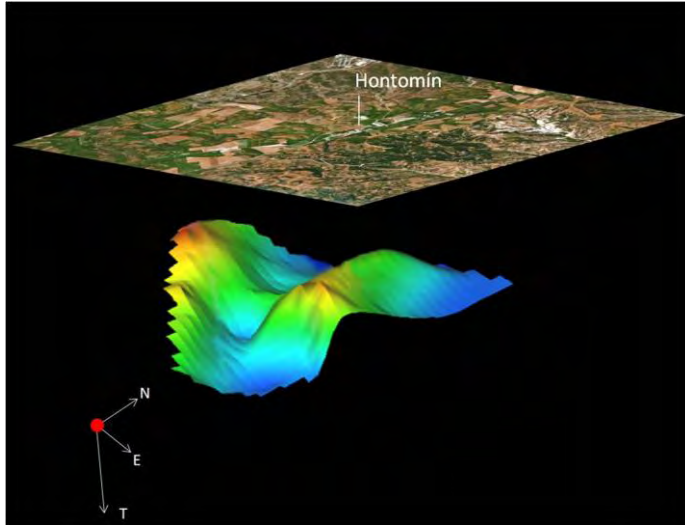


The Storage Programme General Description



CIUDEN's objectives

Related to geological storage of CO₂



- To demonstrate its feasibility and security
- To develop methodologies and technologies
- To facilitate technical criteria for the Regulating Authority
- To promote education
- To competitively improve Spain's industry with CO₂ footprints.

To achieve those objectives



A real scale
Technological Development Plant
is required

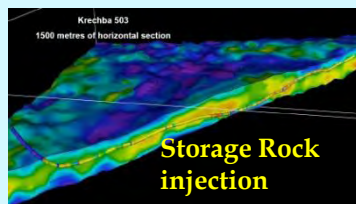
"Life-Cycle" of an industrial CO₂ storage

Pre-operational



Site selection and Characterization

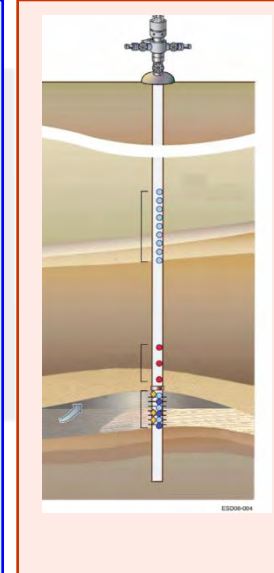
Operational



Industrial storage



Post-operation



Monitoring

Transfer of Liabilities



Operator to Gov.

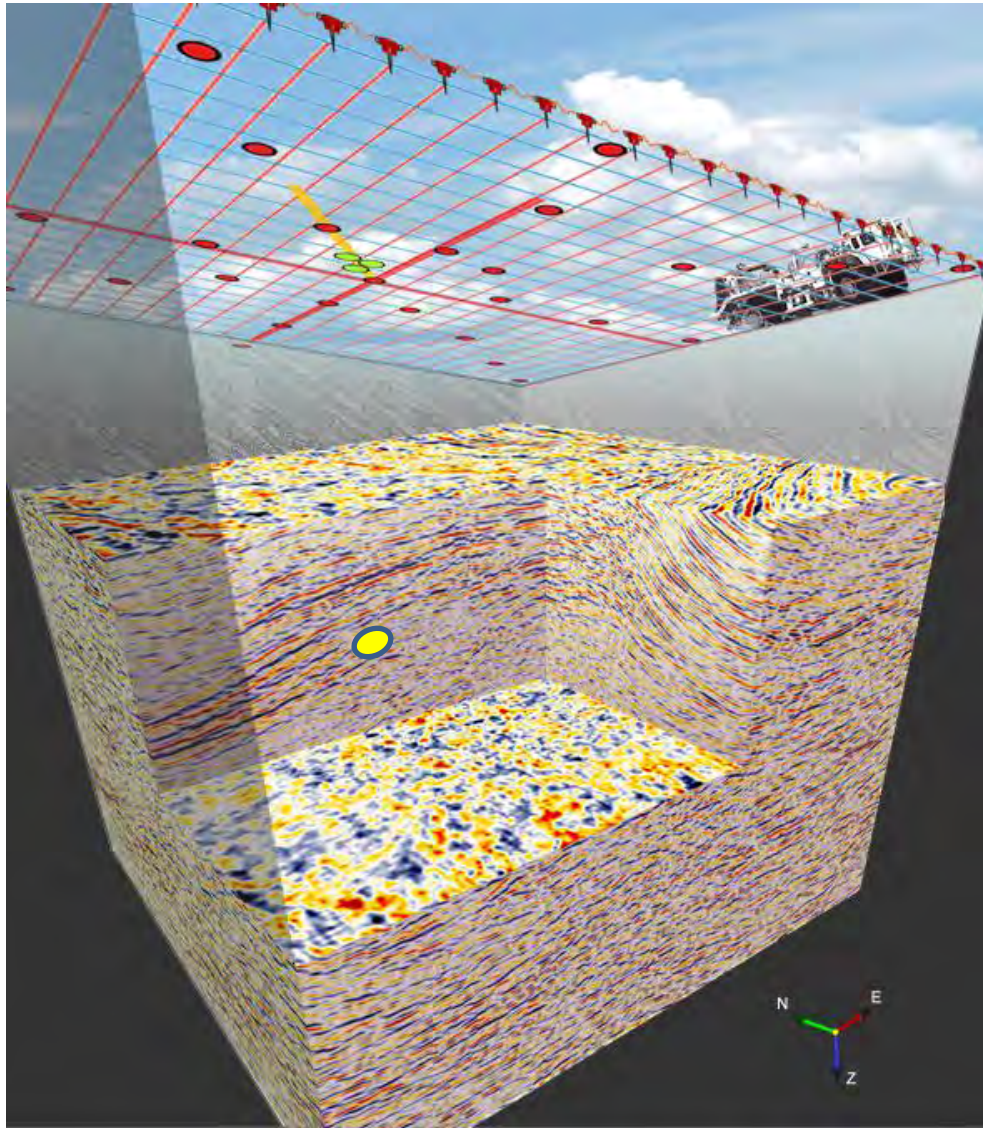
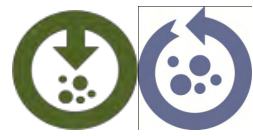
Studies on:

Geology - Geochemistry - Geophysics - Engng -

+

Social Acceptance + Insurances Science + ...





Ciuden's TDP on CO₂ Storage is in its characterization phase.

3D Seismic survey performed & processed, currently under interpretation.

Once exact location of the wells has been found, the work is at their proper design.

Further charac. studies are being performed in the area (geophysics, hydro,...).

