The Role of Biomass in UK Electrification

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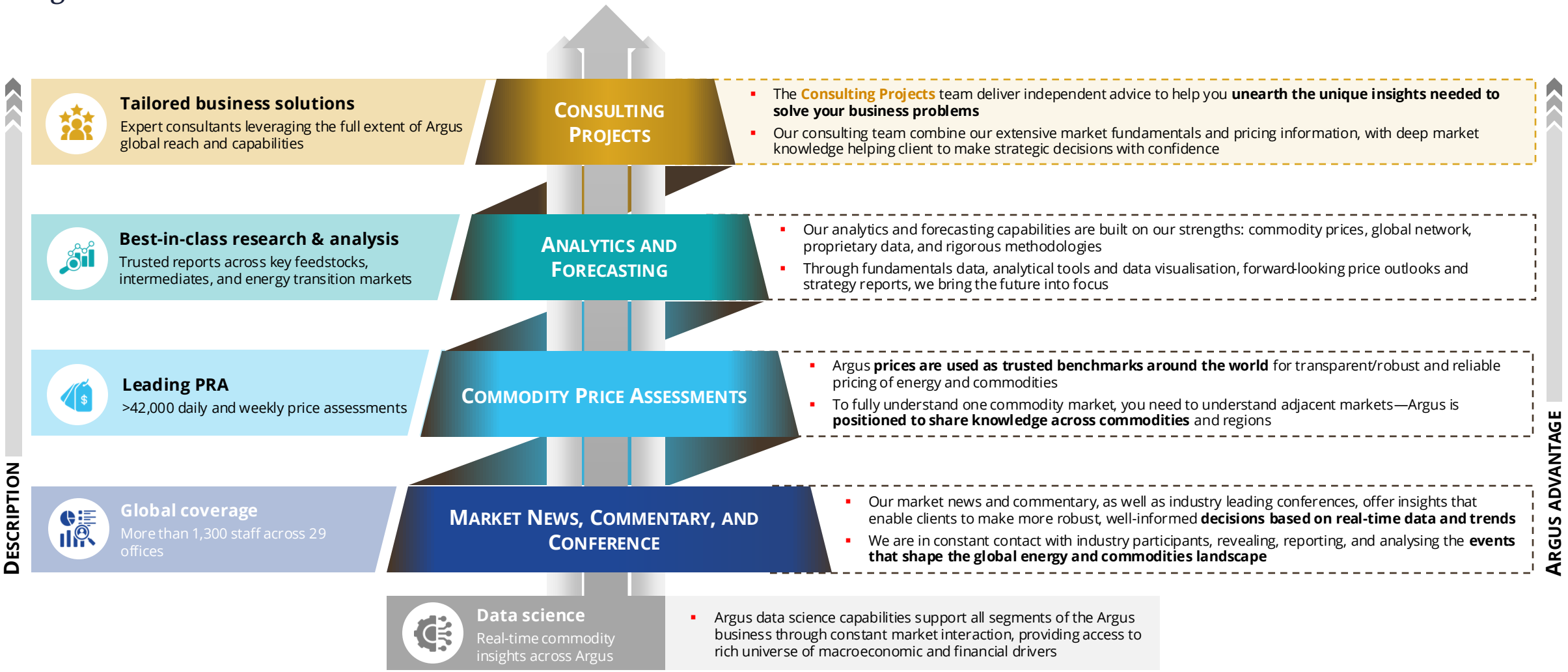
Robie Webster Jr., Manager, Argus Consulting

Wood Pellets Association of Canada, Annual Conference

The Argus Consulting Advantage

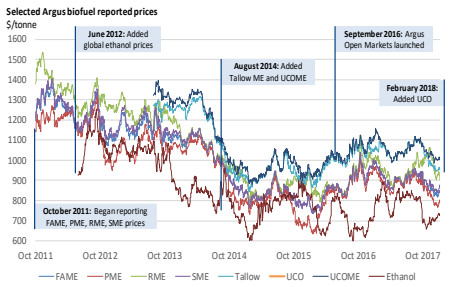
Consulting Project's unique position within Argus allows it to leverage on the organisation's in-depth commodity market insights



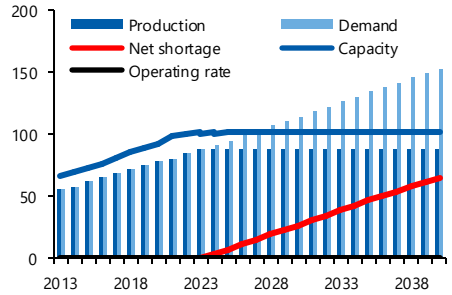
Our Data and Market Information

To each engagement we bring a host of pre-existing information on product price, demand, cost, movement, availability and customer preference and purchasing ability

