China Energy Policy Newsletter: August 2018

1. Recent project activities

International grid planning workshop held in Beijing

On 18 July, CNREC, GIZ, and dena jointly hosted a workshop on the *Future Grid Planning in China: What can China learn from Europe?* The workshop introduced power system planning in China and Europe, and participants discussed grid planning challenges and future visions.

Ms. Carina Heinrich presenting at the workshop

Chinese experts presented China's power system planning, discussing how power load forecasts mainly various social and economic indicators, such as power consumption per capita. Factors like power mix, production methods, weather, power consumption behavior, and prices for electricity and EV are also taken into account. Adequacy analysis includes generation and transmission. The goal is to achieve the highest possible non-fossil energy consumption with the minimum cost.

Mr.Peter Børre Eriksen, chief engineer of Energinet, presented on the European ten-year grid planning process,including advanced methods for measuring the adequacy of power system.In consultation with stakeholders, planners develop a variety of scenarios to establish a range ofuncertainties in grid planning.Thepresent planning model enables planners toevaluate each new transmission and storage project determined by TSOs using cost-benefit analysis (CBA), after identifying intra-regional and intra-country interconnection need under different scenarios. Cost-benefit analysis includes explicity consideration of societal benefits of adding new lines such asreducing emissions of carbon and other pollutants.

Expert Ms. Carina Heinrich from German Federal Network Agency introduced the drivers, process and solutions of the German Network Development Plan. Heinrich's talk described the NOVA principle for grid upgrades used in Germany. (See the interview with Ms. Heinrich below for more on this topic.)

The chief expert of CNREC, Mr. Kaare Sandholt, presented CNREC's power system optimization model (EDO). The bottom-up linear modelling shows the demand and choke points of transmission inter-provincially, and uses to economic optimization of the provincial and regional power dispatch. The EDO model is similar to the models used in the European grid planning process.

Discussion results highlighted several differences between China and Europe grid planning, including power system scenarios setting, planning timeframes, orientation of power system development and project evaluation methodology. Experts pointed out several suggestions for China to learn from Europe. China urgently needs a well-connected network and mutual supports between provinces for integrating renewables. Authorities should consider a wider range of more complex scenarios for grid planning, moving beyond the present system. China could also adopt more comprehensive project evaluation methodology, including additional emphasis on environmental assesssement, system benefits, and other implicit benefits.

2. China energy transition updates

1H 2018 electricity show electricity consumption surging

The National Energy Administration (NEA) reported the status of energy sector development for the first half year of 2018. Coal consumption saw a 3.2% year-on-year growth rate for the first five months, mainly driven by a rapid raising consumption of power coal. Gas consumption grew sharply (16.8% year-on-year), driven by urban, industrial, and power-sector gas use. In the power sector, the total electricity consumption growth of 9.4% for the first half year was the highest for the previous six years. Of this figure, secondary industry consumption contributed 5.3 percentage points. Expert comments in media reports have given various explanations for the high growth in consumption, including rebounding infrastructure investment, ongoing urbanization (urban residents consume more energy), rising heating and cooling loads due to a relatively cold winter and hot spring/summer, rising demand from new industries such as digital currencies, and electrification of some industrial and heating applications.[1] Since the second quarter, coal, power, and natural gas consumption have remained high abnormally during off seasons. Due to rising coal prices, generation companies have experienced losses.[2]

Low-carbon power sources growing

During the first half year, nuclear, wind, and solar power accounted for 66.1% of newly installed capacity. China now has 687 GW of renewable energy capacity: 344 GW hydropower, 172 GW of grid-connected wind power, 155 GW of solar PV, and 16 GW of biomass power. Distributed PV accounted for 50.4% of newly-installed solar PV capacity. Distributed PV additions grew by 72% year-on-year, whereas utility-scale PV additions decreased. The top four provinces for PV additions were Shandong, Zhejiang, Henan, and Jiangsu, accounting for 52.6% of the total.