Risk evaluation, performance assessment and public awareness topics are addressed as a continuous process.





The Capture Centre General Description

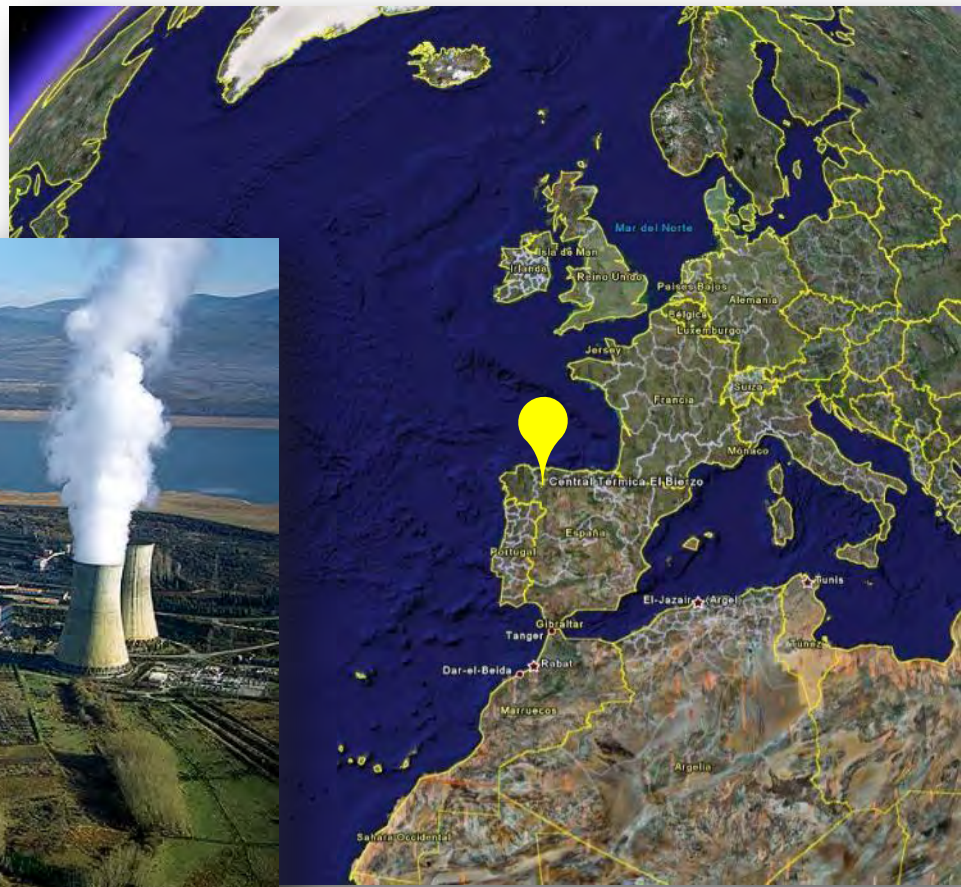
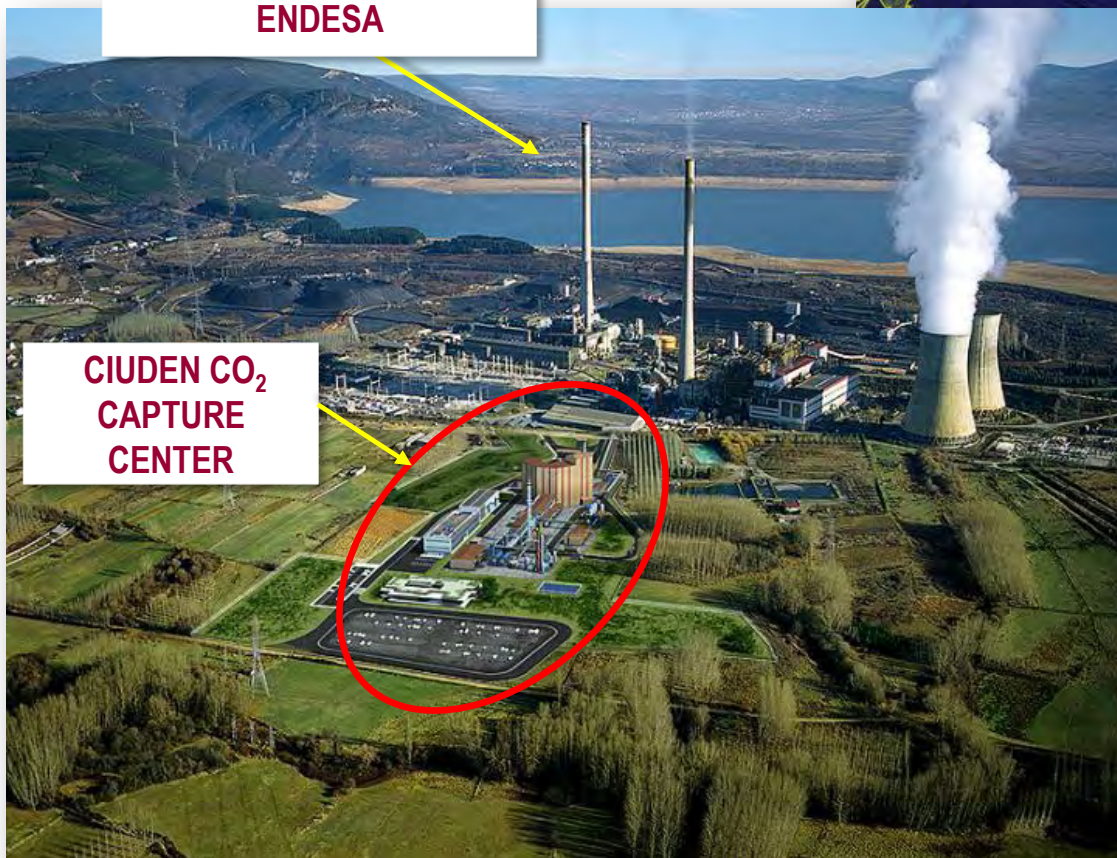


