

# Large-Scale Biomass Use for Bioenergy

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BioCleantech Conference

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# Drax Group plc

## Overview

**DRX**

Stock Symbol (LSE)

**£1.2bn**

Market Capitalization

31 August 2016

**BB+**

S&P Credit Rating



**Source**



**Generate**



**Supply**





# Drax Power Station circa. 1975



- UK's largest power station... 4 GW (6 x 645 MW units)
- Major emitter of CO<sub>2</sub>... 22m tonnes/yr at peak
- Critical asset... ~8% of total UK electricity supply



# Drax Power Station



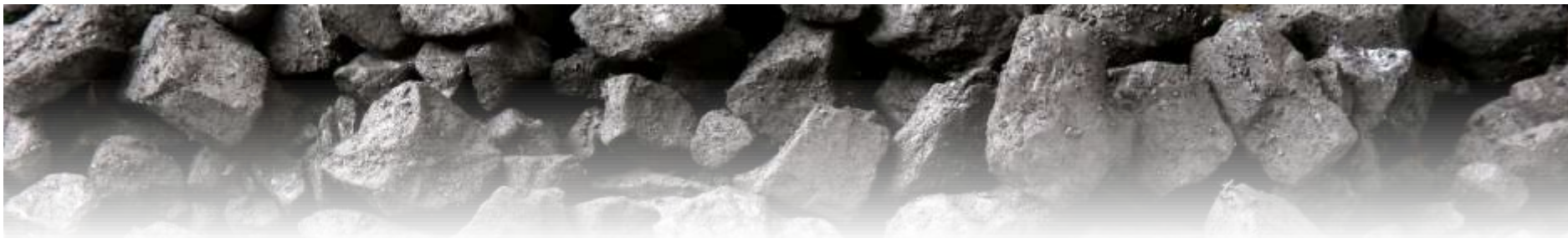
- 3 units converted to biomass. No loss of output or efficiency
- 20% of UK renewable generation
- Largest decarbonization project in Western Europe



# Coal-to-Biomass Conversion

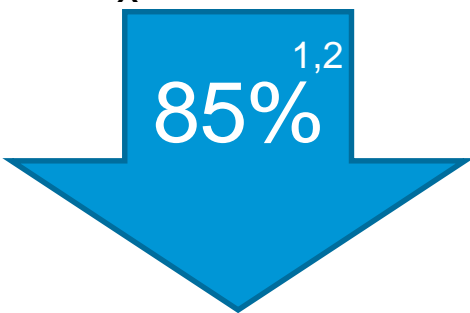
## Environmental benefits

### Significant environmental benefits from conversion to biomass generation



SO<sub>x</sub> emissions

<sup>1,2</sup>  
85%

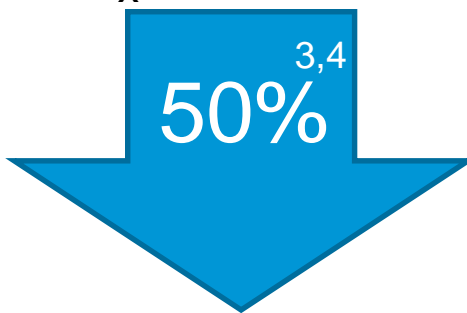


<sup>1</sup>FGD-abated coal versus unabated biomass

<sup>2</sup>Abated sulfur content of coal = 200-300 mg/m<sup>3</sup>

NO<sub>x</sub> emissions

<sup>3,4</sup>  
50%



<sup>3</sup>Unabated coal versus unabated biomass

<sup>4</sup>Normal operating conditions - Boosted Overfire Air system and low-NOx coal

CO<sub>2</sub> emissions

<sup>5,6</sup>  
>80%



<sup>5</sup>Fossil (geologic) emissions versus lifecycle (biogenic) emissions

<sup>6</sup>Includes emissions from production and transportation of biomass fuel



