Engineering & Consulting for Heat & Power

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Korea District Heating Engineering Co.,LTD.

Open ENERTOPIA World!

Energy + Utopia

KDHEC is the international expert group in combined heat & power plant and district heating & cooling system.

- "Happy Energy" for Human Beings
- "Green Energy" by Perfect Harmony of Environment & Energy
- "Dream Energy" of Future-Oriented Clean Energy

Experts & Specialists

- Ph.D & Master Degree Engineers with the Registered Professional Engineers
- Specialists for CHP Plant Engineering Service

Extensive Experiences in Domestic & Overseas Projects

- Design Engineering & Technical Support Services for Diverse Projects
- Overseas Projects in China, Mongolia, Malaysia and Peru
- Technical Collaboration with Internationally Renowned Engineering Companies

Utilization of Shareholders' Exclusive Knowledge

- KDHC's Intensive Know-how for More Than Two Decades

We strive to become the best partner to our clients by providing high quality technology and service.

KDHEC was established in 1991 as a joint venture company of Korea District Heating Corp. and ENER GROUP LTD. an international energy consulting firm in Finland, for the purpose of advancing TES technology.

We have performed a key role in TES industry for the past 24 years, and KDHEC has become the best engineering company in Korea.

Now, It is time for KDHEC to take a new step based on numerous project experiences and in-house developed technology.

We will continue to reinforce our strength through cultivating technical experts and systematizing core technology. At the same time, we will expand our business to coal-fired power plant industry and strengthen our market position by creating more opportunities to participate international power plant design projects.

Additionally in Korea, KDHEC will commit to contribute to the low-carbon green growth, the national aim of Korea, by designing high efficiency power plant to reduce energy and applying renewable energy technology including SRF and Bio-SRF.

We sincerely appreciate your continuous interest in KDHEC as we grow into the best global energy company that brings you new value and trust as the best partner.

Thank you.

CEO
LEE, Byeong-wook

Milestones

1991	Establishment of KDHEC as a Joint Venture Firm of KDHC & ENERY GROUP LTD.
1992 ~ 1999	DH System Design for the Five New Towns Basic Design for East SUWON, CHEONGJU, ANSAN & GOGAN CHP Plant & DH System Detail Design for ILWON, SANGAM, North-SUWON DH Production Plant
2000	Detail Design of KIMHAE DH Production Plant
2001	Basic Design of SANGAM DMC CES Plant
2002	Ulaanbaatar Heat Efficiency Project Bidpackage, Lot B&C(Mongolia)
2003	Basic Design of HWASEONG CHP Plant & DH System
2004	Basic & Detail Design of SONGDO CHP Plant & DH System
2005	Detail Design of HWASEONG CHP Plant & DH System Basic Design of PAJU CHP Plant & DH System Basic Design of East-SUWON Power Boiler De-nitrification System
2006	Detail Design of PAJU CHP Plant & DH System Basic Design of SHINAN JEUNG-DO Island Solar Power Station Basic Design of DAEGU Wood Chip Firing CHP Plant & DH System Winning of 2nd Prize Award in Community Energy Related Business (Award of the Industry & Resources Committee Chairman of the Korean National Assembly)
2007	Basic Design of SUWAN (GWANGJU City) CHP Plant & DH System Feasibility Study of EFB Firing Gasification CHP Plant(Malaysia) Winning of Environmentally-Friendly Management Award (Application of the De-Nitrification System for CHP Plant)
2008	Basic & Detail Design of HAKHA (DAEJEON City) CHP Plant & DH System Overseas Engineering Business License Acquired
2009	Detail Design of GWANGGYO CHP Plant & DH System Basic & Detail Design for YANGJU and HOICHUN TES Acquiring License for Fire Extinction Facility(mechanical&electrical) Engineering Acquiring Supervisory Business License for General Construction & Electrical Facilities Acquiring Certificate for ISO9001
2010	Basic Design of DAEGU Innovation City CHP Plant & DH System Detail Design of ChilcaUno Power Station Add-on Project in Peru
2011	Basic & Detail Design of GWANGJU-JEONNAM Innovation City CHP Plant & DH System Technical Support Service for KIMCHEON TES
2012	Basic & Detail Design of PYEONGTAEK Combined Cycle Power Plant Feasibility Study of Coal Fired Power Plant Technical Support Service for DANGJIN Bio-mass Power Plant
2013	Detail Design for OSAN DH facility and CHP Technical Support Service for POCHEON Industry Complex CHP plant & DH System Design for Bismayah IPP-Simple Cycle Power Plant in Iraq Design for CIPREL IV Add-on EPC project in Côte d´Ivoire
2014	Detail Design for SEOKMOON, NAEPO New Town, CHUNCHEON CHP Plant & DH System Basic Design for GORYEONG PE-IGCC Plant
2015	Basic Design for ANYANG CHP Plant Basic Design for Pet-coke Thermal Power Plant in Venezuela Change of Shareholder(Pöyry Finland Oy→ KEPS CALISTA PRIVATE EQUITY FUND)