CIUDEN CO₂ Capture Center



COMPOSTILLA II PS
ENDESA

CIUDEN CO₂
CAPTURE
CENTER



Oxycombustion

**Pulverized
Coal
20 MWth**

**Circulating
Fluidized
Bed
30 MWth**

**DeNO_x
Dedust
DeSO_x**

CO₂ purification and compression

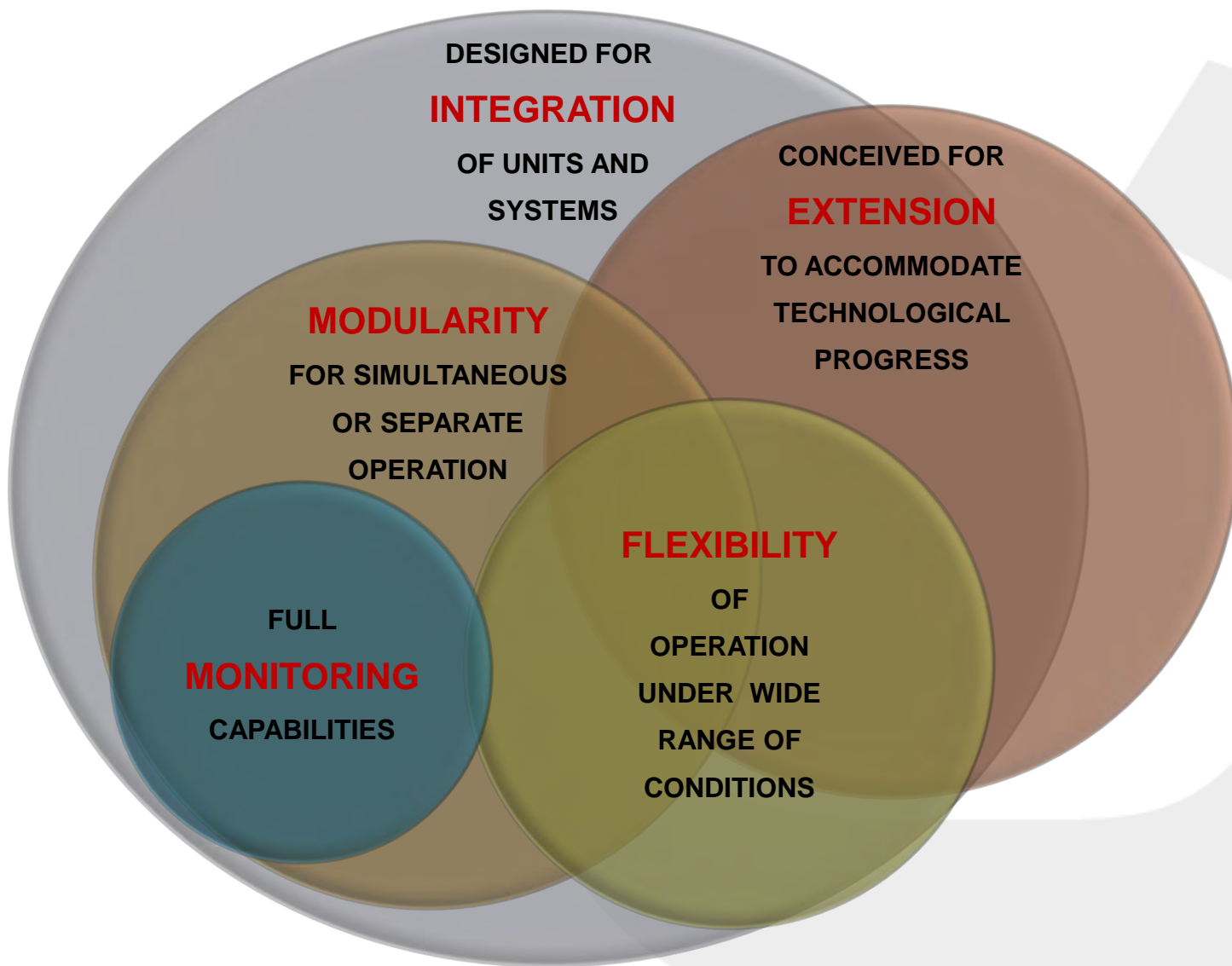
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Biomass Gasifier 3 MWth

**Fuels: anthracites, bituminous, subbituminous coals, pet coke,
sustainable biomass**



Main characteristics





Commissioning on going!



The Capture Centre Technical Description



SOLID FUEL PREPARATION

- Anthracite, Bituminous, Subbituminous, Petcoke
- Roller crusher, 15 t/h
- Crushed coal silos, 2 x 120 m³
- Ball mill, 5 t/h

PULVERIZED COAL BOILER

- 20 MWth: 3,4 t/h pulverized coal
- 4 Horizontal + 2 Vertical burners
- Co-combustion biomass, 25%
- Steam: 30 bar , 420°C
- Oxygen: 6,6 t/h

CIRCULATING FLUIDIZED BED (CFB) BOILER

- 30 MWth: 5,5 t/h crushed coal
- Co-combustión biomass
- In bed DeSO_x, limestone
- Steam: 30 bar, 250°C
- Oxygen: 8,8 t/h

FLUE GAS DEPURATION

- CYCLONS BATTERY
- DeNO_x (SCR): < 40 ppmv NO_x
- BAGFILTER: < 15 mg/Nm³
- DeSO_x efficiency > 95%
- Design flue gas flow: 23.215 Nm³/h

CO₂ COMPRESSION & PURIFICATION

- COMPRESSION
- DRYING
- CLEANING
- COOLING

BIOMASS GASIFIER

- 3 MWth
- Bubbling fluidized bed

AUXILIARY SERVICES

- Oxygen supply: 10,6 t/h
- CO₂ supply : 3 t/h (inertizing)
- Electricity supply: actual 4 MVA ; 10 MVA future
- LNG : 1.500 Nm³/h