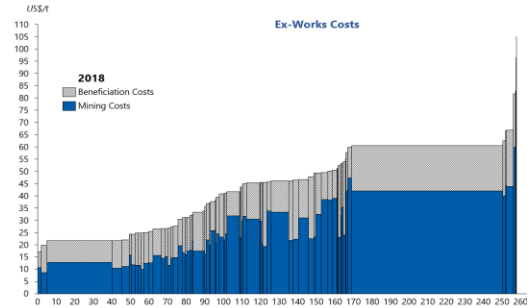
Global price database



Supply and demand



Production capacity and cost database



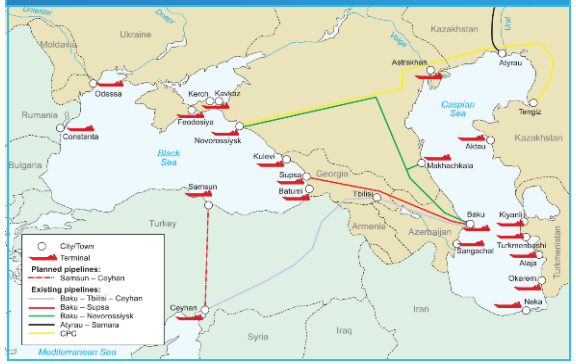
Shipping data

Trade movements and freight costs

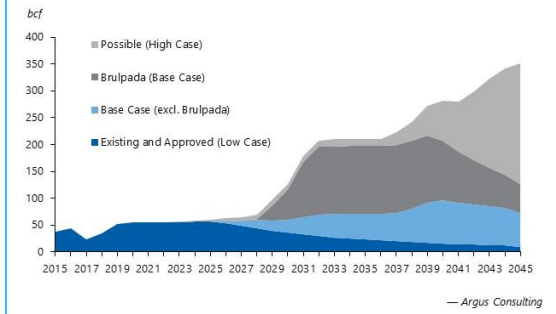
Market shares

Market share	Producer	Importer/ exporter	Wholesale	Retail
20pc		Petrocas energy group	Buys Russian volumes (Rosneft owns 49pc), sells in Georgia, Armenia, Afghanistan, etc Owns Poti terminal and logistics company TEPCO Retail network of 140 stations through Gulf brand Acquired Wissol's jet operations in Tbilisi airport (50pc of the market share)	
15pc		Wissol	One of the largest importers of transport fuels Retail network of 120+ stations	
15pc	SOCAR	SOCAR	Owns production assets in Azerbaijan, brings diesel, jet Imports ULSD and gasoline 95/98 from Lukoil and Rompetrol, jet from Greece and spot European cargos Owns Kulevi Oil Terminal, imports high quality transport fuels there, exports Azeri volumes Network of 90+ retail stations, 50pc of jet supply for Tbilisi airport	
15pc	КазМунайГаз	КазМунайГаз	Owns production assets in Kazakhstan and Romania Mostly sells Romanian volumes, re-sells about 30pc of imports to SOCAR, Petrocas Owns Batumi terminal, which it plans to sell together with all Rompetrol's operations. Deal with the Chinese failed, search for a new customer Retail network of 76 stations through Rompetrol	
10pc	LUKOIL	LUKOIL	Owns production assets in Russia, Bulgaria Rail deliveries from Volgograd refinery, sea – from Burgas Retail network of 50+ stations	

Infrastructure maps



Production estimates



Biomass

Capabilities

- **Global supply and demand forecasting** – Outlooks for supply-demand balances of biomass fuels based on plant-level databases
- **Competitive review** – Assessment of effect of related industries on availability of biomass feedstock
- **Price benchmarking and forecasting** – Pricing outlooks for key biomass fuels and pricing estimates for niche products
- **Production cost analysis** – Assessment of production costs economics against regional benchmarks

Example Projects

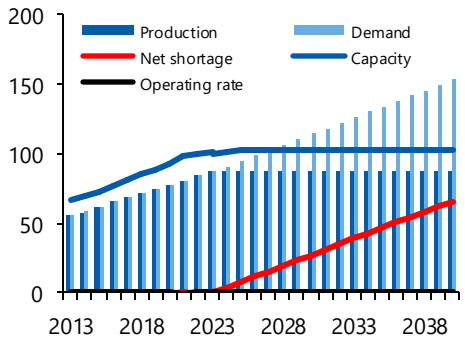
- **Wood chip supply assessment** – EU power generator. Assessment of potential availability of wood chips in northwest Europe to examine the viability of switching to biomass from fossil fuels
- **Torrefied biomass feasibility study** – Various. Analysis of the potential market for torrefied biomass globally and how this may develop in future
- **Investment feasibility analysis –** Major industrial conglomerate. Outlook for the global supply and demand of wood pellets, review of subsidy schemes and scenarios for pricing
- **Agri-biomass market entry support** – Various. Analysis of the potential market for agri-biomass globally, subsidy support, and price baseline support

