



# Sustainable development through green energy and smart technology

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In the quiet Scottish town of Greenock, one James Watt was born in 1736. In 1755, he moved to London where he found work as an apprentice mechanic for drainage systems. It is here that he invented the steam engine, a discovery whose importance would eventually lead to the onset of the Industrial Revolution. At the time, the era of fossil fuels was dawning, while the introduction of steam locomotives and railways capable of carrying loads quickly over distances allowed mass production to take place.

The invention of this innovative technology sent shockwaves around the world, and James Watt was declared the inventor of the day. From that time, competition for fossil fuels between countries led to the development of a mechanical civilisation through machinery and technology which would enrich the world.

Since the start of the industrial revolution, however, the development of fossil fuel-driven technology has had unexpected results. If we consider, for example, the world as a type of environmental clock, we stand today at 9:30 pm. Just a little over 2 hours remain until the Earth's life is over. A rise in the average global temperature of just 0.74°C has brought with it drought, flood and heat waves, resulting in ecological destruction and economic loss.

Added to this, the development of such technology has used up 85 per cent of the world's fossil fuels, thus resulting in an explosion in demand as the resource depletion crisis deepens. As a result of not having alternative energy sources, fossil fuel prices continue to rise and economic growth slows down. The unpleasant reality is that the depletion of fossil fuels is adding a great deal of confusion and inconvenience to our lives.

In this regard, technological innovation such as that during the time of James Watt is needed now to survive this crisis. There is much work to do to develop more of the technologies we have believed in until now, although not just in the area of the natural environment.

## Emerging environmental issues and changes in the global energy market

Since the industrial revolution, growth-oriented industrialisation has brought with it concerns about the environment. From 1970, these issues have been the focus of the world's attention. Environmental regulations have been strengthened by over 175 international agreements which have had a tangible effect on both society and the economy.

As a response to changes in environmental regulations, the global energy market is rapidly evolving. Energy prices and volatility continue to rise, while competition for energy security has increased and intensified. In addition, improved efficiency as well as the development of green technology has increased demand for new programmes, and the portfolio of renewable energy is expanding. In this light, the development of smart grids and related technology, not to mention IT convergence, are now taking place. It can be said that interest in nuclear power, which has been the key alternative to fossil fuels, continues to grow even after the Fukushima nuclear accident which took place in Japan in 2010.

Reflecting this, the United States has recently announced plans to invest US\$150 billion by 2020 in the renewable energy field, including green cars – a 15 per cent overall increase. The EU intends to focus on developing large-scale wind power and CCS projects, while in Eastern Europe there are plans to build 27 nuclear power plants by 2030. In order to initiate low-carbon and energy efficiency projects in urban areas, €80 million has been set aside. In Japan, the country's "Cool Earth 2050 Strategy" is a plan to promote greenhouse gas reductions to the tune of 60-80 per cent by 2050. China National Energy has announced a policy of limiting production and consumption of coal to 3.9 billion tonnes by 2015, and has expressed its desire to actively cooperate with international efforts on climate change.

As the spotlight shines on the green industry, new and renewable energy industries are also seeing an increase in investment. In 2011, despite the financial crisis and challenges seen in European countries, US\$2.6 trillion was invested in these areas, a 5 per cent increase over the amount of investment made just one year earlier. The government of South Korea will continue to keep pace with global markets as it actively implements the country's "5-year Plan for Green Growth." In short, the domestic energy industry will continue to move quickly.

## The power industry's current reality

Feeling the harsh reality of 'only the strongest survive,' global and domestic companies alike are working hard to evolve. In this light, the electric power industry is still dependent on fossil fuels, while so-called smokestack industries are now being treated as polluting industries.

If so, we must look at KEPCO's current appearance



from the inside out. In terms of scale of power generation, KEPCO stands in the global top 10. The company's annual sales have reached KRW 40 trillion, while the UAE's order of 4 KEPCO nuclear power plants has given a massive boost to Korea's largest government-owned enterprise. At first glance, it would appear that KEPCO is full of trees bearing fruit which is ripe for the picking.

Taking a deeper look, however, one would see that the reality was just the opposite. In fact, KEPCO has recorded a deficit for the past four years consecutively, while overseas sales have plateaued at a mere 3 per cent of total revenue. The proportion of thermal power generation at KEPCO in regard to overall power generation is 67 per cent, while the company accounts for 29 per cent of all of Korea's carbon dioxide emissions. In contrast, there is a very small level of development in renewable energies. Given this reality, KEPCO's growth can be represented by a stunted tree instead of one laden with fruit.

### **Vision and action plan**

It is thus that the tree with stunted growth must have life breathed into it in order to continue growing. To this end, KEPCO has taken a penguin's perspective of being on a melting iceberg as we strive to establish new 'blue ocean' strategies.

Upon assuming my current position in September 2011, I set a target of KRW 180 trillion in annual sales by 2025, established a "Global Top Green & Smart Energy Pioneer" vision, and vowed to unite our employees to carry out this vision to the best of my ability.

To the end of realising a low-carbon society and seeing this vision through, the company has implemented a two-pronged approach. The first is the development of green energy and the second, the implementation of smart technology. Of course, the ultimate goal is the convergence of both.

