

INDUSTRY OVERVIEW

Certain information contained in this section and elsewhere in this document has been derived from various public sources or extracted from a commissioned market research report prepared by Frost & Sullivan for the purposes of this document. We believe that the sources of the information in this section are appropriate sources for such information, and we have taken reasonable care in extracting and reproducing such information. We have no reason to believe that such information is false or that any fact has been omitted that would render such information misleading. In addition, we believe there is no adverse change in market information since the date of the Frost & Sullivan report which may qualify, contradict or have an impact on such information. However, such information has not been independently verified by us or any of our Directors, the [REDACTED], the [REDACTED], the [REDACTED], the [REDACTED] or the [REDACTED] and no representation is given as to its accuracy. Such information may not be consistent with the information compiled by other sources.

SOURCE OF INFORMATION

We have commissioned Frost & Sullivan to conduct market research and analysis of the PLC market and its various applications in China and prepare a report entitled “China’s Power Line Communication (PLC) Market Study” dated [REDACTED] (the “**Frost & Sullivan Report**”). Frost & Sullivan is an independent global consulting firm founded in 1961 in New York. It provides industry research, consulting and corporate training services.

In preparing the Frost & Sullivan Report, Frost & Sullivan conducted primary research including interviews with selected industry participants, as well as secondary research including analysis of company reports, independent research reports and relevant data based on its own research database. Frost & Sullivan obtained the figures for various market size estimates from historical data analysis plotted against macroeconomic data, taking into consideration the identified key drivers and using multiple forecasting techniques such as expert-opinion forecasting methodology, integrated with its analysis of market trends and econometric variables. Frost & Sullivan prepared its report based on the assumptions that the social, economic and political conditions of China are likely to remain stable and related industry growth drivers are likely to drive the PLC market and the relevant applications in the forecasted periods.

We incurred RMB850,000 for the preparation of the Frost & Sullivan Report. Our payment of such fee to Frost & Sullivan is not contingent upon the results of its research and analysis.

Our Directors confirm that, after taking reasonable care, there is no adverse change in the market information since the date of the Frost & Sullivan Report, which may qualify, contradict or have an impact on the information as disclosed in this section.

Our Directors are of the view that the sources of information used in this section are reliable as the information was extracted from the Frost & Sullivan Report. Our Directors believe that the Frost & Sullivan Report is reliable and not misleading as Frost & Sullivan is an independent professional research agency with extensive experience in its profession.

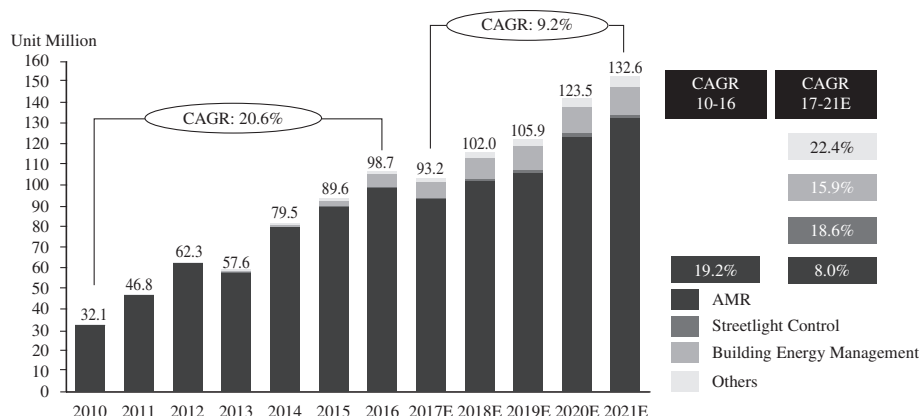
THE OVERALL PLC MARKET IN CHINA

While PLC products were first developed and applied in Europe as early as the 1930s, the PLC technology was first applied commercially in the power distribution sector in China in the 2000s. Notably, State Grid launched its pilot PLC-based AMR projects in 2008, setting off a rapid development of China’s PLC industry. As of today, the PLC technology has been widely adopted as the dominant communications technology for the deployment of AMR systems, which are a key part of the smart grid infrastructure in China. According to Frost & Sullivan, AMR systems accounted for more than 90% of the use of PLC products in 2016 and have become, and are expected to continue to be, the main PLC application in China.

The PLC industry in China has also seen an increasing penetration for other applications as the development of the PLC technology continues to mature. Among these are selected smart energy management applications involving the remote control and monitoring of various kinds of energy consumption or generation systems, including streetlight control, building energy management and photovoltaic power management applications.

INDUSTRY OVERVIEW

The following chart sets out the historical and projected sales volume of PLC products in China by major applications from 2010 to 2021:



Source: Frost & Sullivan

China's PLC market had grown rapidly during the period from 2010 to 2016. According to Frost & Sullivan, the total sales volume of PLC products in China grew at a CAGR of 20.6% from 32.1 million units in 2010 to 98.7 million units in 2016. The significant increase in sales of PLC products during this period was mainly driven by the massive procurement of AMR devices, in particular smart meters, by State Grid in connection with its continual deployment of AMR systems.

Frost & Sullivan estimates that China's PLC market will continue its growth at a CAGR of 9.2% during the period from 2017 to 2021, with total sales volume of PLC products increasing from 93.2 million units in 2017 to 132.6 million units in 2021. China's PLC market is expected to slow down its growth from 2017 to 2021 as compared to the period from 2010 to 2016, mainly affected by (i) the penetration rate of smart meters under State Grid's first-round commercial deployment, which commenced back in 2010, has already reached approximately 80% as of the end of 2016 and is reaching saturation, and (ii) other non-AMR PLC applications in China are relatively at a development stage to reach a stage of stable growth. The future growth of China's PLC market is expected to continue to be driven by governmental support for the IC industry, increasing deployment of smart grids in China and continual advancement in the PLC technology.