TDP PERSONNEL

- Research Team: 16
- O&M Team: 20
- Administration: 3

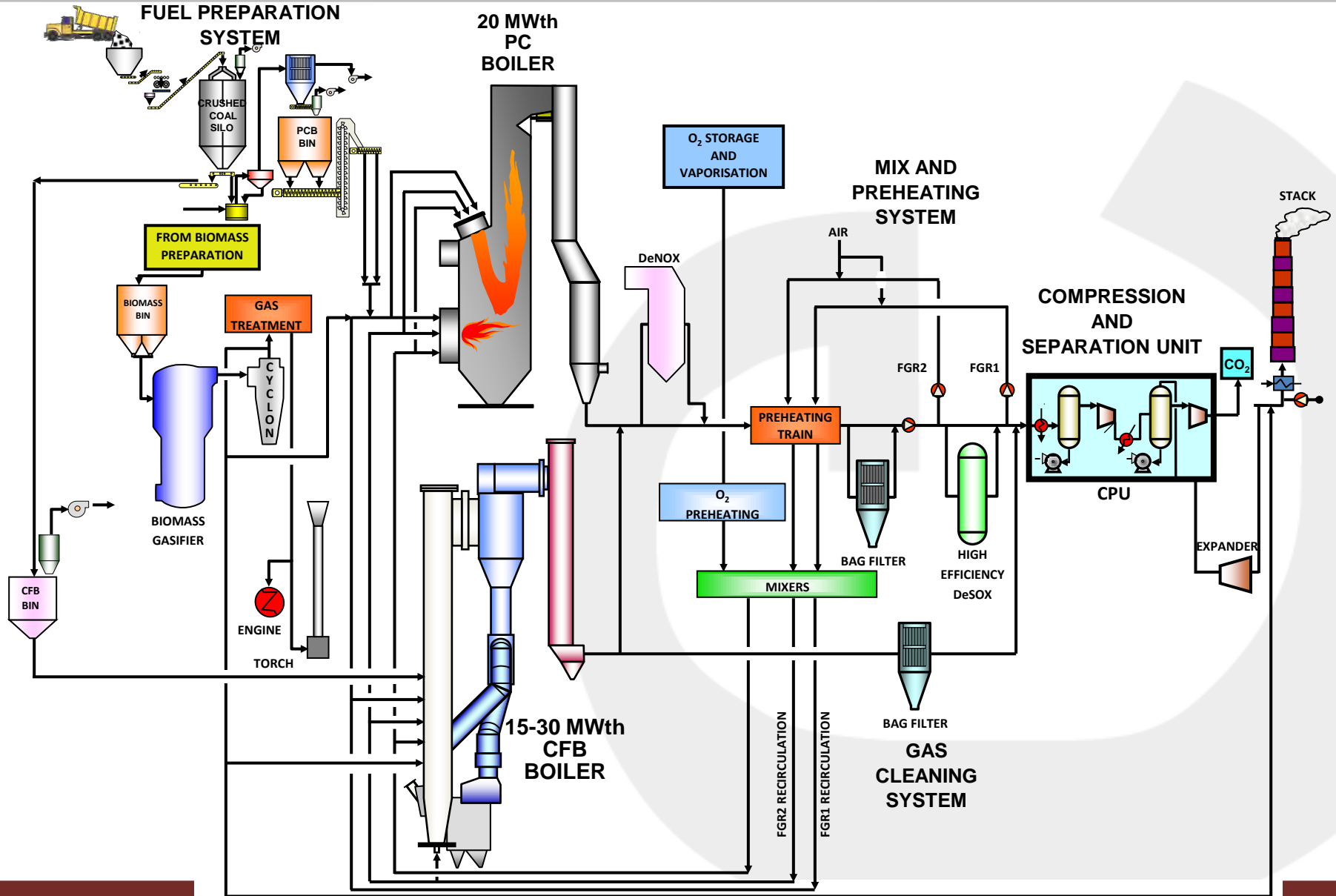
INDUSTRIAL AREA

100.000 m²

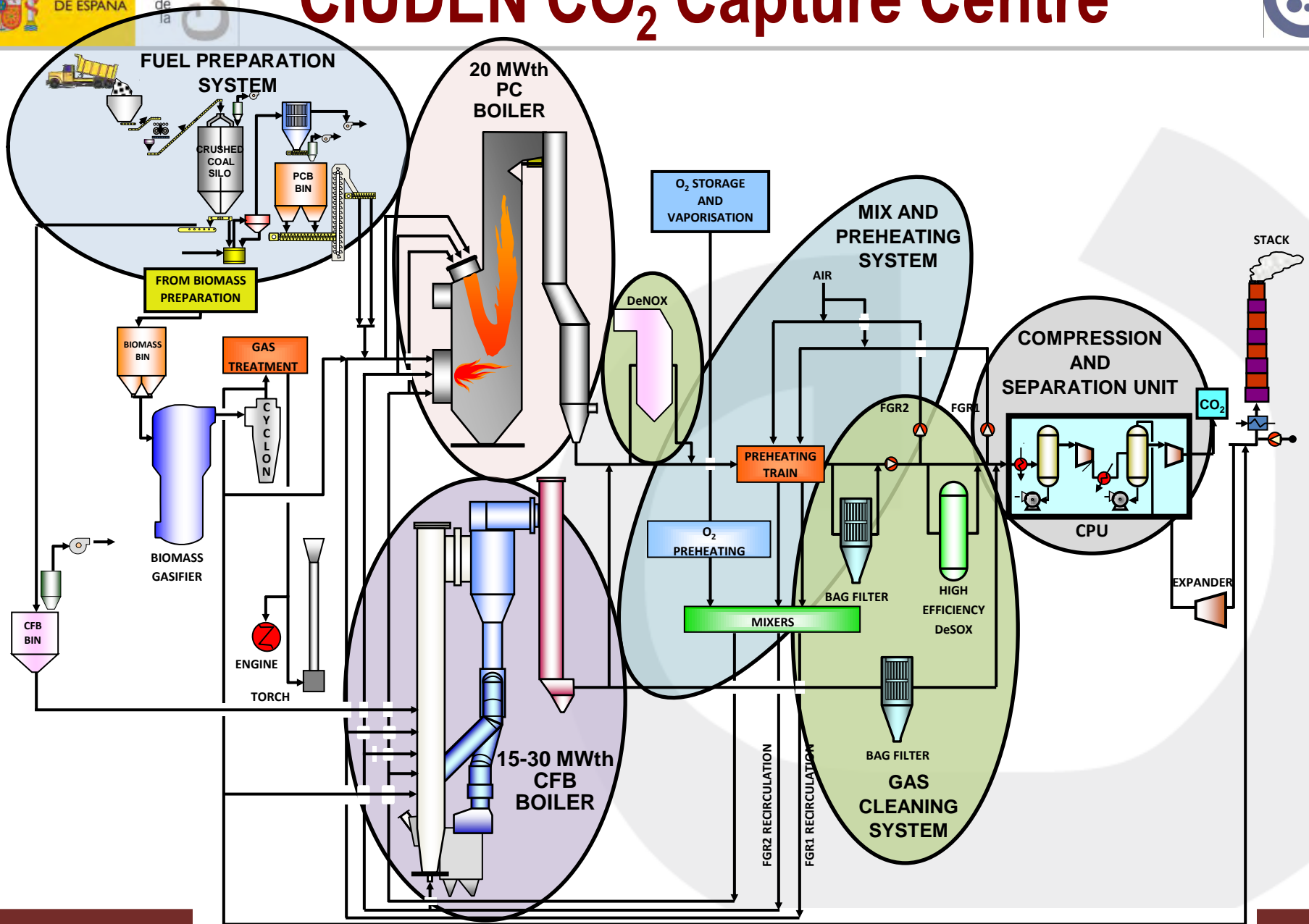