# The need for change

## A “renewable fuel” approach

- Changes in regulations led Drax to evaluate its business model:
  - Drax was the largest CO<sup>2</sup> emitter in Western Europe
  - The EU Emissions Trading scheme and the UK carbon tax floor were introduced
  - UK Government introduced a 2020 renewables targets ...
- What did we already know:
  - Drax had started low scale co-firing in 2003 ~100kt
  - Fuel purchased on an ad hoc basis predominantly agricultural residue pellets
  - £80m+ co-firing project increased demand to 1.5mt ... needed a new approach
- Establishing the supply chain:
  - European utilities were already using biomass – but insufficient supply for Drax scale
  - Initiated a consultants report on potential regions with surplus and sustainable forestry supply
  - Supply chain key evaluation : country risk, feedstock supply, inland and export logistics

**Regulation created risks to the coal business, but an opportunity to transform**

Converting to biomass

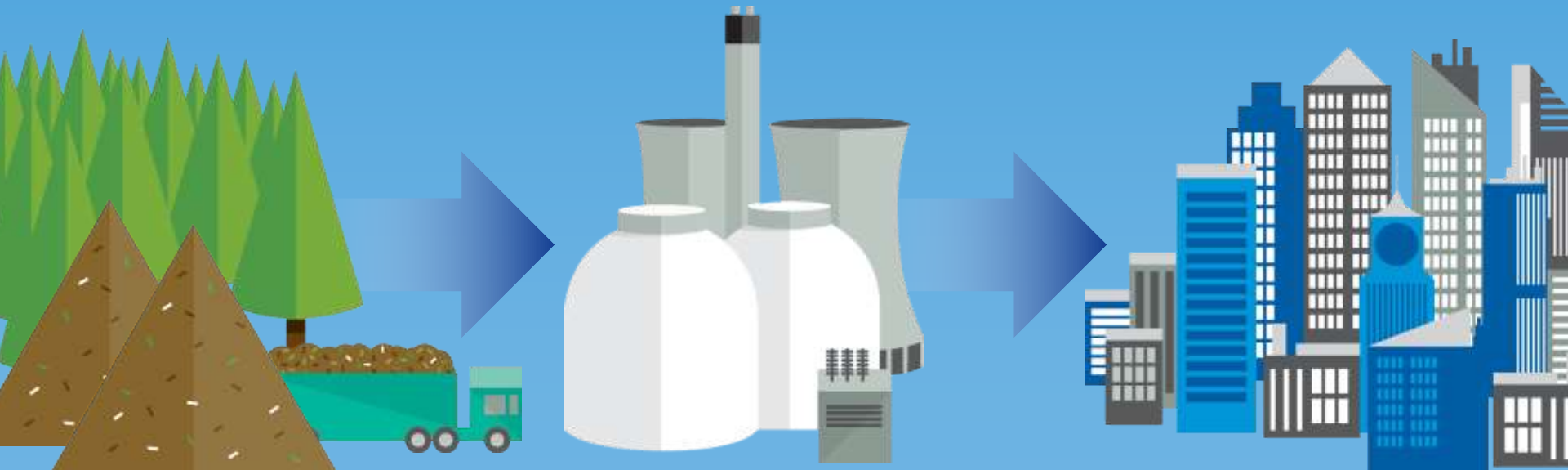
Deployable  
renewable  
generation

Reliable **Flexible**

Uses existing infrastructure

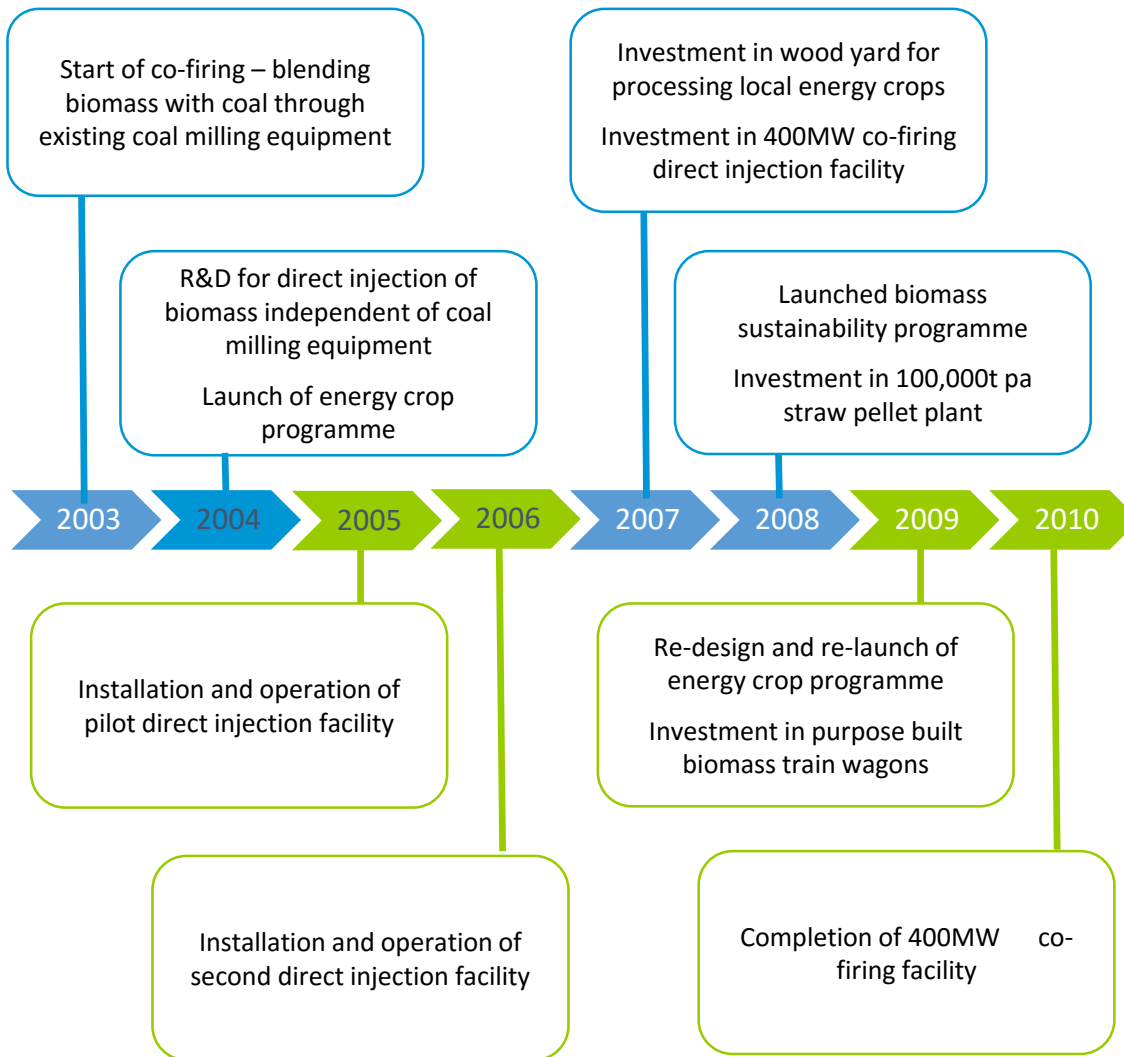
24/7

Affordable



# Biomass co-firing

Wide range of fuels for co-firing



Forestry Thinnings



Harvesting residues



Chips/sawdust



Bark



Olive pulp



Nut shell



Wheat/Oat/Rape straw



Sunflower husks



# Co-firing project

The largest UK co-firing renewable generation project

- £80m capital project completed mid-2010
- Capacity to co-fire >1.5Mt pellets pa
- Benefits in reductions of approximately 2Mt pa of CO<sub>2</sub> and displaces 1Mt pa of coal



Road storage: 7,500t



Rail storage: 16,500t

# What biomass can we use for conversion?

Low value wood “residues”

