CONCEPT

Biomass Energy and Biofuels: Feedstocks, Conversion Routes and Project Feasibility

21 – 25 March 2027
Jeddah - Corniche four-star



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Introduction:

Biomass energy and biofuels projects stall when feedstock tonnages are overstated, the conversion route does not suit the residue or waste actually available, and plant economics ignore moisture, logistics and offtake risk. Straw, manure, food waste and wood chips then sit unused while digesters, boilers and gasifiers run below capacity. This Core Concept course trains practitioners to characterise feedstocks, match them to combustion, gasification, anaerobic digestion, pyrolysis or liquid fuel routes, estimate output and cost, and screen carbon intensity and permitting risk. Participants build a Bioenergy Project Feasibility Model.

Course Objectives:

- Characterise biomass feedstocks by moisture, ash, calorific value and seasonal availability, and plan collection, storage and haulage for agricultural residues, food waste and woody material
- Match a feedstock to a conversion route such as grate combustion with CHP, gasification, anaerobic digestion or pyrolysis using a technology selection matrix
- Estimate biogas yield, digester sizing and upgrading to biomethane for grid injection or vehicle fuel, including digestate handling
- Compare ethanol, biodiesel, renewable diesel HVO and sustainable aviation fuel pathways by feedstock, process and blending constraints
- Calculate plant capital and operating cost, levelised cost of energy and carbon intensity per unit of delivered energy for a bioenergy project
- Build a Bioenergy Project Feasibility Model with feedstock contracts, revenue streams, permitting risks and sensitivity cases

Target Audience:

- Managers responsible for heat, power or fuel supply at utilities, industrial sites and district energy schemes
- Waste treatment managers who oversee organic waste streams, digesters or residual waste plants
- Project development managers who screen bioenergy sites and prepare investment cases
- Sustainability managers who report the carbon intensity of fuels and energy purchased or produced
- Agribusiness and forestry operations managers who hold crop residues, manure or wood by-products

Course Outline:

Day 1: Bioenergy Landscape and Biomass Feedstock Characterisation

- Bioenergy Share of Primary Energy Supply and Modern Versus Traditional Biomass Use
- Feedstock Classes: Crop Residues, Energy Crops, Animal Manure, Food Waste and Wood Residues
- Proximate and Ultimate Analysis: Moisture, Volatile Matter, Ash and Calorific Value
- Feedstock Availability Mapping with Seasonal Harvest Calendars and Collection Radius
- Supply Chain Cost Stack: Baling, Chipping, Drying, Storage Losses and Haulage per Tonne

Day 2: Thermochemical Conversion: Combustion, CHP, Gasification and Pyrolysis

- Grate, Fluidised Bed and Co-Firing Boilers for Solid Biomass
- Combined Heat and Power Configuration and Heat-to-Power Ratio Selection
- Gasifier Types, Syngas Composition and Tar Removal Methods
- Fast and Slow Pyrolysis: Bio-Oil, Biochar and Torrefied Pellet Products
- Mass-Burn Waste-to-Energy Plants: Moving Grate, Flue Gas Treatment and Bottom Ash

Day 3: Anaerobic Digestion, Biogas Upgrading and Liquid Biofuels

- Hydrolysis, Acidogenesis, Acetogenesis and Methanogenesis Stages in Digester Operation
- Biochemical Methane Potential Testing, Organic Loading Rate and Retention Time Sizing
- Biogas Upgrading by Pressure Swing Adsorption, Membranes and Water Scrubbing to Biomethane
- Ethanol Fermentation and Biodiesel Transesterification Process Flows
- Renewable Diesel HVO Hydrotreating and Sustainable Aviation Fuel Pathway Overview

Day 4: Plant Economics, Carbon Intensity and Project Risk

- Capex and Opex Build-Up and Levelised Cost of Heat, Power and Biomethane
- Revenue Stacking: Gate Fees, Energy Sales, Digestate, Biochar and Low-Carbon Fuel Credits
- Carbon Intensity Accounting Across Cultivation, Transport, Conversion and Land Use Change
- Feedstock Supply Contracts, Offtake Agreements and Price Indexation Clauses
- Permitting, Emissions, Odour and Fire Risk Register for Bioenergy Plants

Day 5: Feasibility Case Work and the Bioenergy Project Feasibility Model

- Agro-Industrial Residue Case: Biogas CHP Versus Biomethane Injection Comparison
- Wood Residue Case: Pellet Boiler Versus Gasifier Heat Supply Option
- Bioenergy Project Feasibility Model Build: Feedstock, Output and Cash Flow Sheets
- Sensitivity and Scenario Testing on Feedstock Price, Availability and Plant Uptime
- Investment Committee Presentation and Peer Challenge of Feasibility Results

Skills You Will Gain:

- Feedstock Characterisation
- Biomass Supply Chain Costing
- Conversion Technology Selection
- Digester Sizing
- Biomethane Upgrading Assessment
- Biofuel Pathway Comparison
- Carbon Intensity Calculation
- Bioenergy Financial Modelling

Why Attend This Course:

- Return with a Bioenergy Project Feasibility Model populated with feedstock, output, cost and carbon data for a realistic site
- Stop committing capital to digesters, boilers or gasifiers sized on feedstock tonnages that the supply chain cannot deliver
- Question vendor yield claims and developer business cases using methane potential, calorific value and uptime evidence
- Exchange practice with peers from utilities, waste operators, agribusiness, forestry and fuel producers

Conclusion:

Bioenergy plants deliver value only when feedstock, technology, economics and carbon accounting are decided together. The one week move from feedstock characterisation and supply chain costing, through combustion, CHP, gasification, pyrolysis and waste-to-energy, to anaerobic digestion, biomethane upgrading and liquid biofuel pathways, then to plant economics, carbon intensity, contracts and permitting risk. The final day applies these methods to residue and wood cases and produces a Bioenergy Project Feasibility Model ready for an investment review.