BUILDINGS

- Technical: 3.500 m²
- Industrial: 1.300 m²

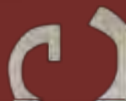
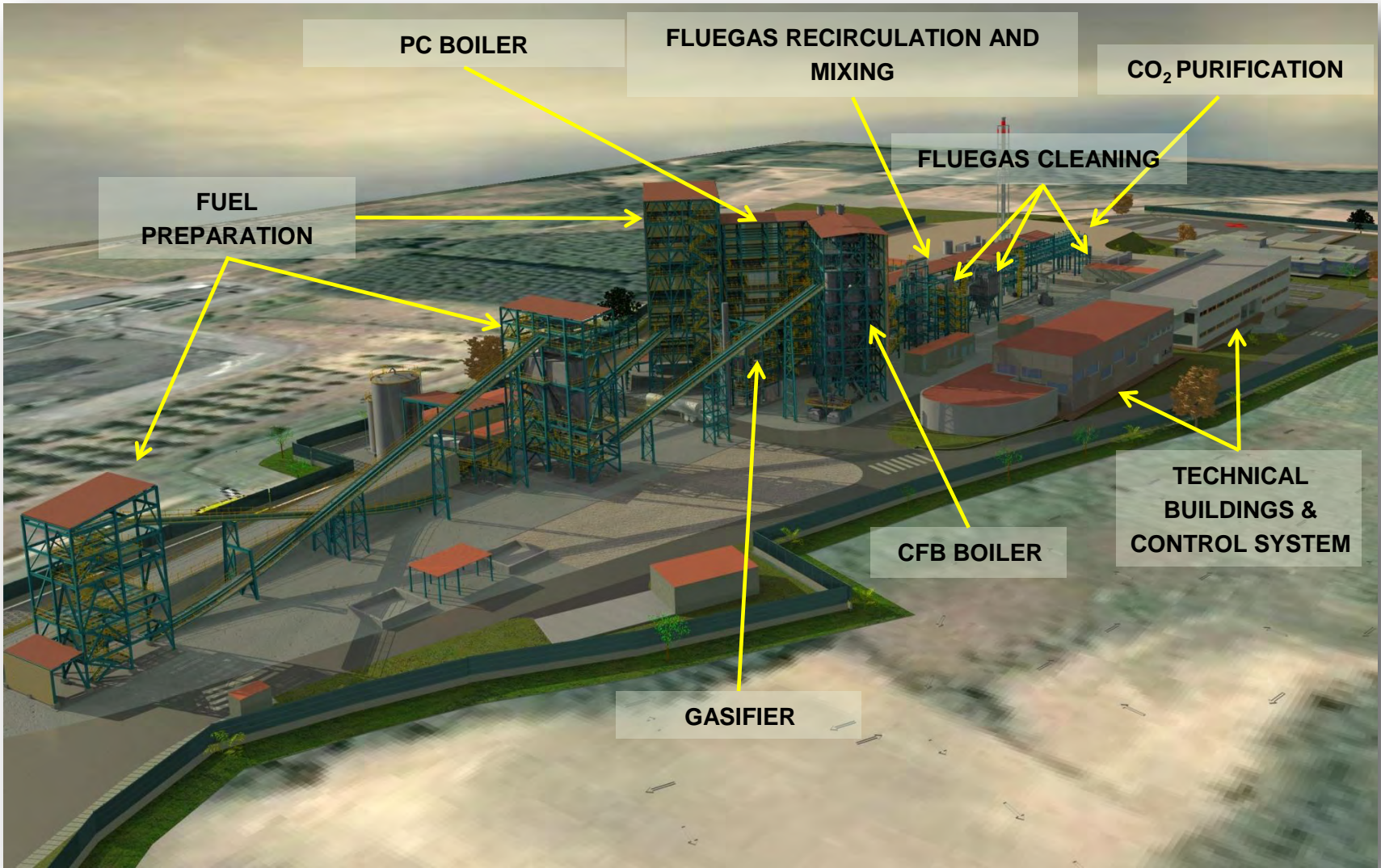
CIUDEN CO₂ Capture Centre



