

# XELPOWER

*Proven Technology and Solution for Green Energy Management*

## 1. Overview

Xelpower Co., Ltd was established in 1992, specializing in monitoring, controlling, and protecting electric power system. The following record is Xelpower's history for the last 26 years.

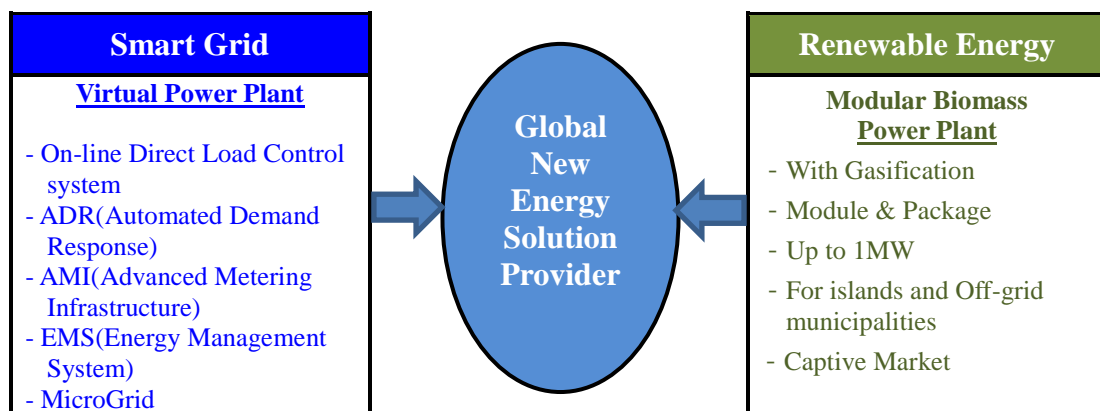
Oct 1992	Established as Keyin System Ltd.
July 1995	Development of 154kV Transmission line Digital Protection Relay
Sep 1997	Development of Demand Controller & pilot service with KEPCO(Korea Electric Power Corp.)
Nov 1997	Award of Venture Enterprise by Ministry of Commerce, Industry &Energy
Apr 1998	Award of EM mark as new breakthrough technology for Demand Controller from Korean government
Mar 1998	ISO 9001 Certification by British BM TRADA
May 1999	Spin-Off of Keyin Telecom(former Xeline) for PLC(Power Line Communication) biz
Nov 1999	First Shipping of 154kV Transmission Line Protection Relay Panel to KEPCO
Dec 2000	50% market share of KEPCO market for 154KV Transmission Line Protection Relay
Mar 2001	Change of company name from Keyin System to Xelpower
Aug 2002	Contract of on-line DLC(Direct Load Control) Project from KEPCO and KEMCO(Korea Energy Management Corp.)
Sep 2002	Development of Substation Automation System for KEPCO and Shipping & Installation
Apr 2003	Contract of on-line DLC(Direct Load Control) Project from KEPCO and KEMCO
Sep 2003	Development of 345kV Transmission Line Protection Relay & Breaker Failure Relay and shipping/installation to KEPCO
Oct 2003	Development of 154kV Transformer Protection Relay & UFR(Under Frequency Relay) and shipping to KEPCO
Dec 2004	Registration of Digital watt-hour meter and shipping to KEPCO firstly in Korea
Apr 2005	Award of EM mark as new breakthrough technology for 154kV/345kVTransmission Line Protection Relay from Korean government
Apr 2008	Award of NEP mark as new breakthrough technology for 154kV/345kVTransmission Line Protection Relay from Korean government
Aug. 2011	LOI from Maybank MEACP Clean Energy Fund for investment of Smart Grid Project in Vietnam
Sep 2011	Real time control up to 890MW in nationwide at power shortage by DLC
Aug 2012	Real time control up to 1,000MW in nationwide at power shortage by DLC
Aug 2012	Registration of Demand Response Service Operator License from Korean government
Apr 2013	MOU of Smart Grid Project with Energy Minister of Congo Republic for Power System Reliability Enhancement by ADR.
May 2014	LOI signing with Secretary of Energy in Argentina for Smart Grid project for Power System Reliability Enhancement by ADR
Dec. 2015	Contract of Ghana Smart Grid ADR Project with Samsung T&C and GS E&C (funded by Korean ODA program)

July 2016	Agreement of ADR Pilot Project in Spain with GRUPO IMAGIC, S.L.
Dec. 2016	Submission of Feasibility Study Report for Smart Grid ADR Project to Tanzanian Government (funded by Korean ODA program)
Jan. 2017	Approval of Feasibility Study Report for Smart Grid ADR Project from Ghana Power Company (GRIDCo)
Feb. 2017	Agreement with Movenergy International S.A. for Sales Agentship
Dec. 2017	LOI from Frontera Capital Group for investment of Smart Grid ADR Project