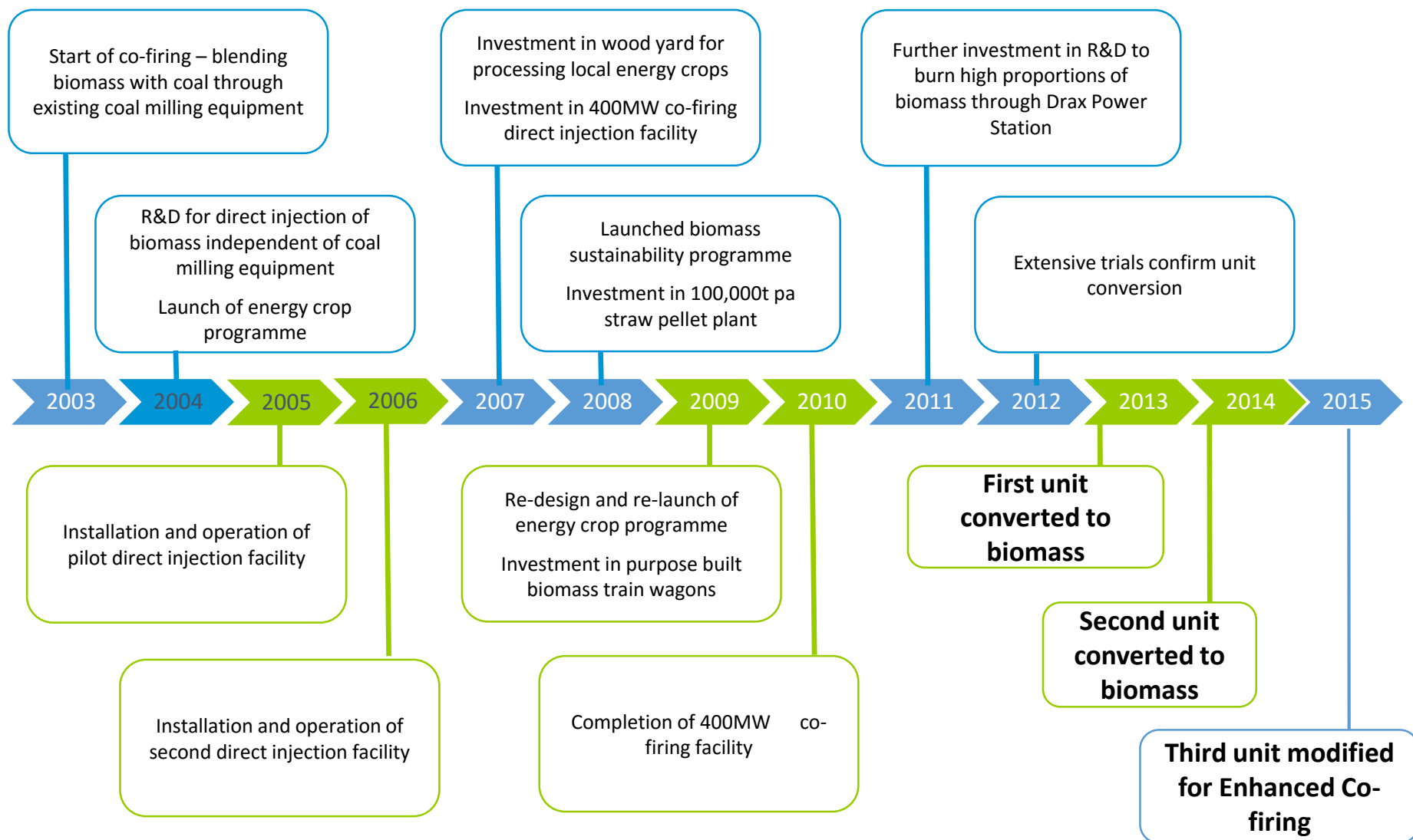


- Without coal to offset corrosion, slagging and fouling the feedstock has to be limited