Publications

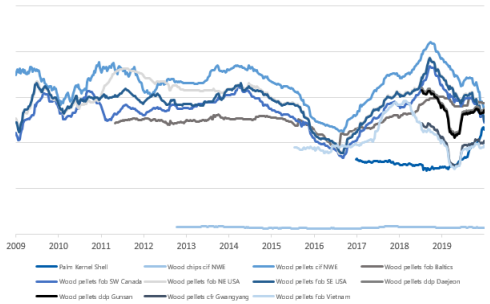
Argus Biomass Markets

Argus European Emissions Markets

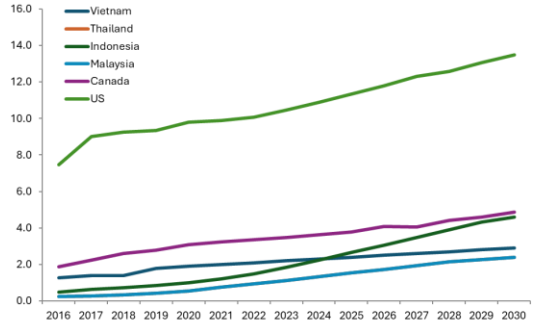
Assets



Supply and demand fundamentals



Global price database

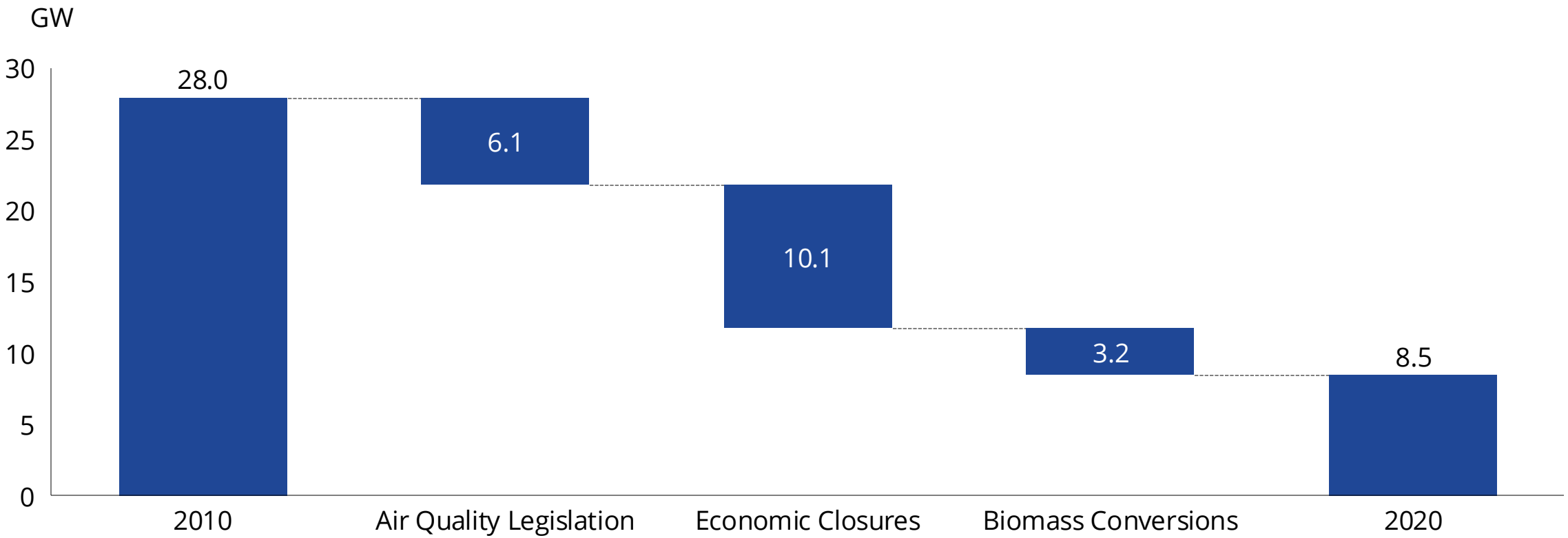


Regional Production Cost Economics

Historical Context: UK Shift from Coal to Biomass

As the UK government announced in 2013 that facilities shifting from coal to biomass power production would be eligible for Renewable Obligation Certificates, the shift away from coal-fired power plants was unfolding.

Evolution of Coal Power Capacity

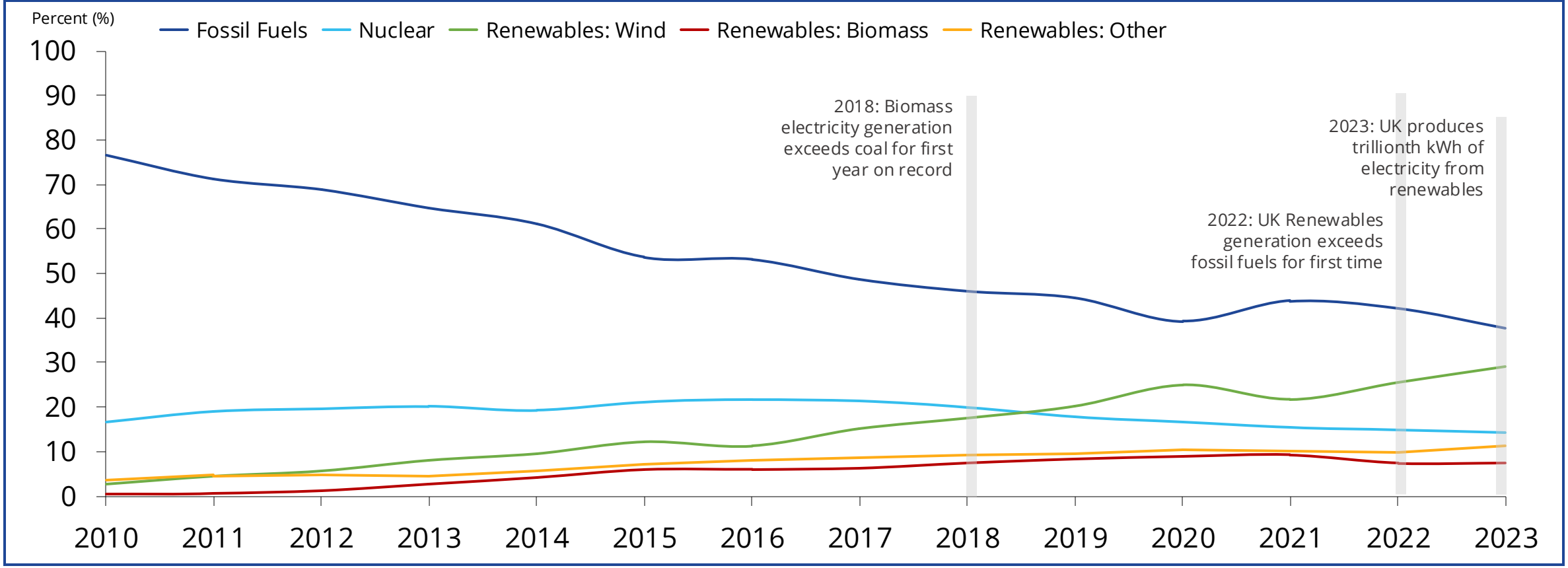


Source DRAX

UK Generation Mix

Overall, UK actual generation has fallen c. 25pc since 2010. Key Statistics: Renewables are up 41pc to 135TWh; Biomass is up 7pc to 21TWh; Wind is up 26pc to 82TWh; Gas is down 11pc to 102TWh; Coal is down 27pc to 4TWh.

