Black & Veatch is recognised as one of the most diverse and broad ranging providers of biomass energy systems and services.

From project development, through to turnkey design and construction, Black & Veatch has worked with project developers, utilities, lenders and government agencies on biomass projects utilising more 40 different biomass fuels throughout the world.

Black & Veatch has capabilities in a wide variety of biomass applications:
- Biomass heat, power and cogeneration
- Municipal waste to energy
- Biogas production, recovery and energy utilisation
- Biofuels including ethanol, biodiesel and bio-oil

Black & Veatch offers a full scope of services to the biomass industry:
- Consultancy, engineering, procurement and construction
- Feasibility studies and technology characterisation
- Resource studies
- Research and development
- Biomass co-firing boiler impact modelling
- Transmission access studies and interconnection support
- Environmental permitting and licensing
- Project technical and financial due diligence

SELECTED PROJECT EXAMPLES

UK BIOMASS SECTOR REVIEW AND THE DESIGN, START-UP, AND ONGOING TECHNICAL ADVICE FOR THE BIOMASS HEAT ACCELERATOR
The Carbon Trust | 2004–2012
Black & Veatch completed a study of the UK potential biomass resource, analysed and reviewed all the available conversion technologies, and assessed the economics of all biomass technologies. In addition, Black & Veatch carried out a detailed sensitivity and economic analysis of the chains with the most promising carbon savings, identified the main barriers to their development, and assessed the realistic carbon reduction contribution that biomass could make to the UK.

Black & Veatch assisted the Carbon Trust to design the Biomass Heat Accelerator that would help lower the barriers in the sector. This work involved assessing the off-gas-grid market, the economics and carbon benefits, and identifying the work to be undertaken to help accelerate the sector. Black & Veatch then managed the start-up of the project and provided technical advice.

SECOND GENERATION BIOETHANOL PLANT FEASIBILITY STUDY
National Non Food Crop Centre (NNFCC) | 2008
Black & Veatch carried out a technical and commercial feasibility study of a lignocellulosic ethanol plant in the UK on behalf of the NNFCC. Black & Veatch’s work included the review of the fiscal and legislative environment, potential feedstock availability, technology options and technology providers, greenhouse gas emissions and comparison with first generation technologies, cost competitiveness, price and profitability, plan for implementation, and by-products market opportunity.

BIODIESEL TECHNICAL DUE DILIGENCE
Rabobank | August 2007–March 2008
Black & Veatch carried out an evaluation of the viability and reasonableness of the development of a fully integrated oilseed crushing facility, with a capacity of 1M tpa, and a biodiesel plant, with a capacity of 500k tpa, to be built in Rotterdam. Black & Veatch acted as an independent technical advisor, assessing the ability of the project to be completed on time and on budget, identifying areas of risk and concern with the proposed bio-diesel and associated crushing facility.

1MWE CHP CONCEPT, DESIGN, INSTALLATION AND COMMISSIONING
McCain Foods GB | 2006–2008
Black & Veatch undertook feasibility work for a 1MWe combined heat and power (CHP) system design to run on biogas produced by a Food & Drink factory effluent. The concept design report included the determination of future biogas yield, system sizing, optimum system configuration and expected costs. Black & Veatch was then asked to produce a basic design report covering more detailed (budget) costs, and system design, contracting and interface issues. Black & Veatch then undertook detailed engineering and assisted with procurement, followed by supervision of site installation activities.

50MWE CHP FEASIBILITY & PROJECT DEVELOPMENT
Black & Veatch was appointed to deliver a full feasibility study for building a 50MWe biomass fuelled CHP station at the paper mill in Glenrothes and to provide ongoing technical advice.
LANDFILL GAS TECHNICAL DUE DILIGENCE  
**Viridis | 2006–2010**  
Black & Veatch was retained by Viridis to provide technical due diligence of the NRL facilities and equipment associated with the successful acquisition of NRL. The objective of the technical due diligence work was to verify various assumptions made by Viridis in reaching a valuation of the assets/business.