# Biomass Evolution at Drax

The next stage – full unit conversions



# Building an industrial scale supply chain

## The challenges to a new approach

- **Procurement and supply chain developed from a standing start**
  - Creating a new fuel specification and long term fuel supply agreement
  - Developing own sustainability policy to protect against introduction of future legislation
  - Identifying key locations with sustainable forestry management
- **Physical supply chain development**
  - Export and import facilities needed building
  - Carbon foot printing of supply chain
  - Investment underpinned by long term fuel supply agreements
- **Pricing**
  - Coal well established with published index pricing
  - Wood pellets had no indexation – long term price indexation has changed over time
  - Payback to investment
- **Managing procurement in a nascent market**
  - A need for large scale storage – expensive
  - Multiple suppliers and aim for future diversification
  - Developing indexation for wood pellets
  - Global recognition of wood pellets and development of Sustainability Biomass Partnership for certifying legal and sustainable supply



# Sourcing Wood Pellets

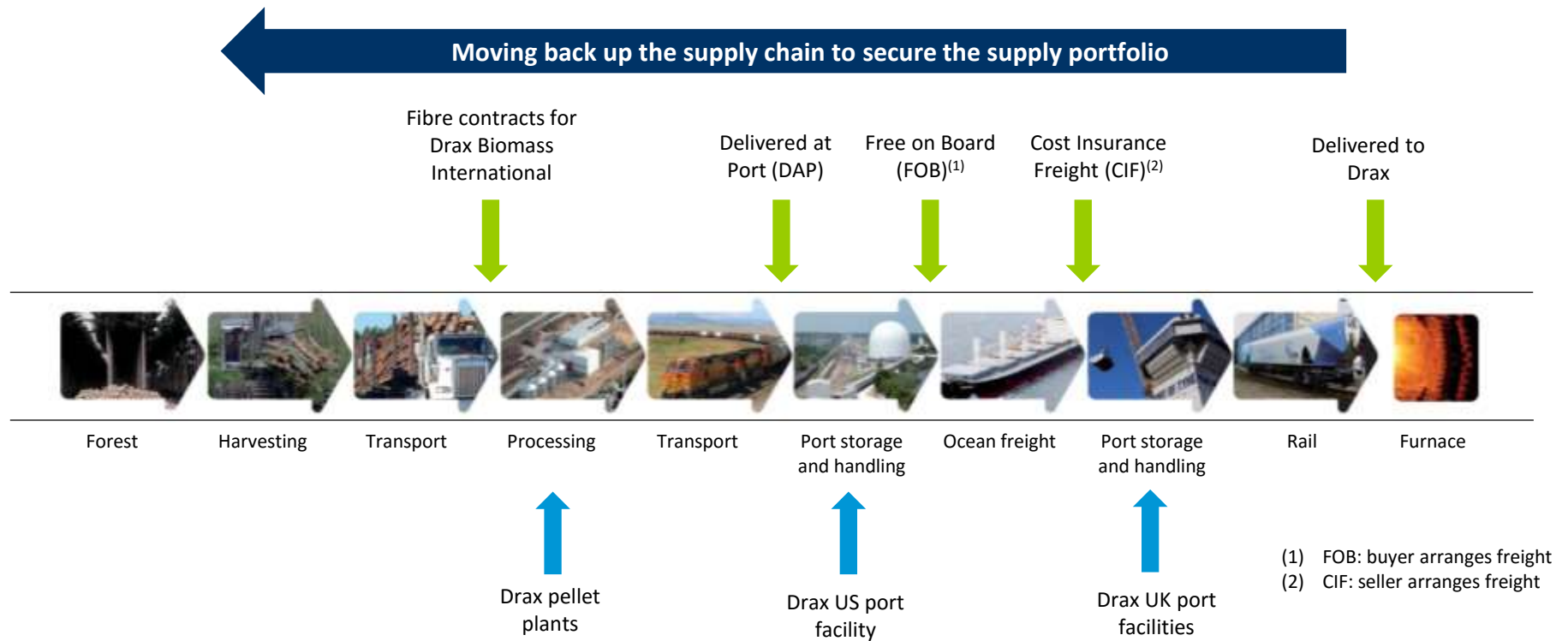
## Sustainable sourcing

- Abundant sources of feedstock for wood pellets available overseas – in particular in Canada and USA
- Canada well positioned for export with high levels of forestry certification and excellent sustainability credentials