CIUDEN CO₂ Capture Centre



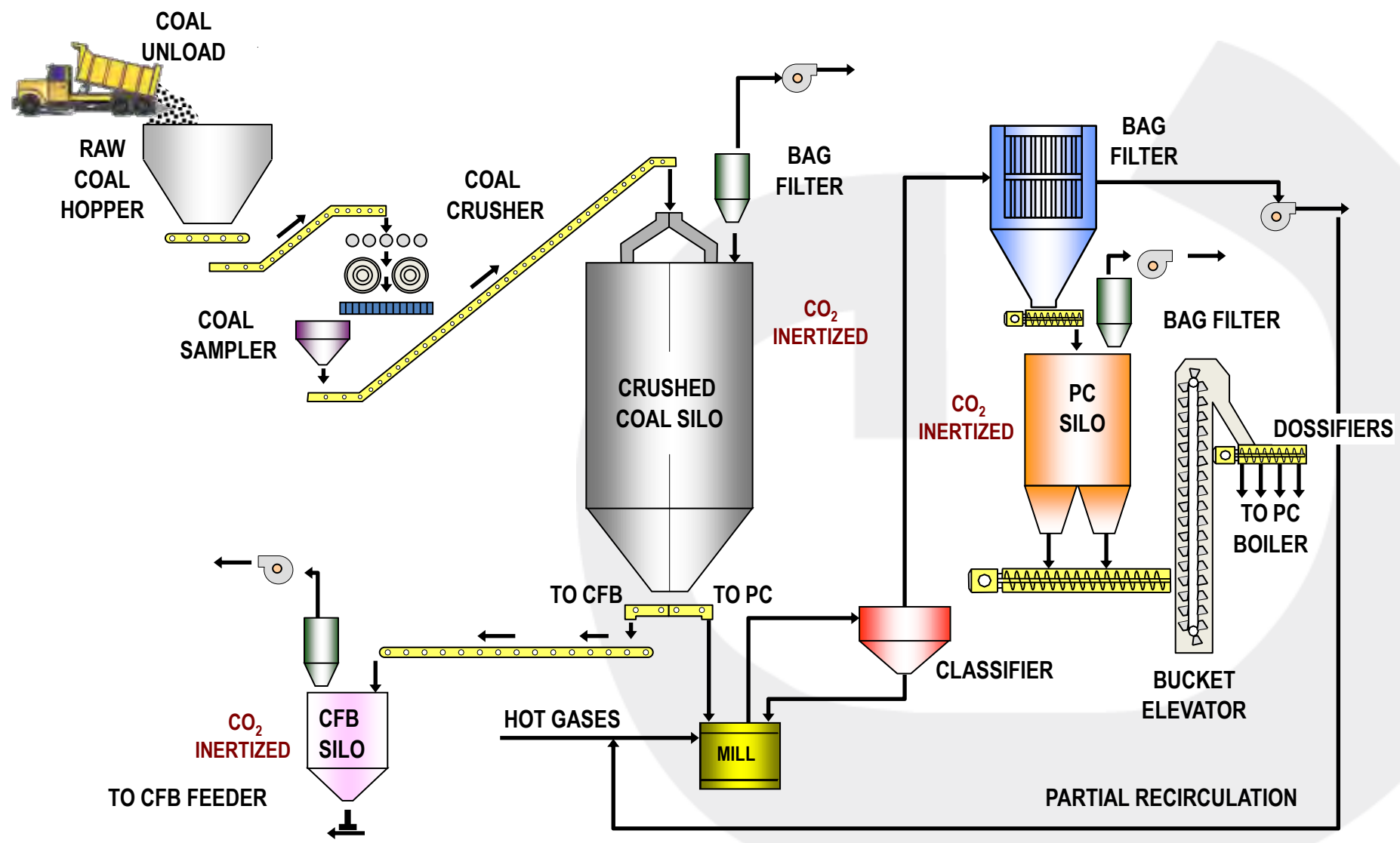
CIUDEN CO₂ Capture Centre



CIUDEN CO₂ Capture Centre



Fuel preparation system





Design Fuels



Proximate analysis as received (wet)	Anthracite	Bituminous	Sub-bituminous	Pet coke
Moisture (%)	8.8	7.5	26.8	6.8
Volatiles (%)	6.5	22.3	36.8	10.6
Ash (%)	32.0	13.8	1.5	0.8
Fixed carbon (%)	52.7	56.4	34.9	81.8
H.H.V. (kcal/kg)	4888	6550	4941	7785





GOBIERNO
DE ESPAÑA

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energía

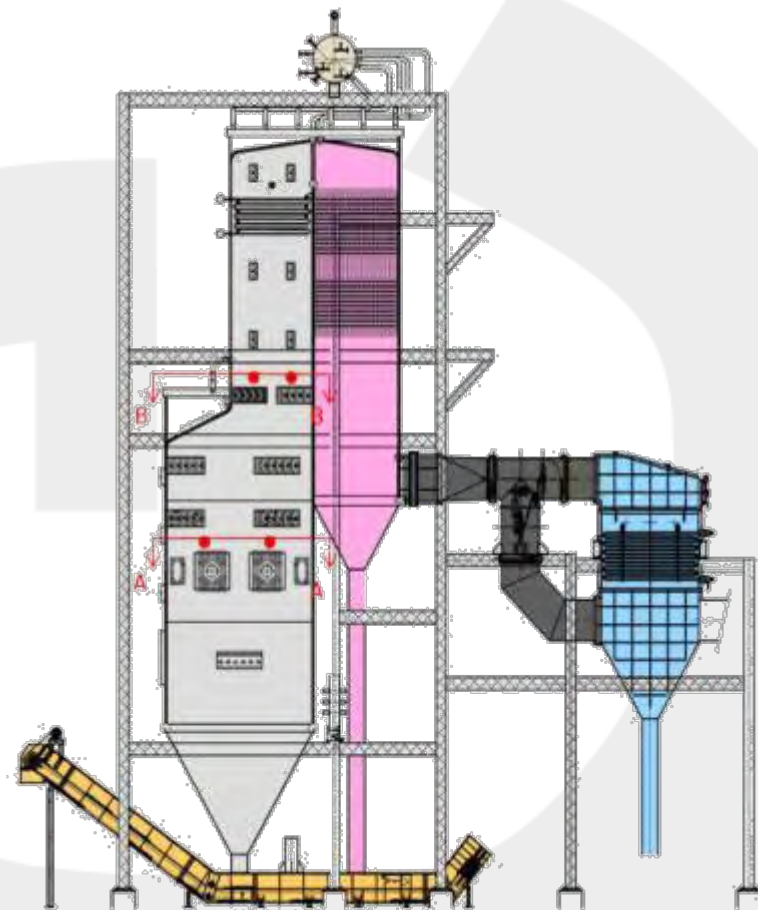
Fuel preparation system



PC Boiler



Size (m)	24 x 7.6 x 4.5
Burners	4 horizontal burners 2 vertical burners Biomass feed system
MWth PCS max oxy mode	20
O ₂ (kg/h)	6600
Recirculation gas flow (kg/h)	17900
Flue gas flow (kg/h)	26400
Coal flow rate (kg/h)	3350
Steam (t/h)	25
P(bar) / T (°C)	30 / 420



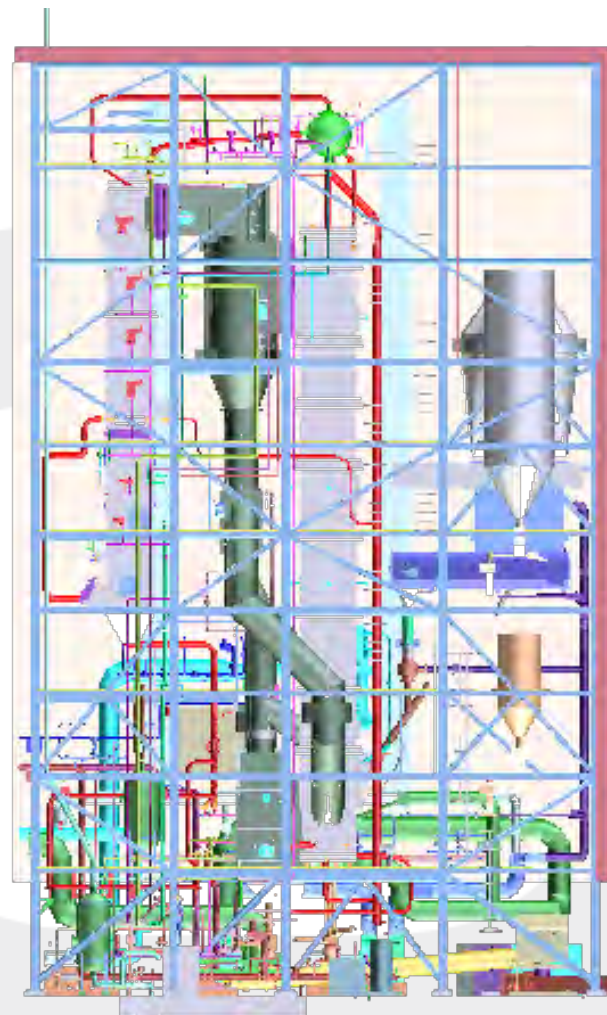
PC Boiler



CFB Boiler



Dimensions (m)	21x2.7x2.4
MWth max oxycombustion	30
O ₂ consumption (kg/h)	8775
Flue gas recycle (kg/h)	25532
Flue gas (kg/h)	28800
Coal consumption (kg/h)	5469
Limestone feed (kg/h)	720
Steam (t/h)	47.5
P(bar) / T (°C)	30 / 250



