In March 2013, the first edition of China's "Economy-Green China" magazine contained an interview with Smart Grid Network CEO Bruce Hamilton in which he contrasts smart grid initiatives in China and the U.S. and provides advice for enhanced international collaboration.

The following are the initial interview insights Mr. Hamilton shared with *China Daily Economy.*

1、 智能电网的建设对促进全球的低碳经济发展具有怎样的意义？

1、 How does the smart grid construction promote the global low carbon economy development?

The electricity that powers everything from residential appliances (heaters, refrigerators, lighting, televisions, computers, smart phones) to commercial and industrial applications (apartment buildings, hospitals, datacenters, digital manufacturing) is an integral part of our daily lives. Historically, electricity has been generated at large, central fossil fuel plants, hydroelectric dams, and nuclear facilities, and then delivered across a network of transmission and distribution lines using mechanical switches, relays and one-directional meters to provide electricity to consumers.

Smart grid construction introduces digital energy technology that enables more efficient, reliable and clean use of energy by allowing electricity to be measured and controlled from the source of generation, through transmission and distribution, to where it is consumed. Smart grid technology allows for two-way communication providing consumers and utilities with accurate, timely, and detailed information about energy use. These capabilities promote the global low carbon economy development by allowing greater integration of clean energy technologies; providing a greater level of information and control to customers; and contributing to a more reliable electricity network, which drives down cost for households and business.

The World Energy Council (WEC) agrees that smart grids are an essential element to facilitate the transformation to a low-carbon economy. In 2012, WEC published a report titled *World Energy Perspective: Smart grids: best practice fundamentals for a modern energy system*, which asserts that:

> Smart grids can help reduce transmission and distribution losses, optimize the use of existing infrastructure by helping to regulate power flows and meet peak demand, accommodate significant volumes of decentralized and renewable energy into the grid, and improve energy efficiency by managing the consumption patterns of new and existing users connected to the grid. Smart grids are essential for achieving energy security, affordable energy and climate change mitigation— the three elements of the "energy trilemma".

In 2008, the Electric Power Research Institute (EPRI) issued a Technical Update Report titled *The Green Grid: Energy Savings and Carbon Emissions Reductions Enabled by a Smart Grid*. The study analyzed seven emissions-reduction mechanisms enabled by smart grid (smart buildings, voltage control, peak load management, energy efficiency programs, greater integration of renewables, and plug-in hybrid electric vehicles) and estimated that all mechanisms combined have the potential to reduce annual carbon emissions in the United States by 60 to 211 million metric tons CO_2 by 2030.

2、 就企业而言，在践行绿色发展的进程中应如何肩负起社会责任？Smart Grid Network，Inc 又是如何践行的？

2、In the process of green development, how does the enterprise show their social responsibility? How about the Smart Grid Network, Inc？

There are many ways for enterprises to show their social responsibility. In addition to taking actions that reduce their own carbon footprint, depending on the size and nature of the business, enterprises can also make positive impacts by:

1. Creating innovative solutions that contribute to low-carbon economy development and making these products and services available globally at affordable prices;
2. Taking active participation in collaborative efforts to define interoperability standards that help make products more secure and easier to integrate;
3. Highlighting smart grid implementation projects and sharing lessons learned;
4. Helping to educate consumers on availability and benefits of smart grid technology;
5. Deploying smart grid and clean energy technologies at universities and training centers to enable academic institutions to expand their smart grid education and workforce development programs.

The goal of Smart Grid Network, Inc. is to help accelerate the pace of smart grid deployment by operating a global knowledge sharing and communication platform at SmartGrid.com. Countries, states and communities can use our site, to highlight smart grid projects and attract best-of-class solutions suitable for their local requirements. We also partnered with universities and non-profit organizations like the Smart Grid Consumer Collaborative to provide free online education materials, industry publications and answers to common questions from consumers.

The Smart Grid Network® website has three primary components — one-directional information from authorized content administrators in a country, province or city highlighting local smart grid initiatives (key players, projects, articles, reports and videos); customized company websites that smart grid vendors can use to get the message out about their products and services to interest consumers around the globe; and a free social media site where consumers, solution providers, students and others can communicate about smart grid issues of interest.

We are proud of the societal impact we are currently making in partnership with government agencies, private-sector companies and non-profit organizations in Asia, Europe, Latin America and the United States. However, this is just a start. Imagine the societal benefits that can be achieved by all, when SmartGrid.com is adopted as common global platform for knowledge sharing and communication – providing multi-lingual sharing of lessons learned

from smart grid implementation; viewing of educational materials; facilitation of dialogue on the development of smart grid standards, policy and business models; and identification of solution providers.