HAPPY ENERGY

| Consulting | Feasibility Studies |

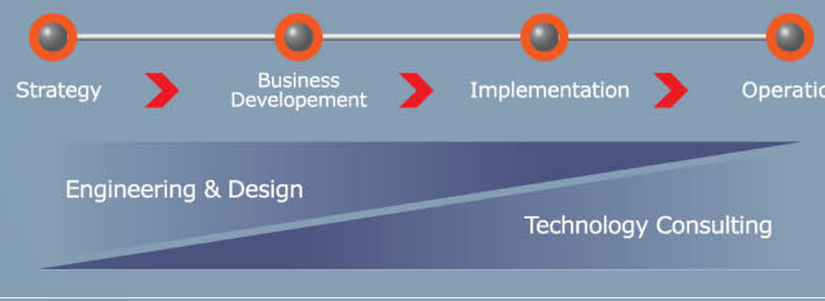
We always think of the Economy, Convenience and far to the Comfortable Life

Now, we are seriously facing the rapid and substantial changes in the environment of the energy utilizations. The heightened threat of the depletion of the fossil fuels together with the global warming makes us to pay much attention, than ever, to the CHP plants having the high efficiency and the environmentally-friendly design with the enhanced plant economy.

KDHEC surely has accomplished the remarkable achievements in the CHP plant & DH system design engineering service ever since the establishment of the company in 1991 surpassing the initial goals of acquiring the foreign advanced technologies and the establishment of stand-alone technologies. We have introduced the highly advanced technologies of Finnish design as appropriate,and develop our own localized technologies thereof for its improved applications, which lead to the most cost-effective plant construction for the common success of the energy business owners and us.

Our extensive experiences and knowledge certainly enable us to provide the engineering services for the more convenient, stable and environmentally-friendly CHP plant construction actively coping with the increasing energy crisis, environment contamination, finally to export our own technologies to the world.

Business Model



Consulting

Consult with our experts & specialists for your best solution!

Consulting

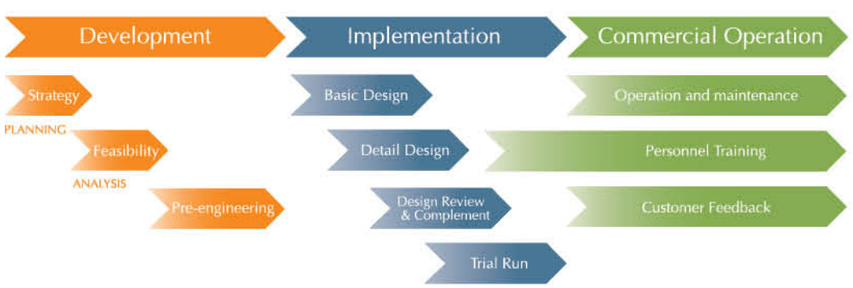
We offer the optimized business proposal to our clients, which evaluates all possible variables in terms of technological, economical and environmental aspects. By utilizing our project experiences and knowledge in tariff system and energy regulations in TES, power plant and renewable energy business we also provide project financing to the client with our finance partner companies.

Our in-house technology library has over 250 domestic and international plant design database including district heating and cooling system, renewable energy plant and power plant facilities. In addition to our valuable database, our know-how accumulated through numerous design experiences and the collaboration with various international engineering firms enables us to provide the optimal consulting service and project financing in TES, power plant and renewable energy projects.