Key raw materials for PLC ICs are IC chipsets. According to Frost & Sullivan, the production volume of IC chipsets in China grew at a CAGR of 12.6% from 2010 to 2016, reaching 132.9 billion units in 2016, and the import volume of IC chipsets in China grew at a CAGR of 9.3% from 2010 to 2016, reaching 342.5 billion units in 2016. As the demand of PLC ICs only account for a limited portion of the entire IC chipsets market in China, the supply of IC chipsets is expected to be sufficient for the growing production needs from PLC technology companies in China, according to Frost & Sullivan.

THE AMR APPLICATION

Smart Grids and AMR Systems

The power distribution sector in China (except for middle and western Inner Mongolia¹) is controlled by State Grid and Southern Grid, the two state-owned enterprises established both in 2002 in connection with the reform of China's power system to separate power generation from power transmission and distribution. State Grid is the largest power grid company in China which invests in, constructs and operates power grids in 26 provinces², covering approximately 85% of electric power users in China as of December 31, 2016, while Southern Grid is responsible for the five provinces in

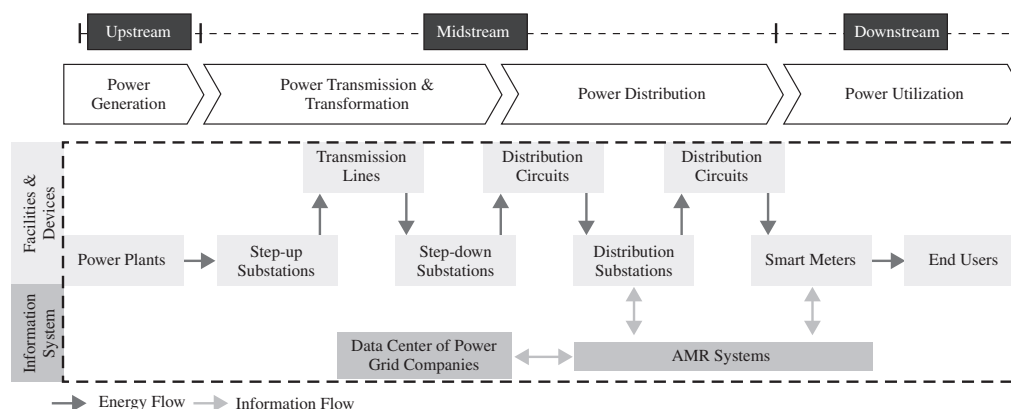
1&2. State Grid operates the power grids in the eastern part of the Inner Mongolia Autonomous Region, while the power grids in the middle and western parts are covered by Inner Mongolia Power (Group) Co., Ltd. (內蒙古電力(集團)有限責任公司) ("Inner Mongolia Power"), which operates independently from State Grid and Southern Grid.

INDUSTRY OVERVIEW

Southern China, namely, Guangdong, Guangxi, Yunnan, Guizhou and Hainan. These two power grid companies implement power grids investment and development plans and policies promulgated by the PRC government, including the State Council, the NDRC and the NEA, from time to time.

State Grid has led in promoting and implementing the PRC government’s plan of building a modern smart grid system. State Grid launched its pilot PLC-based AMR projects in 2008 and commenced commercial deployment of AMR systems in 2010. Pursuant to its White Paper on Green Development (《綠色發展白皮書》) issued in 2010, State Grid targets to roll out a reliable, effective, clean and environmentally friendly nationwide smart grid system by 2020. A smart grid system differs from a conventional power grid system in a number of ways, including, among others, the use of communications technologies to transmit electric power usage data more efficiently and reliably. This is enabled at the power distribution and utilization end of the power grid value chain by the deployment of an AMR system, which is designed to automatically collect, process and monitor data relating to power distribution and consumption, as well as to enable the remote control of the local components in a power grid system. The following diagram illustrates the power grid value chain and the deployment of AMR systems in China:

INDUSTRY OVERVIEW

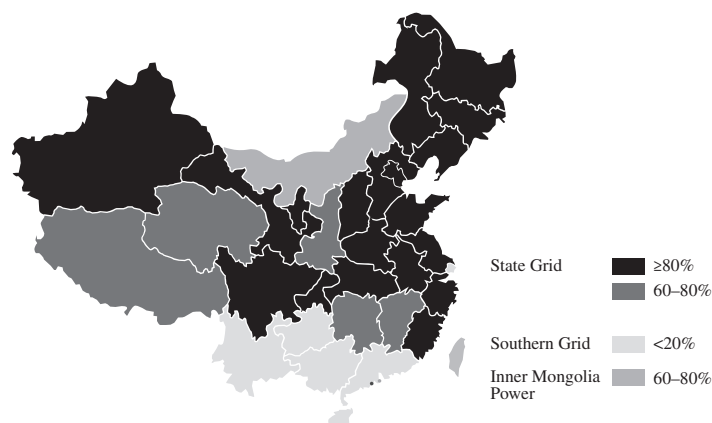


Source: Frost & Sullivan

According to Frost & Sullivan, China’s annual power grid investment reached RMB542.6 billion in 2016 while the total sales value of smart meters in China was RMB26.6 billion in 2016. The amount of investment required for the initial deployment and upgrades of AMR systems only accounts for a small proportion of the total power grid investment in China. The majority of China’s power grid investment goes to the construction of ultra-high voltage power grids. Except for this, the emphasis of future power grid investment is expected to shift to smart grid infrastructure and the power distribution and consumption, among other areas.

In particular, State Grid has commercially deployed AMR systems since 2010 in all of the 26 provinces it covers with an average smart meters penetration rate of approximately 80% as of the end of 2016, according to Frost & Sullivan. According to Frost & Sullivan, prior to 2016, Southern Grid was only engaged in pilot AMR projects and it commenced commercial deployment of AMR systems in its five provinces in March 2016. According to Frost & Sullivan, as Southern Grid plans to achieve full deployment of AMR systems by 2020, it is estimated to fuel the demand for more than 80 million units of smart meters from 2017 to 2021.

