

## References in the energy sector

Client/Year	Project description
Baltic Green I 2017- ongoing	<p>Building Design and Building Permit for a biomass power plant</p> <p>The project involves developing a complete technical documentation and other necessary documents as well as support in the permitting process for the construction of a biomass-fired power plant. The scope includes optimising technical and economic concept of the biomass fired power plant in steam technology, up to 25 MW fuel input, approx. 7.8 MWe gross power output in condensing mode, with a possibility to implement the cogeneration facility at a later stage; developing design documentation for the unit; applying to the authorities for the building permit and obtaining the valid permit; preparing cost and budget assumptions, including cost estimation for the purpose of budgeting (CAPEX, OPEX for 20 years' operation).</p>
RADPEC S.A. 2017	<p>Technical and economic analysis for the construction of a new multi-fuel cogeneration unit in Radom, based on RDF, coal, and biomass.</p> <p>Works included preparing a technical concept of a multi-fuel cogeneration unit fired with RDF, coal, and biomass. Analyses were made to select optimum size of the unit from the range of 25-35 MWe. Two possible unit locations were analysed in terms of terrain conditions, utility supply, connection to the power grid and DH network. Analysis of alternative fuel supply was conducted taking into account fuel parameters that can enable RADPEC to obtain the status of an energy-efficient DH system.</p> <p>Input data on the existing assets were updated, a concept of flue gas cleaning and necessary investments was prepared, taking into account the planned unit. An active economic and technical model was developed. An economic and financial analysis of the new unit and of the entire RADPEC DH company was made.</p> <p>Main reasons to limit the size of the unit will be RDF availability and the conditions of becoming an energy-efficient DH system.</p>
PGNiG Termika 2017	<p>Technical design of 75 MWe multifuel unit at Siekierki CHP Plant, to be implemented as SPV, including analysis of legal and regulatory conditions for the project.</p> <p>The works were related to the construction of a moc 75 MWe/145 MWt cogeneration unit fired with coal, RDF, and biomass, to be implemented as a special-purpose venture (SPV). The planned location is in the neighbourhood of existing facilities of Siekierki CHP Plant in Warsaw. The works included analysis of legal conditions and requirements as a basis to prepare a business model of SPV. Analyses legislation included Energy Law, Environmental Law, Waste Act, Water Law, CO2 emission trade act etc. Analysis of legal and regulatory issues was focused in particular in the impact on SPV's possibility to sell head and electrical power and on PGNiG Termika providing services of coal supply and storage for SPV. Also analysed was the possibility to use the support systems for renewable energy, cogeneration and the planned power market. Various options for SPV organisation were presented, including participation of PGNiG Termika personnel in operating the new unit.</p> <p>A final detailed technical concept of the multifuel unit was prepared. The level of detail and scope of the concept is sufficient to prepare of tender specification for the selection of the contractor for the unit construction, to prepare applications for power grid and DH network connections, and to prepare application of issuing development conditions for the project.</p>

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Energa Kogeneracja 2016 – ongoing	Technical and legal support for selection of contractor for BB20 biomass boiler modernisation in Elblag.
TAMEH Polska 2016-2017	<p>Services of Technical Advisor for the project „Construction of 35 MWe turbine and generator set, including auxiliary systems at Kraków CHP Plant”.</p> <p>Works included developing a multi discipline technical concept of the project and technical/economic analyses for Kraków CHP Plant, drafting invitation to tender, developing Tender Specification for the procurement and providing services of technical advisor throughout the procurement procedure, including correspondence with the bidders, prequalification, tender evaluation, participation in negotiations and support in preparing final contract with the Contractor. The project covered the construction of a turbine and generator set with a complete steam and water system, construction of a new DH section, modernisation of the steam pipeline of approx. 160 m for the existing CHP plant, construction of two feed water pumps, connecting to the new central control room to be procured, connection to the infrastructure in the existing and operating Kraków CHP Plant..</p> <p>As a result of the tendering procedure, contract for the construction of a 55 MWe turbine was awarded.</p>
Baltic Green I 2016	<p>Feasibility study of 0.5-14 MWe biomass unit construction, to be combined with wind farm for a hybrid installation in compliance with RES Act.</p> <p>As part of the work, multiple alternatives of the unit concept were prepared. Analysed technologies included steam based unit, ORC, gasification, with a dry or wet fan cooling tower. Basing on the analyses, an optimum solution was recommended, and detailed feasibility study prepared for the recommended solution for the location indicated by the Client. .</p>
CONSTRUCT Export-Import Sp. z o. o. 2016	<p>Consultancy and technical support for an industrial cogeneration plant to be fired with the production waste (wood shavings, sawdust, wood chips etc.) from manufacturing of furniture boards and timber processing.</p> <p>Work included preparing a concept of using production waste from a furniture factory for energy generation using waste wood gasification technology. Formal documents were prepared (including Project Information Document) for project implementation. The concept includes the possibility of constructing a cogeneration system of approx. 1-2 MWe based on waste wood gasification technology. Analysis of co-financing from RES support funds was conducted.</p>
TAMEH Polska 2016	<p>Services of Technical Advisor for the project „Construction of gas fired boilers, including auxiliary systems at Kraków CHP Plant”</p> <p>The project referred to the construction of two gas fired boilers fuelled with blast furnace gas, coke gas and natural gas, each of approx. 150 t/h live steam, with steam parameters: 9.4 MPa, 540oC, including natural gas supply system from the high pressure gas network via a pressure reduction and measurement station. Works included developing a multi discipline technical concept of the project and technical/economic analyses for Kraków CHP Plant, drafting invitation to tender, developing Tender Specification for the procurement and providing services of technical advisor throughout the procurement procedure, including correspondence with the bidders, prequalification, tender evaluation, participation in negotiations and support in preparing final contract with the Contractor.!</p>

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Energa Invest S.A. 2016	<p>Boiler island inventory for biomass fired unit BB20p, covering civil engineering and thermal/ mechanical systems.</p> <p>Works included taking inventory, including preparation of a 3D model, of the boiler island, preparing inventory report and listing any missing as-built documentation.</p>
Client undisclosed 2016	<p>Feasibility study of gas combustion engines using coke gas at an industrial plant. Work includes selecting the optimum size and number of coke-gas engines of approx. 3 MW, The scope includes selection of optimum size and number of gas engines for the plant taking into account variable power demand, availability of gas and its variable parameters, analysis of project environment including utilities, auxiliary power supply, connection to the power grid and integration with the existing infrastructure. Environmental requirements were analysed, including noise emission, and conditions for construction of the plant in a building vs in containers were compared. The purpose of the work is to present possible project alternatives including thermal balance calculations, financial analysis of the project and recommendation on the optimum solution.</p>
Elektrociepłownia Puławy S.A. 2016	<p>Feasibility study of Puławy CHP Plant extension.</p> <p>The purpose of the project was to prepare the concept of reconstructing the existing generation capacities at Puławy Chemical Factory by building a new coal fired or a gas fired cogeneration plant (including among other a 250 MW CCGT unit) in case the planned 400 MWe class unit is not built. The work included analysis of current and future heat demand at the chemical plant, including the defined modernisation scope of the existing Puławy CHP plant, and preparing technical concepts for further extension of the CHP plant with a cogeneration facility of 220-250MWt for optimum cooperation with the existing coal fired CHP plant. Analysed options included: approx. 90 MW coal fired unit, a 250 MW CCGT unit with one gas turbine, one or two gas turbines with steam HRSGs of approx. 150 MWe. For all alternatives, optimisation analyses were conducted, and an active technical and economic model was developed. Sensitivity analysis and risk analysis were conducted.</p>
PGNIG Termika 2016	<p>Feasibility study of a 200-650 MWe/200 MWt gas fired unit at Siekierki CHP Plant in Warsaw, Poland</p> <p>The study analyses the possibilities for construction of a gas fired cogeneration unit of 200-650 MWe/200 MWt, meeting BAT requirements. A technical and economic concept was prepared for multiple alternatives, including a single shaft and a double shaft CCGT unit, single cycle unit with HRSG and gas engines. For selected alternatives, which included among other a 400 MW CCGT unit, and a 600 MW CCGT unit, a full feasibility study was prepared.</p>
PGNIG Termika 2016	<p>Multi-fuel unit feasibility study</p> <p>Feasibility study of constructing a multi-fuel cogeneration unit at one of the existing coal fired CHP plants in Warsaw, including optimisation of the fuel mix. The study included analysis of multiple alternatives such as a 20 MWe RDF fired unit and a 75-100 MWe multi-fuel unit with a fluidised bed boiler able to operate on 100% coal. Site analysis was made for selected locations, as well as a detailed technical description, CAPEX and OPEX calculations, detailed implementation schedule. Economic analysis was made both for the new unit itself and for the entire company,</p>

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	operating Warsaw's CHP plants. Technical and economic models were made for each analysed alternative and sensitivity analysis was made.
PGNIG Termika 2016	<p>Preparation of a complete conceptual documentation and technical documentation to obtain a construction permit for a gas fired CHP plant to be located at Zasanie HOB Plant area in Przemyśl, Poland</p> <p>Work included preparing a concept of a gas fired CHP plant based on two, or alternatively on three gas engines of 5 MW in total, with a 5 MWt gas boiler. Then the civil engineering design (building design) was developed for the 2 gas engines alternative, including all the necessary approvals from authorities. A complete application for the construction permit was prepared and submitted to the authorities. The construction permit was obtained.</p>
Elektrownia Ostrołęka 2016	<p>Update of Feasibility study for the construction of a 1000 MW Ostrołęka C Power Plant, Poland</p> <p>The project was to update the detailed feasibility study, originally prepared in 2009-2010, for the construction of a coal fired 1000 MW unit at Ostrołęka Power Station Groups in the north-east of Poland, with a pulverised fuel (PF) boiler fired with coal with up to 20% of biomass co-firing possibility) with a cooling tower and heat generation of approx. 140 MWt. A financial and economic analysis of the project was made taking into account the current economic and legal conditions, as well as sensitivity analysis, risk analysis and business plan for the project.</p>
Undisclosed Client 2016	<p>Audit of a 1000 MW class coal fired unit under construction</p> <p>As part of the works, assessment of the current implementation state of the unit construction and auxiliary systems was made, taking into account project risks and formal/legal risks. Design documentation, the compliance of construction and installation works with the documentation, and the compliance of implemented and planned works with the project time schedule were analysed.</p>
PGNIG Termika 2016	<p>Technical and economic due diligence of heat generation assets owned by Spółka Energetyczna Jastrzębie and its subsidiary PEC Jastrzębie-Zdrój.</p> <p>Due diligence included, among other things, technical condition assessment of DH networks, CHP plants, HOB plants and pumping stations as well as main process equipment in heat sources, analysis of DH system operation, full scope analysis of environmental issues as well as evaluation of heat market forecasts, in order to support the Client in the process of purchasing heat generation assets.</p>
Energa Kogeneracja 2015 – in progress	<p>Preparing tender specification and conducting tendering procedure for biomass fired unit at Kalisz CHP Plant.</p> <p>The subject of tendering procedure will be construction of an approx. 10 MWe biomass fired (wood chips and/or pellets) cogeneration unit.</p>
Client: Lietuvos Enerģia / Employer: UAB "Teisingi Enerģetikos Sprendimai" 2015 – 2016	<p>Technical consultancy in the process of selecting contractors for a new CHP plant in Vilnius (Lithuania).</p> <p>Work includes development of Tender Specification for the construction of a new CHP plant which is to be executed under two separate contracts. The CHP plant will include a biomass fired plant (2 boilers fired with wood chips, energy crops, lignin,</p>

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<p>PGE GiEK, Oddział Zespół Elektrowni Dolna Odra 2015 – 2016</p>	<p>peat and straw, net thermal output 2x95 MWt, equipped with 20 MWt flue gas condensers, and a 70 MWe/120 MWt backpressure steam turbine) and a waste-to-energy plant fired with MSW, RDF, SRF, sludge, and with a possibility of using biomass as backup fuel (grate boiler of 70 MWt thermal output in fuel and 31 t/h maximum continuous throughput, equipped with flue gas condenser, and a 17,6 MWe/40 MWt backpressure steam turbine).</p> <p>Work also included adapting FIDIC contractual conditions to the conditions of the Contract.</p> <p>Further services included participation in the selection of the contractors. The contractors were chosen in July 2016.</p>
<p>MPEC w Łomży (district heating company in Łomża) 2015</p>	<p>Developing documentation for the project and for selection of contractors for the tasks aiming to modernise the existing generation facilities to the emission standards required by IED.</p> <p>Work includes developing Tender Specification for two tendering procedures: one for a semi-dry FGD plant for 2 boilers OP-206, along with a pneumatic fly ash transport and storage system, and the other for an SCR deNOx system for 2 boilers OP-206. As part of the works, a technical concept of the project was developed and a feasibility study was prepared. The work also includes preparing and conducting tendering procedures, including definition of qualification criteria and tender evaluation criteria, followed by evaluation of bidders' applications and offers, and support for the Client. The project also includes preparing applications for, and obtaining the environmental permit and the land development conditions for the Project.</p> <p>The project is currently at the stage of releasing Tender Specifications to potential bidders..</p>
<p>MPEC w Łomży (district heating company in Łomża) 2015</p>	<p>Concept for dust removal, desulphurisation and deNOx technology for municipal HOB plant in the city of Łomża</p> <p>The purpose of the study was to show the most attractive technological alternatives for flue gas cleaning system for heat-only boilers in order to enable further operation of the boilers after 2022 in view of IED and introduction of new emission standards. The report includes analysis and concept of complex flue gas cleaning installation including NOx reduction, dust removal and desulphurisation.</p> <p>The study included description and selection of technologies for the given amount of flue gas, taking into account the plant operation profile, use of existing infrastructure, site conditions, and limitations of each technology. CAPEX estimation were made for the analysed alternatives and mass and energy balance calculations for the plant were made.</p>
<p>Energa Invest S.A. 2015</p>	<p>An Analysis of pellet size on the biomass combustion process in the steam boiler of the biomass fired unit BB20p at Elbląg CHP plant.</p> <p>Analysis covered assessment of the boiler plant and its documentation in order to assess the impact of the fired pellet length on the boiler's possibility to reach MCR, detailed evaluation of the pellet length on the combustion process in the boiler and on the thermal balance of the boiler, and the evaluation of pellet length on air distribution. As a result of the analysis, recommendations were presented for repair procedures and for further analyses aimed to optimise the combustion process and</p>

