

## Preface

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by **Prof. Dr. Dr. Klaus Töpfer**, Executive Director of the Institute for Advanced Sustainability Studies, Potsdam



Source: Schulzendorff

Until 2025, about 250 million people will move to cities in China, where by then there will be 221 cities with more than 1 million inhabitants. They will be clustered in about 11 regions with more than 60 million people each. In order to ensure energy supply with reduced impact on health and the environment a central element of the Chinese governments' five year plan is developing smart eco-cities. With this, the conservation of energy, water, land and materials, reducing pollution, optimizing the transportation, protecting the environment, and improving building comfort, health and safety should be maximized. This will be a critical moment in the acceleration of industrialization, urbanization and rural development providing great opportunities in many respects, business opportunities for the economic sector and saving potential for millions of households.

As China increasingly embraces clean energy, with newly set renewable energy targets and energy efficiency, smart grid capabilities are crucial for achieving and driving the low-carbon transition. With increasing shares of power from renewable energy facilities with their specifics of intermittency, the transformation of the demand and supply sides towards more flexibility is vital. This is recognized in the 12<sup>th</sup> Five-Year Plan for National Economic and Social Development, where the People's National Congress has set up a goal for the acceleration of smart grid developments. Additionally to balancing the demand and supply sides smart grids can potentially contribute to a reduction in overall need of energy of up to 25 % and reduce the costs of integrating renewable energy into the power system. Doing this will both be useful for the economy, opening up new business models and be a challenge for the regulators, who need to create a supportive framework. Such a regulatory basis should provide incentives and ensure an acceleration of the smart grid development also encouraging competition in order

to fuel innovation. Supporting the development of industrial clusters, by creating special industry funds can be one option to fully realize the potential of the economic opportunity of the smart grid development. Considering that China in 2013 for the first time surpassed the spending of the United States on smart grid technologies, accounting for more than a quarter of the worldwide smart grid spending, it is clear that a massive transformation of the country's energy landscape is underway. The potential of being a global leader in the technology development and serving as a role model in smart energy system development however still implies regulatory challenges in order to balance the energy policy goals of reliability, affordability and sustainability – keeping in mind that the social dimension of energy is central to sustainable energy systems.

Sincerely,

**Prof. Dr. Dr. Klaus Töpfer**

## Preface

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by **Dr. Werner Brinker**, Chairman of the Board of the EWE AG, Oldenburg



Europe is committed to the decarbonization of its economy, driven by the European Union (EU) climate and energy policies on renewable energy, low carbon emissions, energy savings and energy efficiency. The further development of the energy sector is pivotal to meeting these objectives, ensuring the transition towards a more sustainable energy system and driving innovation in the energy sector.

While the German energy sector is already well prepared for a successful integration of decentralized power generation from renewable energy sources, Germany is currently heading the necessary legal and regulatory steps to build future-oriented electricity networks, complete the market integration of renewables and ensure at the same time the functioning of electricity markets.

Automation as well as information and communication technology (ICT) are playing an important role in this context. So called *smart grids* are deemed to improve the efficiency, reliability, and sustainability of the production and distribution of electricity. They are able to collect, transmit and use information about the behaviors of electricity producers and consumers in an automated fashion by means of automation and ICT.

In Germany, the transition towards smart grids is driven by a large variety of different institutions and companies interacting on well-functioning markets for electricity and associated products. However, despite all the valuable experiences with regard to the build-up of smart grids, Germany's regulatory framework has not yet been adapted completely to the vision of smart grids. In China, the transition towards smart grids is mainly pushed forward by the government and the politically powerful and vertically integrated grid operators due to the absence of competition in many parts of the energy sector and the non-existence of markets for electricity.

The present study aims to give regulatory recommendations for the deployment of smart grids in China based on German and international experiences and ongoing discussions. I

am convinced that the results can help Chinese policy makers to optimize smart grid regulation in China. I am even more convinced that, based on this study, China and Germany have the unique opportunity to link their strengths, overcome weaknesses and withstand threats to maximize overall benefits for the society during the build-up of smart grids. As Germany is already a very important partner for China in Europe and China is of utmost importance for Germany in Asia, it could be important to align and ensure the right legal and regulatory framework as a precondition for a more sustainable energy sector in China.

We as the management of the EWE Group are honored that Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH chose experts from our companies to support the further development of smart grids in China. It was also a pleasure for us to welcome a group of Chinese experts in Oldenburg in April 2013.

Finally, I would like to wish you many new insights during the reading of this study.

Your

A handwritten signature in black ink, appearing to read 'W. Brinker', written in a cursive style.