The following map shows the geographic coverage of AMR systems deployed by power grid companies in China with the respective penetration level of smart meters as of December 31, 2016:



Source: Frost & Sullivan

INDUSTRY OVERVIEW

Existing Technologies for AMR Systems

An AMR system generally consists of the host station located at the power grid company and the on-site terminals located at the power distribution end, including concentrators, collectors and smart meters. The primary function of AMR systems in China is for the automated meter reading of power usage data from end users. Currently, the vast majority of AMR systems deployed in China only allow master-slave communications in which smart meters can only respond to instructions from the host station but cannot voluntarily initiate communications to the host station. It requires an upgrade of the communications protocols from the host station level for an AMR system to achieve peer-to-peer communications.

It is essential for AMR systems to adopt suitable communications technologies to maintain a transmission environment that is reliable, timely, non-interrupted and flexible to adapt to varying interference signals. While the upstream data transmission between the host station and the concentrators is typically conducted by non-PLC technologies through public or private wireless network or optical fiber cable network, the downstream data transmission between the concentrators and smart meters or collectors can be conducted by PLC or other communications technologies as follows:

- **PLC.** The PLC technology is a communications technology which allows transmission of data through low-voltage power lines, usually with voltage at 220V/380V. Compared to other communications technologies, such as RS-485, wireless and optical fiber cable, PLC has two significant advantages in (i) lower installation and maintenance cost due to utilization of existing power lines; and (ii) greater potential for application in various fields attributable to the widespread of power grid systems. The major types of PLC technologies include:
 - **Narrowband PLC**, which is currently the most widely adopted and mature communications technology for the AMR application in China and accounted for approximately 80% of the AMR systems deployed in China, according to Frost & Sullivan. Compared to broadband PLC, narrowband PLC has lower cost and lower energy consumption but is more susceptible to power line signal interference and can be easily influenced by electrical load.
 - **Broadband PLC**, which has a significantly higher data transmission rate theoretically ten times faster than narrowband PLC. Broadband PLC is a more recently developed technology and has the advantages of higher data capacity, reliability and anti-interference capability. However, due to its limitation of shorter transmission distance, broadband PLC requires higher cost for construction of repeaters. Currently, the PLC technology, whether narrowband or broadband, adopted in China’s AMR systems generally cannot achieve interconnection and intercommunication (互聯互通), meaning that AMR products and PLC communications protocols of different PLC technology companies are not compatible with all others. As such, a new industry standard for broadband PLC is currently being developed in China, which to our best understanding is being pursued and promoted by State Grid to ultimately become a unified standard of communications to be complied by all PLC technology companies in China supplying broadband PLC products for State Grid’s AMR systems to ensure their interconnection and intercommunication, which in turn should greatly facilitate the efficiency of advancements in smart energy management and functionality enablement in the long run. At present, there is only very limited adoption of broadband PLC in China’s AMR systems with a penetration rate of only approximately 1% according to Frost & Sullivan, which are not conformed to a unified standard of communications and currently do not support interconnection and intercommunication. Given the formulation of the intended new industry standard is still in progress, to our best understanding and

INDUSTRY OVERVIEW

experience, we expect that any commercial launch of new AMR systems bearing the new unified industry standard of broadband PLC will much likely be preceded by a period of local pilot installations, evaluations and fine tuning to validate a stable mass deployment. Accordingly, it is currently expected that while broadband PLC technology is being proposed for future promotion and adoption under China’s AMR systems, it will undergo a period of gradual migration after the new industry standard is formally adopted as more local pilot installations are carried out and evaluated, and will take a faster and more comprehensive penetration once the local pilot installation and evaluation stage has yielded sufficient success. According to forecast by Frost & Sullivan, the penetration rate of broadband PLC in China’s AMR systems is expected to reach 20% by 2021, assuming such unified industry standard of broadband PLC can be formally adopted in 2017.

OFDM is a newer generation and higher-speed modulation scheme for the PLC technology, as opposed to lower speed modulation schemes, such as BPSK. OFDM modulation scheme can be adopted in both narrowband and broadband PLC. OFDM PLC has a higher data transmission rate, stronger anti-interference capability and higher frequency utilization than conventional non-OFDM PLC but requires a higher cost for production. Several major PLC IC suppliers in China, including us, have been focusing on developing new products based on OFDM PLC. OFDM PLC, both narrowband and broadband, is currently at an early stage of commercial application with relatively limited adoption in China’s AMR systems, according to Frost & Sullivan.