3、 我们知道，Smart Grid Network，Inc 是致力于绘制一个新能源未来的美国智能电网企业，您认为，区别于美国，中国智能电网的建设具有怎样的特点？请您进行对比。

3、As we know，The Smart Grid Network，Inc is an American firm which want to chart a new energy future that embraces alternative and renewable energy. In your point of view, compared to the United States, what characteristics did Chinese smart grid construction has?

An important characteristic shared by China and the United States regarding smart grid construction is that in both cases, Presidential commitment to chart a new energy future that embraces renewable energy and addresses the global climate crisis resulted in government action to intensify development of smart grids. In the case of China, on Sep. 22nd 2009, President Hu Jintao put forward that by 2020, the portion of non-fossil energy consumption in China would reach about 15% of the national total, and on Mar. 5th 2010, in the Government Work Report, Premier Wen pointed out the requirement to intensify development of smart power grids. Although China and the U.S. both expect smart grid construction to support national sustainability objectives, the focus of smart grid initiatives in the two countries vary due to the differences in approach to setting energy policy, structure of electricity industry and condition of national grids.

China's Twelfth Five-Year Plan (12th FYP) calls for increased deployment of renewable energy, expansion of smart grid and development of China's electric vehicle industry. China has over 1.3 billion citizens served by 2 utilities – State Grid Corporation of China (SGCC) and China Southern Grid Company (CSG). SGCC and CSG are instrumental in contributing to development of smart grid strategies and pilot projects, as well as executing the implementation and operation of an integrated national smart grid network. China has a three-stage plan for development of a strong and smart grid by 2020 with an estimated government investment of $9.2 billion in smart grid technology during the planning and trial phase from 2009-2010 and total government investment in smart grid technology expected to exceed $100 billion by 2020.

China's grid system is split into six regional power grids, which operate rather independently. The lack of a unified national grid system heightens the risk of localized shortages and limits the ability to utilize rich wind resources concentrated in the north and northeast to supply primary electricity demand centers in the south and east. Early smart grid measures were designed to realize the optimal utilization of wind power on a national level by strengthening

wind power forecasting, interconnection and monitoring; and accelerating construction of high-capacity power lines that enable long-distance electricity transmission to interconnect the North China, East China and Central China grids. Construction of pumped storage hydro stations was accelerated to satisfy peaking capacity requirements and help manage intermittent generation from wind power. In addition, national energy research centers were constructed for solar (in Nanjing), grid connection of bulk wind power (in Beijing), and smart grid R&D (in Beijing and Nanjing). Initial pilot projects included: coordination of power generation, transmission monitoring, smart substations, distribution automation, advanced metering infrastructure (AMI), electric vehicle charging, dispatch support systems and a comprehensive smart grid demonstration project at the Shanghai World Expo.

In contrast, the continental United States is covered by three interconnected power grids, but 2003 blackouts experienced in large parts of the country amplified concerns over the aging and inefficient state of the underlying transmission and distribution infrastructure. As a result, the U.S. smart grid initiative focused on developing and implementing advanced information, communication and control technologies to modernize the national electricity delivery system for more reliable and efficient operations. USDOE funded 76 AMI projects (deploying 15.5 million smart meters), 65 distribution automation projects, 11 phasor measurement unit (PMU) and 12 energy storage projects, along with the development of interoperability standards and workforce training. Significant advancements are also being made in the development and deployment of situational awareness and visualization technology for managing large volumes of data collected by smart grid technology.

In the United States, over 150 investor owned utilities (IOUs) provide service for three quarters of the 310 million American citizens living in 50 states and the remaining 25% of the population are served by smaller public utilities. IOUs must receive state approval to recover costs relating to smart grid deployment from customers. In 2009, USDOE was charged with administering a one-time federal government appropriation of $4.5 billion for smart grid development with the hope that this action would stimulate large scale deployment of smart grid technology in states across the nation. Additional smart grid construction projects are being authorized by individual states (for IOUs) and communities with greater importance given to the creation of sustainable business models, enabling policies and customer engagement.