**Dr. Werner Brinker**

## Preface

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by **Dr. TONG Guangyi**, Deputy Director General of the Electricity Department

National Energy Administration of the P.R. China, Beijing



In light of today's environmental challenges, in order to meet the requirements of sustainable development, economic restructuring as well as flexible transmission, distribution and utilization of electricity, optimizing the way we operate our power systems by building a smart grid has become an inevitable trend. Therefore, how to rationally and scientifically lay out a roadmap and at the same time design a sound legal and regulatory framework to promote smart grid development is a major question. This study gives important insights on modern smart grid concepts, policy frameworks and avenues for development in Germany and elsewhere providing us with a wealth of ideas and pathways to choose from.

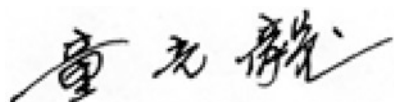
According to an old Chinese saying "advice from others may help one overcome one's shortcomings". To study the advanced experiences of other countries and learn from their example is of great significance to the development of China's smart grid. This study on "Regulatory Pathways for Smart Grid Development in China" includes an analysis of the current state of smart grid development in China and Germany, summarizes the latest discussion on the regulatory environment for smart grids in Germany and compares it with the current situation in China. Based on this analysis and in accordance with China's overall energy development targets, the study provides seven policy recommendations and three regulatory roadmaps to promote smart grid development in China.

I believe this study provides a useful reference for the healthy development, effective guidance and supervision of China's smart grid. We want to take this opportunity and express our appreciation to Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and the team of experts led by the German side. We thank all the contributors for their rigorous

and prudent research approach as well as their professionalism, hard work and dedication in the whole process of writing this report.

At last, I sincerely wish all the best for the future development of smart grids in Germany and China.

Sincerely,

A handwritten signature in black ink, consisting of three Chinese characters: 童光毅 (Tong Guangyi). The signature is written in a cursive, flowing style.

Dr. TONG Guangyi

## Preface

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by **Bernhard Zymła**, Head of the Energy Department

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Eschborn



The primary driver for smart grid development in Germany is the integration of a rising share of electricity generated from variable renewable energies into the power system. The German Federal Government's Energy concept for an environmentally friendly, reliable and affordable energy supply of September 2010 and the Package of Energy Laws enacted in July 2011 contain guidelines and objectives related to Germany's future energy system. The government plans express a commitment to sustainable development and environmental protection by setting a target to reduce CO<sub>2</sub> emissions by 40 % compared to 1990 by 2020 and by 80 to 95 % by 2050.

With the German energy transition, the *Energiewende*, the German government has taken ambitious steps and action to tackle the problems related to fossil fuel combustion. To achieve the ambitious targets for reducing greenhouse gas emissions while also gradually phasing out nuclear power until 2022, a rapid expansion of renewable energy is essential. In 2025, 40 to 45 % of gross electricity consumption is to be covered by renewables, with the share planned to rise to 80 % by 2050. An increasing share of intermittent renewables requires a fundamental restructuring of our electricity system, allowing for an effective synchronization of demand with increasingly variable supply, while at the same time maintaining system reliability and stability. To achieve this objective, electricity markets have to be reformed to set the right incentives for an efficient utilization of the system's flexibility resources on the supply and demand side. For this purpose the development of a future-oriented electric power network infrastructure – or smart grid – is indispensable.

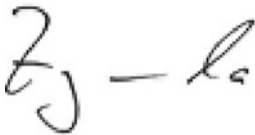
Smart grids enable real-time communication between electricity suppliers, grid operators and consumers with the help of modern information and communication technologies facilitating an intelligent grid operation as well as the efficient utilization of all power system components through supply- and demand-side management. Thus, it is possible to integrate a high share of variable renewable energies without compromising the reliability of supply, while cutting peak loads and reducing the need for so-called *baseload* power plants. At the same time,

the upgrade of the electric power grid with the help of innovative grid technologies helps to reduce the need for traditional grid expansion avoiding substantial costs. Smart grids lead to the emergence of new business models and new market players together with an increasing spectrum of energy services in the years to come.

The development of smart grids requires a sound legal and regulatory basis that sets the right incentives and clearly defines the roles of different power system actors, the interaction between them and enables a smooth communication between its components. This study presents an overview of China's and Germany's power system as well as each country's view on smart grid development. Built on this foundation recommendations for the adaptation of the policy and regulatory framework were developed aimed at facilitating the development of smart grids in China in order to allow the integration of a rising share of renewable energy in its power system.

We trust you will have an interesting and informative read.

Sincerely,

A handwritten signature in black ink, appearing to read 'Zy - la' or similar, with a stylized, cursive script.

**Bernhard Zyma**



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China

Brunekreeft, G.; Luhmann, T.; Menz, T.; Müller, S.-U.;  
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