



Klean Industries
Renewable energy, resource recovery & recycling

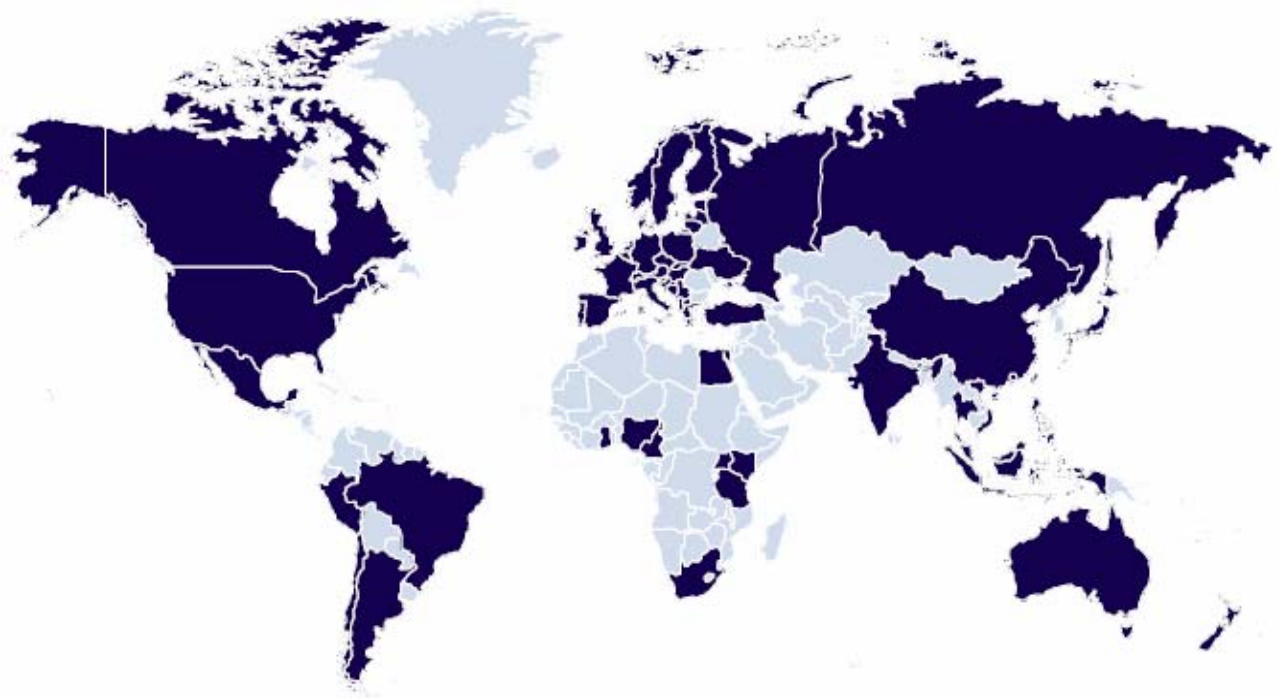
Klean Renewable Energy
& Due Diligence Services

www.kleanindustries.com

What is the Klean Industries Renewable Energy Due Diligence Service?

The Klean Team, is already one of North America's largest resource bases for environmental due diligence services, and draws upon an extensive team of technical, commercial and environmental assessment experts to introduce an integrated due diligence and transaction support service for the renewable energy sector.

The Klean Team has relationships and strong alliances with some of the world's leading companies and financial institutions. As new government policies and market incentives concerning, resource management, renewable energy, carbon emissions trading, and sustainable waste management become powerful catalysts for investments in renewable energy technologies, the Klean Team is ready to assist investors in understanding the unique risks involved in this sector.



■ Countries with resident Klean Team capabilities

This service profile describes the three core aspects of the Klean Team Renewable Energy Due Diligence product. Our commercial, technical and environmental strengths are found within teams of experts spread across a network of country offices, which provide our customers with access to deep industry expertise in power engineering, energy system analysis, biomass and biogas fuels, waste policy and energy sector economics.





The Klean Team stands behind a uniform set of due diligence procedures and quality assurance that ensure rapid mobilisation and the highest standards of service for our customers. While Klean offers its customers a single point of contact and standardised assessment procedures no matter what the assignment, individual project teams are assembled to match the particular needs of the project. Often, this involves placing the appropriate technical experts alongside in country consultants with local market knowledge.

The Klean Team has direct rapid mobilisation and geographic flexibility for immediate project execution. Klean consultants provide fully translated reports and a pragmatic, business-centric approach to risk and liability assessment.

The Klean Team holds a wealth of project experience to demonstrate our understanding of the commercial, technical and environmental risks posed by investment in renewable energy projects.



Technical Expertise: Our Business Strength

Technical due diligence focuses on an independent assessment of plant and equipment to be used in the project. Klean consultants assess the risks associated with the power plant's adopted operational plan and review the engineering, procurement and construction contracts.

The Klean Team has been engaged for independent risk assessment in a wide variety of renewable energy projects. Our technical coverage is focused on the renewable energy technologies shown below.