Share of Annual Electricity Generated, UK (2010 – 2023)



Source: Digest of UK Energy Statistics (DUKES)

UK Policy Towards Electrification: Build Back Greener

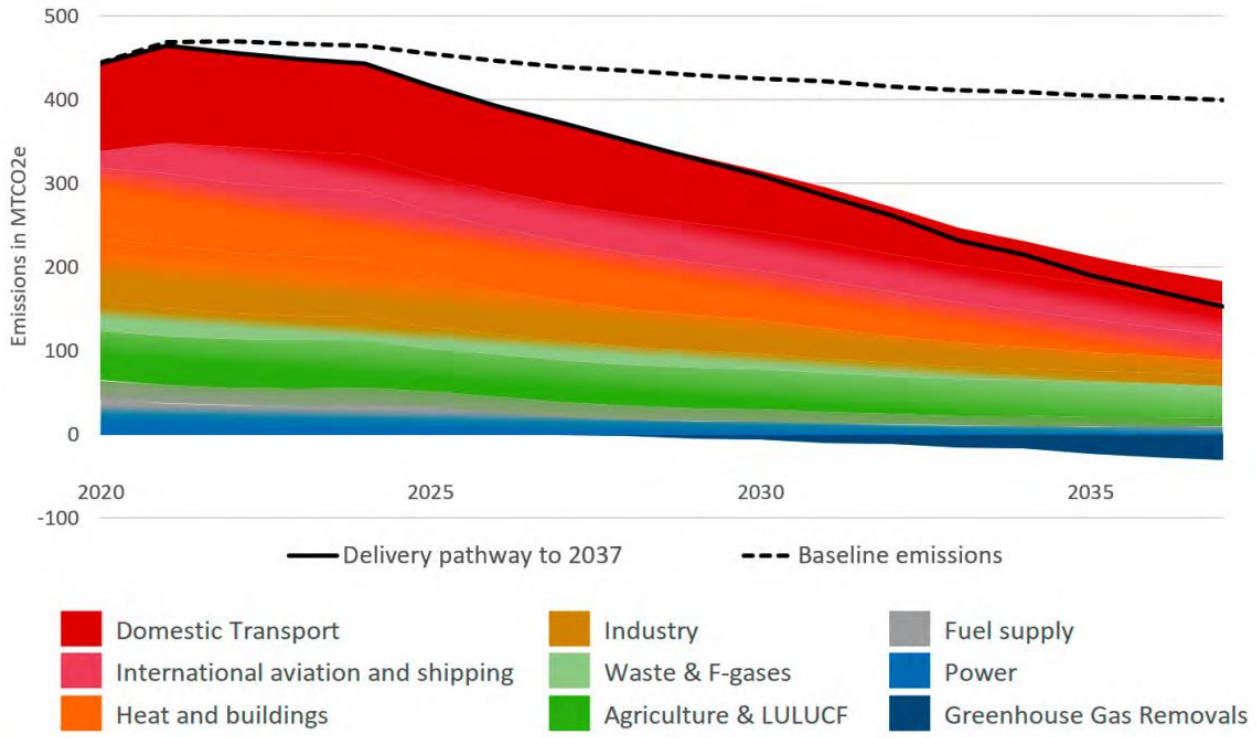
The UK's Build Back Greener plan (2021) is centered around reaching net zero to limit global warming, being a first mover in ending its own contribution to climate change, and doing so in a way that provides favorable economic impact for its citizens and constituents.

Key Components of UK Legislation on Electrification:

- Invest £150-270bn in the Power sector to fully decarbonize and electrify
- Power: Fully decarbonized power system by 2035
- Key technologies highlighted in electrification plans: wind, nuclear, and solar
- "Reliable" is mentioned more than 15 times throughout when writing specifically about Power
  - "Storage", "CCS", "hydrogen"
- Greenhouse gas removals (e.g., BECCS) is a significant part of the strategy

Note: Under the Labour Party, it is probable that these targets may become more aggressive in reaching large-scale electrification, for example, with the formation of "GB Energy"

Figure 1: Indicative delivery pathway to 2037 by sector



Source: BEIS Analysis (2021)

Source: UK Net Zero Strategy

The Role of Biomass Today in the UK

Today, there is more than 4.5GW of operational power capacity online in the UK, with Drax and Lynemouth accounting for 2.6GW and 399MW, respectively.

UK Operational Biomass Power Plants			
Company	Plant & Unit	Primary Fuel	Capacity MW
Drax	Drax 1	Wood pellets	645
Drax	Drax 2	Wood pellets	645
Drax	Drax 3	Wood pellets	645
Drax	Drax 4	Biomass	645
MGT Power	Teesside	Wood pellets	299
MGT	MGT Teeside 1	Wood pellets	285
Iggesund	Iggesund Paperboard	Wood chips	150
EPH	Lynemouth unit 1	Wood pellets	133
EPH	Lynemouth unit 2	Wood pellets	133
EPH	Lynemouth unit 3	Wood pellets	133
SSE	Ferrybridge multifuel 2	Biomass	70
SSE, Wheelabrator Technologies	Ferrybridge multifuel (FM1)	Wood waste	70
Multifuel Energy, SSE	Ferrybridge multifuel (FM2)	Wood waste	70
Other			940
Total			4,863

- Solid biomass represents the second largest source of renewable electricity in the UK, generating c. 7pc of the total UK electricity supply in 2023 (9pc in 2021).
- Less than 25pc of the 42 production units have a capacity of more than 100MW,
- Share of production in total units for biomass feedstocks:
    i. Wood pellets: 2,633 MW (54pc)
    ii. Wood Waste: 618 MW (13pc)
    iii. Wood chips: 364 MW (8pc)
    iv. Straw: 161 MW (3pc)
    v. Other: 1,081 MW* (22pc)
- More than 60pc of plants were commissioned in the last 10 years, including 1 Drax and 1 Lynemouth unit, while the useful life of a plant is 50+ years.
- There is 300+ MW of planned biomass production capacity in the UK utilizing wood pellets, the largest of which is Uskmouth.