Core technologies

- Economic feasibility review of energy business
- Roadmap establishment for project execution
- Permit process to obtain business approval
- Proposal on feasible bidding process
- Project financing plan
- Construction feasibility review
- Master plan establishment
- Project financing for project execution

Business Process



Feasibility Studies

We investigate and evaluate the feasibility for the project investment to the clients from the technical, economical and commercial stand point of view

Feasibility Studies

We review the project proposals of TES, power generation and renewable energy in terms of legal, technical, economical aspects to ensure profitable project. Feasibility study includes market survey, technology benchmarking, commercial viability, regulation review, financing plan and social aspect analysis including environment, forecast on electricity supply and demand as well as forecast on supply and demand of fuel.

Considering the site condition, external and internal changes of power plant and renewable energy market, we evaluate the investment value and offers the optimized configuration of energy facility to ensure the stable and economical business.
In addition, project financing (PF) is available as we have financial and credit-rating companies as partners to help the client commence large size projects.

Core technology

- Analyses of DH/DC Loads together with Electrical Loads
- Simulation Engine for CHP Operation Modes
- Software for Economic Evaluation
- Operation report of energy project
- Project financing of energy project

Major experiences

- Medium and large size combined heating power plant (CHP, PLB) feasibility study (Hwasung, Paju, Songdo, Pangyo, Gwanggyo, Gwangju Suwan, Goyang, Samsong, Multifunctional administrative city, Gawngju Jeonnam innovative city, Byeolnae, Chuncheon, Dongtan 2, Saemanguem, Namyang New Town, Daegu Green Power, Hanam Misa, Sangyong Cement Wasted heating power plant, Ansan, Cheongna, etc.)
- Community Energy Supply (CES) feasibility study (Sangam 2, Goyang, Dongnam region distribution center, etc.)
- Project Financing (Yangju Okjeong, Daegu green power, Sangyong cement waste heat, Hanam Misa, Ansan, etc.)
- Operation report (Gwangju Suwan, Osung, Homaesil, etc.)

GREEN ENERGY

| CHP Plants | CCPP | Coal-Fired Power Plants | DH Piping Network | PLB |

Our cutting-edge technologies for the Energy Production Plants bring the enjoyable and living nature

The new era of the ENERTOPIA, where the enriched life and the clean environment lies, comes true through the cutting-edge technologies resulting from the vast experiences and know-how of KDHEC's.

KDHEC is pioneering 21st century environment and energy technology to enhance life style of people, reduce energy consumption, and improve environmental issues by adopting energy business focused on cutting edge technology from designing of high efficiency combined heat power plant and coal-fired power plant to designing of environmental facility including district cooling and heating system, and heat piping.

And from the establishment of the Firm, we have accumulated the technology through the collaboration with Finnish Corporate Pöyry Finland Oy Danish Corporate RAMBØLL and developed our stand-alone technologies to provide them to the overseas clients, by which KDHEC is getting acknowledged worldwide.




Combined Heat & Power (CHP)
Combined Cycle Power Plant(CCPP)

It produces simultaneously electricity and heat for various purposes resulting in the maximum energy utilization efficiency

Combined Heat & Power Generation

The CHP plant referred to as the 'Total Energy System', which produces the power and heat in either the process steam or hot water simultaneously by the high temperature side and the low temperature side, respectively.

The CHP plant consists of, unlike the normal power plant, much complicated systems due to the diversity of the operation modes, each of which needs to control the loads appropriately for the stable production and supply of the district heating water, depending upon either the power generation or DH production. The DH water circulating the circuit through the DH heating system connected to the steam turbine replacing the condenser, where most of the energy loss occurs in the normal power plant, to produce the hot water for heating and hot tap water service giving the higher energy utilization process.

Particularly, we are the only engineering corporate who has experiences with MHPS J class, Siemens H class or GE H class which are the cutting edge gas turbines.