### **Green energy development**

Green energy should be interpreted as a concept which includes solar, wind and other natural power sources, as well as nuclear power, IGCC and CCS technology which can convert fossil fuels into sustainable energy.

KEPCO is focusing its core technology on offshore wind power development while simultaneously developing power generation from tidal currents and solar power.

The company is also expanding its core data to develop a special purpose company geared toward overseas projects. Due to the currently low level of desalination technology, KEPCO is boosting collaboration efforts with world-class companies, conducting research and acquiring plant sites with the hope of establishing a demonstration plant capable of desalinating 10,000 tonnes of water per day by 2020.

Meanwhile, solar, geothermal and biotechnology have been designated as future strategic technologies for our company. Plans are being established to combine solar energy with heat energy technology to raise the commercial viability of photovoltaic power generation, connect available geothermal technology with overseas geothermal resource development plans to develop a feasible project model, and use waste as the feedstock for biogeneration to perform overseas verifications of 10 MW by 2018. Through the development of such green energies, we will be able to raise the ratio of domestic renewable (excluding hydro) from 2.3 per cent at present to 7.2 per cent by 2024.

In regard to nuclear energy on the domestic front, plans are in place to raise the total contribution of nuclear energy to the nation's power generation from 25 per cent at present to 32 per cent by 2024. Public-private partnerships between Korea and other countries will also be strengthened through investing in stakes of relevant companies and by providing value chain services for nuclear power plants around the world. For certain, the export and construction of additional nuclear plants will also lead to the expansion of green energy.

In addition, we have designated IGCC and CCS as growth engines and will work to expand these business areas overseas. Investment in R&D for IGCC technology will also increase. With the completion of construction on the Tae'an IGCC plant, KEPCO has raised its level of technology to 90 per cent, thus equipping the company with the ability to compete in the global market. In regard to CCS, a collaborative programme with KEPCO's group subsidiaries will be initiated to build a 500 MW integrated propulsion system by 2018.

As a result, through the development and expansion of green energy, the domestic and international power configuration currently centred on thermal power will switch to a low-carbon power mix better suited to address climate change.





## Implementation of smart technology

As mentioned above, there is a need for the convergence of smart technology in order to distribute green energy to where it is needed. In regard to smart technology, in order to operate the technology for hardware such as smart grids, HVDC and superconductivity, and to combine green energy with smart technology, an efficient organisation, administration and human resources system must be established, while R&D activities must also include software technology.

Concerning the development of core hardware technology, namely smart grids and microgrids, KEPCO has made a significant level of investment which has enabled it to secure core technology in communications security solutions and control technology, and thus take the lead in the global market through a KEPCO-led consortium and demonstrations.

In light of the expected rapid growth in the HVDC and superconducting market, the company has plans to make aggressive R&D investment in this field in order to bring its advanced technology up to necessary levels. Following the introduction of this technology, we plan to increase the number of outside research personnel and establish an integrated work scheme with our subsidiaries to connect 2 GW of offshore wind power to the existing power grid.

In the long term, KEPCO has great interest in establishing a supergrid with a high-voltage capacity which will connect Russia, China, North Korea, South Korea and Japan. At present, this plan has been divided into three stages.

At the present time, green energy and the smart technology used to distribute it are being readied. Finally, it is now time to establish the global organisation and human resources needed for to manage this integrated smart software technology.

In order to ensure an effective global management structure capable of carrying out its vision, KEPCO will give independent governance functions to business units where each will receive respective targets and be assessed based on post-performance. Communication channels between the business units and our subsidiaries will be established to ensure the integrated management of this new structure.

In addition, a Corporate Centre will be established to monitor and manage each project and its respective risk,

while plans are in place to analyse potential synergies for new business development.

In order to ensure sufficient 'smart' human resources, KEPCO is operating a Meister School as well as K-INGS, the world's first graduate school devoted solely to cultivating nuclear experts. The company is also developing talent through varied in-house training and education programmes to enhance the practical skills of its employees.

## Blueprint and Closing Comments

Now, all the preparations are complete. All that is left to do is to take on the world, and indeed the world is on our doorstep. Today, KEPCO is set to achieve KRW 180 trillion in annual sales, 50 per cent of its total business coming from overseas projects and a capacity of 107 GW for Korea's domestic power plants, 71 GW of which will be from offshore. Green energy will account for 32 per cent of KEPCO's power ratio, all of which will transform the company into a global, eco-friendly top-level utility company.

The winds of change began to blow two centuries ago in a little town in Scotland called Greenock. Today, KEPCO stands ready to achieve the Butterfly Effect as it rides an even bigger wind. Time, like the leaves of autumn, is fleeting, and change means that nothing is certain and there is nothing to hold on to.

In other words, the sun's light does not work on its own. Instead, it requires a body which represents smart hardware technology, and a head formed by smart software technology. As a result, the sun can shine to make the world a better place.

It is time for us to stop lingering on negative thoughts, only acknowledging that technological advancements have failed to benefit the environment and regarding nature simply as good scenery. We need to act on giving back the beauty and joy that nature has given to us. It is crucial to find a way to exist together with nature without violating it. In light of this mission, KEPCO is seeking to combine smart energy technologies with James Watt's steam engine and to develop new environmentally-friendly growth engines for green energy. We believe this is the initial step to achieving our vision of becoming a "Global Top Green & Smart Energy Pioneer" and changing the world for a better future. □

