



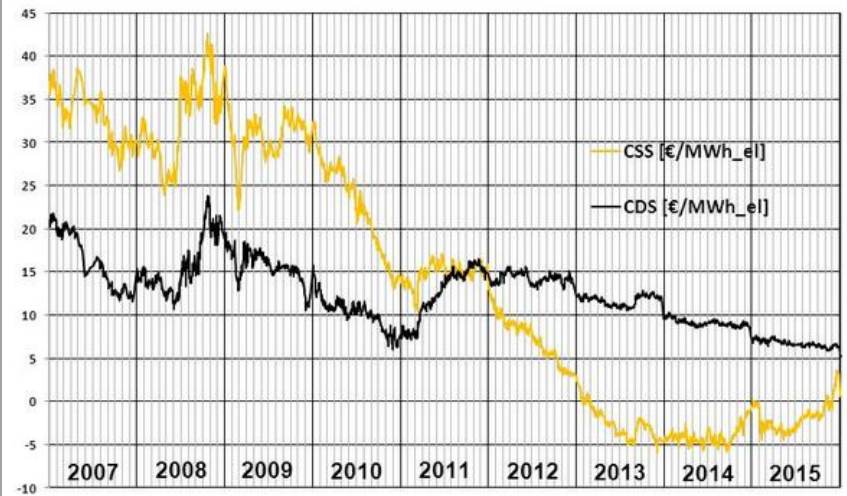
Leading the Energy Transition: the EPH Case

January 2022

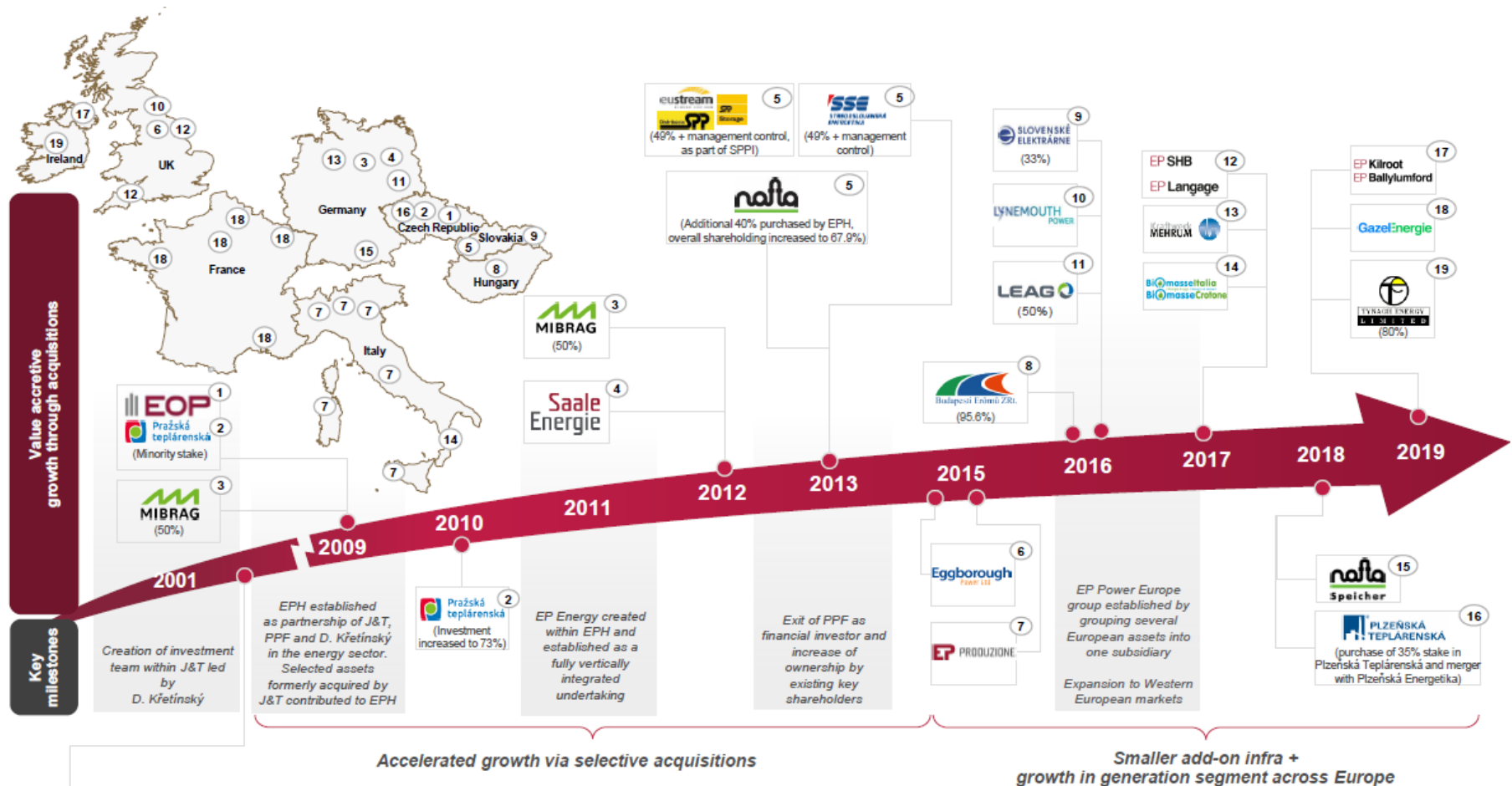
The last 20 years have transformed the energy sector forever