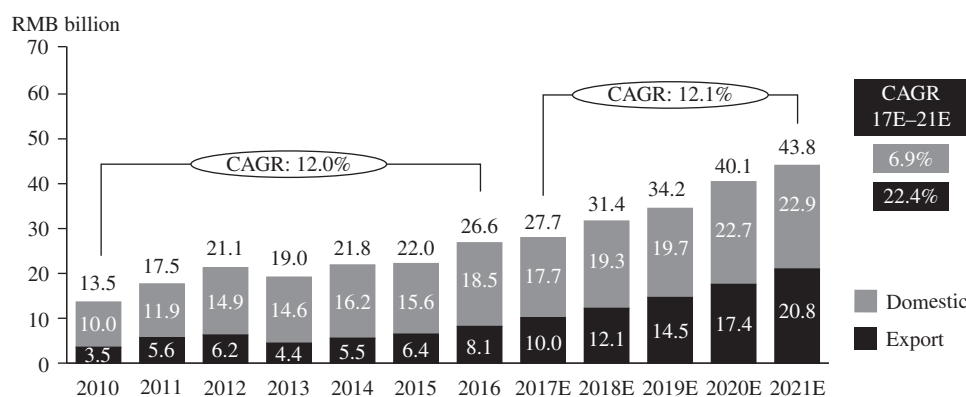
INDUSTRY OVERVIEW

- RS-485.** RS-485 is a communications technology for transmitting data between AMR devices connected by the RS-485 cable. RS-485 is a mature technology adopted in China since the 1980s and is the second most widely adopted communications technology for the deployment of AMR systems in China, according to Frost & Sullivan. RS-485 has high reliability in transmitting data through the RS-485 cable, but it requires a large quantity of additional wiring and thus a higher installation and maintenance costs. RS-485 can be combined with PLC in a semi-PLC AMR system in which collectors gather data from RS-485 cable connected meters and transmit data to concentrators through power lines.
- Wireless.** The wireless technology requires no additional wiring and is not subject to the interference of and limitations imposed by the power grid infrastructure. However, it has relatively poor reliability, short transmission distance and low penetrating capability and is exposed to higher security risks. Moreover, wireless communications require a large amount of network nodes and therefore significant maintenance costs. Due to these limitations, the adoption of the wireless technology is low for the AMR application in China.
- Optical fiber cable.** Using an existing optical fiber cable network, such as the television cable network, could allow installation of AMR devices at low costs and avoid electromagnetic interference from the power lines. However, this requires collaboration between different government authorities and industry participants, such as those of the power sector and the broadcasting sector, which has significantly limited the adoption of this technology for the AMR application in China.

Market Size for the AMR Application

The major AMR devices are smart meters, concentrators and collectors, each of which, when deployed in an AMR system adopting PLC as its communications technology, is in general embedded with one PLC module containing one PLC IC. In a typical PLC AMR system, each concentrator is connected, directly or indirectly, with up to around 100 smart meters. Collectors are only used in semi-PLC AMR systems, which have a lower penetration in China than the full PLC AMR systems. As such, according to Frost & Sullivan, the vast majority of PLC ICs produced for the AMR application in China are used for the assembly of smart meters, and the sale of smart meters also accounts for the vast majority of AMR devices sold in China.

The following chart sets out the historical and projected sales value of smart meters in China from 2010 to 2021:



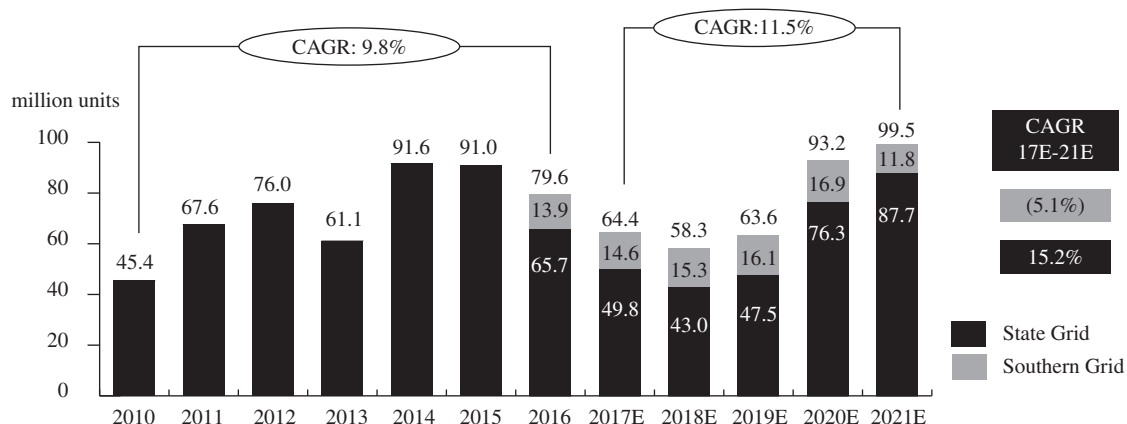
Source: Frost & Sullivan

According to Frost & Sullivan, total sales value of smart meters in China grew from RMB13.5 billion in 2010 to RMB26.6 billion in 2016, representing a CAGR of 12.0%. This general increase was mainly driven by the massive procurement of smart meters by State Grid in

INDUSTRY OVERVIEW

connection with its commercial deployment of AMR systems since 2010. On the other hand, China is also a major exporter of smart meters in the world. As a number of overseas markets such as Asia-Pacific, Africa and Latin America are also promoting the deployment of AMR systems, the global demand for smart meters and consequently the export demand for smart meters from China are expected to grow in the next few years. Frost & Sullivan estimates that total sales value of smart meters in China will grow at a CAGR of 12.1% from RMB27.7 billion in 2017 to RMB43.8 billion in 2021.

From the demand side, State Grid and Southern Grid are the largest purchasers of smart meters in China and they generally procure smart meters through bidding process. The following chart sets out the aggregate historical and projected total bidding volume of smart meters by State Grid and Southern Grid from 2010 to 2021:



Source: Frost & Sullivan

According to Frost & Sullivan, State Grid commenced commercial deployment of AMR systems in 2010, as a result, State Grid's annual bidding volume for smart meters increased at a CAGR of 6.5% from 45.4 million units in 2010 to 65.7 million units in 2016 and is expected to grow at a CAGR of 15.2% from 2017 to 2021. According to Frost & Sullivan, State Grid's bidding volume of smart meters decreased from 91.0 million units in 2015 to 65.7 million units in 2016 and is expected to further decrease to 43.0 million units by 2018, partly as penetration of smart meters under State Grid's first-round commercial deployment is reaching saturation, and also as State Grid has exhibited a trend of slow-down in its procurement of smart meters in anticipation of a new industry standard for broadband PLC which is expected to be formally adopted in 2017. Such bidding volume is expected to pick up and increase to 87.7 million units by 2021 as smart meters in China are expected to enter into a new phase of upgrades from 2018 onward.

According to Frost & Sullivan, Southern Grid commenced commercial deployment of AMR systems in 2016 and its bidding volume of smart meters reached 13.9 million units in the same year. Southern Grid's first-round commercial deployment of AMR systems is expected to cover all of its current 75 million users by 2020 with bidding volume of smart meters expected to increase from 14.6 million units in 2017 to 16.9 million units in 2020 and decrease to 11.8 million units in 2021, according to Frost & Sullivan.