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	thermal balance of the boiler.
Dalkia 2015	Technical and environmental due diligence of ZEC Katowice heat generation assets. Work included analysis of available documentation and technical information collected on site, as well as developing a technical and economic model to support the Client in the process of purchasing heat generation assets.
Radpec S.A. 2015	<p>RADPEC S.A. development strategy, including coal firing reduction and cogeneration development</p> <p>A long term multiple-alternative concept was prepared for the development of RAPDPEC heat distribution company. Analysis of external conditions was made, including legal issues related to the environmental protection, support for RES, cogeneration and WtE, as well as the possibilities of connection to gas network and biomass acquisition. Possibilities of modernising the existing sources to meet the changes in environmental requirements were analysed.</p> <p>As part of the concept, new cogeneration sources were analysed: a 115 MW CCGT unit, a set of gas engines, and a 20 MW biomass unit, and their impact on the existing DH system. A concept of WtE plant in Radom was also developed and its impact on the planned RADPEC projects was investigated.</p> <p>A long term strategy for RADPEC was prepared, taking into account possible changes to the legal and market conditions.</p> <p>An economic and financial analysis was made, and a dynamic model for RADPEC and for WtE was developed.</p>
Elektrociepłownia Stalowa Wola S.A. 2015	GE 9FB gas turbine shipment: assessment of options The study analysed the options of land transport of turbines in pieces and the possibilities of its assembly and start-up. Possibilities of gas turbine major overhaul on site were described.
Zakład Separacji Popiołów Siekierki Sp. z o.o. (PGNiG Termika) 2014 – in progress	<p>Owner's Engineer services during implementation of „Construction of a complete ash separation system at Siekierki CHP Plant on turn-key basis". Services include the evaluation of tenders for the main contractor in turn-key procedure and supervision over preparation, management, control and implementation by the Contractor of the complete ash separation installation.</p> <p>The project includes construction of a 20 000 m3 ash storage tank, process system for ash separation, 1.5 km ash transport bridge and a number of other facilities related to ash storage and technology.</p> <p>Total project value approx. 40 MPLN.</p>
TergoPower 2014-2016	<p>Services for biomass fired CHP plant in Lublin in project preparation phase</p> <p>Work included developing an environmental impact assessment report and support in the administrative procedure of obtaining environmental permit for a 50 MWe straw fired combined heat and power plant. The work also included nature inventory and soil investigation, geotechnical report and geotechnical engineering documentation.</p> <p>Works included participation in developing a civil engineering design was developed, as necessary to obtain the construction permit, covering design of CHP structures.</p>

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<p>Grupa Azoty S.A. 2014-2015</p>	<p>Feasibility study of an integrated waste management and energy project in Tarnow, including construction of waste-to-energy plant firing municipal waste and sludge, and construction of DH pipeline connecting DH systems for Grupa Azoty S.A.”</p> <p>The feasibility study was conducted in compliance with good engineering practice and with Ministry of Infrastructure and Development guidelines for application procedures for EU co-financing grants. The work included: analysis of options regarding site, technology and waste management of Tarnów region, including also an option of not building a WtE plant for Tarnów DH system; analysis of waste systems, including demand analysis, in Tarnów region, population of approx. 560,000 and waste generation of approx. 160,000 t/a, sludge from two waste treatment plants and formed fuels (RDF/preRDF/SRF) that may be generated from waste in MBT facilities in Tarnów region and outside; analysis of DH supply for the city of Tarnów from Grupy Azoty CHP plant; WTE structural analysis (legal form and organisation of project and its operation); environmental impact analysis; plant of WTE implementation and functioning, including analysis of grant/co-financing acquisition; financial and economic analysis, sensitivity and risk analysis with an active financial model; WTE implementation synergy analysis in technical and economic terms from Grupa Azoty point of view, i.e. construction of WTE boiler at Grupa Azoty CHP plant II, supplying steam to the existing generation facilities, with an active economic model.</p>
<p>WPEC Legnica 2014-2015</p>	<p>Concept for heat supply for DH system of Legnica, including feasibility study.</p> <p>A number of alternatives and scenarios were analysed, taking into account installations based on system gas, local gas, biomass or coal, of thermal output in the range of approx. 10-60 MWt. Analysis of heat sources operation in the context of DH supply in Legnica was conducted, taking into account the necessary modernisations to meet IED requirements. Local site conditions were analysed, as well as the possibilities of incorporating a new plant into the existing infrastructure. CAPEX was estimated and economic analysis was conducted.</p>
<p>Grupa Azoty S.A. 2014-2015 Chemical factory</p>	<p>Second-opinion report for „ECII CHP Plant operation optimisation design at GA S.A.”</p> <p>Work included selection of an optimum condensing turbine for 0.9 MPa – thermodynamic calculations, selection of size and parameters, analysis of cooling system and analysis of the existing concept of installing a low-parameter DH condensing turbine, and analysis of the possibility of using existing WPT turbine sets (USSR) for power and heat generation without using LANG turbines, by adjusting operating point to the new forecast loads and parameters (including the possibility of turbine modernisation and construction of 40 bar steam pipeline and using 40 bar steam for generating power on the UK turbine (USSR)). Work included analysis of steam turbine expansion path, and limitations arising from change to the turbine set operating parameters.</p>
<p>PGNiG Termika 2014 – 2015</p>	<p>Detailed conceptual design for separating boiler K-1 and turbine set Tz-1 at Siekierki CHP Plant from the header system and converting it into a power unit</p> <p>Work covered complex separation of 50 MWe condensing-extraction turbine and an OP230 boiler converted to biomass, from the existing header system of Siekierki CHP Plant. Works included developing a detailed conceptual design for the separation (basic engineering) in all disciplines, including BoP, as well as preparing</p>

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Undisclosed 2014 – 2015	<p>technical part of Tender Specification. Work also included detailed analysis of turbine set operation after separating the BoP from the common header system (increase of attainable power of the turbine set due to higher load on the condensing part) – analysis of the operation of separated systems: steam and water cycle of the unit, turbine steam path*, control system, turbine set auxiliary systems (drainage, sealing steam, generator cooling, start-up system, dumping stations).</p> <p>Work is conducted in stages. Last stage to be performed is support in the selection of Contractor.</p>
Undisclosed 2014	<p>Technical and environmental due diligence for a CHP Plant in Poland</p> <p>Technical and environmental due diligence covers evaluation of the technical conditions of the CHP Plant, meeting the present and future environmental limits for greenhouse gases emission, furnace waste generation and water and sewage management, taking into account the existing permits, the evaluation of the present investment plan and proposals for its modification, evaluation of operational efficiency and effectiveness and preparing a forecast of CHP Plant operational parameters (efficiency, outage, overhauls) including planned investments, and drafting a list of main technical risks and preventive actions.</p>
Undisclosed 2014	<p>Technical due diligence of a heat-only boiler plant owned by a municipal district heating company.</p>
Zakład Separacji Popiołów Siekierki 2014	<p>Technical due diligence for the project of constructing ash separation plant at Siekierki CHP Plant.</p> <p>Due diligence included verification of the project status in terms of technology selection, plant sizing, permitting, environmental requirements, selection of technology supplier and contractor, as well as budget and schedule review and risk identification.</p>
PGNiG Termika 2014	<p>Feasibility study for a gas fired CHP plant to supply heat to Turek DH system.</p> <p>A number of alternatives for the CHP plant were analysed, based on gas engines or gas turbine in simple cycle, in the range of 4-20 MWe. Local site conditions were analysed. CAPEX was estimated. Economic analysis was conducted and an active technical-economic model was developed.</p>
MPEC Olsztyn 2014	<p>„Feasibility Study for a CHP plant in Olsztyn, including RDF as main fuel, 90 MW total available capacity”.</p> <p>The study analysed various alternatives for CHP plant with an RDF fired unit (grating boilers, CFB, BFB). Extension of the CHP plant with an installation firing natural gas, biomass or coal was also analysed. Site related conditions and limitations were analysed. CAPEX was evaluated, economic analysis was made and an active technical and economic model for the project developed. Basing on the study, the technological alternative for the CHP plant was selected from implementation,</p>



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	consisting in a cogeneration WtE unit and a gas/oil fired peak loading boiler plant, and guidelines for Terms of Reference were defined.
PGE Gorzów 2014	<p>Evaluation of technical usability of the existing facilities of ECI for the construction of a reserve and peak loading boiler plant</p> <p>Works covered development of a technical concept for an approx. 100 MW boiler plant fired with fuel oil, with steam and water boilers at the site of existing facilities. Evaluation of technical conditions of ECI facilities was conducted with view to reusing them for the construction of the boiler plant and identification of the potential risks of adapting the buildings for a new purpose. A concept for constructing the boiler plant in the existing buildings was prepared, covering the process, civil engineering, electrical, I&amp;C, and piping/networks part. Optimum location for the fuel oil tank and oil unloading plant near ECI facilities was indicated.</p>
PGNiG Termika 2014	<p>Tender Specification for the construction of 400 kW gas fired mini cogeneration unit at Regaty HOB Plant.</p> <p>Technical concept was developed. Analysis of the mini cogeneration unit size was made in terms of electrical output and the possibilities of construction on site. Geological survey for the construction was made. Complete Tender Specification was prepared for the construction of a mini cogeneration unit, with gross electrical output in the range 300 - 500 kWe and heat output over 400 kWt, including also incorporating the unit with the existing systems of Regaty HOB Plant, such as gas supply system, DH connection system, unit connection to the power grid, Regaty control system.. Work also included developing the model for section of the Main Contractor (selection based on NPV) and draft service agreement was proposed.</p>
Fenice Poland Sp. z o.o. 2014 Metal parts factory	<p>Modernisation concept for heat and power generation sources of FENICE Poland Sp. z o.o. in Rzeszów in view of IED requirements and market conditions</p> <p>As part of the feasibility study legal background for the analysed projects was presented and the impact of base case (no modernisation) on the functioning of the company until 2023 and after was analysed. Conditions for using derogation from IED by Rzeszów CHP Plant were described. Technical possibilities of constructing new generation units of 3-11 MWe were analysed, including back pressure steam turbine, 3 MWe class gas engines, gas turbines with heat recovery, biomass unit (10 MW), biomass boiler. Site conditions for the planned generation sources were analysed, including collisions and demolitions, as well as existing infrastructure that can be used for new plants..</p> <p>CAPEX was evaluated and economic analysis of feasibility was made for the analysed alternatives. An active technical and economic model was developed.</p>
Fenice Poland Sp. z o.o. 2014 Automotive industry	<p>Modernisation concept for heat and power generation sources of FENICE Poland Sp. z o.o. in Tychy in view of IED requirements and market conditions</p> <p>As part of the feasibility study legal background for the analysed projects was presented and the impact of base case (no modernisation) on the functioning of the company until 2023 and after was analysed. Conditions for using derogation from IED by Tychy HOB Plant were described. Technical possibilities of pumping system modernisation and of constructing new generation units of 3-11 MWe were analysed, including: 3 MWe class gas engine, 11 MWe gas turbine with water-based</p>

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	<p>heat recovery boiler, gas fire boiler (10 MW). In each alternative, auxiliary power supply for the Client's heat generation sources was taken into account. Site conditions for the planned generation sources were analysed, including collisions and demolitions, as well as existing infrastructure that can be used for new plants. CAPEX was evaluated and economic analysis of feasibility was made for the analysed alternatives. An active technical and economic model was developed.</p>
MPEC Olsztyn 2013 – in progress	<p>Technical consultancy services for the on-going tendering procedure in the PPP formula for "Selection of private partner for heat supply to municipal DH system in Olsztyn"</p> <p>Services included developing a concept of waste incineration plant which covers WtE plant fired with RDF (100,000 t/a) with a flue gas cleaning plant and a peak loading/reserve gas/oil fired boiler plant, as well as a concept of environmental control systems for the existing heat-only boilers at Kortowo HOB Plant in order to meet BAT requirements and prolong the plant's operational life.</p> <p>Terms of Reference, including functional tender specification of the WtE plant and the peak loading reserve boiler plant was prepared, as well as the scope of plant operation services. Technical aspects for the EPC contract for the CHP Plant construction and for the operation contract were developed, as well as the technical scope of risk analysis. Methodology of tender evaluation in technical terms was prepared.</p> <p>Analysis of RDF availability was also conducted. An active technical and economic model was developed for the purpose of financial modelling, and technical input for EIA report. A functional tender specification was prepared for adjusting Kortowo HOB Plant's parameters to the environmental requirements (IED) and to prolong its operational lifetime.</p> <p>The scope of services includes participation in negotiation meetings as part of the competitive dialogue with bidders and in working meetings, preparing clarifications and replies to bidders' questions, as well as support to the Client and Client's legal consultants in the process of selecting the private partner.</p>
Hitachi Power Europe GmbH, Polimex-Mostostal S.A., PKO BP S.A. 2013- in progress	<p>Services of the independent Technical Advisor to the Bank and Advisor Monitoring of the Progress of Project Implementation during construction of a supercritical hard coal fired 1075 MWe power unit in ENEA Wytwarzanie S.A., Koźienice</p> <p>The scope covers observing and inspecting progress of construction process, activities of contractor and subcontractors as well verification of payment transfer orders.</p>
PGNiG Termika 2013 – 2014	<p>Preparing Tender Specification and permitting process for the public procurement for a new Pruszków CHP Plant</p> <p>Work included developing a concept of Pruszków CHP Plant in the conditions of limited gas supply. The study analysed a technical concept of then cogeneration units in the form of cogeneration engines of total output approx. 10 MWe, modifying the existing HOB boiler WR25 to meet environmental requirements and a new peak-load and reserve boiler plant.</p> <p>A complete tender documentation was prepared for 3 tendering procedures: for modernisation of K12 and K13 water boilers for stricter environmental standards, for</p>

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	<p>the construction of water pre-treatment plant; for the delivery and erection of a cogeneration unit based on gas engines and a peak-load and reserve boiler plant (cogeneration unit of approx. 10 MWe, 3-5 gas engines).</p> <p>An information sheet was prepared for the modernisation of K12 and K13 HOB boilers for stricter environmental standards and environmental decision for the project was obtained. An environmental impact assessment (EIA) report was prepared, and environmental decision was obtained.</p>
Dalkia Polska S.A. 2013- 2014	<p>Technical Advisor services for the project of a CCGT CHP plant construction at Karolin CHP basing on a 55 MWe/56 MWt CCGT unit transferred from another location, including necessary changes for local conditions.</p> <p>The work included developing a detailed technical concept of a CHP plant construction based on CCGT facilities to be relocated from another country. As part of the study, analysis of local conditions was made, and the facilities to be relocated and not to be relocated were determined. The necessary modernisation scope for the relocated equipment was defined in connection with the planned change to the plant's functionality, including maximised district heat generation and steam consumption for process purposes. The scope of works/supply for the new equipment and for the new building was defined, as well as technical conditions related to the project implementation, such as interfaces with external infrastructure, general requirements for the contractor, technical requirements for equipment, certification requirements. The work also included development of a spatial arrangement plan with connections to external networks, and the concept of the main building suited for the local conditions. Thermal balance calculations for the unit and its auxiliary systems were performed.</p> <p>Technical specification (Terms of Reference) for the relocation and construction of the CCGT unit was prepared.</p> <p>Next stage of the project will involve support in the tendering process for the selection of the contractor for the transfer and construction of the plant, including tender evaluation and negotiations with potential contractors.</p>
PCC Rokita 2013-2014 Chemical factory	<p>Technical and economic concept of adjusting the CHP plant owned by PCC Rokita SA to the new environmental requirements of Industrial Emissions Directive (IED).</p> <p>Work included developing the concept of modernising the CHP Plant, with one OP-130 boiler and two OR-45 boilers, of total input energy of approx. 193 MW, with the existing environmental installations, to meet the new IED environmental requirements. Modernisation of the existing cyclone filters and wet desulphurisation plant was analysed, as well as application of new installations for NOx reduction and dust removal. Formal aspects for the implementation of environmental facilities and the possibilities of subsidising the project were also analysed. .</p>
PGE GiEK S.A. 2013-2014	<p>Feasibility Study of the construction of DH transmission pipeline between Dolna Odra Power Plant and Pomorzany Power Plant.</p> <p>Formal conditions related to zoning/land development were analysed, as well as technical, legal and environmental conditions having an impact of the DH pipeline route. A model of potential heat market development for Dolna Odra Power Plant, and of cooperation between the transmission pipeline and the DH network of</p>