FUNDAMENTALS

REGULATION TECHNOLOGY



EPH became the largest private, strategic investor in the energy sector in Europe



Regulated assets
When the world was going merchant

Merchant assets (incl 12 GW coal)
When the world was going infra

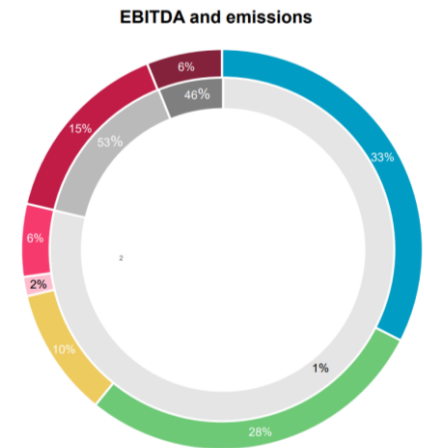
EPH further consolidated as one of the largest European biomass operator

- **Achieve direct operational experience** in biomass and biomass sourcing
- **Strengthen** the technical and commercial team
- Develop a portfolio of **baseload renewable energy**
 - **80 MW** installed at three plants
 - **630 GWh** of energy produced, equivalent to the production of 500 MW of solar PV
 - **200 M€** invested
 - **100 direct FTE** and over **1000 indirect**



EPH spotted an interesting opportunity to grow in the industry and lead the transition

- **Sites are limited and increasingly difficult to develop, so we should valorise them**
 - There is an option value in locations that are needed to keep the lights on
- **Fossil plants will be retired over time but they are needed over the next 30 years**
 - 40% renewables by 2040 means 60% will be fossil-fired
 - Transition should be gradual to avoid stress on the system
- **Assets can be managed responsibly to create more opportunities**
 - Good ESG practice requires managing assets, not just selling them
 - Convert, mothball or shut down responsibly
 - 80% of EBITDA from CO2-free assets, 15% from low-CO2
 - Reduce CO2 emissions by 60% by 2030
 - Zero coal by 2030 outside of Germany, 2038 in Germany



EPH is a leader in the energy transition and coal phase out

2300 MW reconversions

Lynemouth (UK)

- Coal to biomass
- 395 MW, 1.6 MT/yr
- COD 2018
- Investment 500 M€



SHB (UK)

- Gas to EFW
- 75 MW, 0.6 MT/yr
- COD 2022
- Investment 350 M€



Jaenschwalde (Germany)