# Wood pellet supply chain

Upstream investment







**Amite BioEnergy**

- Sustainable fibre supply
- Regional terminal for aggregation and export
- Strong local support



**Baton Rouge Transit**



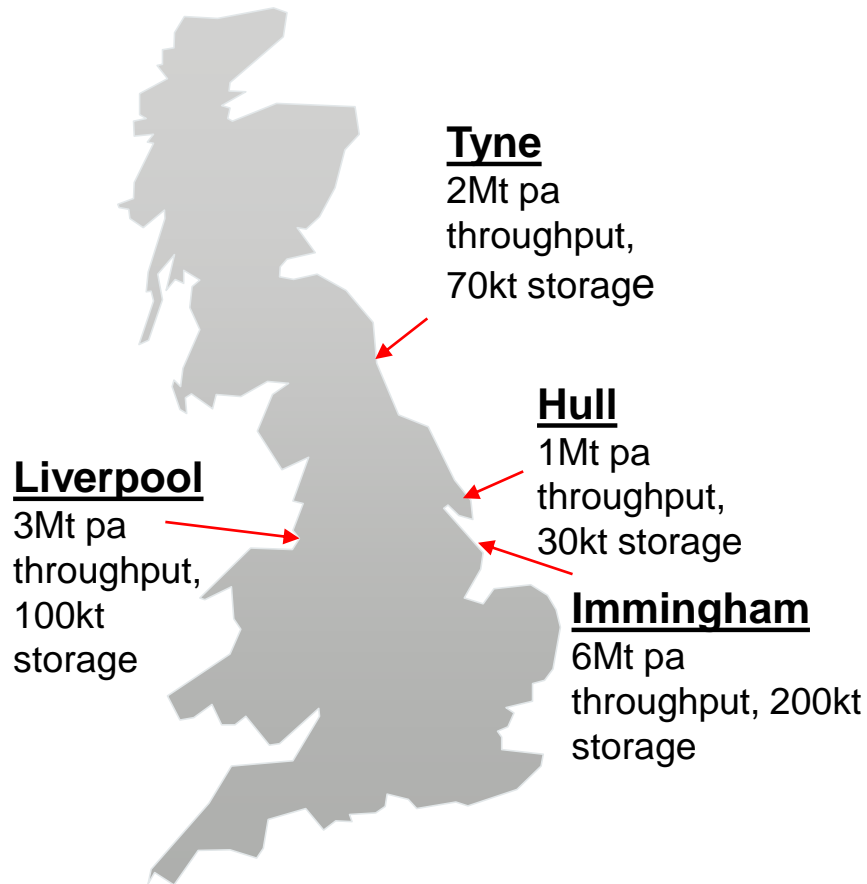
**Morehouse BioEnergy**

## Upstream investment

US pellet plants and port

# Supply Chain infrastructure

Shipping, Ports and Rail



- More than £300m invested in UK supply chain
- Drax handles around 150-200 trains per week
- Shipment sizes range between 5kt up to 60kt - pre 2010 vessels typically <5kt