## References in the energy sector

Client/Year	Project description
<p>GAZ-SYSTEM S.A. 2013</p>	<p>Szczecin was prepared. A potential route of the pipeline was defined, including the profile of the route, location of buildings along the way, and solutions for collisions with natural obstacles and with infrastructure.</p> <p>As part of the study, total cost estimation was developed, an analysis of risk, opportunities and threats for the project was performed. Preliminary approvals from local authorities and interested parties were obtained. A list of approvals and administrative decisions required for the project was developed and project permitting and implementation schedule was drafted.</p> <p>Analysis of gas utilisation possibilities in the energy sector, in particular including development of gas-based cogeneration and RES facilities until 2050</p> <p>The analysis defined the legislative conditions for development of gas-based cogeneration in Poland. Types and conditions for various operation profiles of cogeneration systems were described. The work included market analyses covering the present status and development perspectives for the heat market, gas cogeneration and RES. Basing on the analyses, scenarios for gas cogeneration until 2050 were prepared, with a focus on key geographic areas for gas based energy sources development. Supporting and adverse factors were identified, including economic conditions required for development of cogeneration. Gas based technologies of major importance for Poland's energy safety were described and basis for the application of smart grid solutions in the gas transmission systems was defined</p>
<p>TAURON Wytwarzanie S.A. 2013</p>	<p>Feasibility Study for the construction of CCGT unit with district heating generation at TAURON Wytwarzanie S.A., Łagisza Power Plant in Będzin.</p> <p>As part of the Study, the possibilities of power construction were analysed, covering power output from 450 MW to 600 MW and heat output of approx. 250 MWt. The Study analysed the site conditions, assessed the possibility of using the existing infrastructure and systems of Łagisza Power Plant for the new CCGT unit and compared to options of connecting to the gas system (distribution vs. transmission system). A comparative analysis of various CCGT locations within the premises of the existing Power Plant was made. Competitive power projects in Poland were analysed, as well as electricity prices on the stock exchange, and probable operation profiles of the new units on the competitive market were defined.</p> <p>An active economic model was prepared. Economic analysis, including sensitivity analysis, was performed, and the conditions on the power market and natural gas market influencing the operation mode and profitability of the new gas fired unit operation were discussed.</p>
<p>Grupa Azoty, ZA w Tarnowie-Mościcach S.A. 2013 – 2014 Chemical factory</p>	<p>Preparing Tender Specification for tendering procedures based on the Client internal regulations in order to select a contractor for the task implemented on turn-key basis - the supply and construction of a complex deNOx system – for three boilers: TP-170 (input energy 135 MW), OPF-230 (input energy 185 MW) and OP-230 (input energy 180 MW), fired mostly with coal, installed at the nitrogen industry plant's CHP plant ECII in Tarnów-Mościce. Implementation of the flue gas cleaning systems is to ensure emission reduction and enable further boiler operation after the enforcement of IED in 2016.</p>

## References in the energy sector

Client/Year	Project description
<p>Grupa Azoty, ZA w Tarnowie-Mościcach S.A. 2013 – 2014 Chemical factory</p>	<p>Preparing Tender Specification for tendering procedures based on the Client internal regulations in order to select a contractor for the task implemented on turn-key basis - the supply and construction of a complex FGD and dust removal system – for three boilers: TP-170 (input energy 135 MW), OPF-230 (input energy 185 MW) and OP-230 (input energy 180 MW), fired mostly with coal, installed at the nitrogen industry plant's CHP plant ECII in Tarnów-Mościce. Implementation of the flue gas cleaning systems is to ensure emission reduction and enable further boiler operation after the enforcement of IED in 2016.</p>
<p>PGE GIEK, Elektrociepłownia Lublin Wrotków 2013</p>	<p>Technical and economic concept of adding a heat accumulator to the DH system of the Lublin CHP Plant</p> <p>The study includes a technical analysis of the construction of heat accumulation system based on non-pressurised tank at Lublin Wrotków CHP Plant, to ensure increase of heat generation by the CCGT unit (230MWe/185MWt) and limit the operation time of peak-load boiler, as well as optimise the unit operation outside the heating season. The analysed capacity range of accumulator tanks was 10,000-40,000 m3. Site analysis for the heat accumulator was conducted.</p> <p>Works included project feasibility analysis. For selected technical alternatives of the heat accumulator, sensitivity analysis was performed, covering various scenarios of legislative support for cogeneration. The work also included the possibilities of aid financing for the project.</p>
<p>PGNiG Termika SA 2012-2013</p>	<p>Feasibility Study for FGD plant for boilers K1 and K2 at Siekierki CHP Plant</p> <p>As part of the study, preliminary selection of FGD technologies was made and analysis of selected technical alternatives for the project was conducted, taking into account the possibility of using the existing infrastructure of the CHP Plant, such as the existing wet FGD plant.</p> <p>Economic analysis for the selected technical alternatives was made.</p>
<p>Fortum Power and Heat Polska Sp. z o.o. 2012-2013</p>	<p>Biomass Supply Study for Częstochowa and Zabrze units</p> <p>Work included assessment of the current RES legal frame and its planned changes and impact of possible changes on biomass use in Poland. Legal basis for biomass import was described. National and local potential for forest and non-forest biomass for Fortum plants was analysed. Trends and forecasts of biomass prices were presented as well as competition in the market of biomass utilisation. Logistic possibilities and limitations for biomass delivery to Fortum plants were presented. Potential biomass suppliers for Fortum, both domestic and foreign, were reviewed and preliminary declarations on for biomass supply were obtained. Fuel options were prepared for both Fortum units, taking into account logistics, storage, process and legal regulations. Significant provisions to be included in biomass supply contract were proposed.</p>
<p>PGNiG Termika 2012-2013</p>	<p>Coal fired OP230 K2 boiler conversion to BFB biomass firing at Siekierki CHP Plant, Warsaw. The project includes boiler retrofit and implementing a new biomass handling systems with all auxiliary systems enabling biomass delivery by rail and by road at up to approx. 320,000 t/a.</p>

## References in the energy sector

Client/Year	Project description
Energomontaż Zachód 2012-2013	<p>Feasibility Study for boiler retrofit to biomass firing was prepared – analysed technologies included BFB, pulverised fuel and vibrating grate. Feasibility Study for biomass handling system for K2 boiler was also conducted.</p> <p>Additionally, the scope of works includes preparing environmental impact report and an application for environmental permits as well as an application for a decision of public purpose project location (including obtaining the specified permits/decisions).</p> <p>The project also includes preparing tendering documents (Tender Specification, contract) to select the contractor for boiler retrofit including biomass handling facilities as well as participation in tender evaluation and selection of contractors..</p> <p>Construction of heat source at Ostrołęka "B" Power Plant, consisting in conversion 13K200 turbines for heat generation and connection to the existing DH infrastructure.</p> <p>Design of heat accumulator was made for the maximum water temperature of 98°C, with a non-pressurised cylinder tank of a diameter of 24 m and a usable volume of 13,000 m3.</p> <p>Works included preparing technical/process design of the heat accumulator and steam pressure reduction station for the steam area in the accumulator, including connecting the heat accumulator to the loading/unloading pipelines, staircase and platforms for the measuring nozzles, thermal insulation, inspection hatches, openings for the installation of control and measuring instrumentation, roof drainage, guidelines for control and instrumentation system; detailed design of the heat accumulator, including inner pipelines and nozzles; detailed design of the heat accumulator foundation; detailed design of the steam pressure reduction station.</p>
Energia Invest 2012 – 2015	<p>Services for the construction of CCGT unit in Gdańsk.</p> <p>The scope of work included preparation of Feasibility Study analysing a 420-520 MW CCGT unit with closed cooling system. The study analysed site conditions and limitations, connection to the infrastructure and to the power grid.</p> <p>The Study included analysis of energy market, analysis of environmental impact, detailed technical concept, legal and organizational analysis, detailed time schedule for project implementation, economic and financial analysis, including an active technical and economic model.</p> <p>Services also include preparation of EIA as well as preparing necessary documentation, technical and legal advice in the permitting process of documentation, technical and legal consultancy in the administrative process of obtaining the Environmental Decision for the project. .</p>
EDF Polska 2012-2013	<p>Technical and economic Feasibility Study on CCS-ready for coal fired 900 MW Rybnik Power Plant, including simulation model of the unit with and without carbon capture installation, based on state-of-the-art technologies.</p> <p>The scope of work included analysis of the proposed modifications and compliance of the analysed unit with CCS installation and defining the necessary area to be reserved for CCS, with preliminary layout of specific installations and interfaces. It covered the entire technological chain from sequestration through transport to the storage of CO2.</p> <p>The scope also covers the schedule for implementing CCS including permitting,</p>

## References in the energy sector

Client/Year	Project description
PGNiG Termika 2012	<p>economic analysis, legal analysis for CCS in compliance with 2009/31/EC and other relevant legislation.</p> <p>Feasibility Study for Pruszków CHP Modernisation basing on cogeneration unit with gas engines.</p> <p>The study analysed two alternatives of technical concept of a CHP plant, with the description of reasons behind the technology applied in selected process nodes.</p> <p>The study analysed technical possibilities as well as site-related possibilities and limitations, taking into account continuity of heat production in the existing part of the plant during the construction of the new facility. The scope of work includes technical concept for new CHP generation sets, of total output of approx. 20 MWe, concept of modernising the existing WR25 boilers to the environmental requirements and the concept of new peak load and reserve boiler installation. A preliminary environmental impact analysis was presented, covering all the essential environmental aspects. The concept was prepared in such a way that it can be used as a basis for a turn-key tender specification.</p>
Kompania Węglowa S.A. 2012 – 2014	<p>Technical Advisor services. Pre-feasibility study for the construction of a 900-1000 MW coal fired power unit.</p> <p>The study analysed the site conditions and limitations related to environmental protection, existing infrastructure, raw water supply and waste water discharge and connection to the power grid. A comparative analysis of 900 MW power units was made. Technical concept of a power plant consisting of one 900-1000 MW, was prepared, to be located at the mine premises and using the existing railway system. For the selected solution, configuration of main equipment, plant layout and operation profile were described.</p> <p>An economic and financial analysis was prepared. The study was based on UNIDO methodology and completed in July 2012.</p> <p>The scope of work also covered preparation of environmental impact report, obtaining environmental decision. The decision was obtained but appealed against by environmental NGOs.</p>
PGE GiEK S.A. and OGP GAZ-SYSTEM S.A. 2012 LNG Terminal	<p>Feasibility study for a combined cycle gas turbine (CCGT) unit with infrastructure for LNG Terminal in Świnoujście.</p> <p>The study analysed the possibility of applying cogeneration systems based on gas engines, gas turbines and a CCGT unit, with outputs in the range of 40-140 MW. Conditions and limitations for the new unit construction in terms of site/local conditions, environment, connection to the power grid were assessed, taking into account the existing and new facilities and infrastructure. Alternative technical connections were analysed to use heat for LNG regasification. A detailed concept of selected alternatives was prepared, including an economic and financial analysis together with active economic model.</p>
PGE GiEK S.A. 2012	<p>Feasibility Study: Concept for peak load / emergency power generation at Dolna Odra Power Plant.</p> <p>The study analysed multiple alternative concepts of a peak load power plant based on gas engines or gas turbines. Fuels analysed included natural gas, LNG, CNG and light fuel oil. Analysed technologies included 100MW gas turbines, GT systems</p>

## References in the energy sector

Client/Year	Project description
	and gas engines systems of 100-200MW. An economic and financial analysis was made. An economic model was prepared to calculate optimum load profile on the unit depending on the income for peak load / backup services, and the feasibility of constructing a peak load emergency power plant was discussed.
BWSC A/S 2012	<p>Technical and environmental due diligence of PEC Legionowo (ordered heat capacity approx. 94 MW).</p> <p>Tasks included analysis of environmental status of HOB plant as well as operating conditions of HOB and district heating system. Demand for maintenance, modernisation and investment was determined taking into account present and planned environmental requirements and technical status of existing sources. Efficiency increase programme was described.</p>
TAMEH (former Tauron Ciepło) 2012 – 2015 Steel Mill	<p>Owner's Engineer services (OE) for the project of 50 MW extraction/condensing turbine set construction at Nowa CHP.</p> <p>As part of OE services, full tendering documentation was prepared for a limited tendering procedure in compliance with Public Procurement Law, including tender announcement and a complete tendering documentation (Tender Specification and contract) and active participation in the entire procedure.</p> <p>OE services included management of the entire project, coordination and supervision until the turbine set was commissioned for commercial operation and support to the Employer in making economic, organisational and technical decisions related to the project.</p>
Energa Invest 2012-2013	<p>Technical Advisor services in a project of approx. 900MW CCGT unit construction in Grudziądz.</p> <p>The scope of works included preparing Feasibility Study analysing the application of F&amp;H class turbines. The study included a review of current applications of gas turbines and solutions for CCGT units, case study analyses (detailed contracting and management systems in projects similar to the analysed project, in Poland and internationally), reference to Polish public procurement conditions, analysis of energy market in terms of competition, power trade market, detailed technical concept, legal an organisation analysis, economic and financial analysis. Besides environmental analyses were made and input to EIA report was prepared. SWOT analysis was also conducted, as well as risk analysis and competition analysis for the project neighbourhood. Detailed concept of CCS installation was presented in the study as well as CCS information as an input to investor's environment impact analysis.</p> <p>Thermal balance calculations were made and thermodynamic model was prepared in Thermoflex.. And active technical and economic (financial) model was prepared, enabling flexible change of unit operation mode following power price changes during the day and during the week, and including maintenance plan for gas turbines.</p>
PGNIG Termika 2011 - 2014	<p>Technical consultancy in the process of preparing tender documents (Tender Specification and Contract) for the tendering procedure based on Public Procurement Law to select EPC Contractor for a new CCGT unit at Żerań CHP</p>