Real-time information and communication technology (ICT) based “**ADR (Automatic Demand Response) system**” completed in 2001 is one of the most advanced solutions in the world for real-scale electric power energy management. The system delivered to Korea Electric Power Corporation (KEPCO) has been used for on-line monitoring and controlling electrical loads of high voltage and medium voltage customers, and it handles up to 1,357MW across the nation until the end of 2012. This product, named “**Direct Load Control(DLC) / Reliable Demand Response Solution(RDRS)**”, is considered one of the most proven load management systems based on the nationwide scale. Xelpower owns several original patents (IPR) and is the leading market shareholder in Korea.

In addition, the digital protection relay for 154KV transmission lines completed in 1999 has been delivered to KEPCO from 2000 in the quantity more than 600 panels. Xelpower is also the leading market shareholder in this market segment. The technology related with digital protection relay for 154 KV system has been exclusively possessed only by the world class heavy electric equipment vendors such as GE, Siemens, ABB, Toshiba and Mitsubishi. However, Xelpower Co., Ltd had successfully developed and commercialized this product, and it was the first and last venture company to have accomplished this task in the world.

Based on such field-proven excellent technologies in the load management area, Xelpower Co., Ltd has been developing next generation technologies and products in the sector of Smart Grid, especially, intelligent demand response solution. Recently Xelpower is expanding his area to Renewable Energy sector as Gasification type Biomass Power Plant with Proprietary technology. These technologies will play a critical role for the implementation of Green Energy in the future. Also, Xelpower will concentrate its efforts on supply of total solution as well as developing of a core technology in this new energy sector.



## 2. Product Line

### ○ Smart Grid (Virtual Power Plant)

Black out, brown out, load shedding and other load management activities are frequently occurring in the developing countries because power supply cannot timely match the increasing demand for electricity. More specifically, it is impossible to construct power plants (or transmission line & distribution line) in timely manner to keep up with the explosively increasing electricity demand due to the lead-time of power plant constructions, lack of enormous capital, environmental regulations, etc. In terms of fuel mix for generation, relatively expensive fuels such as oil or gas should be avoided from use during peak time in order to improve generation efficiency & OPEX cost in power company. Moreover, a lot of nuclear power plants in the developed countries are scheduled to be shut down after Fukushima disaster in Japan. However it shall be not so easy to find out any concrete alternative solution to secure power system reliability and be economically operated simultaneously.

In this regard, our IT-based load management system is the optimal solution for securing power system security, minimizing the generation costs through the selective control of loads within a customer, and maximizing the transformer and generator asset values.

A key factor essential for the nationwide peak power management is the two-way automatic control technology, which ensures real time connection of demand and supply and the optimal reduction of customer loads. Power management solution of Xelpower Co., Ltd can control peak power of customers connected with the Load Dispatch Center of the power company and monitor terminal load conditions of customers directly, not only in emergency situations for power system security but also in normal operating conditions for minimizing the tariffs. Such secured nationwide loads are aggregated in a real-time basis, which is operable any time in the country in order to reduce and manage the national energy resources efficiently.

Xelpower Co., Ltd has greatly contributed in increasing power system reliability and reducing CO2 emissions in Korea through IT-based reliable demand response solution (i.e., Direct Load Control system) preferentially to Korea Electric Power Corporation (KEPCO) and Korea Energy Management Corporation (KEMCO) since 2001. Xelpower had installed for approximately 816 high voltage and medium voltage customers within the country as of 2009. KEPCO could control peak power of up to 1,357MW in 2010 in a real-time & ADR basis that had reduced infrastructure investment for power plant construction.

### ➤ **Central Server System**

It supports various ICT-based on-line communication networks (Internet, telephone and mobile communication network) and allows for management of major loads of customers in real time by connecting 'nation-wide EMS(Energy Management System)' to remote EMD(Energy Management Device) installed within customers through exclusive purpose database.

- Direct load control through interconnection of EMS
- Management of historical demand of customers
- Location information of customers
- Function of data analysis for each area, load significance
- Function of data analysis for customer load patterns
- Remote setting of EMD



<Central Dispatch Center>



< DLC Center Server >



<DLC Center Server Screen>

### ➤ Customer System

The EMD device installed in the distribution panel of the customer monitors and automatically controls the loads of the customer by itself, or it enables remote control by DLC/RDRS central server in the center. In addition, the RCU(Remote Control Unit) devices make it possible to connect/disconnect and manage remote loads in the customer based on wire or wireless communication network and take charge of supporting the function of Measurement and Verification of power where power system protection function and power quality analysis functions can be added.