In addition to smart meters, concentrators are also an important type of AMR device which serves as a critical link between the host station located at the power grid companies and other on-site terminals of an AMR system. To ensure seamless communications between concentrators and downstream AMR devices, such as collectors and smart meters, power grid companies are usually more inclined to adopt the same or the most compatible communications protocols for collectors and smart meters as is adopted for the concentrator in an AMR system. We believe supplying concentrators in an

INDUSTRY OVERVIEW

AMR system enables PLC technology companies to better secure their market share for other AMR system components. According to Frost & Sullivan, the sales volume of concentrators in China adopting the PLC technology increased at a CAGR of 7.0% from 2010 to 2016, and is expected to grow at a CAGR of 6.8% from 2017 to 2021, reaching 1.5 million units in 2021.

Key Drivers for the AMR Application

As described above, China’s PLC market for the AMR application is expected to continue to grow during the period from 2017 to 2021. The key drivers for the growth are:

- ***Cost benefit and management efficiency for AMR systems.*** AMR systems replace traditional meters with smart meters, which enable the automated meter reading of power consumption instead of manual meter reading and consequently help reduce the operational cost of power grid companies considerably. AMR systems also enable real-time monitoring of power consumption data and help improve the management efficiency of power grid companies for routine maintenance. Moreover, AMR systems can accurately calculate power line transmission loss on the terminal side, which help power grid companies avoid large energy loss.
- ***Favorable governmental policies and industry initiatives.*** The development of the AMR application in China has been, and will continue to be, driven by favorable policies of the PRC government as well as initiatives implemented by State Grid and other major industry participants, including:
 - the Guidance on Promoting the Development of Smart Grids (《關於促進智能電網發展的指導意見》) jointly issued by the NDRC and the NEA in 2015 to promote the enhancement of intelligence of the power grid system;
 - the Guidance on Accelerating the Construction and Overhaul of Power Grids (《關於加快配電網建設改造的指導意見》) issued by the NDRC in 2015 to promote the equipment upgrades and technological innovation of power grids in China;
 - the Action Plan for Overhauling the Construction of Power Grids (2015–2020) (《配電網建設改造行動計劃 (2015–2020)》) issued by the NEA in 2015 for the increase in investment in the construction of power grids in China;
 - the Development Plan of China Southern Power Grid (2013–2020) (《南方電網發展規劃 (2013–2020)》) issued by Southern Grid in 2013 to, among others, promote the development of smart grids; and

INDUSTRY OVERVIEW

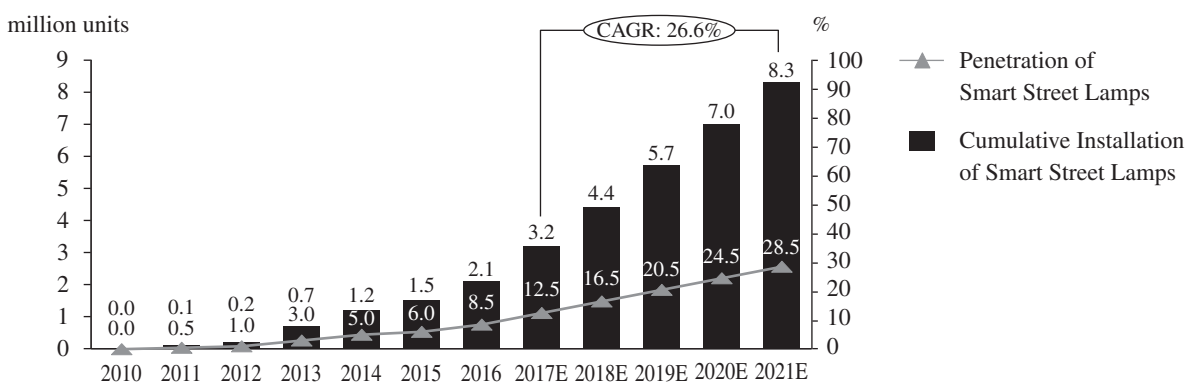
- the White Paper on Green Development (《綠色發展白皮書》) issued by State Grid in 2010 with the target to roll out a sophisticated smart grid system with the full deployment of AMR systems by 2020.
- **More sophisticated power demand side management.** Users are expected to have increasing needs for power demand side management. Power grid companies in China are likely to see more diversified user demand, such as distributed power generation monitoring and peer-to-peer communication services. The higher demand for new AMR functionality is expected to fuel the demand for and further development of the AMR application in China.
- **Advancement in technology.** With the advent of smart grids and fueled by the continual improvements in big data technology and communications technology, the power grid companies are likely to have increasing needs for AMR systems in terms of data processing and peer-to-peer communications capabilities. The advancement in technology is likely to continue to drive the further upgrades of AMR systems in the future.
- **“Four-Meters-In-One” (“四表合一”) Initiative.** There is a trend in China to integrate electric, water, gas and heat meters into one single AMR system, which is led by State Grid because of the successful deployment of AMR systems in the power grid sector. The Four-Meters-in-One initiative is likely to strengthen the application of PLC technology. Starting from the end of 2015, State Grid began to implement such pilot integration projects currently covering more than ten provinces in China, according to Frost & Sullivan.
- **Export growth.** An increasing number of countries is expected to deploy AMR systems in the world, according to Frost & Sullivan. These include selected markets in Asia-Pacific, Africa and Latin America, which are the main export destinations of smart meters manufactured in China. The potential growth in export of smart meters from China is expected to drive the future growth of China’s PLC industry.

SMART ENERGY MANAGEMENT APPLICATIONS

Streetlight Control

A streetlight control system is a centralized public street lighting system equipped smart street lamps which incorporate real-time data communication components that can enable the monitoring and management of such a system on a highway or within a district. PLC and ZigBee, a form of wireless solution, are at present the two dominant communications technologies used for the streetlight control application in China. Due to PLC’s higher reliability and data transmission rate as well as lower installation cost, PLC has become the most popular communications technology for streetlight control in China and accounts for a market share of approximately 60% to 70% by the installation volume of smart street lamps, according to Frost & Sullivan.