## References in the energy sector

Client/Year	Project description
PGNiG Termika 2011-2013	<p>Plant in Warsaw, of approx.. 420-500 MWe gross power output and heat output in the range of 250-350 MWth.</p> <p>Work included preparing tendering materials, including the criteria and formula for tender evaluation, Tender Specification, including technical requirements of the CCGT unit assuming compliance with CCS requirements, functional programme, draft contract for the turn-key EPC construction, as well as technical and contractual conditions for LTSA..</p>
PGNiG Termika 2011-2013	<p>Biomass conversion of coal fired OP230 K-1 boiler at Siekierki CHP Plant in Warsaw.</p> <p>The project includes conversion of the boiler and implementation of biomass handling system, including auxiliary systems for approx. 320,000 t/h biomass deliveries by rail and by road.</p> <p>The task was related to the repeated tendering procedure for the selection of contractor for the unit modernisation and for biomass handling. The original concept of the project was modified, in particular by providing a possibility to propose a different combustion technology and eliminate the flue gas condensing system maintaining the original guarantee emission levels. The scope of work covered verification of tender documentation and participation in bid evaluation and tender selection.</p> <p>The scope of work also covered updating the environmental documentation and obtaining a new environmental permit for the modified project.</p>
PKN Orlen S.A. 2011-2012 Crude oil refinery	<p>Technical evaluation of tenders for DeNOx and dust removal system SCR+EF at Płock CHP Plant.</p> <p>The work included analysis of Tender Specification (Terms of Reference) and of the evaluation criteria. The tenders submitted by potential contractors were evaluated in terms of completeness and compliance with the specification, the solutions proposed were assessed and clarifying questions were formulated. Basing on the tenders and clarifications, a ranking list of tenders was prepared. The scope of work covered assistance for the Client in formulating the final wording of technical part of the Contract.</p> <p>Contracts with the selected Contractors were signed.</p>
PGNiG Termika 2011-2012	<p>Feasibility Study "Analysis of the construction of gas and oil fired peak load and reserve boiler plant at Żerań CHP Plant, including optimisation of technical and operational parameters".</p> <p>As part of the study, multiple detailed concept alternatives for a heat-only boiler plant of approx. 650MWt, cooperating with the planned CCGT unit at Żerań CHP (to be implemented as part of overall modernisation plan) were prepared. The study analysed application of fire-tube and water-tube types of boilers and the possibility of converting the existing coal fired boilers to gas. The market of large heat-only boilers fired with gas and light fuel oil was reviewed. The possibilities of constructing the plant and connecting it to the existing process systems and infrastructure of Żerań CHP in different locations were analysed. The analyses included analysis of main fuel supply (natural gas from HP and IP gas supply network) and reserve fuel (light fuel oil) supply, including oil handling system location analysis. Additionally, an alternative concept for reserve fuel was presented, based on using LNG. Feasibility</p>

## References in the energy sector

Client/Year	Project description
<p>PGNIG 2011-2012</p>	<p>of applying gas expander using gas pressure for power production was analysed. Optimisation analysis of the boiler plant operation included availability of raw materials/utilities, generation costs, heat prices and environmental conditions.</p> <p>Feasibility Study for the construction of a gas fired CHP power plant at ZAK S.A..</p> <p>The objective of the work was to present an optimum concept for the construction of a new gas fired plant of 100-500MWe and approx. 250MWt , meeting the technical requirements of the chemical plant and the demand profile of the chemical plant and of other consumers at ZAK S.A. chemical factory. The work was conducted in two phases. In phase I, the study, an analysis of multiple concepts was made, covering a CCGT unit with gas turbines + peak load/reserve boiler plant. The existing site conditions were analysed, the possibilities of connecting to the existing infrastructure and covering the new plant's demand for the utilities by ZAK S.A. The work analysed an alternative with turbines operating on coke gas and natural gas. In phase 2, a detailed technical concept was prepared for the selected alternative, which was used as a basis for preparing Tender Specification and EIA report (input data for EIA report were prepared, including technical data, emission and noise propagation analysis). Analysis of using the existing process systems was made and incorporating the plant into the existing CHP Plant and ZAK installations.</p> <p>Thermal balance calculations were made and thermodynamic model was prepared in Thermoflex and an active economic model was prepared. The study was a basis for drafting contracts with partners and for decision making.</p>
<p>Vattenfall Heat Poland Sp. z o.o. 2011-2012</p>	<p>Feasibility study for biomass fired CHP Plant in Pruszków. The concept included implementation of up to 20 MW biomass fired unit with a water boiler biomass plant and peak load oil fire boilers. Analysed issues included formal and legal conditions, site conditions and technical conditions for the CHP plant construction, with assumed heat demand of approx. 120 MWt. Several CHP concepts were analysed, including biomass unit with condensing-extraction turbine and unit with backpressure turbine, fluidised bed boiler or vibrating grate boiler, using a wet or dry fan cooling tower, with outdoor or indoor wet biomass storage as well as using flue gas condensing system.</p>
<p>Energa S.A. / Energa Elektrociepłownie Kalisz 2011-2012</p>	<p>Analysis of multiple alternatives for extension of energy generation sources in the city of Kalisz (northern Poland) covering fuel supply possibilities, technology and meeting the demand of municipal DH system.</p> <p>The objective was to prepare an optimum concept for the extension of energy sources in Kalisz. In order to select the recommended alternative, the study analysed and compared alternative cogeneration units of 10-140 MWe based on coal, biomass or gas, basing on gas engines and gas turbines. The work included preparing a detailed technical concept of a 54 MWe/48 MWt CHP plant based on gas engines. Based on the expected heat demand from municipal DH system of Kalisz, optimum parameters for the plant were determined. An economic and financial analysis for the projects was conducted and an active model for it was prepared. The scope of work also included PESTEL analysis.</p>
<p>Energa S.A. / Energa Kogeneracja Sp. z o.o.</p>	<p>Analysis of multiple alternatives for extension of energy generation sources in the city of Elbląg (northern Poland) covering fuel supply possibilities, technology and</p>

## References in the energy sector

Client/Year	Project description
2011-2012	<p>meeting the demand of municipal DH system.</p> <p>The objective was to prepare an optimum concept for the extension of energy sources in Elbląg. In order to select the recommended alternative, the study analysed and compared alternative cogeneration units of 10-140 MWe based on coal, biomass or gas, basing on gas engines and gas turbines. The work included preparing a detailed technical concept of a 54 MWe/48 MWt CHP plant based on gas engines. Based on the expected heat demand from municipal DH system of Elbląg, optimum parameters for the plant were determined. Analysis included construction of heat accumulator for 135 MW CCGT unit and for 25 MWe biomass fired unit. An economic and financial analysis for the projects was conducted and an active model for it was prepared. The scope of work also included PESTEL analysis.</p>
Dalkia Polska S.A. 2011	<p>Preliminary concept of CCGT plant relocation from Italy to Poland</p> <p>The subject was to analyse the possibilities and viability of relocating an existing CHP plant with a CCGT unit (approx. 50 MW/40 MWt) from Pigna near Bergamo in Italy to Warsaw. Relocated plant is to be adopted to the local heat market by constructing a new peak load / reserve boiler house. The scope of work included analysis of formal conditions for the construction of CHP plant and connection to gas system, DH network, power grid, feasibility analysis of relocation of gas compressor system and air cooling system for the gas turbine, project cost calculation including disassembly, transport, storage, construction at the new location. The project analysed the alternative based on equipment relocation and for comparison also alternative based on new equipment.</p>
Radpec 2011	<p>A study of RADPEC S.A. development in phases until 2023, covering multiple alternatives, based on extending the existing coal-fired power sources with cogeneration facilities.</p> <p>The study analysed technical possibilities (connection to the main infrastructure of the existing heat plants and DH system, and location analysis) and economic effectiveness of the construction of new generation units: gas engines of 1-18 MWe, gas turbine with heat recovery, CCGT cogeneration unit from 50 to 130 MWe, biomass fired unit of 20 MWe. A detailed technical description of the proposed solutions was presented as well as economic and financial analysis of all alternatives taking into account various financing options. The study presented several scenarios for adopting the existing WR25 boilers at Północ and Południe heat plants to meet the environmental requirements optimised for the cooperation with the new units. As a result of the study, development alternatives of highest economic profitability were selected.</p>
PGE Górnictwo i Energetyka Konwencjonalna S.A. 2011-2012	<p>Technical consultancy in the process of selecting a contractor for the construction of biomass co-firing installation bypassing coal mills at Unit 8 of Dolna Odra Power Plant. The min. 40 MWt installation will be fired with pellets, briquettes and straw bales at the total amount of 54000 t/y.</p> <p>The scope of works includes evaluation of preliminary offers, participation in negotiations with potential contractors, preparation of the final version of Tender Specification and final bid evaluation.</p> <p>Tendering procedure based on Public Procurement Law – negotiated procedure with publication.</p>

## References in the energy sector

Client/Year	Project description
EDF Polska 2011	Preparing concept of approx. 100 MWe CCGT power plant with LM6000 turbines and heat accumulator.
EDF Polska / Cergia 2011	<p>Consultancy services to prepare implementation of 100 MWe/176 MWt gas fired CHP Plant with two gas turbines and water heat recovery boilers in Torun.</p> <p>Works included analysis of site condition for the new units, possible connections to the existing infrastructures and environmental limitations as well as formal requirements for the project. Feasibility Study for the CHP plant was prepared, including operation of the existing CHP generation facilities. As part of the work, detailed plant concept with auxiliary systems was prepared. An alternative concept of the unit as CCGT unit of approx. 100 MWe was presented. Construction of 10,000 m<sup>3</sup> heat accumulator at Cergia Toruń cooperating with gas fired CHP plant and the existing facilities was also analysed. Economic analysis and sensitivity analysis was made.</p> <p>Additionally, input data for EIA report was prepared.</p>
EDF Polska / Kogeneracja 2011	<p>Consultancy services to prepare implementation of 100 MWe/176 MWt gas fired CHP Plant with two gas turbines and water heat recovery boilers in Siechnice.</p> <p>Works included analysis of site condition for the new units, possible connections to the existing infrastructures and environmental limitations as well as formal requirements for the project. Feasibility Study for the CHP plant was prepared, including operation of the existing CHP generation facilities. Economic analysis and sensitivity analysis was made.</p> <p>Additionally, input data for EIA report was prepared.</p>
PGNIG S.A. 2011	Due diligence services covering technical and environmental issues in the process of purchasing Vattenfall Heat Poland S.A. Tasks included evaluation of the condition of generation facilities at CHP plants and HOB plants in Warsaw and Pruszków. Maintenance programmes and investment plans of the company were evaluated. Analysis of heat market and of potential new competition in the heat market was conducted. An investment and development programme was prepared, including required maintenance, modernisation and investments as well as current and planned environmental requirements. A technical and economic model was prepared to be used by the leading advisor in the company evaluation. Basing on technical and economic analyses conducted and taking into account formal issues, investment and development programmes for VHP were prepared, including the possibility of constructing new generation sources.
PGNIG S.A. 2011	Due diligence services covering technical and environmental issues in the process of privatising SPEC - Stołeczne Przedsiębiorstwo Energetyki Ciepłej (Warsaw Heat Company). Tasks included evaluation of technical condition of the district heating system and the existing heat generation facilities in Warsaw area. Demand for maintenance, modernisation and investment was determined taking into account present and planned environmental requirements. A technical and economic model was prepared to be used by the leading advisor in the company evaluation. Basing on technical and economic analyses conducted and taking into account formal issues, investment and development programmes for SPEC were prepared, including the possibility of constructing new generation sources.

## References in the energy sector

Client/Year	Project description
	<p>Potential for new connection to DH system from the Warsaw area was evaluated, with a complexity enabling selection of the best prospective areas for development. For the area of best perspectives, including satellite towns located along the line Ursus-Pruszków-Grodzisk Mazowiecki, a concept of DH system development was prepared, covering a heat demand analysis and heat market development prognosis until 2025. Complexity of the concept makes it possible to select the generation unit (central source and local sources) and the transmission lines. The concept also covered comparison of heat costs for a central heat source versus local small heat sources as well as legal and formal issues.</p>
Dalkia Polska S.A. 2011	<p>Technical analyses in due diligence process as part of SPEC privatisation. Analysis of heat market and of the possibilities to construct new gas or biomass fired heat sources was conducted. The power situation of Warsaw area was also analysed.</p>
Synthos Dwory Sp. z o.o. Oświęcim 2011 Chemical factory	<p>Modernisation programme for Synthos Dwory CHP plant.</p> <p>The work included preparing a concept for plant reconstruction in the form of several alternative investment programmes based on modernisation projects and construction of new coal or gas fired plants as well as reserve and peak load sources fired with various fuels (coal, natural gas, landfill gas, light fuel oil), several process heat demand scenarios (CHP capacity from 250 to 700MWt) and unit operation regime (full cogeneration, partial condensing mode).</p> <p>Economical and financial analysis of investment programmes. Selection of the optimum investment programme was made basing on the most profitable process system, the fuel used and the reliability of heat supply to Synthos Dwory.</p>
Dalkia Poznań 2011	<p>Feasibility study for the construction of new CHP (ECIII) in Poznan</p> <p>The objective was to analyse the possibilities of new gas fired CHP plant construction, including a peak load heat source of approx. 65-80 MWt, at the area of former Kopanina Heat Plant in Poznan. The analysed alternatives included construction of gas fired engines, gas turbines of approx. 6 MWe and a 45 MWe CCGT plant. The scope of work covered technical and economic analyses. As a result, technical concept of the new unit was presented as well as operation mode and economic viability of the project.</p>
Vattenfall Heat Poland 2011	<p>Environmental impact report for a project of modernization and extending Żerań CHP by constructing a 450 MW CCGT plant with all necessary infrastructure and elements of spatial arrangement, including 5-month full nature inventory and thermal analysis of the discharge of post-cooling water to the Vistula and Żerań Canal, and an analysis covering CO2 capture from flue gas (CCS). A detailed concept of CCS system was presented in the Feasibility Study: Analysis of a project involving construction of a gas fired unit at Żeran CHP Plant, Warszawa, including optimisation of technical and operational parameters”</p> <p>Basing on the report, Environmental Condition Decision was issued.</p>
Dalkia Łódź S.A 2011	<p>Pre-feasibility study of CCGT construction at EC-2 Łódź CHP Plant</p> <p>The objective of the study was to analyse the possibility of constructing a CCGT unit at EC2 using the existing steam turbines. As a result of CCGT unit construction, coal combustion will be completely eliminated from the process. The scope of work</p>

## References in the energy sector

Client/Year	Project description
<p>Elektrociepłownia EC Nowa Sp. z o.o. (Tauron) 2011 Steel Mill</p>	<p>covered technical and economic analyses. As a result, a technical concept of the unit was presented, with the operation mode and the economic viability of the project. After construction of CCGT unit, the CHP Plant is expected to have and output of approx. 200 MWt and approx. 100 MWe.</p> <p>Modernisation concept for EC Nowa pumping systems</p> <p>The objective was to prepare an optimum concept for the modernisation of the pumping systems at industrial EC Nowa CHP Plant (120 MWe, 1580 t/h steam), including piping, metering systems, control and instrumentation and power supply, in order to reduce power consumed by the pumping systems. The study presents the results of energy audit of the pumping facilities and a multi-variant concept of modernisation, indicating optimum solutions. The analysis covered feed water pumps, cooling water pumps, district heating water pumps and process water pumps. As a result of the study, an economically feasible modernisation concept was proposed, resulting in the total reduction of power consumption by approx. 32 GWh/a.</p>
<p>International Paper Kwidzyn 2011 Paper Mill</p>	<p>Update of boiler construction concept – feasibility study for a biomass fired boiler</p> <p>The objective of the study was to update a boiler concept prepared in 2009. The study analysed the possibility of constructing a BFB biomass fired boiler at the paper factory, with 140 t/h steam, 6.4 MPa and 440OC or with 150 t/h steam, 11 MPa and 520OC with backpressure steam turbine. Possibilities to use various types of biomass were presented, including bark chips, wood chips, pellets – in compliance with current and planned legislation on energy from renewable sources. Concept of biomass handling and conditions for biomass delivery logistics were presented, for the planned biomass consumption of approx. 260 000 t/a.</p> <p>Economic analysis of technical alternatives was performed.</p>
<p>EDF Polska / Cergia 2010-2011</p>	<p>Advisory services to prepare the project of 120 MWe/150 MWt biomass/coal fired cogeneration unit construction in Torun for implementation.</p> <p>As part of works, site analysis for the new unit was made, including the possibility of connecting to the existing technical networks and the limitations arising from environmental protection as well as formal conditions for the project implementation. Feasibility study of the unit with fluidised bed boiler fired with coal and biomass, taking into account operation of the existing generation facilities, was prepared. The feasibility study included detailed unit concept with auxiliary systems. Economic analysis including sensitivity analysis of the project was made.</p> <p>The scope of work included preparing environmental impact report, application for environmental decision, application for the integrated permit, preparation of application for CO2 emission permit (ETS) and obtaining the permit, and preparing an application to connect the plant to the power grid.</p> <p>Work also included preparing the concept for the tendering procedure to select the contractor(s) in two formulas: as turn-key contract (EPC) and in package-based formula.</p>
<p>EDF Polska / Kogeneracja 2010-2011</p>	<p>Advisory services to prepare the project of 120 MWe/150 MWt biomass/coal fired cogeneration unit construction in Siechnice for implementation.</p> <p>As part of works, site analysis for the new unit was made, including the possibility of</p>