KDHEC's Expertise

- The Maximum Plant Efficiency Design by Minimizing the Waste Heat
- Application of the Most Advanced European Technologies
- Improved Plant Stability by Enhanced Reliability
- Design for Higher Plant Utilization
- Providing the Wider Plant Operating Envelope
- Integrated Design of Power Block & DH Plant

Core Technologies

- Plant Design for both Megawatt Control and DH Load Control
- Implementation of House-Load Operation
- Plant Overpressure Protection Logic for DH Plant (TRD421)
- Optimization of DH Heating System & Arrangement
- Planning & Design for Energy Intensive CHP Plant
- Overall Plant Optimization for Diverse Operation Modes & Wider Envelope

Major Experiences

	DH Production (Gcal/h) (Mode I @-12°C)	Electricity Generation (MW) (Mode III @32°C)
HWASEONG CHP Plant	395.6 Gcal/h	512.3 MW
PAJU CHP Plant	393 Gcal/h	515 MW
SONGDO CHP Plant	170 Gcal/h	206.5 MW
PANGYO CHP Plant	141 Gcal/h	146 MW
GWANGJU SUWAN CHP Plant	86 Gcal/h	114 MW
SAMSONG CHP Plant	98 Gcal/h	99 MW
NAMYANGJU BYEOLLAE CHP Plant	93 Gcal/h	115 MW
YANGJU CHP Plant	400 Gcal/h	524 MW
HANAM CHP Plant	270 Gcal/h	510 MW
DANGJIN CCPP	GT 300MW X 2 ST 300MW X 1	900MW
PYEONGTAEK CCPP 2nd Phase	GT 300MW X 2 ST 300MW X 1	900MW

· Overseas Technical Collaboration : RAMBØLL(Denmark), PÖYRY(Finland)

Coal-Fired Power Generation

It produces economical & environmentally-friendly electricity by cheaper fuel, coal

Coal-Fired Power Generation

The coal-fired power plant is still on the continuous demand for the base to medium load purpose power plants considering the stable supply and cheaper price of coal, of which the total reserves last much longer with the availability in almost every country worldwide.
The coal-fired power plant can be categorized into two groups of which the one is the pure power generation plant and the other is the CHP plant for electricity supply and process steam as well, which can take the role of backbone for the energy supply to a country.

We are providing the customers with the coal-fired power plant engineering service for the circulating fluidized bed boiler in accordance with the customer's requirements taking into account the fuel flexibility and environmental regulations starting from the Owner's Engineering for GIMCHEON CHP Plant (59 MWe) Project and bid proposal design engineering for AES petcoke fired power plants. Recently, a FEED service of the coal and Tail Gas co-fired CFBC boiler CHP plant Project for power generation and process steam supply is awarded to KDHEC, which require the plant cycle optimization for both of the power generation and CHP purposes.

We take, especially, pride in the capability of the basic and detail design engineering of the biomass co-fired power plants providing the appropriate selection of the material handling systems, which might also be supported by our investor PÖYRY.

With these technologies and experiences, we carried out the following projects in a customer friendly manner.

On-going Projects

- GIMCHEON Coal Fired CHP Plant : 59 MWe + 200 t/h Process Steam Supply
- Columbia AES Petcoke Fired Power Plant : 120 MW x 2 + 360 MW x 1
- OCI SE Coal Fired CHP Plant : 150 MW x 2(+ 400 t/h Process Steam Supply)
- Feasibility Study of IPP Coal Fired Power Plant : 500 MW x 1
- POCHEON Industry Complex CHP Plant : 169MW x 1

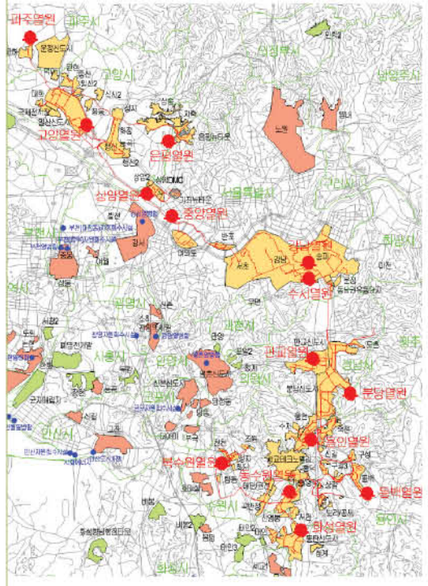
DH Piping Network

DH piping network planning for economic construction & efficient transport based on our exclusive knowledge

D.H. Network

We offer the best solution for the DH network planning and design considering not only the DH demand with topology but also future expansion, which comes from our exclusive knowledge and experiences.