To summarize, both countries are investing a great deal in smart grid technology, with China focused on R&D and the U.S. encouraging private sector innovation. Common priorities include enabling renewable integration, transmission monitoring and control, distribution automation, AMI, energy storage and electric vehicles. China is pursuing a three-stage plan to create an integrated strong and smart national grid by 2020. This effort will be funded by the government and executed by SGCC and CSG. USDOE's smart grid initiative is focused on modernizing the national grid, demonstrating emerging technologies and defining enabling policies and standards. Additionally, while China is building new pumped storage hydro

stations to satisfy peak demand requirements, the U.S. is encouraging demand participation through distributed generation, smart appliances and smart buildings.

4、 您认为，中国智能电网建设的现状如何？在建设的过程中面临着怎样的困难与挑战？取得了哪些实质性进展？未来，又应从哪些方面加强国际合作？

4、What's the status of Chinese smart grid construction now? What kind of difficulties and challenges will come out? What's the progress did we make? In the future, what should we do to strengthen the International cooperation?

China's "Framework and Roadmap for Smart Grid Standards" identifies eight domains and 26 technical fields of focus for smart grid research and development. By the end of 2011, SGCC had implemented 238 smart grid pilot projects to test designs, solve technical issues and develop management systems. After completing the initial planning and pilot stage, China is proceeding with smart grid construction initially focused on:

- Large scale renewable (wind, solar power and biomass) energy integration;
- Ultra-high voltage (UHV) transmission;
- Residential application of smart meters and AMI;
- Intelligent distribution systems;
- Electric vehicle charging facility;
- Energy Storage.

Concerning smart grid infrastructure, China has built an optical fiber communication and network management system enabling a high level of real-time monitoring and control, which helps to support their install base of more than 36 million smart meters. In terms of electric vehicle (EV) infrastructure, Shenzhen also has the largest EV bus and taxi fleet in the world, supported by the government's policies to promote the EV industry. Povetio is implementing the charging infrastructure based on a system of battery swapping and a wide range of businesses have come to create an EV innovation cluster in the region. While State Grid and CSG proposed widescale adoption of a Smart Charging Service Network business model based on battery swapping, gasoline suppliers like Sinopec and PetroChina prefer a Refueling Recharging Integration Station model that would build EV charging stations beside existing gas stations.

Regarding renewable energy, China has the world's largest installed wind power capacity, but one third of it sits idle due to power security, grid connection and transmission issues. For example, the lack of low voltage ride-through capability for most grid-connected wind turbines in China has resulted in power fault events causing a sudden drop of several hundred

megawatts of generation from the grid – threatening power system stability. While China's regulatory bodies and SGCC have undertaken measures to resolve these issues, the nature of wind power production creates additional challenges for system operators.

Wind power production in China is typically highest in the evening when power demand is low. China's SGT Research reports that the combination of peaking generation from wind farms and must-run base load power plants (coal, nuclear and cogeneration) leads to an excess of generation at night causing grid operators to curtail wind power or operate thermal power plants near technical minimum capacity, where they have poor ramping capabilities and struggle to counteract wind's variable output.

State Grid maintains that UHV lines can absorb the intermittent power from renewables. SGCC and CSG launched an extensive expansion of transmission grids nationwide putting into commercial operation a 1000 kV UHV AC line connecting Shanxi and Hubei, and a 800 kV DC line connecting Yunan and Guangdong. Construction has begun on three new UHV AC power lines connecting Xi'men and Nanjing, Sichuan and Shanghai, and western Inner Mongolia and Shandong with an expected completion date of 2015.

State Grid also recently proposed a $250 billion grid upgrade to crisscross the country with 20 UHV power lines, by 2020. The plan is for these lines to connect China's regional grids and help resolve the country's geographical energy imbalance. Critics say the proposed national grid could be susceptible to blackouts, diverts funding from alternative smart grid solutions, and has less appeal as China moves energy-intensive industry inland and west.

New smart grid developments in China will evaluate alternative solutions to:

- Enable integration of renewables (wind, solar and distributed generation), including microgrids and consumer-side technology (in-home generation, EV, storage, etc.);
- Meet the need to have active communication between power suppliers and consumers to encourage use of clean energy and load shifting;
- Upgrade the conventional industries by applying advanced technologies for information, sensors, and automation control.

In August 2012, the NEA published the Renewable Energy Development Plan for 2011-2015, which calls for expanded use of distributed generation and microgrids to meet the country's energy needs. Under this plan, China will construct 100 new energy demonstration cities to promote renewable energy such as solar, wind, geothermal energy and biomass energy usage locally. NEA also looks to conduct 30 microgrid pilots during the 12th FYP period.