## References in the energy sector

Client/Year	Project description
	<p>connecting to the existing technical networks and the limitations arising from environmental protection as well as formal conditions for the project implementation. Feasibility study of the unit with fluidised bed boiler fired with coal and biomass, taking into account operation of the existing generation facilities, was prepared. The feasibility study included detailed unit concept with auxiliary systems. Economic analysis including sensitivity analysis of the project was made.</p> <p>The scope of work included preparing environmental impact report, application for environmental decision, application for the integrated permit, preparation of application for CO2 emission permit (ETS) and obtaining the permit, and preparing an application to connect the plant to the power grid.</p>
Dalkia Łódź 2010	<p>Feasibility study of the construction of heat accumulator tanks at Dalkia Łódź EC-3 (200 MWe/830 MWt CHP) and EC-4 (210 MWe/860 MWt CHP) . Technical possibilities were analysed of applying heat accumulators at the existing DH connection systems of EC-3 and EC-4, and the cooperation of heat sources in Łodz DH system including heat accumulation facilities (heat allocation). Optimum capacity of the heat accumulators was determined in the range of 10 000 m3 to 30 000 m3.</p> <p>A technical and economic model of Łódź DH system was prepared, taking into account relation between the operation of EC-3, EC-4 and the heat accumulator. Economic analysis was made for various alternatives of heat accumulators' operation and the cooperation of both CHP plants in Łódź DH system.</p>
Vattenfall Heat Poland 2010-2011	<p>Siekierki CHP boiler OP230 K-1 conversion to biomass fired BFB boiler. The project includes conversion of the boiler and implementation of biomass handling systems with the systems enabling deliveries of approx.. 320,000 t/a biomass by rail and by road.</p> <p>A feasibility study was prepared to determine the project concept. The study analysed two solutions for boiler operation: common steam header with other boilers or as a separate unit (boiler + turbine set).</p> <p>Concept of flue gas condensing system and biomass handling (320,000 t/a pellets) was described. Economic analysis of the project was made as a basis for optimising project alternatives.</p> <p>The scope of work also included preparation of environmental impact report and an application for environmental permit and preparing an application for land development conditions, including permitting procedures and obtaining the said permits for the project.</p> <p>The work also included preparation of tender documents (tender specification, contract) for two tenders: to select unit modernisation contractor and biomass handling system contractors, as well as participation in the evaluation and selection of contractors.</p>
EC Rzeszów S.A. 2010	<p>Engineering consultancy services related to gas turbine failure at Rzeszów CCGT Plant.</p> <p>Work included evaluation of the required scope of GT repair after failure and evaluation of the quality of repair for 100 MWe Rzeszów CCGT Plant.</p>
Vattenfall Heat Poland 2010	<p>Feasibility Study: Analysis of a project involving construction of a gas fired unit at Żeran CHP Plant, Warszawa, including optimisation of technical and operational</p>

## References in the energy sector

Client/Year	Project description
<p>Elektrownia Ostrołęka S.A. 2009-2012</p>	<p>parameters".</p> <p>The study included analysis of multiple project alternatives for the construction of CCGT unit of approx. 300-500 MWe and approx.. 250 MWt. Optimisation analyses were conducted, taking into account several sizes of gas turbines and CCGT units, in one-shaft and multi-shaft configurations, with backpressure stream turbine and with extraction/condensing steam turbine.</p> <p>Thermal balances and a thermodynamic model using Thermoflex software were prepared.</p> <p>An economic analysis of project profitability was carried out. Various operation modes were analysed depending on the change of power prices throughout the day and on the gas price structure. The analysis included operation of VHP's other generating facilities.</p> <p>Technical (Conceptual) Advisor for the project of Ostrołęka C Power Plant construction (first unit approx. 1000 MWe).</p> <p>The scope of work included preparation of the Concept Study including detailed feasibility study of the project and environmental documentation, as well as materials for the tender to select the Contractor for Ostrołęka C Power Plant construction, in compliance with Poland's Public Procurement Law, in negotiated procedure with publication., as well as technical assistance to the Client throughout the tendering procedure.</p> <p>As part of feasibility study, construction of new power plant with 1000 MW unit (PF boiler fired with coal with up to 20% of biomass co-firing possibility) with a cooling tower and heat generation of approx. 140 MWt was analysed. A financial and economic analysis of the project was made, as well as sensitivity analysis, risk analysis and business plan for the project.</p> <p>The work also included support for the Client in the procedures related to the environmental decision for the project.</p> <p>Tender documentation was developed (Tender Specification, Contract), negotiations with Bidders were conducted, and final Tender Specification was prepared. The tendering procedure was conducted in compliance with Poland's Public Procurement Law, as a negotiated procedure with publication.</p> <p>The procedure was suspended after the preparation of final Tender Specification.</p>
<p>PGE Elektrownia Opole S.A. 2009-2011</p>	<p>Technical consultancy in the tendering procedure to select the Contractor for biomass handling system and biomass feeding installation in compliance with Public Procurement Law, including also preparing Tender Specification, tender evaluation and participation in negotiations.</p> <p>As part of the Project, technical concept (feasibility study) was prepared for the straw pellets feeding system (140,000 t/a) to coal fired PF boilers (360 MW units). Additionally, large-size straw bale technology was analysed. Economic analysis for the analysed alternatives was performed.</p> <p>As a result of tendering procedure, the Contract was awarded.</p>
<p>PGE Elektrociepłownia Gorzów S.A. 2009-2010</p>	<p>Technical study of biomass installation at Gorzów CHP Plant.</p> <p>The study of OP-140 boiler conversion to biomass firing and construction of fuel handling system at Gorzów CHP Plant to produce renewable power.</p>



## References in the energy sector

Client/Year	Project description
	<p>The study includes different alternatives of biomass unit. Alternatives with wet and dry biomass were analysed. Conversion of existing PF OP-140 boiler from coal to biomass was analysed and new boiler was taking in to consideration as an alternative. Thermal calculations for the complete unit were carried out (boiler and turbine).</p>
DONG Energy A/S 2009-2010	<p>Owner's Engineer services during the construction of Karcino Wind Farm (51 MW). The scope of work included preparing tender specification for EPC Contract based on FIDIC for electrical and civil engineering part, participation in negotiations with contractors and Owner's Engineer service for electrical and civil engineering part.</p>
Dalkia Poznań 2009	<p>WTE plant in Poznan – study of site conditions for WTE plant in Poznan, for the total 250,000. t/a municipal waste and sludge from water treatment plant. The study included site preparation, alternatives for the connection of external supply systems to the infrastructure of EC Karolin or to external infrastructure as well as a review of environmental issues.</p>
Vattenfall Heat Poland S.A. 2009	<p>Technical consultancy in the process of organising subsidy for the construction of a high efficiency generation unit - 480 MWe unit at Siekierki CHP Plant. The scope of work included preparing technical information to be included in the application documentation for a grant from Operational Programme Infrastructure and Environment 2007 and preparing and application for Natura 2000 declaration to be attached to the application. Documentation was based on the Feasibility Study prepared before.</p>
GPEC Sp. z o.o. (Stadtwerke Leipzig Group) 2009	<p>Services of technical advisor in the project preparation phase for the construction of a new cogeneration plant fired with straw, to supply Gdańsk DH system. The services included preparing a Feasibility Study, review of available supporting financing sources and their mechanisms as well as analysis of straw resources acquisition possibilities and straw contracting for the project (including guidelines for logistics and sample contract). Feasibility Study presented formal, technical and organisational conditions for the project. Three power plant sizes were analysed – approx. 26 MWe, 20 MWe, 15 MWe, with respective biomass consumption of: 155,000 ton straw and pellets, 120,000 straw, 93,000 straw. Various plant configurations were analysed, such as using a reserve boiler house, applying flue gas condensation, using pellets or wood chips as supplementary fuel, as well as various options of operation depending on the market conditions and the risk of biomass unavailability. An economic and financial analysis was prepared, assuming two different financing options, with a sensitivity analysis. An application for environmental decisions for the project was prepared, including project description and other required attachments.</p>
El. Rybnik S.A. (EDF Polska) 2009	<p>Review of technologies for biomass use in energy production and analysis of application at Rybnik Power Plant in order to increase biomass utilisation (Feasibility Study) The objective of the study was to determine best technical solutions enabling the</p>

## References in the energy sector

Client/Year	Project description
	<p>increase of biomass utilisation up to 700 000 Mg/a.</p> <p>Multi-alternative concept analyses were made, taking into account co-firing various biomass types with coal in the existing unit boilers, as well as concepts of constructing a dedicated biomass firing installation (new boilers, biomass gasifier). Analyses covered biomass at different processing level, such as wet biomass, dry biomass, torrefied biomass, liquid biomass, straw in bales.</p> <p>The study analysed issues related to biomass storage and logistics, including the existing transport limitations. Analysis of formal conditions for power to be qualified as renewable was made, as well as the analysis of metering and billing issues.</p>
ZEW Kogeneracja S.A. (EDF Polska) 2009	<p>Analysis of location conditions for construction of a supercritical condensing/CHP unit of approx. 450 MW at Czechnica CHP Plant.</p> <p>The scope of work included analysis of location conditions for construction of a new condensing/CHP unit of approx. 450 at Czechnica CHP Plant. A supercritical unit with pulverised coal boiler was analysed, with wet FGD and catalytic deNOx system suitable for CO2 capture in the future. To determine the conditions of CHP construction and operation, a preliminary technical concept of the plant was prepared located at the land plot assigned..</p> <p>The work included among other things analysis of the site and the conditions arising from current spatial arrangement and use of the land, environmental impact of the project, power grid connection, DH connection and conditions for CO2 storage.</p>
PGE EC Rzeszów S.A. 2009-2010	<p>Commercial, legal and technical consultancy related to the selection of Contractor for the construction of cogeneration unit based on vegetable oil fired Diesel engines (electrical capacity of engines system – 25-30 MW).</p> <p>The scope of work covered the complete tender documentation for tender with negotiations (including Functional Programme and EPC Contract), participation in the entire process of contractor selection and advice in formulating optimum business solutions until signing the contract.</p> <p>The tendering procedure was conducted.</p>
Dalkia Poznań ZEC S.A. 2009	<p>Technical and economic guidelines for PF OP-140(1K1) boiler conversion to biomass fired BFB boiler at Karolin CHP.</p> <p>The study analysed the project involving modernisation of the unit with the conversion of PF coal fired boiler into biomass fired fluidised bed BFB boiler and construction of biomass handling system at Karolin CHP Plant, as well as turbine modernisation from backpressure to extraction-condensing. The analyses included a new chimney stack dedicated for the modernised boiler and analysed comparative solutions for FGD and SNCR plants. Main fuel after conversion is to be wood chips and non-forest granulate in the amount of approx. 230,000 t/a. A biomass handling system for the assumed types of biomass was proposed as well as a concept of unloading station, storage, crushing and transport to the boiler for the miscanthus straw</p> <p>The study included project profitability study.</p>
PKN Orlen S.A. 2009	<p>Preparing implementation of the project „Construction of 2x420-460MW CCGT plant near Anwil S.A. area in Włocławek”.</p>

## References in the energy sector

Client/Year	Project description
Chemical factory	<p>The works included preparing Feasibility Study analysing multiple alternatives for a two-phase construction of two CCGT units. Construction alternatives were presented. A closed cycle cooling system with cooling towers was analysed as well as an open cooling system using the Vistula river water. Technical and legal conditions for power plant construction were prepared. A preliminary concept for power export and gas fuel supply was presented, determining also the conditions of the local gas network operator. Economic analysis of the alternatives was made, basing on long term prices forecasts.</p> <p>Guidelines for the Environmental Impact Assessment were prepared. General Investment Costs Schedule was prepared, together with the project budget. Project profitability analysis was also implemented.</p> <p>Technical Appendix to Tender Specification for Turn-Key Delivery of CCGT Unit was prepared.</p>
Dalkia Łódź S.A. 2009	<p>Technical and economic guidelines for converting OP230 boiler to a biomass fired fluidised bed boiler at EC-4 CHP Plant in Łódź (biomass consumption 370,000 t/a.)</p> <p>A detailed concept of boiler conversion was prepared with BFB furnace, technology of biomass combustion was presented together with installation parameters. Influence of modernised unit on the other Dalkia Łódź's plants was analysed. Biomass transport and logistics assumptions as well as biomass handling system were prepared.</p> <p>Analysis of economic viability of the project was carried out.</p>
International Paper Kwidzyn 2009 Paper Mill	<p>Preliminary feasibility study for conversion of coal fired OP-140 boiler to fluidised bed biomass boiler</p> <p>As part of the study, the scope of boiler retrofit required for biomass firing was determined and biomass handling system was described along with the necessary adaptations to the existing infrastructure. Planned biomass consumption – approx. 240,000 t/a chips.</p> <p>Analysis of economic effectiveness of the project was conducted.</p>
Vattenfall Heat Poland 2008-2011	<p>Participation in tendering procedure to select EPC Contractor for Siekierki CHP unit implementation.</p> <p>The subject of tender is an extraction/condensing CHP unit with an open cooling system, with a gross electrical capacity of approx. 480 MW. The unit is to operate with the following steam parameters: live steam not lower than 600°C and reheat steam not lower than 600°C. The unit will have a pulverized fuel boiler fired with hard coal (with biomass pellets co-firing possibility) with a complex flue gas cleaning system. The unit will also produce heat for Warsaw district heating system.</p> <p>As part of the work, the unit concept was optimised and Tender Specification for the unit was prepared, covering technical, commercial and legal aspects for EPC project implementation.</p> <p>Tendering procedure based on Public Procurement Law was conducted as negotiated procedure with publication. The scope of work included cooperation with tender evaluation and participation in negotiations.</p> <p>As a result of tendering procedure, final bids were submitted and evaluated.</p>