- Lignite to EFW
- 50 MW, 0.5 MT/yr
- COD 2024
- Investment 300 M€



5400 MW cold reserve and decommissioned

Eggborough (UK)

- 2000 MW

Fiumesanto 1, 2 (Italy)

- 80 MW

Buschhaus, Mumsdorf (Germany)

- 460 MW

Jaenschwalde E, F (Germany)

- 1000 MW

Provence 5, Emile Huchet 6 (France)

- 1200 MW in 2021

Mehrum, Deuben (Germany)

- 760 MW in 2021

EPH contributed 12% of total CO2 reduction in Europe in the period 2014-18

EPH is investing in green conversion of residual sites

Renewables

2500 MW of renewables under operation

- 650 MW biomass, one of the largest operators in the world
- 1650 hydro, 60 MW batteries, highly dispatchable renewables

1000 MW of wind and solar pipeline in Germany

- 300 MW under construction

CCGT

Tavazzano (Italy)

- 800 MW – gas vs 800 MW older technology

Kilroot (No Ireland)

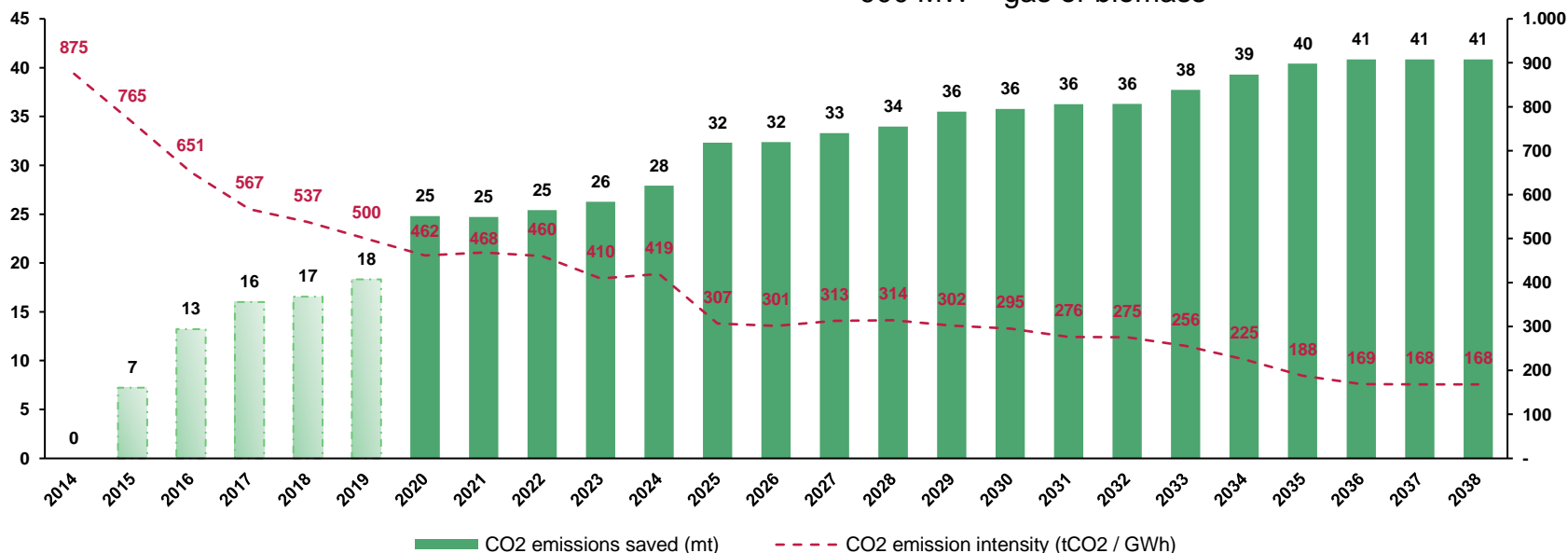
- 700 MW – gas vs 500 MW coal

Fiumesanto (Italy)