Provincial governments and energy-intensive industries may have an interest in microgrids, distributed generation and consumer-side technology; however successful execution of these initiatives require strong governmental commitment, enabling policies, sustainable business models and informed consumers who desire to participate in demand-side programs.

Although there are limits in the transferability of smart grid experience from one country or region to another, some lessons can be drawn from U.S. efforts in the areas of smart grid policy development, business models and customer engagement.

Based on lessons learned from China's smart grid pilot projects and other relevant factors, the National Development and Reform Commission (NDRC) will ultimately decide on which direction the country will take for wide scale smart grid deployment. If the decision is to build a national interconnected grid, system operators could benefit from the enhanced situational awareness systems that Southern California Edison (SCE) uses to manage high volumes of renewable resources. SCE works with other western state utilities on a syncrophasors program that installed 250-300 PMUs across the grid to sample the conditions of the grid 30 times per second. The program not only includes measurement, but also features a communication backbone to pull the data in, provides situational awareness display and decision-making analytics, and factors in demand-side resources to manage these renewable resources. SCE is also working on a centralized remedial action system (C-RAS) including protective analytics and centralized intelligence that optimizes generation and load across the entire transmission grid.

At a U.S.-China Smart Grid Conference, held in Shenzhen during June 28-29, 2012 Mr. Geoffrey Jackson, U.S. Trade and Development Agency (USTDA) Regional Director East Asia and Eurasia commented "As two of the world's largest economies, the U.S. and China must remain on the cutting edge of clean energy technology … and are committed to collaborating to move smart grid technology development and implementation forward". Mr. Wu Guihui, Chief Engineer, Electricity Department, NEA further mentioned that "China and the U.S. are currently collaborating in many fields related to the smart grid, including energy policy, and have signed agreements to jointly implement smart grid and HVDC projects. NEA seeks enhanced cooperation, through this event and other platforms, so that both counties can share experience and learn from each other to develop a common understanding and work together on clean energy and smart grid development".

To strengthen international cooperation, I recommend China focus on:

1. International standards;
    a. GE's Digital Energy business has cooperated with the China Electric Power Research Institute to develop Chinese standards for smart grid infrastructure that are appropriate for China and harmonized with U.S. standards.
    b. Members of China's National Smart Grid Standardization Promotion Group are advised to participate in international standards bodies, such as the Smart Grid Interoperability Panel (SGIP 2.0, Inc.) a private/public partnership focused on shaping of standards that help make products more secure and easier to integrate while reducing cost and speeding time of products to market.
2. Continued low cost manufacturing of quality smart grid products;

3. Partnerships with foreign vendors to pursue international smart grid projects;
    a. Chicago-based utility ComEd received approval for a 10-year, $2.6 billion Infrastructure Investment Plan investing $1.3 billion to strengthen the electric system and another $1.3 billion to add new smart grid technology. ComEd selected Silver Spring Network communication technology to network nearly 4 million homes and businesses. Chinese meter vendors could partner with Silver Spring Network to deploy their technology within the ComEd service territory.
    b. Chinese vendors could engage in similar partnerships with KT to pursue the market for smart buildings in Korea.
    c. GE offers many opportunities for partnership as their smart grid practice covers generation, transmission, distribution, along with commercial, industrial, residential and community solutions.
4. Enhanced international communication and workforce education;
    a. Make use of the global knowledge sharing and communication platform at SmartGrid.com to inform the world of smart grid projects and vendor solutions in China.
    b. Have Chinese professionals receive training on international smart grid issues related to policies, business models, markets, technology, cyber security and customer engagement, as is provided at the Smart Grid Workforce Education and Training Center at Illinois Institute of Technology (IIT).
5. Forming strategic partnerships to offer a range of services customized to local conditions;
    a. Industry experts estimate that smart grid technology and services is a multi-trillion dollar market. IBM projects the market for smart grid analytics alone to be valued at $164 billion.
    b. In pursuing the smart grid market, companies should focus on establishing industry partnerships to bring a wide range of capabilities and open standards-based solutions.
6. Establishing an international test bed to showcase smart grid solutions offered by Chinese companies;
    a. Although smart grid technology spans the entire energy value chain, smart grid systems come in a range of flavors for different countries and regions.
    b. From a global perspective, the smart grid includes both an infrastructure side (UHV transmission, grid optimization, etc.) and an energy services side (reliable and affordable demand side options, distributed generation and microgrids).
    c. China should establish an international test bed for showcasing smart grid solutions provided by Chinese vendors and developing insights into commercial operations within a market environment.