Black & Veatch reviewed the financial model and assumptions as provided by Viridis in the light of information provided in the electronic data room, clarified by the written question-and-answer process and through site inspections and discussions with the plant management and operatives on site. Viridis acquired the portfolio in April 2006.

In 2010, Viridis’ financers requested Black & Veatch to carry out a technical and financial update to ensure that the new financial model accurately projected the likely output.

ANAEROBIC DIGESTION CHP PROJECT DEVELOPMENT  
**Carbon Trust Enterprises Ltd (CTEL) | 2005–2010**  
CTEL Insourcing Energy was set up to develop, deliver and operate onsite integrated waste disposal and energy supply projects to medium- and large-sized food manufacturers. The proposed solution is based around an anaerobic digestion (AD) plant linked to a gas engine CHP plant. Initially, Black & Veatch reviewed the technology options and the biodegradable waste production in the UK and developed a techno-economic model.

TECHNICAL DUE DILIGENCE  
**Scottish BioPower Ltd and Parkhill Estates | 2003–2004**  
Scottish BioPower Ltd commissioned Black & Veatch to carry out technical due diligence work on the torrefied wood process.

SMALL HEATING PROJECT DEVELOPMENT  
**Regen SW | 2007–2009**  
Black & Veatch was appointed to deliver the vast majority of the Regen SWBioheat Programme. Bioheat aims to deliver a 32MW pipeline of new biomass installations in the South West UK.

Black & Veatch completed a Geographical Information System (GIS)-based screening process to identify potential candidate sites in the South West to convert to biomass heat. The most promising sites then received assistance with site feasibility, system specification, fuel negotiations, funding applications, planning liaison and demonstration visits.

ADVANCED BIOMASS CO-FIRING STUDIES  
**Several Clients | ongoing**  
Black & Veatch is involved in examining new approaches to co-firing to minimise impacts, which include ash contamination, boiler de-rating and fouling of boiler surfaces. Work has recently covered gasification for syngas co-firing and NOx control, pyrolysis to co-fire bio-oil: co-firing of ethanol and biodiesel in turbines.

BIOETHANOL TECHNICAL DUE DILIGENCE  
**Rabobank | 2006–2007**  
Black & Veatch was appointed as technical advisor for a proposed bioethanol plant with an annual production capacity of 100,000 tonnes. Black & Veatch’s work included identifying areas of risk and mitigating measures by reviewing the environmental, licensing and permitting issues; proposed project plans, project documentation and finance documents; feedstock, transportation logistics and quay alterations; pro-forma assumptions and financial model and comparison with other technologies.

MSW GASIFICATION TECHNICAL DUE DILIGENCE  
**Confidential Client | 2006–2008**  
Black & Veatch has undertaken the initial due diligence on a waste to energy gasification CHP plant designed to process municipal solid waste. The design includes front-end sorting to maximise revenue from recyclable materials. Black & Veatch reviewed the overall plant design, capital budget and assessment of its accuracy, and also identification of key risks and mitigating measures.

CHP FEASIBILITY STUDY & PROJECT DEVELOPMENT  
**Confidential Client | 2006–2009**  
Black & Veatch completed a techno-economic evaluation of opportunities for combustion of a co-product to generate process heat and power at a food manufacturing site. Following completion of the study, Black & Veatch was appointed to provide technical consultancy to assist with the development of a biomass CHP system.

This involved the outline system design, sizing and optimisation, and environmental and planning work, plus procurement of main equipment.

EPRLE TECHNICAL DUE DILIGENCE  
**Macquarie Bank/Royal Bank of Canada | 2004–2008**  
In 2004, Black & Veatch was asked to verify the assumptions made by Macquarie Bank on the valuation of the EPRL assets, which include five biomass plants. After the purchase of EPRL, Macquarie Bank retained Black & Veatch for debt refinancing and technical support. In 2008, Black & Veatch was tasked by Royal Bank of Canada as a technical and environmental advisor to provide opinion on the operational status, environmental compliance of the plants and the reasonableness of the 2008/09 forecast budget.