# How do we know biomass is better than coal?

**86%**  
**reduction**

**from use of biomass compared to coal**

<b>Biomass</b>	<b>Coal</b>
121 kgCO <sub>2</sub> /MWh	876 kgCO <sub>2</sub> /MWh

**A saving of  
12 million tonnes  
of carbon per year**



# Supply chain emissions

## 1. Production

### Biomass

78.65 kgCO<sub>2</sub>/MWh

### Coal

16.83 kgCO<sub>2</sub>/MWh

## 2. Transportation

### Biomass

42.14 kgCO<sub>2</sub>/MWh

### Coal

15.13 kgCO<sub>2</sub>/MWh

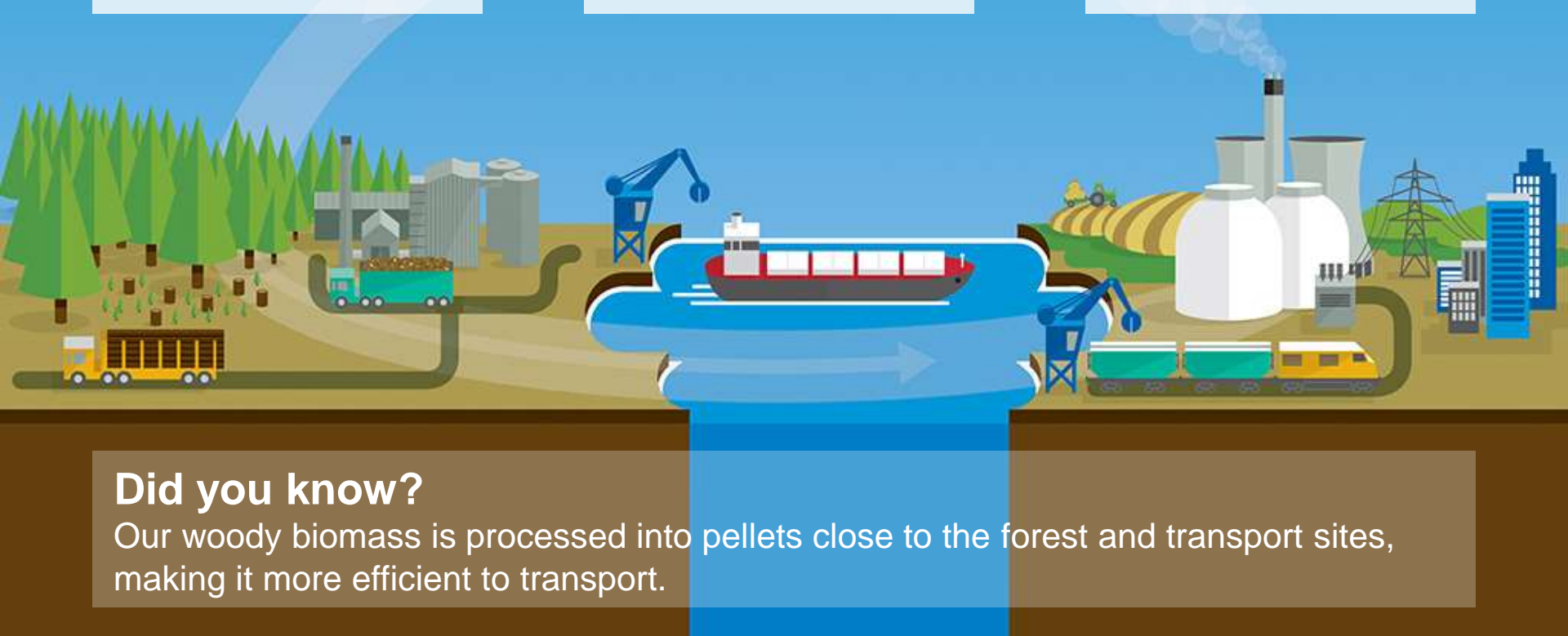
## 3. Combustion

### Biomass neutral

0 kgCO<sub>2</sub>/MWh

### Coal

844 kgCO<sub>2</sub>/MWh



## Did you know?

Our woody biomass is processed into pellets close to the forest and transport sites, making it more efficient to transport.