The following chart sets out the historical and projected cumulative number of street lamps installed in connection with streetlight control systems in China and their penetration rate from 2010 to 2021:



Source: Frost & Sullivan

Streetlight control is still at an early stage of development in many areas in China. According to Frost & Sullivan, the cumulative number of smart street lamps installed in China reached 2.1 million units in 2016, accounting for only approximately 8.5% of all street lamps installed in China. The number

INDUSTRY OVERVIEW

of smart street lamps is expected to achieve significant future growth as the development of streetlight control application becomes more mature and offers higher reliability. Frost & Sullivan estimates that the cumulative number of smart street lamps installed in China will grow at a CAGR of 26.6% from 3.2 million units in 2017 to 8.3 million units in 2021, reaching a penetration rate of approximately 28.5% in 2021.

The key growth drivers for streetlight control application are:

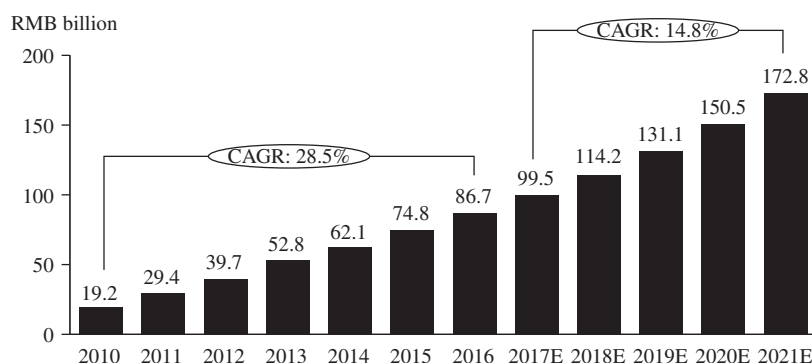
- **Need for energy and cost saving.** Compared to the traditional approach of installing energy-saving streetlight equipment, such as LED lighting, the deployment of streetlight control systems provides a further means to lower energy costs and increase the operational efficiency of streetlight systems to a significant extent.
- **Advantages in PLC technology.** As the PLC technology evolves, the functionality and performance of the PLC-based streetlight control systems have improved and will likely to continue to improve. The installation process of a PLC-based streetlight control system is relatively simple without requiring extra cabling, which greatly lowers the installation and maintenance costs of the system compared to other competing technologies.
- **Increased functionality of streetlight control systems.** Streetlight control systems are being further developed to offer enriched functions such as collection and analysis of environmental data such as temperature, humidity and density of hazardous particles. Streetlight control systems may be further equipped with various sensors and monitors to enable ancillary functions such as loudness detection and vehicle plate recognition.
- **Development of smart city initiative.** As highlighted by the Guidance on Active Promotion of “Internet+” Actions (《關於積極推進“互聯網+”行動的指導意見》) issued by the State Council in 2015, the PRC government is promoting the development of the smart city initiative, which would further drive the development of the streetlight control application as a main component of the smart city development plan.

Building Energy Management

Building energy systems, in particular HVAC and interior lighting systems, constitute one of the main uses of urban energy consumption in China. Building energy management solutions have been developed using the PLC technology to enable real-time control, monitoring and processing of energy consumption data for various energy systems within a building or multiple buildings.

The major communications technologies used for control and communication systems of the building energy management application include PLC, wired technology (such as twisted pair) and wireless technology. With lower installation cost, strong anti-interference ability and higher stability, PLC is increasingly being recognized as a viable communications technology used for building energy management, particularly for industrial and commercial buildings in China.

The following chart sets out the historical and projected total sales revenue for building energy management application in China from 2010 to 2021:



Source: Frost & Sullivan

INDUSTRY OVERVIEW

The building energy management application is at its early stage of development in China. According to Frost & Sullivan, total sales revenue for the building energy management application in China grew at a CAGR of 28.5% from RMB19.2 billion in 2010 to RMB86.7 billion in 2016 and is expected to grow further at a CAGR of 14.8% from RMB99.5 billion in 2017 to RMB172.8 billion in 2021.

The key growth drivers for building energy management application are:

- **Corporate awareness of energy management.** With the promotion of smart city and green building concepts by the Ministry of Housing and Urban-Rural Development of the PRC, real estate companies have become more aware of, and play an increasingly active role in implementing building energy management.
- **Need for energy saving and management.** Building energy management solutions can bring substantial economic benefits as it can reduce as much as 40% of the amount of energy consumption. In addition, the PLC control system allows real-time remote control of the energy systems within a building or a multiple-building area and enables effective energy management through collection and analysis of power consumption data and environmental metrics.
- **Advantages in PLC technology.** As PLC-based building energy management solutions can be tailored to different client needs, the advancement in the PLC technology allows increased flexibility in the design of solutions to address evolving market needs. In addition, PLC-based solutions do not require extra re-wiring, which lowers the installation costs significantly and gives a comparative advantage over major competing technologies. More particularly, PLC-based solutions have a cost advantage for buildings constructed in earlier periods without built-in cable infrastructure where re-wiring for the whole building structure would otherwise be required. Moreover, when building energy management is applied to a multi-story and multi-unit building as a whole, data transmission interference would cause the communications via wireless technology to be less practicable and more costly than PLC. Future trends of PLC applications in building energy management include the use of “PLC+RF” dual mode technologies which utilize the complementary merits of PLC and RF technologies to overcome both signal blockage in concrete structure and noise-interruption. “PLC+RF” technology is expected to become a mainstream PLC technology for control and communication systems of building energy management in the next few years. PLC technology is also seeing increasing use in the monitor and control of various energy systems within a building by a single unified control platform. As PLC technology evolves over the years, the sales revenue for the building energy management application adopting PLC technology in China are expected to reach RMB2.3 billion by 2021, according to Frost & Sullivan.
- **Favorable governmental policies.** The PRC government has promulgated a series of favorable policies to support the development of smart building energy management, including:
 - Chapter 43 (Promoting Effective Resource Utilization) of the 13th Five-Year Plan of National Economy and Social Development (《國民經濟和社會發展第十三個五年規劃綱要》) issued by the NDRC in 2016;
 - the 13th Five-Year Special Plan for Energy Saving for Buildings (《十三五建築節能專項規劃》) issued by the Ministry of Housing and Urban-Rural Development of China in 2015;