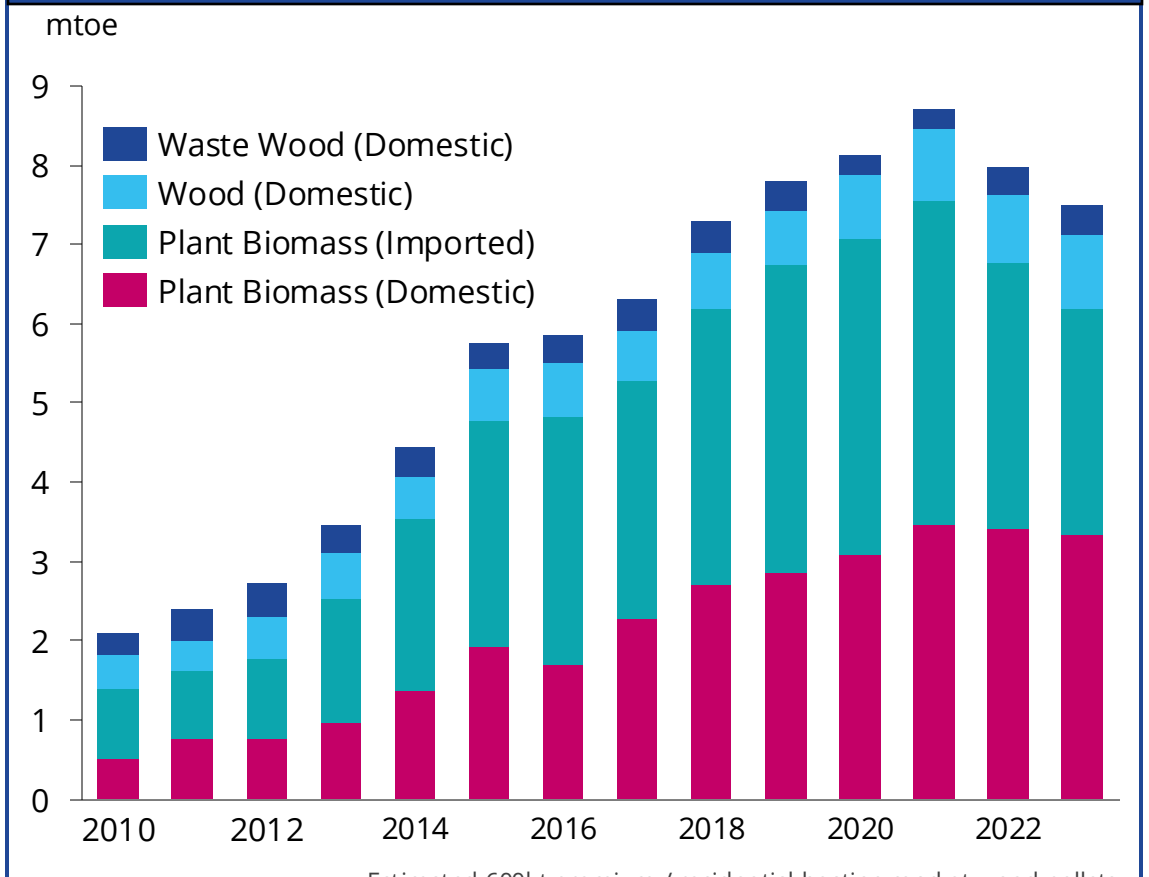
*Other includes 1 Drax unit with less certainty of the exact feedstock, biomass secondary fuel units, and additional units with limited feedstock certainty.

Source: Argus Research, Digest of UK Energy Statistics (DUKES)