# Coal to biomass

Complementary to other renewables

- **Reliable**

Renewable, low-carbon baseload generation

- **Flexible**

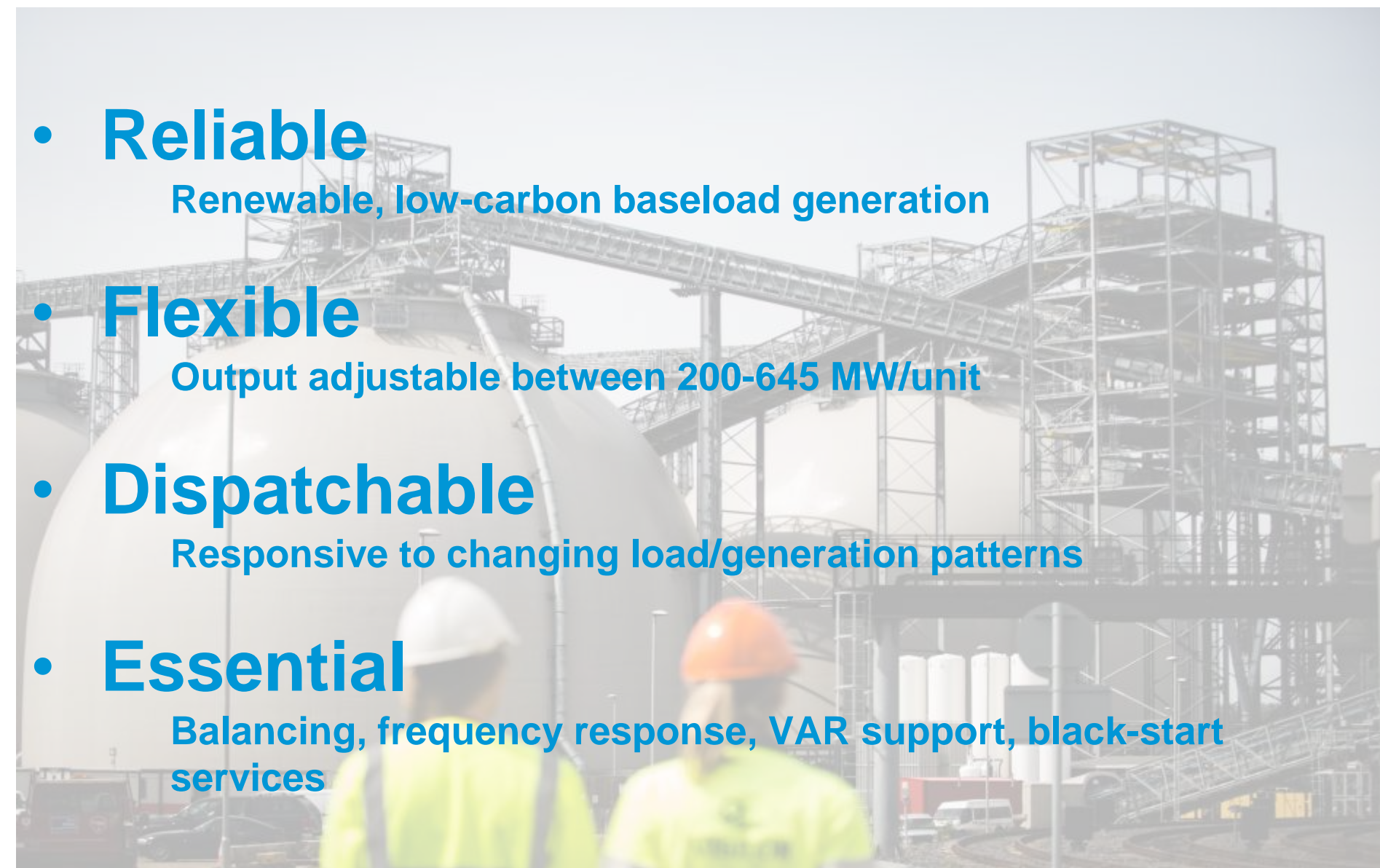
Output adjustable between 200-645 MW/unit

- **Dispatchable**

Responsive to changing load/generation patterns

- **Essential**

Balancing, frequency response, VAR support, black-start services



# Summary

**Drax provides millions of UK customers with power that is:**

- ✓ Affordable
- ✓ Reliable
- ✓ Renewable







**Thank You**