- 600 MW – gas or biomass

3 CHP (Czech Rep)

- 900 MW – gas or biomass



Over € 1 Bn invested in the last 5 years plus € 1 Bn to be invested in the next 3

The Lynemouth experience - timeline

2014 Plant awarded Investment Contract from UK Government to reconvert from coal to biomass



2015 Investment Contract receives State Aid approval from EU Commission



2016 Construction starts in January

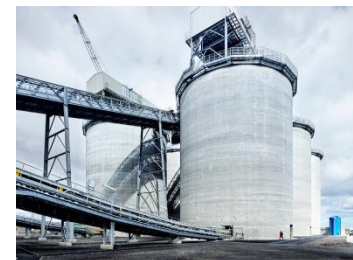
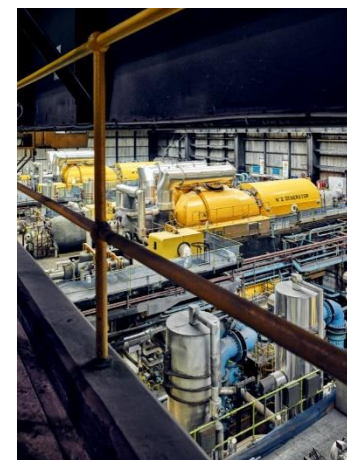


23.6.2018 Investment contract start date achieved, securing 420 MW renewable generation until March 2027



The Lynemouth experience – key data

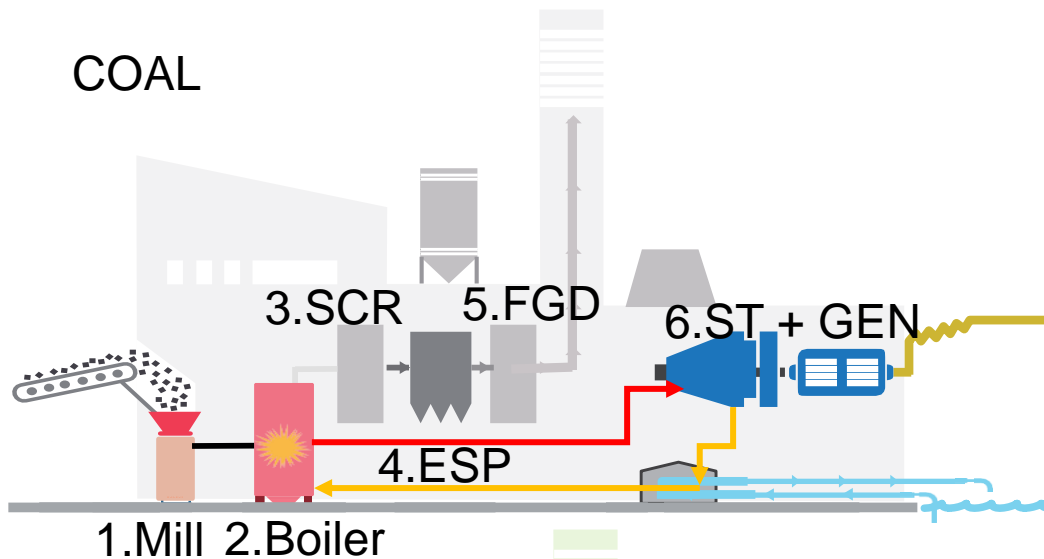
- **Scale:** one of the largest biomass plants in the EU at **420 MW gross capacity**. One of the most ambitious projects to be undertaken in the energy industry in recent years
- **Environment:** savings of approx. **1.5 million tonnes of carbon dioxide** emissions compared to coal
- **Investment:** plant biomass conversion and biomass storage capacity of 75,000 tonnes at the Port of Tyne and 50,000 tonnes at the station
- **Employment:** securing permanent jobs for **146 employees** and supporting many more in the supply chain
- **Logistics:** **1.8 mn ton pellet** mainly from Canada and USA, a direct sea/rail infrastructure network directly transporting biomass fuels to Lynemouth from the Port of Tyne