5、 Q5: 截至目前，您公司是否已经开始与中国的城市以及企业展开合作？如已经展开合作，进展如何（请举例说明）？如没有，目前做了哪些准备加以促进？未来，Smart Grid Network，Inc 与中国城市间合作又有怎样的规划？

5、Until now, did your company start to cooperate with the Chinese cities and enterprises? If there are, what's the progress (for example)? If not, what will you do to promote the cooperation opportunities? In the future, what's your plan with the Chinese cities and enterprises?

Smart Grid Network's founder and President, Bruce Hamilton, began collaborating with Chinese government agencies in 1995 while employed at the International Atomic Energy Agency (IAEA) when he was head of the IAEA's Energy Modeling, Databanks and Capacity Building Unit. In April 2011, while serving as President of Adica, a global energy software and consulting company, he attended the Asia Power T&D Summit to gain insights on China's smart grid market and speak on the Illinois-Korea Smart Grid Partnership that Adica played a key role in establishing.

After forming Smart Grid Network Inc., Mr. Hamilton initiated communications between Chinese cities and the U.S. state of Illinois and, in May 2012, participated in the Illinois Delegation Life Sciences and Energy Mission to China. During this mission, Smart Grid Network signed a Memorandum of Understanding (MOU) to collaborate with Chinese enterprise SGT Research, Inc. to promote dialog and information exchange among smart grid stakeholders; and at the same time, the Illinois Science and Technology Coalition (ISTC) signed MOUs with the Administrative Committee of Baoding National Hi-tech Development Zone. Mr. Hamilton also had the opportunity to meet with editorial staff of the Chinese Economic Daily Economy magazine, along with management and staff of the China Electricity Council, State Grid Energy Research Institute (SGERI) and Baoding National

Hi-Tech Development Zone.

In June 2012, Mr. Hamilton served as the United States' chief technical consultant for a U.S.-China Smart Grid Conference co-sponsored by the U.S. Trade and Development Agency (USTDA), Federal Energy Regulatory Commission (FERC), and China's National Energy Administration. The Dialogue featured 37 presenters and a total of around 150 participants from U.S. and China.

Since June 2012, Smart Grid Network has been collaborating with SGT Research Inc. to increase global awareness of smart grid activities in China, by posting relevant content at china.smartgrid.com. We also hired a graduate of Northern China Electric Power University to work in our Chicago office to developed an understanding of the SmartGrid.Com platform, populate the site with information on China's smart grid initiative and prepare to support future Smart Grid Network operations in China. Smart Grid Network has established collaboration agreements with public and private-sector organizations who manage local content on smart grid activities in Asia, Europe, South America and the United States. We are hopeful to establish similar relations with NEA, SGCC and CSG; and to setup a permanent office in China staffed by local professionals.

In addition to assisting with international communication, Smart Grid Network is prepared to assist Chinese enterprises in identifying project opportunities, establishing strategic

partnerships and facilitating product customization, certification and deployment. One potential location is the state of Illinois, which has received international recognition as an ideal partner for smart grid development and deployment. Countries want to develop and deploy emerging technologies in a part of the world that has a lucrative market conducive for smart grid implementation. Global partners are attracted to the wide array of smart grid and renewable energy projects in Illinois, the state's advanced research capabilities at universities (IIT-microgrids, University of Illinois-cybersecurity, Northwestern and University of Chicago) and national laboratory (Argonne) Illinois is situated within both the PJM and MISO electricity markets and established an Innovation Corridor within the ComEd service territory where U.S. and international enterprises can field test their smart grid solutions.

USDOE selected Argonne to house a new innovative energy storage and research facility. This Batteries and Energy Storage Hub is funded at $20,000,000. Today's electrical energy storage approaches suffer from limited energy and power capacities, lower-than-desired rates of charge and discharge, cycle life limitations, low abuse tolerance, high cost, and poor performance at high or low temperatures. The Batteries and Energy Storage Hub will accelerate the development of energy storage solutions that are well beyond current capabilities and approach theoretical limits. This development will be enabled by cross-disciplinary R&D focused on the barriers to transforming electrochemical energy storage, including the exploration of new materials, devices, systems, and novel approaches for transportation and utility-scale storage.

In closing, I would like to thank the Chinese Daily Economy Magazine for the opportunity to share our insights. We are honored to work together with enterprises from China with the lofty goal of creating a better world.

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