Our expertise on the interpretation of the network analysis supported by the FLOWRA-Win enables us to establish the cost-effective ways of heat transport and flow division based on the definite analysis. The SiS-KMR also used for the structural analysis for the DH network integrity.

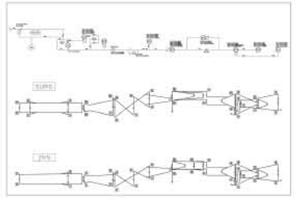


DH Network Analysis

- Database Establishment of KDHC DH Network including the Transmission Lines
- Effective & Speedy Execution of the DH Network Expansion Utilizing the Established Database
- User-Friendly Instruction for DH Production & Transmission

DH Network Structural Analysis

- Establishment of DH Piping Analysis Criteria for Electrically Preheated Pipes
- Repair Design by Non-COM instead of COM
- Expertise on DH Piping Construction Issues for Dependable Solutions



Major Experiences

- Study for DH Network Flow Division Characteristics
- Basic Designs for New Housing Projects (PAJU GYOHA/YONGIN-DONGBAEK/HWASEONG-DONGTAN Districts)
- Basic Design for DH Network Expansion
- Design for Improvement of Weak DH Piping in GANGSEO District : Seoul Energy (Construction Change from COM to Non-COM)
- Study for Thermal Stress Relieving & Improvement of Construction Methods

※ Overseas Technical Collaboration: RAMBØLL (Denmark), GEF (Germany), FFI (Germany), POWERPIPE (Sweden)

Peak Load Boilers(PLB)

Excellent performance of startup, capital investment and upkeep

General Supervision and Construction Management (CM)

Highest quality and quality assurance

PLB & General Supervision • CM

PLB

Due to low initial investment cost and short installation time, the demand of PLB in DH is increasing compared to existing steam boiler. PLB has a good tracing function to match actual heat load and excellent mobility

Strong Features of KDHEC PLB

- Short Startup Time
- Smaller Footprint by Minimum Ancillaries through Direct Heat Exchanging
- Simpler Manufacturing & Installation without Boiler Drum and Deaerator
- Saving of Construction Time & Costs by Standardized Design
- Unmanned Operation by Simpler Operation
- Saving of Fuel Cost & Operational Costs by High Efficiency
- Environmentally-Friendly by Waste Water-Free & Noise-Less Design
- Standardization of various models through technology collaboration with MW Power (previously known as NOVITER) in Finland)

Core Technologies

- PLB for Large to Small Capacities for Separate Heating Stations
- PLB Design for Manufacturing
- Detail Design & Technical Support Services
- Supervision for Manufacture, Installation & Commissioning Work
- Boiler Revamping for Low Pollution & Fuel Conversion
- Boiler Performance Evaluation & Audit

Major Experiences

- Design Service of 40MW Hot Water PLB (1997)
- Design Service of 120MW Hot Water PLB (2000)
- Design Service of 20MW Hot Water PLB (2002)
- Design Service of 80MW Hot Water PLB (2003)
- Engineering support for a total of 62 hot water boilers (3,878Gcal/h) in 2012

General Supervision and Construction Management (CM)

KDHEC pursues the highest quality and quality assurance through statutory supervision, engineering support and construction management which are the necessary process of construction.

Core Technologies

- Construction supervision
- Overall supervision
- Supervision of engineering consulting
- Construction management (CM)

Major Experiences

- Construction supervision of Suwon Homaesil integrated energy project
- Responsible supervision of Posco 7, 8, 9 power plant construction project
- Responsible supervision of Dangjin Biomass plant
- Construction supervision of Myeongji integrated energy project

DREAM ENERGY

The technology for the development of renewable & future energy will bring the harmonious life with the environment

KDHEC, who was actively involved with the development of the district heating technology in Korea, is providing the engineering services for the projects of the environmental protection and energy conservation based on its own and advanced foreign technologies.

Out technical collaboration for the environment protection projects with the renowned Finnish company Pöyry Finland Oy will bring us to the position of the top class engineering company in the world, and the environmental issues with the clean energy development for the good harmony with the mankind will open the new era to the world of the sustainable energy.