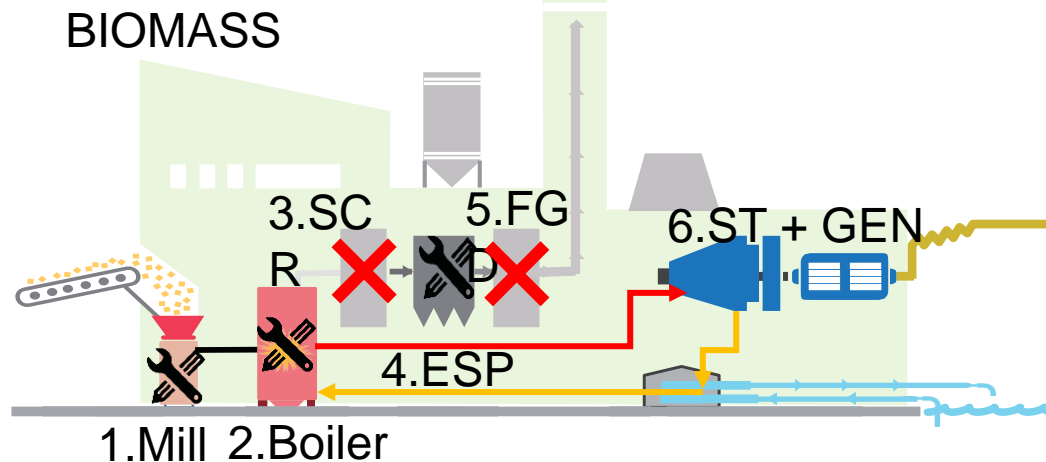
The Fiumesanto project

- **600 MW coal plant** in Sardinia with reliability must run contract until 2025, planned coal phase out thereafter
 - **One of two plants on the island**, with need for at least 600 MW of baseload capacity on the island to guarantee system reliability
- **Biomass and gas conversion considered**, as part of an energy complex including solar PV and cable connector together with System Operator
 - Solar PV and wind plus battery storage solution proposed by some parties
 - Political support for gas grid on the island
- **150 M€ investment** with no technical / operational / commercial red flags
 - 18 months permitting
 - 24-30 months EPC
- **Support scheme needed**
 - **Red 2 implications** (minimum efficiency)
 - 36% efficiency achievable
 - **Red 3 implications** (no new support to power only)
 - No local need for cogeneration
 - **Political support**