- Landfill Gas & Biogas Utilisation
- Dedicated Combustion of Biomass for Heat & Power
- Co-Combustion of Biomass & Fossil Fuels
- Anaerobic Digestion
- Conventional Energy-From-Waste
- Advanced Thermal Processes including Gasification & Pyrolysis

A sample of recent projects include:

Projects	Locations
Supervision of commissioning and technical assessment of the expansion of a tire carbonization facility and its integration to power production within a closed grid.	Japan
Investigation of integration of a steam super-heater fueled by pyrolysis gas produced via a new tire pyrolysis plant.	Norway
Development and design of a new tire pyrolysis plant with the Government of the Slovak Republic.	Slovakia
Technical, economic, and risk analysis of continuous gasification of waste polyolefin plastics at an operating refinery.	UK
Analysis of integrating waste tire gasification and plastic liquefaction plants into an eco-industrial park to inform an investment valuation.	Germany
Supervision of the commissioning of a wood waste pellet mill plant and characterization of wood as input for a gasification power plant and problem solving of combustion failures.	Canada
Review and assessment of detailed engineering for a new wood waste fired power plant including fuel analysis, gasification & combustion tests, biocrude production and evaluation of fuel pre-treatment methods.	Canada
Evaluation of alternative gasification methods for sludge, municipal solid waste and wood chips to produce biocrude.	USA
Review of landfills and gas and leachate management operations plans and assessment of potential for land fill gas utilization including and evaluation of a waste-to-energy facility to inform an investment valuation.	Kuwait
Environmental upgrade of beef processing plant including review of designs for electrical switch to fuel cell integration using biogas and plans for an integrated rendering plant and biodiesel production facility with zero waste.	USA
Review of environmental upgrade of CHP plant including review of designs for MSW processing and the disposal and recycling of ash and slag residues.	Japan
Technical assessment of the expansion of a biomass co-firing power generation facility.	UK
Investigation of an integrated 4000 tonnes per day MSW gasification plant and a water desalination plant	UAE
Analysis of the economic and technical performance of several operating wind farms to inform an investment valuation.	USA
Coal-to-liquids conversion project where services included design and tendering of gasification & CHP plant for processing 1100 to 1500 tonnes per day, tendering and supervision of the conversion from coal to gas of 10 reactors.	USA Canada China
Development and assessment of an integrated insitu gasification, oil sands project which included design and engineering for a heavy oil upgrading facility for the production of 50,000 barrels per day.	Canada
Investigation and review of a integrated wind powered skyscraper development.	Bahrain
Risk analysis of gasification plants including calculation of deflagration loads and modeling of gas and flue gas flows.	UK

Environmental and Social Risk Identification

Klean capabilities in environmental due diligence (EDD) include describing the total impact on the environment associated with the construction and operation of the plant. It also involves identification of safety hazards associated with the plant operations and project commissioning, together with checks on conformance with local and national environmental standards review the local community impacts and social implications of the project that can go beyond regulatory requirements.



Our employees are leading experts in the environmental sector and our work has included site assessments and strategic work for a range of private sector customers. Klean consultants are actively involved in environmental due diligence on cross-border lease financing of power plants and distribution networks.

Our work has examined:

Projects	Locations
Review of over 300 pyrolysis and gasification technologies and consultations on over a thousand projects using best commercially available technologies with EPCM components.	EU, USA, Asia
Acquisition of 2 coal fired district heating plants and retrofitting them to use biomass as the primary fuel source.	Czech Republic
Transactions (five units; plastic liquefaction plants).	Japan
Review of alternative sites for energy from waste gasification plants and consultation with statutory planning authorities and the Environment Agency on mitigation of local impacts.	UK
Preparation of facility permitting application and planning consents for a waste pyrolysis plant.	UK
Pre-acquisition biomass and residual solid waste as fuel regulatory risk assessment.	Germany
Environmental assessment for a proposed energy-from-waste incinerator with emissions assessment and predictive modeling studies.	UAE
Preparation of a new tire stewardship plan for a provincial government and its transition to industry stewardship.	Canada
Process evaluation and HAZOP (hazard and operability) risk analysis of an 12MW gasifier for ASR (automotive shredder residue), contaminated with heavy metals and other chemical wastes.	UK
Full lifecycle analysis of integrated slaughter house waste for the production of biogas integrated with fuel cells and the production of tallow to biodiesel. This included an evaluation of the environmental and health impact giving rise to investor risks.	USA

Commercial Capabilities: Deep Transaction Experience

Commercial Due Diligence activities focus on the market environment of the project. The Klean Team has proven capabilities in understanding all the elements of the regulatory regime, renewable energy support mechanisms, and the underlying structure of national energy markets. The commercial due diligence process may also include a review of fuel supply markets, fuel supply contracts and issues related to the power purchase agreement (PPA).

Our teams have completed:

Projects	Locations
Preparation of a strategy for renewable energy sources within the framework of institutional restructuring and national / regional privatization. Worked with the United Nations Environment Program as an Environmental Ambassador from 2008.	Bosnia and Herzegovina
Elaboration of an implementation plan for the use of domestic energy resources including biogas, wood, peat, waste, geothermal, hydro, solar and wind.	Canada
Feasibility study for a 1.1 MGD waste water treatment plant with a 3MW fuel cell integration facility	USA
Review of the worldwide market for gasification and pyrolysis technologies based on using waste rubber and scrap tires as a feedstocks.	Worldwide
Investment study of biomass fuel availability, prices and handling characteristics for multiple 10MW power plants.	Canada
Definition of rural electrification projects and assessment of institutional and legal frameworks and socio-economic analyses.	Kenya
Engineering and design of the world's first and largest modular 5MW solar thermal power plant.	USA
Assessment of the availability and input of ASR (automobile shredder residue) and waste tires as a fuel for electrical production.	USA
Contracts evaluation for EFW plants and review of financial arrangements, including innovative funding mechanisms and the associated commercial risks.	UK
Full lifecycle analysis of algae biodiesel generation, including due diligence on advanced growth platforms.	Brazil

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