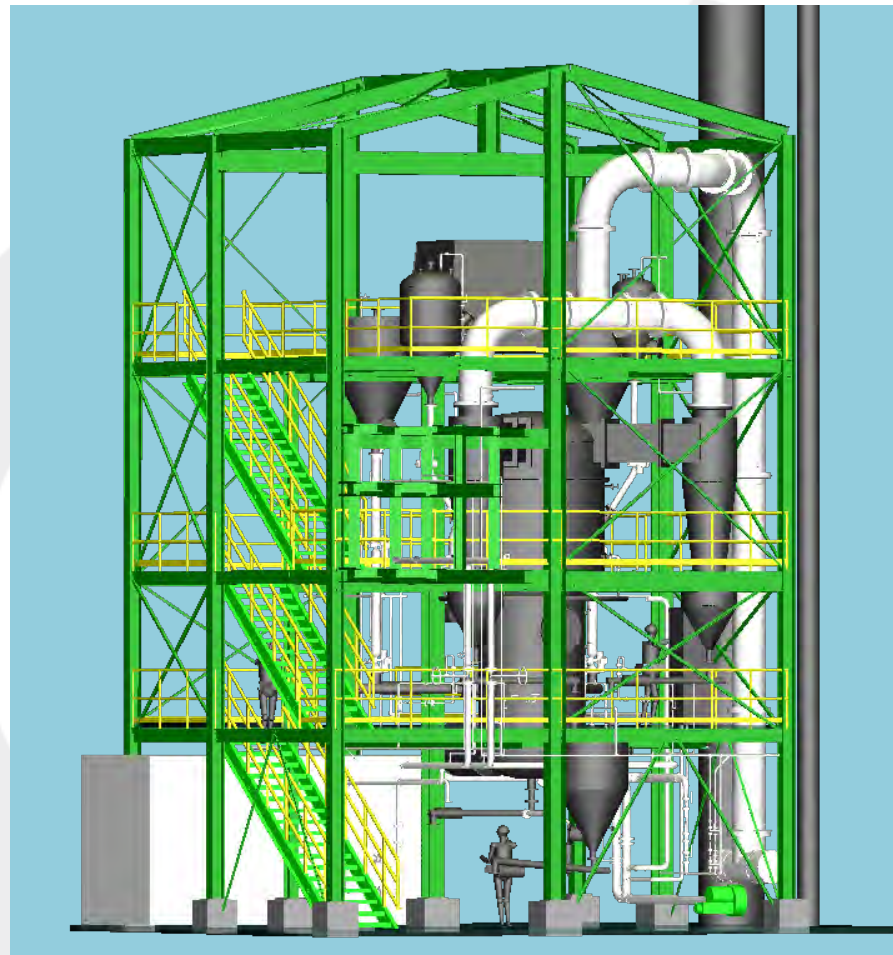
CFB Boiler



Gasifier main characteristics



GASIFICATION TECHNOLOGY	BUBBLING FLUIDISED BED
CAPACITY	3 MWth
APPLICATION	THERMAL
OXIDANT AGENT	AIR
OPERATING PRESSURE/TEMPERATURE	0,3 BARG / 800 °C
BIOMASS TREATMENT CAPACITY	15 t/d
OCCUPIED AREA	90 m2
EFFICIENCY (COLD GAS BASIS)	98% (75%)