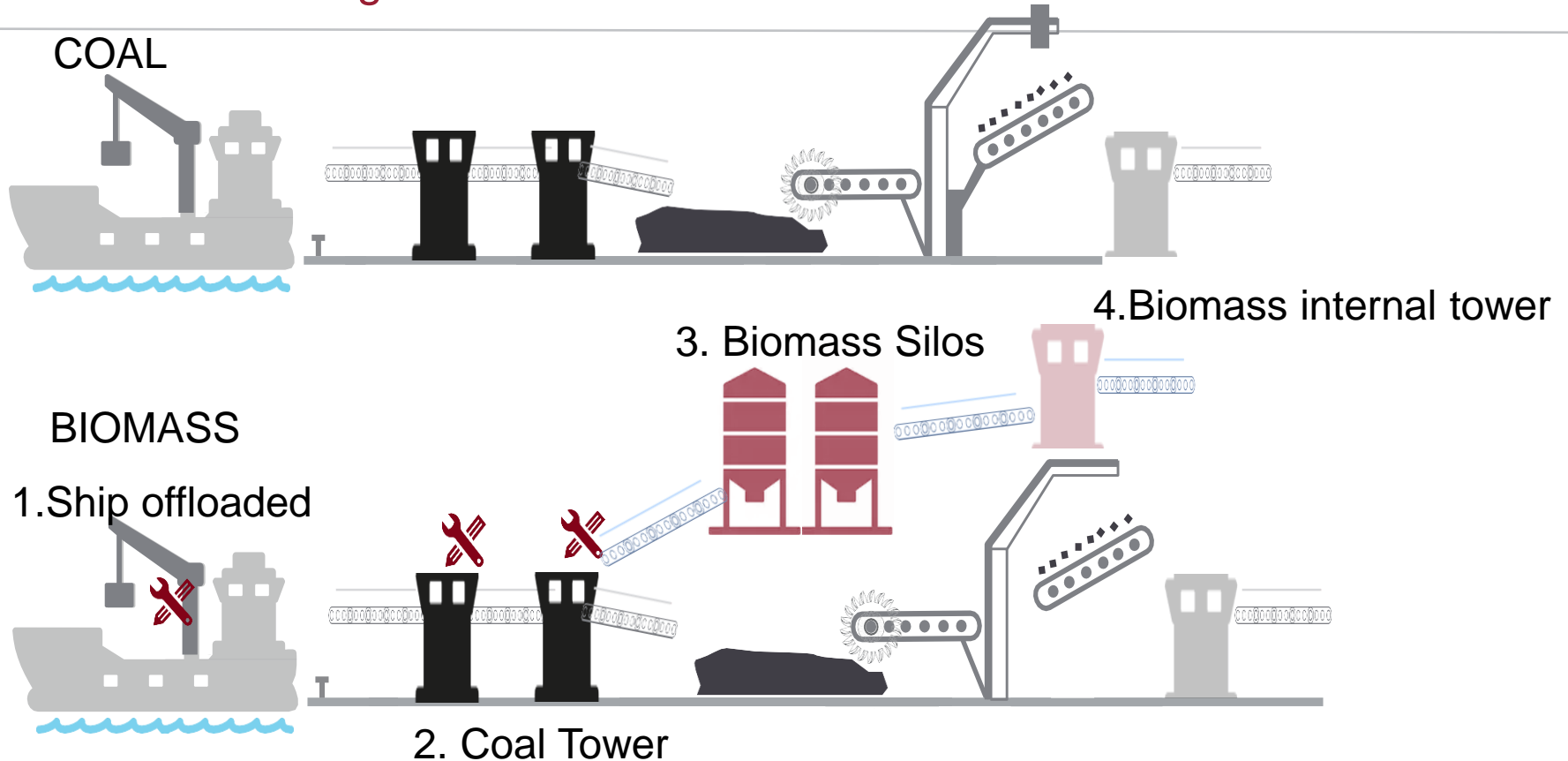
Main power plant modifications



1. MILLS: Install Dynamic Classifier, Piping from mill to boiler to be modified
2. BOILER: Burners to be replaced, to install a SNCR system to inject ammonia into the fire ball
3. SCR: excluded due to high velocity of catalyst poisoning
4. ESP: refurbished
5. FGD: not required, saving 7MW of auxiliary consumption
6. ST + GEN: no modification unless targeting to improve efficiency even further



Main fuel handling modifications



1. Ship off-loader: modification for a stronger dedusting system
2. Coal tower internal hopper to be replaced to avoid pellets fragmentation
3. New Silos (or Shed) – capacity estimated 100kT (>20days @full load)
4. New internal conveyor system from silos to unit 4
5. Modification on fire fighting system in all biomass handling

Key issues for future conversions

The benefits

- **Reducing CO2 emissions:** 70-80% reduction vs fossil alternative
- **Reducing CH4 emissions:** wood left to degrade has 85x effect of CO2
- **Baseload production:** 25€/MWh reduction in grid and system costs
- **Lower use of land:** Fiumesanto reconversion vs 50 sqkm of solar panels
- **Reduction of hydrogeological and wildfire risk:** 5% forest land, 14% wood mass, 69% dead wood increase since 2015
- **Large employment :** 3x other renewables

The challenges

- **Biomass is not always seen as green by NGOs**
- **Increasing support to hydrogen and battery storage**
- **RED 3 proposes no new support to power-only biomass after 2026**

Red 3 (and related local regulations)
will be key to determine
if coal-to-biomass conversions
and new biomass plants
still have a future in the European Union