Curtailment situation of wind and solar improving

Wind and solar curtailment rates both decreased. Solar PV experienced curtailment of 3.6% in the first half year, a year-on-year decline of 3.2 percentage points. Only Gansu, Xinjiang, and Shaanxi had solar curtailment rates over 5%,the maximum threshold set by the National Energy Administration (NEA). The wind curtailment rate was 8.7%, with a year-on-year decline of 5 percentage points,[3] which was lower than the maximum threshold of 12% set by NEA.[4] Improving curtailment likely result from rapid growth in electricity consumption, closer supply-demand balance provincially, as well as policy mandates, such as requirements for increased inter-provincial trading of renewable energy.[5]

Natural gas infrastructure build-out continues

China accounted for a third of global new natural gas consumption in 2017, mainly due to the rush to achieve air pollution control targets by 2017. Industrial and residential retrofits led to shortages of gas supply.[6] In 1H 2018, China promoted construction of gas pipelines and LNG receiving stations.[7] Gas supply rose over 20 billion m^3 compared to 2017, reducing the supply-demand gap to 88.6 billion m^3.[8] In addition, the Shanghai Oil and Gas Trading Centre booked the first domestic LNG bidding transaction.[9]

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[1] Zhang Yousheng et al., "发改委能源研究所：2018 年上半年能源形势、政策及展望," NDRC Energy Research Institute, 1 August 2018, accessed at https://mp.weixin.qq.com/s/NgkAW03_PZxLMy4-cz8DdA; "为什么用电增速持续超预期," CICC, 31 July 2018, accessed at https://mp.weixin.qq.com/s/YWfe9edHnoKbcW9mM5KjNA.

[2] "NEA: Half Thermal Power Companies had losses," National Energy Administration, 31 July 2018, accessed *at* https://www.sohu.com/a/159129656_468637.

[3] "NEA: Renewable Power Generation Expanded, Solar Curtialment Rate in Six Provinces Dropped Below 5%, " National Energy Administration, 30 July 2018, accessed at http://info.hvacr.hc360.com/2018/07/301056733736.shtml.

[4] "The country's energy situation in the first half year: nearly half of thermal power enterprise face losses, distributed photovoltaic construction has exceeded the year scale indicators," Baijiahao, 30 July 2018, accessed at https://baijiahao.baidu.com/s?id=1607401998197702030&wfr=spider&for=pc

[5] "Spring Electricity report: wind powercurtailment greatly improved, wind power is gathering new momentum," Baijiahao, 27 February 2018, accessed at https://baijiahao.baidu.com/s?id=1593529696221340511&wfr=spider&for=pc

[6] Spencer Dale, "BP Statistical Review of World Energy 2018, " BP Report Release Conference, 30 July 2018.

[7] "Notice of the National Development and Reform Commission on matters related to speeding up the key projects of interconnection of natural gas infrastructure in 2018," Wall Street Stories, 19 June 2018, accessed at https://wallstreetcn.com/articles/3340448.

[8] "Analysis of China's total gas consumption in 2017," China Industrial Information, 09 April 2018, accessed at http://www.chyxx.com/industry/201804/628070.html.

[9] "China Natural Gas Market Trading Introduced Tendering Model the First Time, " Energy Observer, 17 July 2018, accessed at

3. Expert interview

Carina Heinrich
Electricity Grid Development Group, German Federal Network Agency

Ms. Heinrich has worked for the German Federal Network Agency (Bundesnetzagentur) since 2016. Her main responsibility is evaluating grid expansion projects under Germany's Grid Development Plan. Ms. Heinrich studied Electricity Engineering with focus on grids and renewable generation at RWTH Aachen University.

QUESTION 1

The Federal Network Agency is responsible for the regulation of energy infrastructures. How does the agency plan and coordinate multiple energy systems including heating, gas networks and power systems?