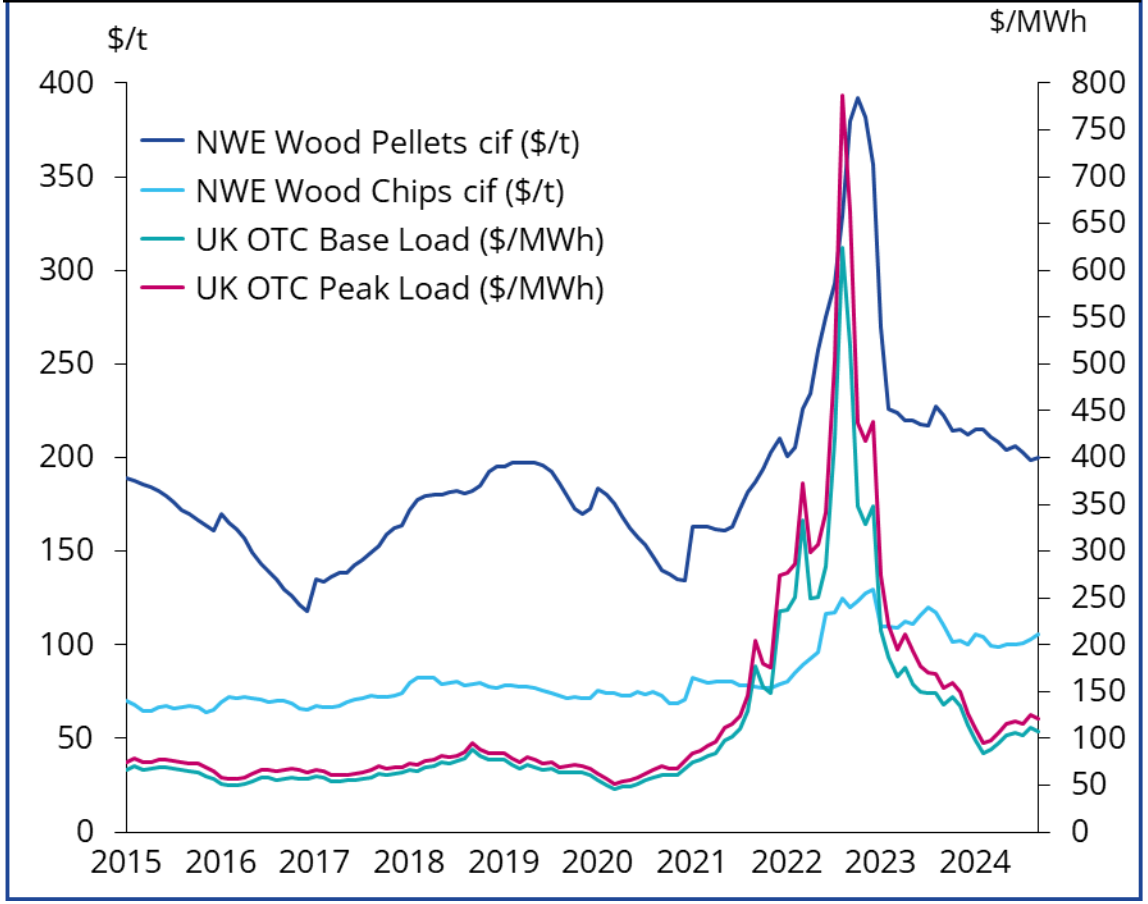
UK Biomass: Price & Tonnage

Biomass supply in the UK fell during the power market boom in the UK that resulted in market-peaking power and feedstock prices.

UK Feedstock Supply in mtoe, 2010 – 2023



Argus NWE Feedstock ($/t) & UK Power Prices ($/MWh), 2015 - 2023



Revisiting Greenhouse Gas Removals

The UK's strategy to reach net zero requires the use of greenhouse gas removals, which includes BECCS, and likely will, given how important these power plants are both to the grid and the economic wealth of the UK.

Illustrative Total Territorial Emissions Under the Different UK Strategy Scenarios

		2050 Illustrative Emissions ($MtCO_2e$)		
Sectors	2019 Emissions (MtCO2e)	High Electrification	High Resource	High Innovation
Power	58	3	2	1
Industry	78	3	3	10
Fuel Supply	26	0	5	8
Heat and Buildings	88	0	0	2
Domestic Transport	122	3	4	5
International Aviation and Shipping	45	35	35	21
Agriculture and LULUCF	63	20	14	21
Waste and F-gases	40	12	13	13
Greenhouse Gas Removals	**0**	**-75**	**-76**	**-81**
Total Emissions	520	0	0	0

- Under each of the UK's scenarios to reach net zero, greenhouse gas removals is imperative to meeting their targets.
- Of great importance, while CCS can enable some technologies to lower their emissions, BECCS creates the clearest path to net negative emission solutions through carbon removal.
- Note: There are other ways to use biomass to achieve negative emissions (e.g., hydrogen, biofuels, and other low carbon fuels)
- BECCS est. 75pc of GHG removals
    i. Twenty (20) Drax-sized units

Source: UK Net Zero Strategy

UK Biomass Strategy

Biomass has a role to play in the electrification of the UK grid and may be one the easiest, cheapest, and already proven methods to achieve negative emissions which can offset emissions in other hard-to-abate sectors.

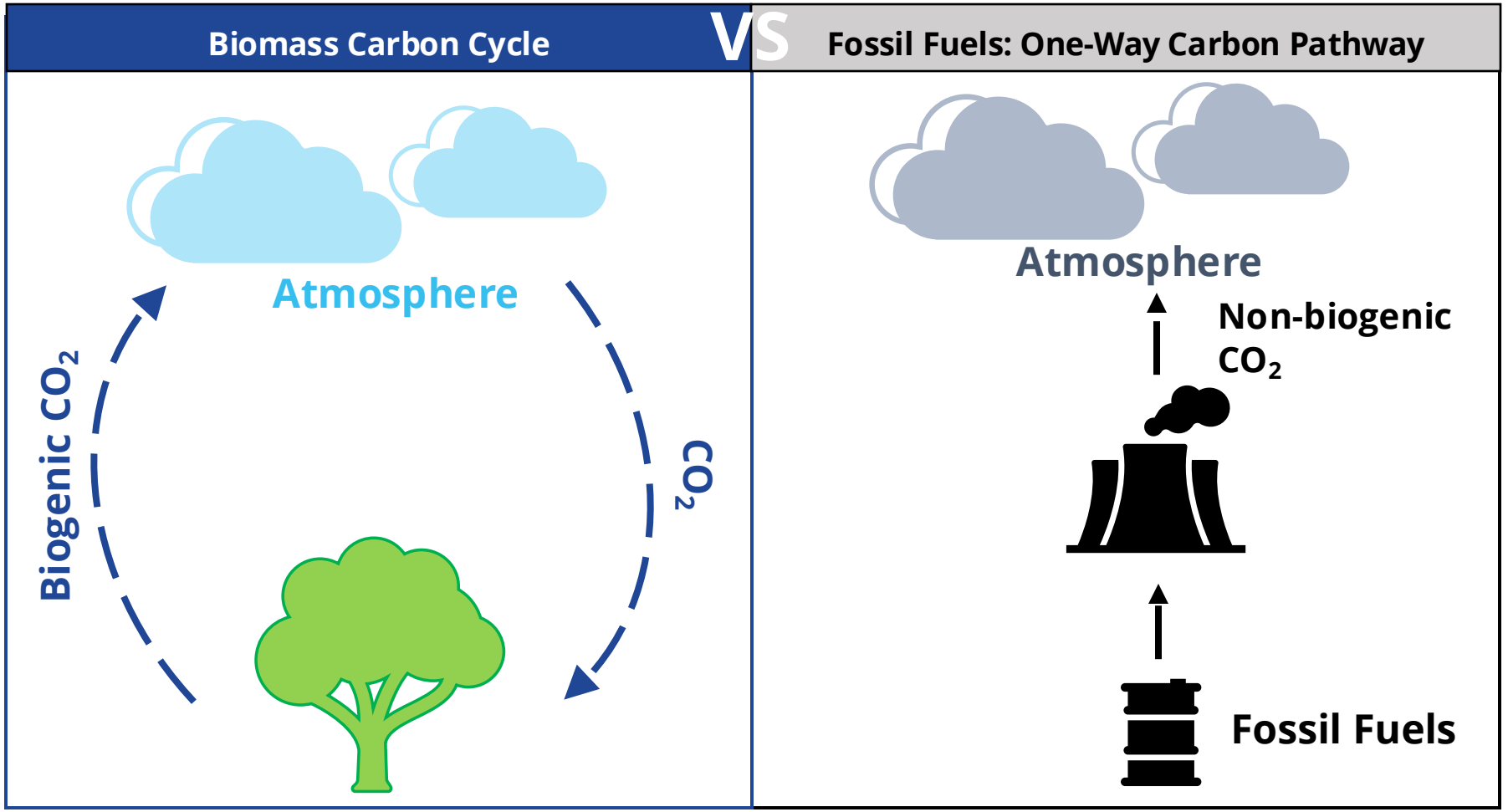
Four Pillars of UK biomass strategy:

1	**Sustainability**	Standardized (Global) monitoring & reporting, including, and going beyond, LCA
2	**Air Quality**	Minimizing non-CO_2 air pollutants in the biomass combustion process
3	**Net Zero**	Transition to abated biomass, through BECCS, and deploy biomass in hard-to-abate sectors
4	**Circular Economy & Resource Efficiency**	Waste minimization (reduce → reuse → recycle → dispose)

Source: UK Biomass Strategy

Sustainability: Biomass Carbon Cycle vs. One-Way Carbon Pathway of Fossil Fuels

The key difference for sustainability is the biogenic carbon cycle that enable atmospheric carbon to be absorbed by biomass sources, as carbon temporarily released during combustion of woody biomass in the atmosphere is then reabsorbed by new growth.



- UK currently requires 70pc certified sustainable biomass for subsidies based on land criteria (e.g., harvesting, biodiversity protection) and GHG criteria (e.g., lifecycle GHG emissions), though specifics based on the specific subsidy
- Biomass strategy proposes 100pc certified biomass for subsidies (no primary woody biomass)
- Implementation study to limit negative impacts on wider forestry sector
- Goal: allow only the most sustainably-sourced and used biomass to continue use in the UK

Net Zero: Bridging the Gap to BECCS

Currently, the UK is set to have volumes of subsidies expire in 2027 for biomass. However, without subsidies like the CfD, biomass would become less competitive in the UK, pushing biomass consumption down. Below provides an outline of what Argus Consulting is thinking about when it comes to bridging the gap between 2027 and the startup of BECCS:

UK Biomass Strategy: High Electrification Scenario

Regardless of which strategy considered for the UK, high electrification, high resource, or high innovation, biomass and imported biomass plays a key role in the path to decarbonization.