New & Renewable Energy

we always think of the renewable energy resources
for the TES plants to cope with the global issue
of climate change crisis

New&Renewable Energy

The world is striving to develop the energy resources of the cheaper and pollution free against the depletion of the fossil fuels.

KDHEC is devoting itself in the development of the technology to recover more effectively energy from the wastes such as the household waste, food waste as well as the landfill gas, which helps us to protect our environment from contamination.

Our own intensive knowledge achieved from the many district heating projects enables us to provide the clients with the optimized solutions by making use of the environmentally friendly energy resources with the sustainability, not only staying within the conventional services of pollutants removal.

Bio-mass projects

Bio-gas business utilizing food wastes, night soils and wooden line bio-mass including wood-chip and Palm Kernel Shell (PKS).

Refuse-Derived Fuels (RDF)

Business that generates electricity by incinerating refuse derived fuel (RDF) produced by mechanical biological treatment (MBT) of domestic waste.

Landfill Gas (LFG) Projects

Business that generates heat or electricity from methane produced during decomposition process of organic matter in domestic waste landfill or that replaces LNG with LGF.

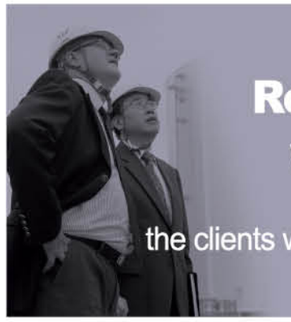
Solar Power Projects

Business that directly converts solar energy to electricity .

Major Experiences

- SANGAM DMC Landfill Gas Boiler Plant
- Solar Power Projects in DAEGU & JEUNGDO Island
- Wood Chip Firing CHP Plant in DAEGU
- Feasibility Study for RDF Fired TES Project in NAJU Innovation City
- Biogas Project for GOYANG City
- POIC Bio-mass CHP project in Malaysia
- Technical Support Service for DANGJIN Bio-mass Power Plant
- PE-IGCC Plant in GORYEONG

※ Overseas Technical Collaboration : SCS Engineers (USA)



Research & Development Projects

We are endeavoring consistently to be one of the energy
experts having the cutting-edge technology providing
the clients with the future energy competitiveness through the R&Ds

Research & Development

Nowadays, the competitiveness of a country depends mostly on the technologies for the development of the new clean energy resources and for the energy use of the maximum efficiency.

It is our definite perspective to be a cutting-edge corporate in the world in the course of developing the technologies for the utilization of the unused low-temperature heat energy, solar energy, ground heat, and biomass energy.

Unused Low-Temperature Heat Energy Projects

We have introduced the heat pumps for the recovery of heat from the river, sewage, seawater and the underground water of low-temperature energy resources, which can be utilized for both the district cooling in summer and district heating in winter by turns.

Major Experiences

- A Study for DH Production from Sewage Treatment Plants for Seoul New Towns
- A Study for District Heating by Seawater for Seashore Cities
- DH Plant Design for YONGIN SUJI District by Sewage Water
- Study of temperature difference improvement for effective heat use and demand capability
- Program development study of optimal CHP capacity

Energy Technology for both human and
environment over two decades

Korea District Heating Engineering Co., Ltd.

KDHEC specializes in the field of CHP, CCPP, DH&C or New and Renewable Energy
with the world class technologies and extensive experiences.
We have been building up our own know-how over past 20 years
by adopting the advanced technology, performing various projects
and training our seasoned engineers.
It is our goal to contribute the stable and enjoyable lives for people
through our high quality technology and service.

Feasibility Study

District Heating & Cooling

Combined Heat & Power Gerneration / CCPP

Coal-fired Power Generation

New & Renewable Energy

General Supervision · CM

KDHEC designs enjoyable Enertopia for you

KDHEC is building up Enertopia which allows people to have more pleasant lives by performing technical and economical feasibility studies, and energy related researches that even consider the environment.

| Feasibility Study | CHP Design | Coal Fired Power Plant | PLB Design | DH Network Design | New & Renewable Energy Design | R&D |

Best Partnership

We are the best partner for your successful business.

KDHEC