- Accuracy of 0.5 class measurement
- Measurement of 3-phase voltage/current, power factor, frequency, and power (measurement and analysis of 15 times frequency harmonic wave)
- Automatic control function of power load
- Predictive Management of demand prior to peak times
- Execution of direct load control function by being connected with remote server through various communication networks
- Execution of power quality analysis function and power protection function



<EMD (Energy Management Device)>

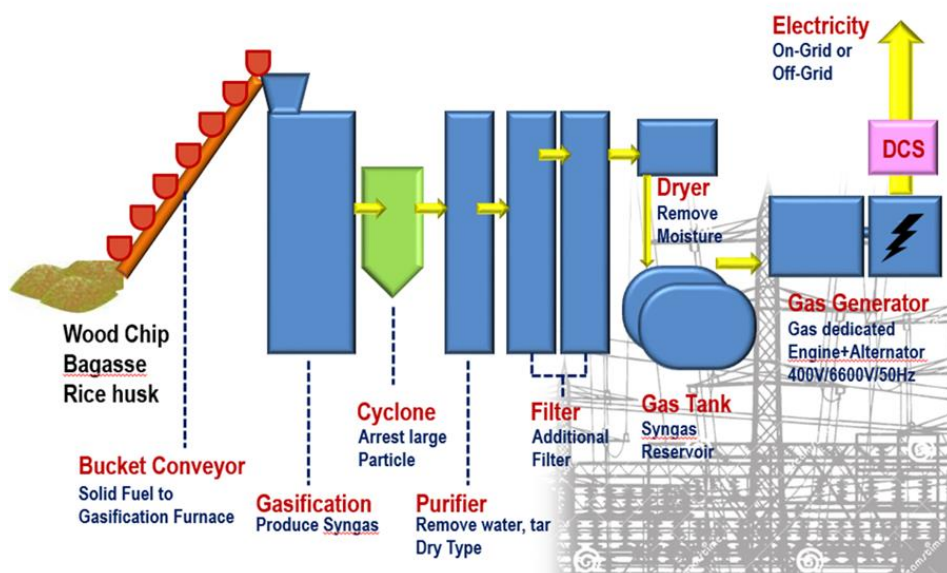


<RCU (Remote Control Unit)>

## ○ Renewable Energy (Modular Biomass Power Plant)

Xelpower's Biomass Power Plant (BPP) based on Gasification process is very environment-friendly solution in comparison of existing BPP based on STG(Steam Turbine Generator) method. It is designed for less air pollution and small cooling water without direct burning process. It offers a win-win strategy for both government/power authority and customers. It follows recent international trends for Green Energy/CO2 reduction.

It is a proven technology by our partners, who have extensive experience in deploying the system in sites in Malaysia, Indonesia and Thailand for many years. This was the first generation system of Gasification based BPP. Now it is upgraded to the second generation convergence system with a modular and package structure using Korean world best shipbuilding technology.



<System Configuration>

Recently the need for Renewable Power Generation in developing countries' islands and off-grid regions was getting higher due to a lot of natural resources for renewable generation. Moreover most of them have been suffering from serious power shortage due to a lack of power generation for many years. On this regards, our environmental friendly BPP by Gasification process would be very timely and adequate in the aspect of a more green power generation and reliability of power grid.

## 3. Prospects

Recently, under the COP21 framework, the role of Economical and Reliable Demand Response programs in Smart Grid has become very important to diminish CO<sup>2</sup> emissions from electricity sector, to decrease the market price of electricity, to reduce the customer bill, and to increase the power system security. The conventional load management system is evolving into the economical demand response scheme by combining ICT technologies, smart meter





technologies, and other smart grid technologies. It is expected that the demand response will play a crucial role for the implementation of smart grid.

Conventional demand control is introduced and operated for the purpose of securing the power system security by managing the peak demand. However, the future demand management system should be developed to conserve energy by managing the resource during the normal times. In addition, the economic demand response technology will be combined with home automation system, building automation system (BAS), advanced metering infrastructure (AMI), and various pricing options to maximize electricity energy usage optimization.

Xelpower's energy management solution will be developed to become the next green energy Virtual Power Plant(VPP) solution including innovative solutions such as effective and efficient demand response functions, integrating with the AMI system, home and building automation system, and the smart grid system. The company will provide various business models and solutions required in rapid-changing energy business environment through market-friendly and environment-friendly next generation energy management platforms.

Xelpower will be positioned as the global innovation leader in the changing energy business sector by developing high value-added integrated resource management platform positively applicable to the new energy business environment through combination of renewable energy technology with biomass and micro grid technology of the company on such platform.

***“Xelpower is a Global Leader in new green energy solution combined with Smart Grid/Micro Grid and Renewable Energy.”***

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