## References in the energy sector

Client/Year	Project description
Dalkia Łódź S.A. 2008-2009	<p>Feasibility study to determine optimum option to reconstruct generation capacity of EC2 (87MWe/578MWt). The study analysed using fluidised bed and pulverised fuel technology, basing on biomass, hard coal or gas. A technical concept of the proposed solution was prepared. As part of the study, analysis technical condition documentation regarding main buildings, equipment and systems of EC2 was made. A technical and economic model was prepared for the operation all three CHP plants of Dalkia Łódź as a part of Łódź district heating system. Alternative concepts of investments after shutdown of old generation equipment.</p> <p>For the discussed investment alternatives economic effectiveness analysis was made.</p>
DONG Energy A/S 2007-2010	<p>Owner's Engineer services during the construction of Karnice Wind Farm (30 MW). The scope of work included preparing two tender specifications for EPC Contracts based on FIDIC for electrical and civil engineering part, participation in negotiations with contractors and Owner's Engineer service for electrical and civil engineering part.</p>
Vattenfall Heat Poland 2007-2009, 2011	<p>Feasibility study of biomass fired CHP Plant in Pruszków. Technical and economic analysis of multiple alternatives were made for the expected heat demand of approx. 250MWt. Plant sizes from 30MWe to 70Mwe, configured as one unit with one boiler, one unit with two boilers or two units were analysed. The option to apply a 3000 m3 to 20 000 m3 heat accumulator tank was also analysed.</p> <p>The study also included analysis of the biomass market and possibilities to establish energy crop plantations.</p>
Vattenfall Heat Poland 2008	<p>Preparing applications for environmental conditions as part of power units construction permit procedure, for the following plants:</p> <p>480 MWe coal fired unit, two CCGT units 400MW each 250 MW CCGT 68 MW coal-and-biomass fired CHP plant with all the necessary documentation.</p>
Vattenfall Heat Poland 2008	<p>Preparing applications for issuing development conditions for the following power units:</p> <p>480 MWe coal fired unit, two CCGT units 400MW each, 250 MW CCGT and 68 MW coal-and-biomass fired CHP plant with all the necessary documentation. Applications were based on technical concepts prepared basing on studies analysing multiple alternatives.</p>
Dalkia Łódź S.A. 2008	<p>Technical and economic guidelines for biomass firing in steam boilers of EC-3 CHP Plant in Łódź (biomass consumption 85,000-300,000 t/a.).</p> <p>A complex concept of EC-3 retrofit for biomass firing, including boiler modernisation and biomass handling. Technical alternatives of modernisation were analysed, including biomass co-firing with coal in OP-230 steam boilers, as well as conversion of OP-130 or OP-230 boiler to biomass firing (coal fired PF boilers conversion to fluidised bed boiler 100% biomass fired). The main biomass fuels analysed were</p>

## References in the energy sector

Client/Year	Project description
Vattenfall Heat Poland 2008, 2010	<p>pellets of agricultural or non-agricultural origin, as well as wood chips.</p> <p>For the discussed technical alternatives analysis of economic viability of the project was made.</p> <p>Preparing the concept of post combustion technology for a 450 MW–550 MW power unit.</p> <p>Balance calculations were made for several ways of connecting CCS with the power unit and the existing system. The report included a preliminary CCS concept and proposed solutions for power supply, mechanical energy supply for main equipment drives and heat for the unit CCS system as well as waste heat recovery from CCS for district heating.</p> <p>In 2010, update of the study was prepared, using up to date knowledge of CCS technology</p>
Vattenfall Heat Poland 2008	<p>Preliminary feasibility study for a municipal waste incineration plant of 300,000 t capacity.</p> <p>The concept included using the energy from waste and the plant operating as a CHP plant. The concept covered preparing the plant layout, waste reception system, boiler house with a flue gas cleaning and furnace waste handling. A cogeneration plant was analysed with different turbine solutions (CHP turbine, condensing turbine with heat extraction) and the resulting different values of power and hear production.</p> <p>A comparative economic analysis of the considered solutions was made.</p>
Vattenfall Heat Poland 2008	<p>Long term development plan for Vattenfall Heat Poland CHP group in Warsaw and Pruszków.</p> <p>Analysis of development directions for energy sources in Warsaw, taking into account the existing internal conditions and the changing external factors (legal, market-related, environmental etc.). The report took into consideration the market situation in the city and in the country as well as performance data of the existing and new (planned) generation units, fuel characteristics, emissions and waste production, material wear etc. Modernisation of the existing facilities and generation units was analysed as well as the construction of new plants up to 500MWe such as coal units, IGCC, Oxy-Fuel and gas units CCGT.</p> <p>A comparative analysis of profitability was made for the selected alternatives, basing on the prepared technical and economic operation model for all the VHP plants operating as part of Warsaw district heating system. Benefits and risks were indicated for each alternative.</p> <p>Profitability analysis was conducted, aiming in comparison profits and risks of all development alternatives.</p>
EC Białystok S.A (E.On Group) 2008	<p>Concept of a heat recovery system from flue gas condensation for a 75 MW boiler fired with biomass (fuel humidity approx. 40%). The study presented multiple alternatives for the 13-15 MW system consisting of a scrubber and a condenser recovering head for district heating. Technical solutions were presented as well as location and connection of the heat recovery system with flue gas ducts, DH system and raw water system. Technical and economic analyses were made, as well as project profitability analyses, taking into account environmental issues and grants.</p>

## References in the energy sector

Client/Year	Project description
	The system is in realisation phase.
Vattenfall Heat Poland 2008	Feasibility study of a biomass unit for Siekierki CHP Plant. Analyses of multiple technical alternatives for biomass in the form of wood chips and pellets, gasifier, coal fired boiler conversion to biomass, construction of a new biomass boiler, construction of a new biomass unit, biomass handling systems for 50-300 thousand t/a biomass.
Poland's Ministry of Science and Higher Education 2008	<p>Commissioned research project PBZ-MeiN-4/2/2006, research task no. I.2.6/1 „Supercritical coal units – use in cogeneration”</p> <p>Ramboll Polska (former Elsamprojekt) participated in the project as a member of a consortium consisting of Poland's leading R&amp;D institutions and technical universities.</p> <p>In the study, a detailed analysis was made of thermodynamic model for 400-800 MW ultra-supercritical coal fired units with and without CO<sub>2</sub> capture by amine method. Optimisation analysis was carried out, taking into account technical possibilities and economic effectiveness of heat extraction from the unit and of heat recovery from CCS system for district heating purposes.</p>
J-Power 2007 Zajaczkowo Wind Farm	Preparation of Wind Farm Operation and Maintenance Manual, including the requirements for wind farm operator and power grid operator regarding the division of equipment in terms of operation and maintenance, operation of 110/30 kV substation and wind turbine, operation actions, safety principles, co-ordination of operation and maintenance.
BOT Opole S.A. 2007	<p>Analysis of biomass availability for the analysed biomass fired units was made. Analyses included the possibility of acquiring wet biomass in the form of wood chips and dry biomass in the form of pellets, briquettes, rapeseed cake, straw bales etc. As a result of the analyses, the available quantities, costs of acquisition and costs of transport were determined for forest biomass, straw from main cereals and rape, straw from miscanthus plantations, energy willow chips, pellets and rapeseed cake. Competition analysis was conducted, as part of which large and small plants using biomass in the area were indicated, in particular large HOB plants, CHP plants and power plants firing biomass, small local straw bale fired HOB plants and large factories producing chipboards, fiberboards and plywood.</p> <p>Analysis of biomass properties was made in terms of its use in renewable energy production.</p>
ZEW Kogeneracja S.A. (EDF Polska) 2007-2008	<p>Consulting services in the preparation and implementation phase of the project involving biomass conversion K-2/OP-130 at Czechnica CHP.</p> <p>As part of services performed for the Client, a Feasibility Study for the project was prepared in order to select the alternative for co-firing at Czechnica CHP Plant. The study analysed retrofit of a pulverised fuel boiler to BFB, application of flue gas condensing system, as well as handling different types of biomass. Technical and economic analysis of the project was made.</p> <p>An environmental impact report was prepared for the project, which was a basis for issuing Environmental Condition Decision. An application for conditions of crossing PKP owned area was prepared.</p>

## References in the energy sector

Client/Year	Project description
ZEW Kogeneracja S.A. (EDF Polska) 2007-2008	<p>Technical part of Tender Specification was prepared for two tendering procedures: boiler modernisation and construction of biomass handling systems.</p> <p>Documentation prepared was subsequently used by the Client to select contractors and sing contracts for project implementation.</p> <p>Consulting services in the preparation and implementation phase of the project involving biomass co-firing system for Wroclaw CHP Plant unit 1.</p> <p>Services included preparation of Feasibility Study to select the technology for co-firing dry biomass (pellets) with approx. 45% energy input, in a pulverised fuel boiler OP230 and a biomass handling system with silos and biomass transport to the boiler. Technical and economic analysis of the project was made.</p> <p>An environmental impact report was prepared for the project, which was a basis for issuing Environmental Condition Decision. An application for land development conditions for the project was prepared”.</p> <p>Tender documentation was prepared for three tendering procedures: boiler OP230 modernisation, biomass transport to the boiler and biomass handling systems.</p> <p>Documentation prepared was subsequently used by the Client to select contractors and sing contracts for project implementation</p>
Vattenfall Heat Poland 2007-2008	<p>Analyses regarding the possibility of constructing a new CHP Plant in Grudziądz municipality (Kujawsko-Pomorskie province).</p> <p>The report presents the concept of a coal fired 2x800 MW ultra-supercritical power plant with an open cooling system (water from the Vistula), and alternatively with a closed cooling system with a cooling tower. A preliminary layout of the plant in the area indicated by the Employer was made. External conditions for the project in the suggested location were analysed, including connection to the HV power grid, connection to the road and railway systems, possibilities to take in and discharge post-cooling water, collisions with airway routes. A preliminary analysis of railway and truck transport for the new power plant was made, including agreements with the Polish Railway regarding the construction of a railway siding. A preliminary geotechnical analysis of the location was carried out to determine the conditions for building settlement. A preliminary environmental impact assessment was made for the new power plant, including Nature 2000 and other protected areas. Taking into account the analyses specified above, a general investment budget was prepared for the green-field project with all the accompanying infrastructure in the analysed location.</p>
Vattenfall Heat Poland 2007	<p>Environmental impact assessment report regarding wet desulphurisation plant for Siekierki CHP Plant, preparing application for environmental decision, submission of application to the relevant environmental authorities and negotiations with the authorities. The project obtained environmental decision for constructing the plant.</p>
EC Białystok S.A. (E.On Group) 2007-2009	<p>Owners Engineer. The project involves construction of biomass plant for renewable power generation.</p> <p>The project included PF coal fired boiler conversion into a bubbling fluidised bed (BFB) boiler firing biomass similar to wood chips, and construction of complete biomass handling system. Boiler capacity after modernisation 105t/h steam; annual biomass consumption up to 200,000 t. The scope of work included review of</p>

## References in the energy sector

Client/Year	Project description
EC Białystok S.A. (E.On Group) 2007	<p>technical documentation, site supervision and inspection visits covering construction, technical and process issues, workshop acceptance procedures, supervision over commissioning of the unit and project management.</p> <p>Technical and economic concept for DH supply, including construction of DH part and heat accumulator tank.</p> <p>The objective of the study was to analyse several technical alternatives for modernization of internal DH part at EC Białystok. Analyses of the pumping system and DH water piping were made. The influence of heat accumulator tank on levelling daily heat demand amplitude was analysed, as well as the reduction of costs of participation in balancing market and the impact of introducing varied power prices at different times of day.</p> <p>Heat accumulator capacities analysed were from 5000 m3 to 20000 m3 , with the indication of 12000m3 as the best choice.</p> <p>Rebuilding of the pumping station is realised in 2008. The accumulator has been in operation since 2011.</p>
Gdańskie Przedsiębiorstwo Energetyki Ciepłej (Stadtwerke Leipzig) 2007	<p>Feasibility study of a cogeneration unit with municipal waste and biomass as main fuel. A number of technical and economic alternatives were analysed for a forecast heat demand of approx. 100MWt. Main alternatives included: Waste-To-Energy project based on unsorted municipal waste and alternatively energy fraction separated from waste and a biomass installation, as well as heat accumulator with capacity of approx. 8000 m3. Biomass types analysed included straw, pellets and wood chips.</p>
ZEW Kogeneracja S.A. (EDF Polska) 2007	<p>Study of biomass generation unit at ZEW Kogeneracja S.A.”, aiming to find an optimum technical and economic alternative for using biomass fuel for renewable energy production at Wrocław and Czechnica CHP Plants.</p> <p>In the study functionality of heat accumulator with capacity of 2000-3000 m3 was examined mainly for levelling of irregularity of heat consumption by green house.</p>
Margonin 120 MW Wind Farm 2006	<p>Analysis of renewable energy market in Poland, including evaluation of the present situation and development forecasts (including price projections) for renewable sources.</p>
Vattenfall Heat Poland 2006	<p>Environmental impact report for a project involving construction of a new 480 MWe unit at Siekierki CHP Plant in Warsaw, prepared in order to obtain environmental permit for the project. The report includes the environmental impact of the entire Siekierki CHP Plant after implementing the new unit and the planned environmental systems (flue gas desulphurisation and deNOx plants).</p> <p>Environmental decision was issued on 31.03.2009r.</p>
Zakłady Chemiczne Police S.A. 2006 Chemical factory	<p>Concept of fuel conversion from fuel oil to natural gas for selected systems of Police Chemical Plant.</p> <p>The work included technical and economic analyses of multiple alternatives for fuel conversion from the currently used mazout and light fuel oil to natural gas. Basing on the economic analysis, which included investments costs, differences in the fuel costs and in the related costs (such as operation costs, environmental costs,</p>



## References in the energy sector

Client/Year	Project description
	<p>maintenance costs), recommended alternatives were presented.</p>
Vattenfall Heat Poland 2006	<p>FGD plant for Siekierki CHP Plant in Warsaw.</p> <p>The scope of work included preparing a concept for FGD and a new chimney stack for Siekierki CHP, for the existing coal-fired units and the planned new unit, including analysis of several alternatives. The study compared the FGD concepts based on wet lime technology, semi-dry method and dry method. As a continuation of the conceptual work on multiple alternatives, a detailed FGD concept for coal fired boilers at Siekierki CHP was prepared.</p> <p>Works included preparing the application and appendices for the application for issuing construction conditions for the selected alternative. Tender Specification was also made for FGD system with two absorbers for 8 boilers, for 3.1 million Nm<sup>3</sup>/h, including functional programme and the technical part of the contract with appendices necessary for public procurement procedure</p> <p>FGD system at Siekierki is currently in operation.</p>
Vattenfall Heat Poland 2006	<p>Analysis of possibilities of constructing new units in Poland; the study analysed location conditions for construction of new coal fired and CCGT units, analysis of the existing energy sources and local heat markets, selection of optimal locations for new power plant of 500-2000 MW. Sites at the existing power plants were analysed as well as green field locations.</p>
Vattenfall Heat Poland 2006	<p>Pre-feasibility study and feasibility study for a construction of a new unit in Warsaw.</p> <p>The analyses covered multiple alternatives of power units from 200 to 700 MWe, sub- and supercritical, of varied heat output. Analyses were made for two possible locations, at Siekierki CHP Plant and at Kawęczyn Heat Plant. Technical and economic optimisation involved incorporation of new facilities into the existing process systems, in compliance with the present and future environmental requirements. The analyses took into account a number of parameters and conditions influencing the optimal selection of recommended alternative, such as combustion technologies, steam parameters, thermal cycle of the plant, concept of district heating part, various cooling solutions involving an open cooling system as well as dry and wet fan cooling towers, plant preparation for the future requirements for CO<sub>2</sub> reduction. Thermal cycles of the analysed alternatives were modelled and analysed for a number of loads. As a result of the analyses, supercritical coal-fired units were recommended as optimum solution, for the location of Siekierki - 450 MWe net, for the location of Kawęczyn – 650 MWe.</p> <p>In the second stage of the project, full feasibility studies were prepared for both recommended alternatives, i.e. for 450 MWe supercritical coal-fired unit at Siekierki CHP Plant and for 650 MWe supercritical coal-fired unit at Kawęczyn Heat Plant.</p>
EC Białystok S.A. (E.On Group) 2006	<p>Preparing tender specification for conversion of OP-140 boiler to a biomass fired fluidised bed (BFB) boiler and implementation of biomass handling system at Białystok CHP Plant.</p>
EC Białystok S.A. (E.On Group)	<p>Preliminary biomass contracting for Białystok CHP Plant. (approx. demand 200,000 t/a). Preparing letters of intent and a draft of long term biomass purchase agreement to secure interests of both parties, covering technical issues, quality assurance,</p>