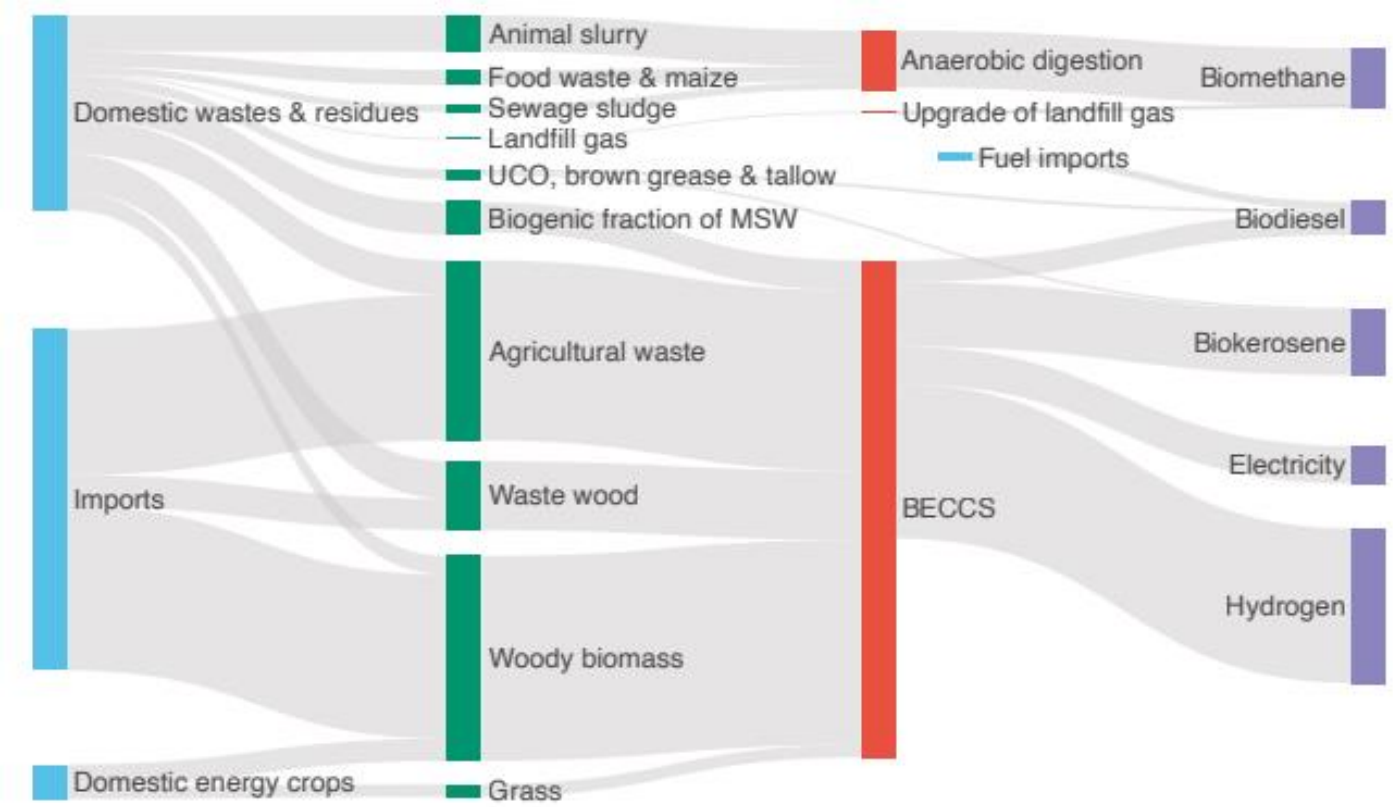


Figure 5.4: Sankey diagram representing the allocation of biomass to the different processing technologies and end uses in illustrative Scenario 1, High Electrification.

Source: UK Biomass Strategy

Connecting the Dots: What Will Dominate Biomass Discussions through 2032?

The biomass sector is extremely important to the UK power sector; with significant amount of time put into what they do next, the industry should be doing the same, asking: "what's next?" There are actions to be taken across the entire value chain.

1 Sustainable production and use of biomass

Production and use that considers impact on labor, land, biodiversity, pollution and emissions, including the use of waste- and agri-biomass alternatives to woody biomass.

Carbon capture & negative emissions

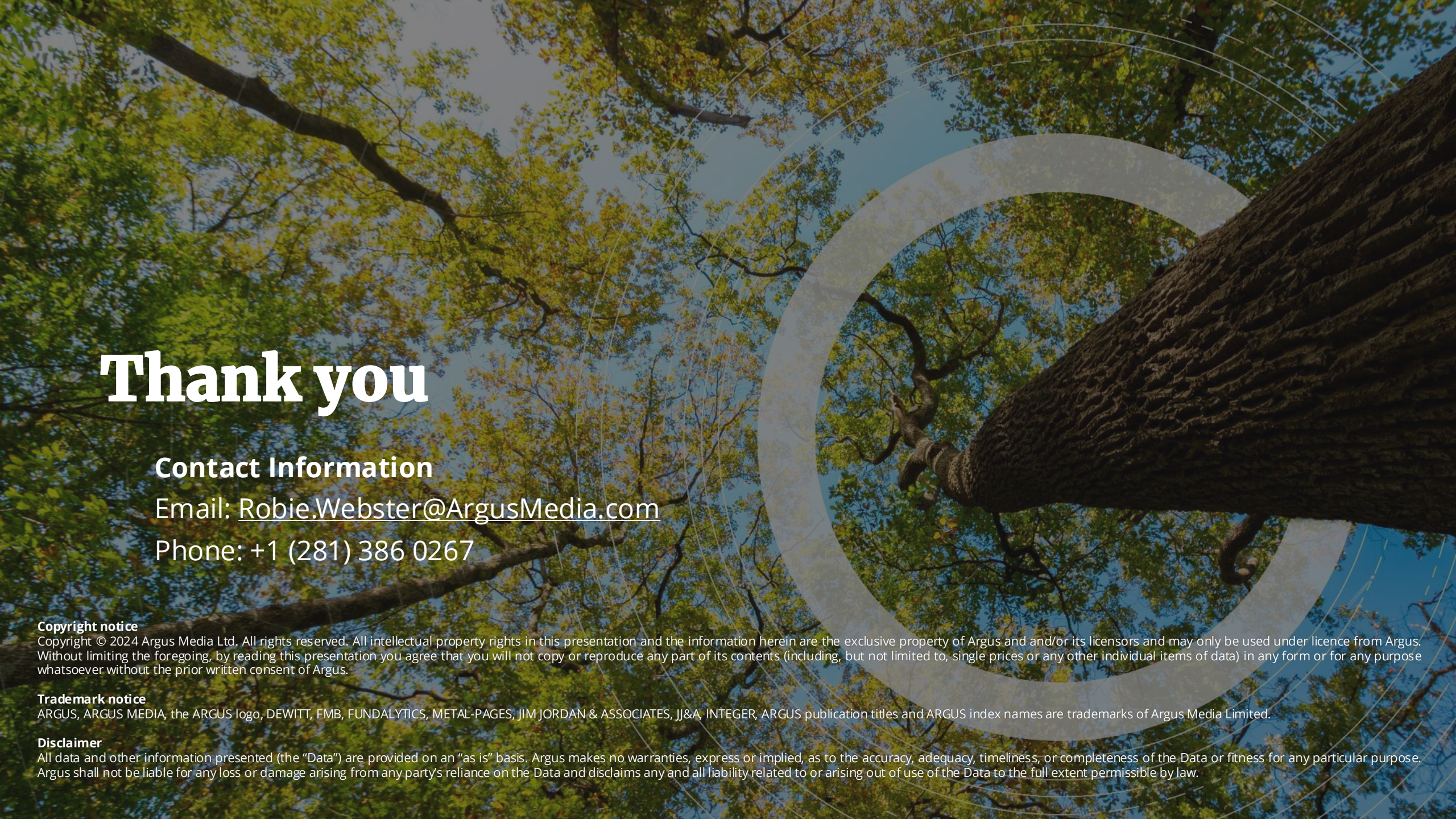
2

Technologies that can be easily integrated with biomass, including BECCS, hydrogen, and biofuels, that can support defossilization of power, and hard-to-abate sectors.

Cost

3

Cost of biomass, power production economics, & subsidy implications



Thank you

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