INDUSTRY OVERVIEW

- the Opinion on Accelerating the Development of the Energy Saving and Environmental Protection Industry (《關於加快發展節能環保產業的意見》) issued by the State Council in 2013; and
- the Proposal for Green Building Action (《綠色建築行動方案》) issued by the Ministry of Housing and Urban-Rural Development of the PRC in 2013.

Photovoltaic Power Management

In distributed photovoltaic power stations, micro-inverters are often used to convert direct current generated by a single solar module to alternating current. Photovoltaic power management systems are developed to control and manage micro-inverters to achieve higher efficiency in solar power generation.

PLC and ZigBee are the two commonly used technologies to enable data transmission with and remote control of micro-inverters in a photovoltaic power management system. PLC has lower installation cost due to utilization of existing power lines while ZigBee offers better stability within a limited transmission distance.

The photovoltaic power management application is also at its early stage of development in China. The key drivers for the development of this application are:

- ***Increasing demand for solar power.*** With the rising public awareness for use of renewable energy and the PRC government’s subsidies for installation of distributed photovoltaic power stations, there is a growing demand for solar power generation from distributed photovoltaic stations and stronger demand for micro-inverters.

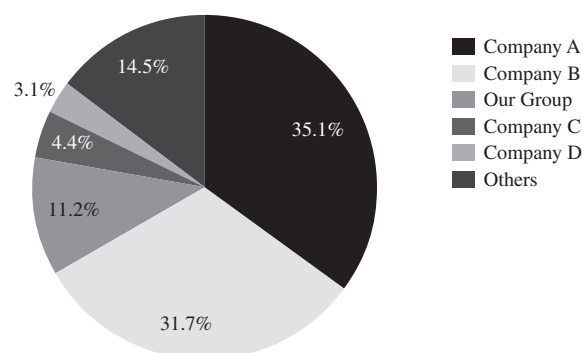
INDUSTRY OVERVIEW

- **Advantages of micro-inverters over conventional inverters.** Micro-inverters adopt a one-to-one energy converting process in which one micro-inverter is connected to only one solar module for converting direct current to alternating current, whereby a conventional inverter is connected to multiple solar modules. Micro-inverters offer several benefits over conventional inverters, such as higher flexibility and system efficiency by setting different controls for each solar module to monitor its respective voltage on a real time basis and achieve greatest possible power output.

COMPETITIVE LANDSCAPE OF CHINA’S PLC MARKET

China’s PLC market is largely concentrated with a few major PLC IC suppliers. According to Frost & Sullivan, there were approximately 20 PLC suppliers in China as of the end of 2016 and the top five PLC IC suppliers, which were all domestic players, accounted for more than 85% of total sales volume of PLC products in 2016. Most of the major PLC IC suppliers, including us, have a fabless production model under which IC chipsets are not produced, or “fabricated,” in-house but sourced from suppliers such as IC foundries or back-end IC service providers, with the relevant IC designs provided by PLC IC suppliers.

According to Frost & Sullivan, we were the third largest PLC IC supplier in China in 2016 with a market share of 11.2% in terms of sales volume of PLC products. Our two major competitors accounted for 35.1% and 31.7% of the total sales volume of PLC products in China in 2016, respectively. The following chart sets out the market shares of major PLC IC suppliers in China in terms of sales volume of PLC products in 2016:



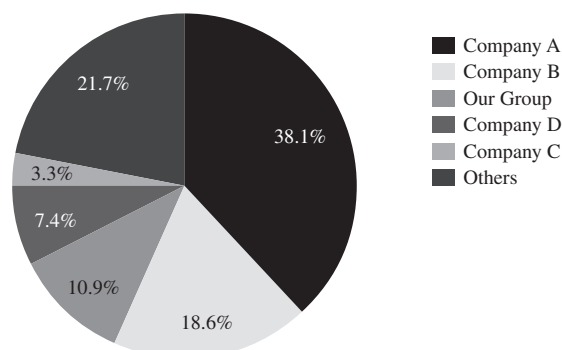
Source: Frost & Sullivan

Notes:

- (1) Company A is listed on the Shanghai Stock Exchange and supplies PLC products mainly for the AMR and streetlight control applications.
- (2) Company B is listed on the Shenzhen Stock Exchange and is one of the earliest PLC IC suppliers in China. Company B focuses on the AMR and smart home applications.

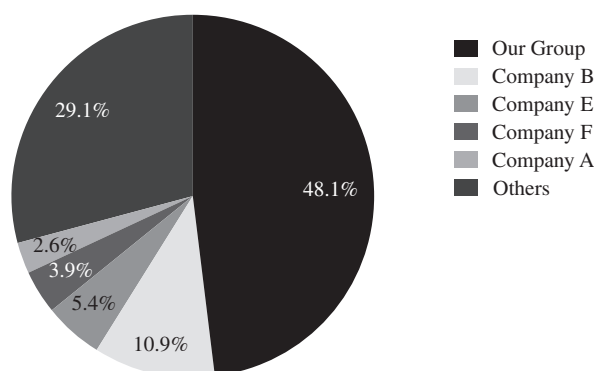
INDUSTRY OVERVIEW

With respect to the AMR application, we were the third largest PLC IC supplier in 2016 in China, with our sales accounting for 10.9% of State Grid’s total bidding volume for PLC-based AMR devices in 2016. The following chart sets out the market shares of major PLC IC suppliers in China in terms of State Grid’s bidding volume for PLC-based AMR devices in 2016:



Source: Frost & Sullivan

With respect to the streetlight control application, we were the largest PLC IC supplier in China with a market share of 48.1% in terms of sales volume of streetlight control PLC products in 2016. The following chart sets out the market shares of major PLC IC suppliers in China in terms of sales volume for the streetlight control application in 2016:



Source: Frost & Sullivan

Barriers of Entry to China’s PLC Market

High barriers of entry exist for the PLC market in China. These include:

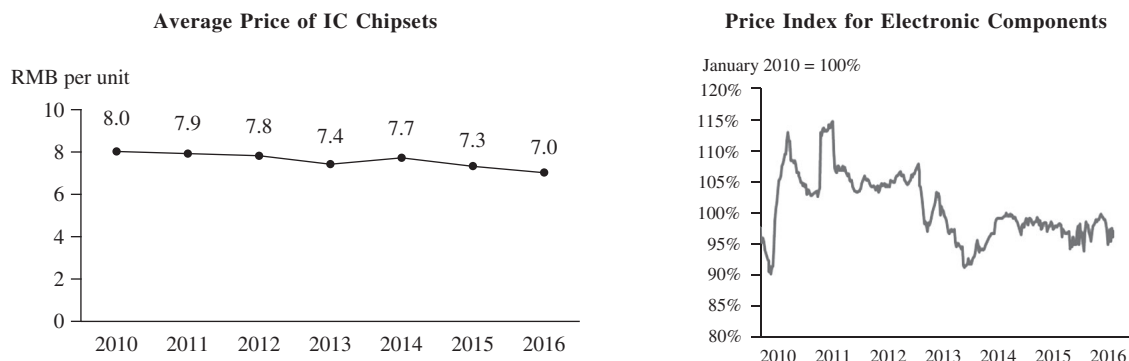
- **Technical barrier.** China’s power grid systems are featured by massive users, complicated power grid structure and networks, intensive interference on the power lines, as well as large disparity between regions. New entrants, especially foreign PLC providers, face high technical barriers to come up with customized and flexible PLC products to address the substantial technical problems and requirements resulting from the complexity of China’s power grid infrastructure and operating environment.
- **Customer barrier.** For the AMR application, as the power distribution sector is dominated by the two state-owned power grid companies, a substantial amount of time and efforts will be required for new entrants to become a qualified supplier of and cultivate business relationships with these power grid companies. New entrants face significant barriers in competing with existing PLC IC suppliers who have already established stable relationships with the power grid companies.
- **Talent barrier.** The PLC industry is technology-intensive. There is constant pressure on the new entrants to attract and retain suitable professional talent who possess sufficient technological expertise in the design and development of PLC products, as well as adequate experience in such fields related to the PLC applications.

INDUSTRY OVERVIEW

PRICE TRENDS IN CHINA’S PLC MARKET

Prices of Raw Materials

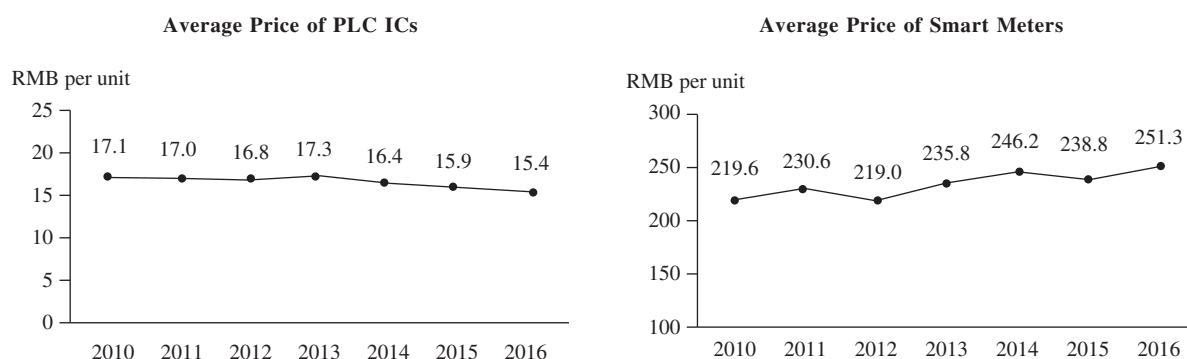
Raw materials for PLC ICs mainly consist of IC chipsets and electronic components, such as capacitors and inductors. IC chipsets account for the majority of raw materials for PLC ICs. According to Frost & Sullivan, the average price of IC chipsets decreased gradually from RMB8.0 per unit in 2010 to RMB7.0 per unit in 2016 and is expected to remain relatively flat for the next few years due to the long-term relationships between IC chipset providers and PLC IC suppliers. The price index of electronic components showed a similar pattern during the period from 2010 to 2016 and is expected to fluctuate within a narrow range for the next few years, according to Frost & Sullivan. The following charts set out the prices of IC chipsets and the price index of electronic components in China from 2010 to 2016, respectively:



Source: Frost & Sullivan

Market Prices of PLC ICs and Smart Meters

The vast majority of the PLC ICs sold in China are used to produce AMR devices, in particular smart meters. According to Frost & Sullivan, the market prices of PLC ICs and smart meters in China are mainly determined by the bidding process of power grid companies. The market price of PLC ICs decreased gradually from RMB17.1 per unit in 2010 to RMB15.4 per unit in 2016 and is expected to decline gradually due to lower costs from increased production scale of PLC IC suppliers. The market price of smart meters ranged between RMB200 to RMB255 per unit during the period from 2010 to 2016 and is expected to decline slowly for the next few years as competition will likely increase among meter manufacturers in China. The following charts set out the market prices of PLC ICs and smart meters from 2010 to 2016, respectively:



Source: Frost & Sullivan