## References in the energy sector

Client/Year	Project description
2006	price development and billing system, organisation and logistics etc. Letters of intent signed as a result of negotiations covered the supply of biomass of various origin in compliance with relevant Polish legislation.
J-Power 2006-2008	Zajęczkowo Wind Farm project. Services included preparing tender specification for a wind farm in north-western Poland, consisting of 24 x 2MW. In the implementation phase Ramboll (former Elsamprojekt) performed the function of Owner's Engineer.
Elsam A/S 2006-2007	Ostrowo Wind Farm project. Services include preparing tender specification for a wind farm in north-western Poland, consisting of 17 x 1.8 MW wind turbines, based on FIDIC and participation in negotiations with contractors. In the implementation phase Ramboll (former Elsamprojekt) performed the function of Project Manager and was responsible for Owners Engineer services (electrical systems and civil works) and Project Management.
J-Power 2006	Due diligence and review of documentation for a wind farm to be constructed in northern Poland (Zajęczkowo, 24x2MW),, carried out for the Investor in order to provide a basis for the final decision on project implementation.
Karpacka Spółka Gazownictwa S.A. / Pekao Access 2006	Technical due diligence of Łańcut heat plant as part of privatisation process. The heat plant has 30 MWt thermal capacity in coal fired grate water boilers and approx.. 10 km of DH network. Technical condition of heat plant equipment was evaluated – as well as the need for modernisation. Operation of the CHP plant was evaluated and the heat sale was analysed. Alternative modernisation programmes were prepared. Technical risk was evaluated.
Vattenfall Heat Poland 2005	Feasibility study of installing heat accumulator tank at Żerań CHP Plant, Warsaw The study investigated the possibilities of incorporating a heat accumulator in the existing DH system at Żerań CHP Plant. Selection of optimal heat accumulator capacity was done in range of 10 000-40 000 m3. Economic analysis was made for a number of operation modes.
Vattenfall Heat Poland 2005	Technical and economic analysis of installing a steam engine at CHP Pruszków. A number of engine designs were analysed and economic analyses were made for the selected alternatives.
Zakłady Chemiczne Police S.A. 2005 Chemical factory	Pre-project study evaluating economic viability of the projects involving modernisation of turbine-driven compressors of synthesis gas and CO2 turbine in the ammonia and urea production plant.
Elana Energetyka 2005 Chemical factory	Technical and economic audit at industrial CHP Plant Elana Energetyka to formulate reorganisation guidelines. The audit included two CHP plants fired with coal and heavy fuel oil (6 steam boiler with 4,5 MWe turbine and 3 steam boilers with 20 MWe turbine), compressed air, cool, nitrogen systems as well as water supply and sewage system. As part of the work, potential of the existing equipment was assessed and rationality

## References in the energy sector

Client/Year	Project description
	of the investments conducted and planned so far. Possible development concepts and directions were prepared for modernisation projects.
Radpec S.A. 2005	<p>Full feasibility study of waste incineration plant construction in Radom, according to The National Fund for Environmental Protection and Water Management (NFOŚiGW) requirements. Analysis of waste fuel availability, including RDF and sludge; preliminary analysis of technical alternatives of the waste-to-energy plant, producing heat and power in cogeneration, including incorporation of heat accumulator with capacity of approx. 2000 m3.</p> <p>Economic and financial analysis of the selected alternatives was conducted.</p>
EC Białystok S.A. (E.On Group) 2005-2009	<p>Modernisation and automation project for Białystok CHP Plant. Ramboll (former Elsamprojekt) was a Project Manager for the entire project. Automation was carried out at three CHP units of EC Białystok and included auxiliary systems, and DH water pumping stations were also replaced. The scope of work included preparing Tender Specification and tender evaluation, and advisory services during the implementation of automation works, as well as coordination of construction and overhaul works .</p> <p>As part of the project, basing on documentation prepared by the Client, automation of DCS system for the following plants was carried out:</p> <ul style="list-style-type: none"> <li>• units BC - 50 no. 1, 2, 3</li> <li>• auxiliary systems including coal handling, slag handling, ash handling, start-up oil system, connection to the power grid, water conditioning plant</li> </ul> <p>Ramboll Polska (former Elsamprojekt) managed the preparation of modernisation and automation programme, and supervised design and erection works performed by external contractors.</p>
Vattenfall Heat Poland 2005	<p>Feasibility study of installing heat accumulator tank at Siekierki CHP Plant, Warsaw</p> <p>The study investigated the possibilities of incorporating a heat accumulator in the existing DH system at Siekierki CHP Plant. Analysed heat accumulator capacity was 15 000-40 000 m3. Economic analysis was made for a number of operation modes. Tender specification for heat accumulator technical design was prepared.</p> <p>Project was realised and heat accumulator is operating since the 2nd quarter of 2009.</p>
BOT Elektrownia Bełchatów S.A 2005-2006	<p>Study on location of flue gas desulphurisation plant for units 1 and 2, aimed to select a location optimal from both economic and technical point of view.</p>
EC Białystok S.A. (E.On Group) 2005-2006	<p>Feasibility study of boiler coal-to-biomass conversion at Białystok CHP Plant. The study consisted of analysis of the possibilities of supplying timber biomass to Białystok CHP Plant; technical-economic analysis of possibilities of conversion; financial analysis of the investment; environmental impact report to obtain environmental permits.</p>
Vattenfall Heat Poland 2005	<p>Environmental due diligence of Kozienice Power Plant (coal fired units 8x200MW, 2x500MW), including necessary environmental investment projects.</p>

## References in the energy sector

Client/Year	Project description
PCC AG 2005	<p>Risk related to adopted and planned environmental regulations were identified and evaluated. Condition of the plant in terms of compliance with current and future requirements of environmental protection. Planned investments were assessed and the necessary investments were indicated in the context of environmental protection.</p> <p>Technical and market due diligence of Koziernice Power Plant. (coal fired units 8x200MW, 2x500MW) as part of privatisation process.</p> <p>Technical evaluation of Power Plant equipment was made and technical risks were identified. Risks related to legislation including environmental legislation was assessed. The power plant investment programme was assessed as well as the position of the plant on the Polish market. Technical and economic model of the plant was made and a proposal for the plant development was drafted, including calculation of the power plant value based on long term cash flow projection.</p>
Vattenfall Heat Poland 2005	<p>Environmental due diligence of Bydgoszcz CHP Plant. The power plant group consists of three CHP plants of respective capacities 187 MW/270MWt, 810MWt and 80MWt.</p> <p>Risks related to current and planned environmental protection requirements were identified and evaluated. The condition of installation was assessed in terms of compliance with the current and future environmental standards. Planned investments were assessed and necessary environmental assessments were identified.</p>
PCC AG 2005	<p>Technical and market due diligence for Ostroleka Power Plant Group (ZEO).</p> <p>The power plant group consists of a CHP Plant (75MWe/367MWt) and a power plant (647MW). Technical condition of the power plant and CHP plant equipment were assessed and technical risks were identified. Risks related to legislation were assessed, including environmental legislation. ZEO investment progress was evaluated. ZEO position in the Polish market was estimated. A technical and economic model of ZEO was prepared. A proposal of development was prepared together with a calculation of ZEO value basing on long term cash flow projections.</p>
Atex Sp. z o.o. 2005	<p>Preliminary feasibility study of a biomass-fired CHP project in Przemysl</p>
Zakłady Chemiczne Police S.A. / Access Ltd. 2005 Chemical factory	<p>Technical and market due-diligence of power generation systems with two CHP plants at ZCh Police for the Treasury as part of privatisation process. CHP plants have 6 pulverised fuel boilers with a 38 MWe turbine and 2 PF boilers with a 64MWe turbine set.</p> <p>As part of the works, also the analysis of optimising the energy system of ZCh Police was made.</p>
Vattenfall Heat Poland 2005	<p>Environmental due diligence of Zabrze CHP Plant (106MW/595MWt) in the privatisation process.</p> <p>Risks related to current and planned environmental protection requirements were identified. The condition of installations was assessed in terms of compliance with current and future environmental requirements. Planning was evaluated and necessary environmental investments were identified.</p>

## References in the energy sector

Client/Year	Project description
Elsam A/S 2005	<p>Pre-feasibility Study of a Biomass Fired CHP Plant (10-15 MWe with various cogeneration ratios).</p> <p>The analysis covered a number of solutions for biofuels management and logistics. Feasibility of installing a flue gas condenser to recover heat for district heating was analysed as an additional option.</p>
Elsam A/S 2005	<p>Technical and environmental due diligence of WPEC Legnica as part of privatisation process.</p> <p>WPEC Legnica supplies heat to Legnica and neighbouring towns as well as to Głogów and Lubin. The company has 3 heat plants (230MWt, 23MWt, 162MWt), 9 heat-only boiler plants of total capacity 33 MWt and a district heating network.</p> <p>Technical status of equipment was assessed, and technical risks were identified. Risks related to legislation were evaluated, including environmental protection legislation. Local heat market was analysed.</p>
EC Białystok S.A. (SNET) 2004	<p>Preliminary feasibility study of a project involving power production based on renewable energy sources</p>
Hedeseelskabet Polska 2004	<p>Development, negotiations and assistance in signing renewable power sale agreements with three power distribution companies.</p>
Elsam A/S 2004	<p>Preliminary feasibility study for a biomass fired CHP (20 MWe and 40 MWt) in the north of Poland.</p> <p>The analysis covered a number of solutions for biofuels management and logistics. Feasibility of installing a flue gas condenser to recover heat for district heating was analysed as an additional option.</p>
Elsam A/S 2004	<p>Due diligence and appraisal of heating company in the north of Poland by discounted planned cash flow method, taking into account extension of the existing generation facilities with a biomass unit. The project also included preliminary analysis as well as technical and economic concept for the biomass unit located at the area of the existing heating plant and connected to the municipal DH system.</p>
Elsam A/S 2004	<p>Assessment of biomass resources accessibility from forest areas and industry in north-eastern Poland.</p>
EC Rzeszów S.A 2004	<p>Service Contract for Rzeszów CCGT Plant</p> <p>The project includes preparing tender announcement and a complete tender specification as well as tender evaluation, contract negotiations and drafting a service contract in accordance with the new Public Procurement Law.</p>
PAK 2003-2006	<p>Pątnów II.</p> <p>Participation in Elsam Engineering project, covering review and verification of turn-key contract documentation for the construction of Pątnów II Power Plant, and detailed verification of turbine and boiler efficiency, as well as determining optimisation possibilities in that area. Parameters and performance of the plant was</p>

## References in the energy sector

Client/Year	Project description
	compared to parameters of comparable plants in Danish power sector. Compliance of Pątnów II Power Plant with UTCE requirements was verified.
Undisclosed Client 2003	Due diligence services for 37 MW CCGT project in Starachowice, review of fuel supply contracts, EPC contract.
Elektrociepłownie Warszawskie 2003-2004	<p>Study on EW S.A. development until 2020.</p> <p>The work included analysis of development directions for heat sources owned by Vattenfall Heat Poland (present PGNiG Termika) in Warsaw and Pruszków until 2020, taking into account internal conditions as well as the changing external factors (such as market conditions, environmental requirements etc.). The project involved description and analysis of the concepts for further operation, modernisation, and construction of new generation facilities (e.g. turbines, boilers, units, etc.) at Siekierki CHP Plant, Żerań CHP Plant, Pruszków CHP Plant, Wola HOB Plant and Kawęczyn HOB Plant. For the purpose of the study, a uniform dynamic technical and economic model of all heat sources was prepared, including all VHP heat sources, split to generation units operating in Warsaw DH system (district heating network owned by SPEC) and Pruszków CHP Plant. The model allows comparing the analysed development alternatives. The technical model included efficiency data of the existing and new equipment, minimum and maximum generation capacities of turbines and boilers, fuel parameters, emissions and furnace waste production, use of absorbent, water and other consumable media in the existing and new flue gas cleaning installation as well as a dynamic O&amp;M model, taking into account operation hours, investment costs and O&amp;M costs.</p> <p>As a result of the work, possible investment alternatives were presented, including environmental installations for the existing facilities as well as construction of new generation facilities, such as new boilers, new coal-fired CHP units of various capacities, including a large supercritical unit, combined cycle CHP units of 60-250MWe at various locations, small biomass or multi-fuel CHP units. Basing on the prepared model of DH main lines, limitations of DH networks were analysed as well as the DH network modernisation and extension alternatives for the analysed options of heat allocation between heat sources. Feasibility of incorporation of heat accumulator (capacity 5000-20 000 m3) was also analysed.</p>
EC Rzeszow S.A. 2003	Defect Liability Engineer services for CCGT Rzeszow (100 MWe).
Intercell S.A. 2003 – 2004 Paper Mill	<p>Concepts for long term energy supply to secure Intercell energy demand.</p> <p>Technical condition of the equipment was assessed, and a concept of constructing a new industrial CHP plant of 50-100 MWe was presented. A number of fuel alternatives and technologies were analysed, using coal or natural gas as primary fuel. Each alternative included also applying waste biomass, sewage sludge and waste wood for power purposes. Possibility of connection to the national power grid was assessed.</p>
Elektrownia Bełchatów S.A 2003	Turbine Hall Equipment Modernisation Concept Study for units 3-12 of Bełchatów Power Plant in 2007-2015. Technical condition assessment. Modernisation proposals taking into account available modern technologies and implications

## References in the energy sector

Client/Year	Project description
	<p>related to Poland joining EU.</p> <p>The Client split the preparation of modernisation programme into two separate tasks: modernisation of boiler plant and modernisation of turbine plant, conducted by two different consultants. Elsamprojekt Polska (now Ramboll Polska) was responsible for preparing turbine plant modernisation programme. The components analyses in the project included: live steam pipelines, reheat pipelines, feed water pumps, turbine set with the equipment and heaters, generator, step-up transformer and cooling system including cooling tower. Services included: technical assessment and remnant lifetime evaluation of turbine plant facilities, remnant lifetime evaluation of turbine components by finite element method, detailed thermodynamic model of the unit, • analysis of live steam parameters increase, cold-end optimization. A technical and economic model of the unit was prepared, taking into account modernisation packages, and the modernisation possibilities were optimized in technical and economic terms. As a result of the analyses, a modernisation programme was defined, covering unit output increase, unit efficiency increase and lifetime extension. The modernisation programme is used as a basis for modernizing all units of Bełchatów Power Plant.</p>
Intercell S.A. 2003	Due-diligence of energy management at the paper mill in Myszków.
EC Lublin Wrotkow 2002	Defect Liability Engineer services for CCGT Wrotkow (235 MWe).
Elsam A/S 2002-2003	Owner's Engineer services during the construction of Zagórze Wind Farm (30 MW). Full Owner's supervision, verification of documentation, take-overs.
Elsam A/S 2002	Consulting services during preparation, negotiations and conclusion of long-term power sale contracts for renewable energy. Consulting services for renewable energy sale in balancing market.
Elsam A/S 2002	Consultancy services during negotiations of conditions of connecting to the power grid, interconnection agreement and transmission agreement for 30MW wind farm.
Sydskraft A/S 2002	<p>Technical due diligence in STAR-PEC – district heating company in Starogard Gdański.</p> <p>The company has a heat plant of 58MWt and 16 local heat-only boiler plants (HOB) of total capacity of 17MWt, as well as a DH network of 21,5 km with 242 heat exchange nodes.</p>
Undisclosed Client 2002	Market analysis of the energy sector in Poland, including analyses of fuel market, power market and cogeneration market, as well as predictions of fuel and energy prices.
Undisclosed Client 2002	Due diligence study investigating the possibilities for a 30 MW wind farm project in Poland.
AES Horizons Ltd.	Involved preparation of tender materials.