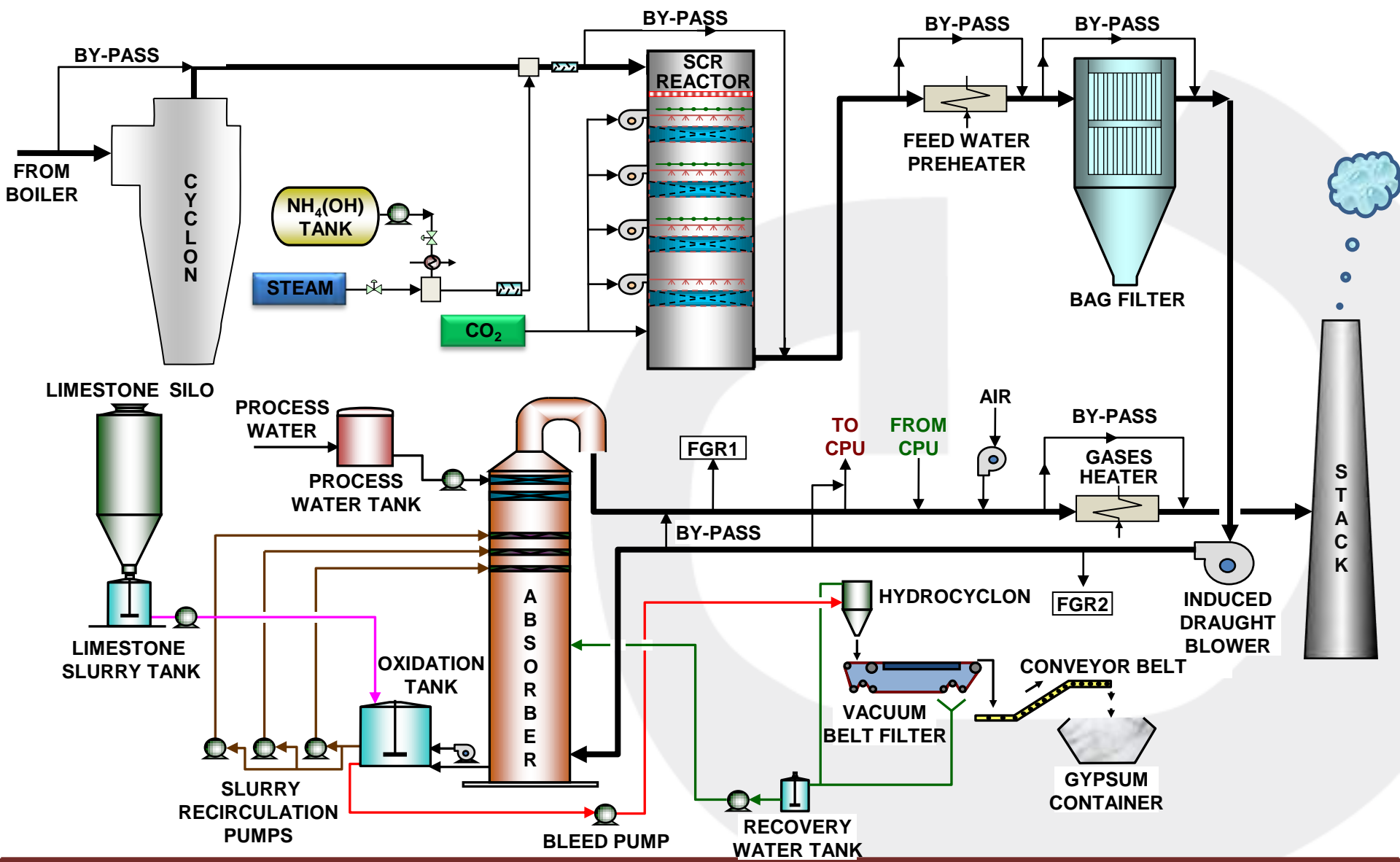




Gasifier



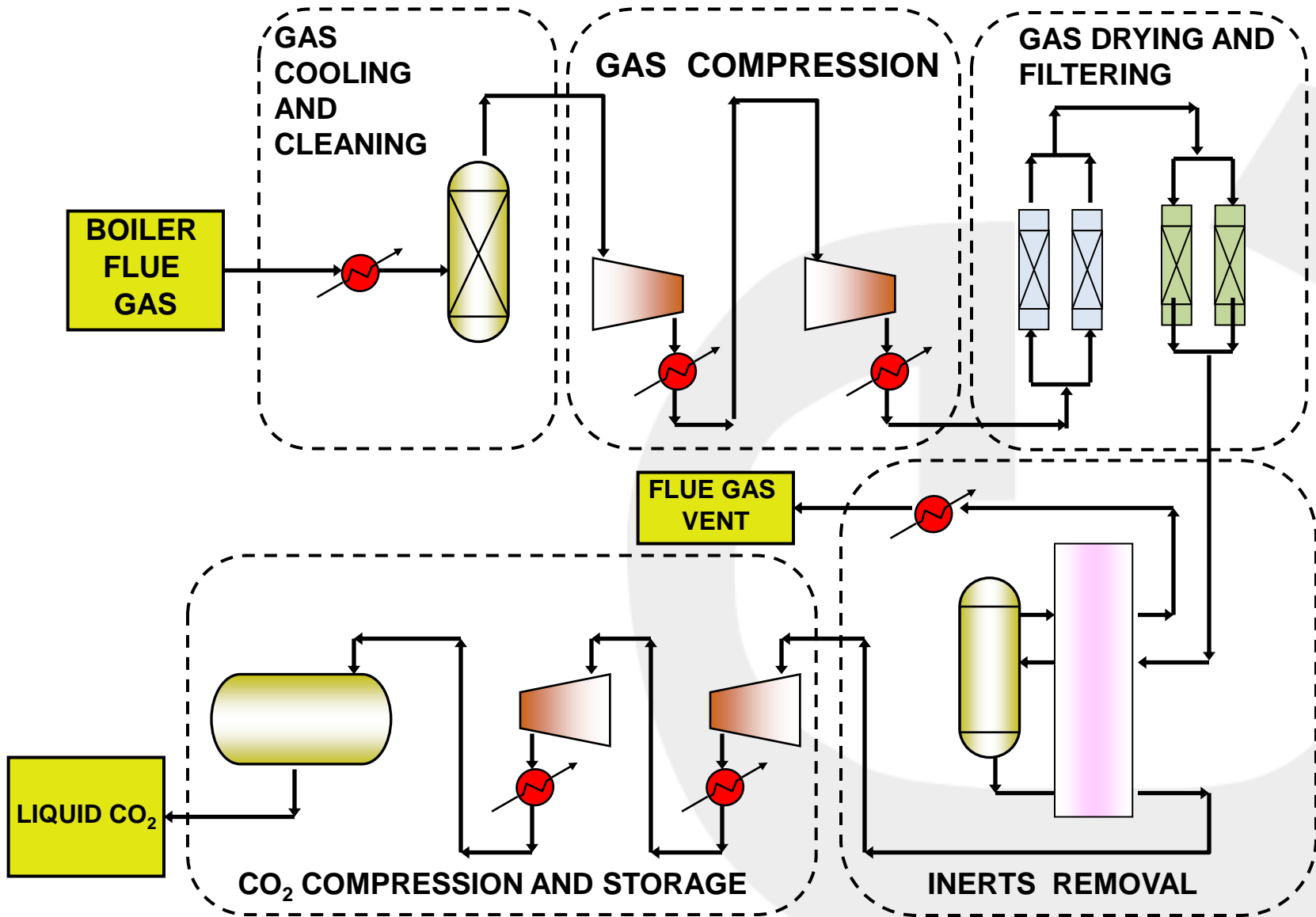
Flue gas cleaning system



Flue Gas Cleaning



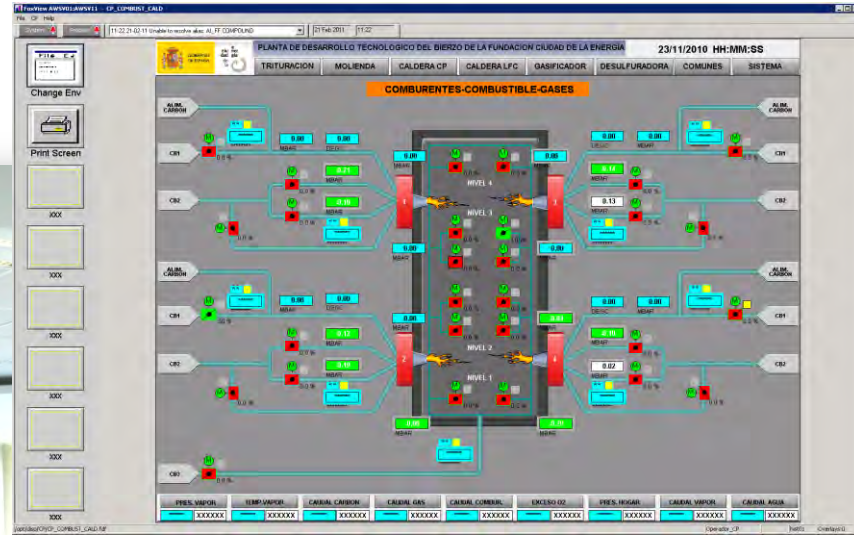
CO2 Processing Unit



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CIUDEN CO₂ Capture Centre



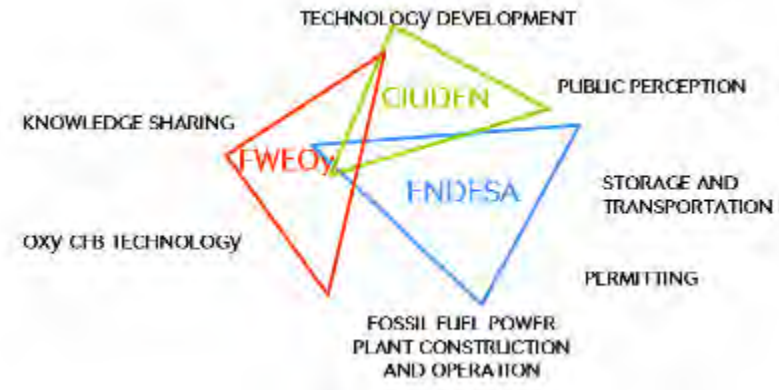
Commissioning on going



The Compostilla Demo Project



Co-financed by the European Union



www.compostillaproject.eu





Thank you!

Any Questions?

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