## References in the energy sector

Client/Year	Project description
2002-2003	Involved in permitting procedures for a 250 MW CCGT project in Żarnowiec, Northern Poland.
Elektrownie Szczytowo-Pompowe S.A. 2001	Concept of a 22 MW wind farm in Loznica, including feasibility study and a application for issuing development conditions
INTERCELL S.A. 2001 Paper Mill	Analysis of alternative heat supply for the paper factory by constructing an industrial CCGT plant (approx. 30 MWe and 140 MWt) or a gas-fired heat plant.
Łęczyńska Energetyka Sp. z o.o. 2001	Feasibility study for an approx. 30 MWe CHP plant with CFB boiler at Bogdanka coal mine, based on coal slurry, waste coal, sludge from sewage treatment plant and municipal waste.
Zielona Góra CHP Plant 2001	Verification of tender documentation for the second stage of tendering procedure for a 190 MWe CCGT CHP plant in Zielona Góra.
Legnica DH Company 2001	Verification of feasibility study for converting the municipal heat plant in Legnica into a CHP plant basing on the existing steam boilers, capacity of approx. 10 MWe.
EC Białystok S.A. 2001	Verification and preparation of tender materials for construction of a 20 MWe condensing turboset at Białystok CHP Plant.  Participation in tender evaluation and selection of the Contractor.  The project is based on a number of contracts (turbine set, DCS cooling tower, equipment deliveries)
Undisclosed client 2001	Due Diligence in PEC Slupsk (Slupsk District Heating Company). Ramboll (former Elsamprojekt) provided consultancy engineering services for one of the potential investors in a due diligence of a heat distribution company as part of privatisation process. The company has two heat plants of 87MW and 74,5MW respectively, and 66 km DH network.  The job was performed for a foreign Client.
Undisclosed client 2001	Due Diligence in a large industrial CHP.  Ramboll (former Elsamprojekt) provided consultancy engineering services for one of the potential investors in the preliminary phase of due diligence in an industrial CHP plant to be outsourced from a large industrial plant. The CHP plant, fuelled with hard coal, has a capacity of approx. 100 MWe and approx. 200 MWt. Ramboll (former Elsamprojekt) scope included evaluation of the process systems, heat demand assessment, analysis of development possibilities of the CHP plant in relation to the entire industrial plant.  The job was performed for a foreign Client.
Sydskraft A/S	Due Diligence in Gorzow District Heating Company.



## References in the energy sector

Client/Year	Project description
2001	Ramboll (former Elsamprojekt) provided consultancy engineering services for one of the potential investors in a due diligence of a heat distribution company as part of privatisation process. Gorzow Heat Distribution Company (PEC) DH system is the main heat supplier to the town of Gorzow Wielkopolski (population of 126,000). The system is supplied from three heat sources. Total demand for heat is approx. 140 MW, 1000 TJ/year. The scope included technical part of due diligence, in particular technology evaluation, heat market evaluation, development and investment programme assessment, taking into account environmental aspects.
Mott MacDonald / PSEG 2001-2003	Owner's Engineer services during the construction of Elcho Chorzow CHP plant, 2x102 MWe, including electrical connection and DH connection, Owner's supervision, technical handover of equipment (incl. turbines and generators), verification of technical documentation and supervision over transport and hydraulic assembly of turbines.
EC Gorzów 2001	Verification and preparation of service contract for a CCGT plant.
Elektrownia Opole, 2000-2001	Technical and economic assessment of "Technical conditions for Opole Power Plant connection to Opole municipality DH network" issued by ECO S.A.  The analysis included influence of design temperatures, pressure and regulation method (quality or quantity) on feasibility of supplying 200 MWt heat from 18K360 turbine extractions to DH network of Opole by a planned DH pipeline of 9 km.
EC Zielona Gora, Sydkraft A/S 2001	Technical Due Diligence in the CHP privatisation process, on behalf of Sydkraft.  Ramboll (former Elsamprojekt) provided consultancy engineering services for one of the potential investors in a due diligence of Zielona Góra CHP Plant (238MWt, 22.5 MWe, hard-coal fired) as part of privatisation process. Ramboll (former Elsamprojekt) scope included all the technical issues, such as evaluation of the process systems at the plant, power and heat market evaluation, cost and price structure analysis, development programme analysis including the planned extension of CHP plant with a 190MWe CCGT unit.
EC Rzeszów S.A. 2000-2003	Owner's Engineer services for new CCGT Rzeszów (98 MWe), Owner's supervision, technical take-overs of equipment, including turbines and generators, verification of technical documentation, commissioning supervision and handovers.
EC Lublin Wrotków 2000-2002	Owner's Engineer services for new CCGT Wrotków (235 MWe), Owner's supervision, technical take-overs of equipment, including turbines and generators, verification of technical documentation, commissioning supervision and handovers.
Bank Pekao S.A. 2000	Independent Technical Advisor to the bank for the implementation of new CCGT Wrotków (235 MWe).
Colombo Power (Private) Limited 2000	Technical supervisory services to certify, witness and review performances tests and commissioning for 60 MW barge-mounted power plant in Sri Lanka, built by Mitsui Engineering & Shipbuilding Co. Ltd., Japan, consisting of 4 diesel generators. Reporting.

## References in the energy sector

Client/Year	Project description
Vattenfall Poland 2000	Study "Optimisation and development of Warsaw district heating system" In the study, strategic development directions for the Warsaw district heating system were marked, in order to increase the cogeneration ratio in Warsaw.
Vattenfall Poland 2000	Assistance to a due diligence team in connection with privatisation of GZE S.A. for one of potential investors Site visits at HV/MV stations and MV/LV substations owned by GZE.
EC Rzeszów S.A. 2000	Drafting of Maintenance Agreement for new CCGT Rzeszów (95 MWe).
Opole Power Plant 2000	Tender specification and offer evaluation for turbine modernisation and preparation of heat extraction. For three 18K360 turbines with a capacity of 360 MWe each.
PSE (Polish Power Grid Company) 1999-2000	Report on development of small-scale gas-fired cogeneration plants in European countries.
Ministry of the Treasury, Access Ltd. 1999	Participation in Wybrzeże CHP Group (Gdańsk) privatisation process. Ramboll's (former Elsamprojekt) tasks included: Technical assessment and value estimation of CHP buildings and equipment. Market analysis and Wybrzeże's position, including power and heat price projection until 2010. Assessment of Wybrzeże technology as compared to Polish and international conditions.
Vattenfall Poland Sp. z o.o. 1999	Technical Advisor in the privatisation team for Warsaw CHP Plants (Elektrociepłownie Warszawskie S.A.). Services of technical due diligence included: Technical Due Diligence of the plants; Development potential forecast, including risk evaluation; Collecting input data for the model of power and heat production balance; Company structure assessment.
EC Rzeszów S.A. 1999-	Preparation and verification of tender specification for EC Rzeszów CCGT (95 MWe); Tender evaluation. Contract negotiations. The tender was prepared based on Public Procurement Law.
PAK Power Stations Group 1999	Ultra Super Critical steam parameters. Optimisation study for Pątnów II Power Project.
Undisclosed Client 1999	Technical due diligence of an industrial CHP plant at the fat processing factory in Brzeg.

## References in the energy sector

Client/Year	Project description
Undisclosed Client 1999	Assessment of environmental issues regarding aluminium foundry at the Kety Metal Processing Factory.
Zamojska Spółka Elektroenerge-tyczna Eastern Generation 1998	Preparation of full tender documentation for turn-key project involving construction of 100-120 MW CCGT plant in Jarosław. Participation in negotiations with Polish Oil and Gas Company (PGNiG) and distribution company.
Elektrownia Opole 1997-1998	Rationalization and availability study for Opole Power Plant. Ramboll (former Elsamprojekt) made a review of company structure and investigated possibilities of employment reductions at Opole Power Plant so as to improve the organisation, operation mode and employment following the example of a comparable foreign (Danish) power plant.
Enron 1998-2000	For the 120 MW industrial combined cycle plant to be erected in Nowa Sarzyna, Ramboll (former Elsamprojekt) support the investor with Site Manager and site supervisors for the erection and commissioning of the plant, including connection to the grid.
Swe-Pol Link 1998-1999	The 300 MW HVDC project between Poland and Sweden. Site supervision during the construction of static inverter plant on behalf of the investor.
[Undisclosed client] 1998	Due diligence study for 10 MW wind farm project in Poland. Activities included production estimate for the wind farm, investment cost, energy pricing, ownership structure and assessment of the economy.
Kobo Sp. z o.o. 1998-1999	A feasibility study analysing construction of a CHP plant (30 MWe, 60 MWt) with fluidised bed boilers at Bogdanka coal mine, using waste coal from the mine. The study also analysed the possibility to cover heat demand of neighbouring towns by the new CHP plant.
Energoinwest Białystok 1998-1999	Feasibility study for modernisation of Fasty CHP plant in Białystok, covering usage of sludge from the municipal sewage treatment plant as fuel for the boilers of the CHP plant. The feasibility study will cover technical solutions as well as economic and financial issues related to finding short term as well as long term solutions for the CHP plant and the municipal sewage treatment plant. Issues related to combustion of sewage sludge were an essential part of the study.
ABB Sweden 1998	Construction permit for HVDC cable project between Poland and Sweden. Authorisation of civil design.
Starogard Gdański Polpharma S.A. Vattenfall Poland Sp. z o.o. 1998	Co-operation with Vattenfall in connection with commissioning of new fluidised boilers at industrial CHP owned by Polpharma pharmaceutical plant.

## References in the energy sector

Client/Year	Project description
Zamojska Spółka Elektroenergetyczna Eastern Generation Ltd. 1998	Feasibility study of a CHP unit for the city of Chełm. Analysed alternatives included a 60 MWe gas fired combined cycle plant, as well as 60 MWe coal fired CFB and PC boiler plants. The issue of utilising waste coal from the nearby Bogdanka coal mine was discussed in detail.
Opole Power Plant 1997-1998	Analysis researching the possibilities of introducing technical and organisational changes at Opole Power Plant, to improve and rationalise its operation. The coal-fired power plant consists of 4 equal units with a capacity of approx. 350 MWe and is one of Poland's most modern power plants. Technical benchmarking with Danish power plants.
Bełchatów II Power Plant Management 1997	Independent expert opinion for the study on super critical parameters and optimisation of unit capacity for Bełchatów II.
Kostrzyn Paper Mill Vattenfall Poland Sp. z o.o. 1997	Feasibility study covering rehabilitation of an industrial CHP plant at Kostrzyn Paper Mill. The study covered analysis of heat and power demand and a technical assessment of the existing equipment. The alternatives analysed included combined cycle alternative consisting of gas turbines and waste heat recovery boilers with supplementary firing, each with a capacity of 70 ton/h steam. Preparation of full tender documentation for modernisation of the existing and erection of two new gas fired boilers. Tendering procedure and selection of Contractor.
Elektrociepłownia Zielona Góra S.A. Danish Energy Agency Partner: DPC. 1995-1998	Preliminary feasibility study for modernisation Zielona Góra CHP Plant. The project was grant supported by the Danish Energy Agency and co-financed by EC Zielona Góra. The project included determining the heat, steam and electricity demand. A number of plant concepts were analysed such as biomass fired boiler and gas fired combined cycle plants. The use of domestic low calorific gas was analysed. A combined cycle plant with a capacity on 100 MWe based on domestic gas was analysed in details covering technical, economic as well as financial matters including defining security package covering off-take contracts.
Zespół Elektrowni Ostrołęka 1994-1995	Feasibility study for modernisation of Ostrołęka A CHP plant. The following alternatives were investigated: rehabilitation of existing CHP, district heating extraction from power plant Ostrołęka B, new coal fired CFB CHP, new combined cycle gas fired CHP. The coal fired CFB and the gas fired Combined Cycle plant were selected as the most attractive solutions and detailed financial analysis were prepared for these alternatives.
Zespół Elektrowni Ostrołęka 1995	Pre-feasibility study of bark firing at Ostrołęka A CHP Plant. The following alternatives were investigated: new multi-fuel CFB boiler, additional furnace to the existing boilers, new Bubbling Fluidized Bed (BFB) boiler, retrofit of the existing PC boiler to BFB bark firing boiler. The latter alternative was

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	implemented.
	Ramboll (former Elsamprojekt) prepared investment package, and long-term fuel supply contract, implementation study, detailed tender specification, and contract with main contractor.
Zespól Elektrociepłowni Bielsko-Biała SA and EBRD 1994-1997	Owner's Engineer services for European Bank for Reconstruction and Development (EBRD) during the construction of a turn-key project involving the construction of 55 MW CHP unit.  The project was subsidised by the European Bank for Reconstruction and Development.
Consortium Foster Wheeler / ABB Power Generation 1993-1997	Supervision over contractual works and verification of Contractor's technical documentation during construction of units 1-3 at Turów Power Plant.
Polskie Sieci Elektroenergetyczne S.A. Danish Environmental Protection Agency 1993-1994	Technical Assistance to Polish Power Grid Company (PSE)  Preparation of a study "Potential of priority and CHP Development in Poland" for the Polskie Sieci Elektroenergetyczne (Polish Power Grid Company).  In 1992 PSE agreed with the World Bank to initiate a least cost plan for the development and rehabilitation of the Polish power plants. Part of this study is an analysis of the potential for development of cogeneration on the basis of existing and new power plants.
ABB Power Generation, Baden, Switzerland 1993-1993	Technical Assistance in connection with TEP1 at Turów Power Station.  In cooperation with Ahlstrom PyroPower (USA) ABB Power Generation was awarded the contract to rehabilitate up to six units of the Polish lignite-fired 2000 MW power station in Turów. The rehabilitated units were supplied with new turbines/generators and new CFB boilers. The capacity of each unit is 230 MWe.  Prior to the rehabilitation, a Technical Evaluation Package (TEP1) was carried out in order to determine how much of the existing installation could be reused under the new conditions.