The Federal Network Agency is responsible for the regulation of most grid-connected infrastructures such as telecommunication, postal services, railways, and energy. In the field of energy the agency is in charge of the regulation of the grid expansion of transmission lines in the power and gas grids. The heating grids are not regulated in Germany, because the Federal Cartel Office doesn't see any necessity for an unbundling of the heating system due to the regional limitation of the grids. The expansion of the gas and transmission systems is planned in two separate processes. Both processes include the compilation and examination of the scenario framework in the first step, and of the grid expansion plan in the second step. Despite the separate processes there are of course points of contact—for example, when assumptions for gas power plants have to be made within the compilation of the respective scenario framework.

QUESTION 2

In the review of National Grid Development Plan (NGDP), how does your agency cope with the input from four transmission system operators (TSOs) in Germany and with any inconsistencies in their plans? What about handling plans from the country's 875 distribution system operators (DSOs)?

The German TSOs are private economical organizations. The transmission grid (defined as 380 kV and 220 kV) is divided into four parts of different sizes. Each TSO is responsible for the operation and the security of supply of his grid area. The costs for the electricity grid and also for new investments in the grid are covered by users, and so by each individual. That's why the grid expansion projects need to be monitored by the Federal Network Agency. The four German TSOs are legally required to submit a joint grid development plan with all of their projects, to ensure that the planned transmission grid is consistent and can be operated safely in the areas of all four TSOs.

The distribution system operators in Germany are responsible for the grids from high voltage (110 kV) to low voltage (0.4 kV). Only the larger DSOs are regulated by FNA, which receives information and data about these grids. All other DSOs are regulated by state authorities. Usually this data is not part of the National Grid Development Plan.

http://chuansong.me/n/2430066641430.

QUESTION 3

TSOs submit transmission projects they plan to build, and the agency selects those that appear most needed. How does the agency examine the efficiency of those projects in both economic and technical aspects?

The TSOs set the extent of the network expansion by applying the NOVA Principle [a German acronym for Grid Optimization Strengthening and Extension]. The background of this principle is that the TSOs have to figure out if there are more efficient ways to solve a problem other than adding a new line. The first step in the NOVA Principle is then the optimization of the grid—for example, via topology measures or transmission line monitoring. The second step is the strengthening of the grid—for example, by a voltage increase. The third step of NOVA is extension of the grid via new lines.

The agency has two main check criteria for submitted projects: technical efficiency and the economic necessity. As the electrical grid needs to be (n-1) secure, the efficiency of new projects is examined by load flow calculations of different failure situations in all 8760 hours of the simulated target year. The technical efficiency is confirmed if the results of calculation have shown a resolve or reduction of line overloads by the new project. The necessity of a new project is examined with the objective of covering projects with a utilization of capacity of less than 20%. If a project doesn't reach this value, this might be an indication that a grid expansion in the distribution grid might be more economically efficient than an upgrade to the transmission grid. In these cases, the agency requests data sets from DSOs to evaluate alternatives.

问题一

联邦网络署负责监管能源基础设施。 该机构如何规划和协调多个能源系统，包括供暖，燃气输送网络和电力系统？

联邦网络署负责大多数的并网基础设施，例如电信，邮政服务，铁路和能源网络。在能源领域，该机构负责监管电力和燃气系统中输送网络的扩展。供热系统在德国不受监管，因为联邦卡特尔办公室认为由于网络的区域性限制，没有必要对供暖系统进行拆分。天然气和电力传输系统的计划可分为两个部分。这两个部分都包括第一步的情景框架的搭建和检查，以及第二步的网络扩展计划。尽管电、气这两个部分相对分开，但当然还有交叉点，例如，关于燃气发电厂的假设必须在相应的情景框架的搭建中进行。

问题二

在审查国家电网发展计划过程中，您的机构如何处理来自德国四个传输系统运营商的输入，以及其上交的不同计划中任何不一致之处？又是如何处理来自 875 个分配系统运营商的不同计划？

德国的传输系统运营商是私营经济组织。传输网络（定义为 380 kV 和 220 kV）被分为不同大小的四个部分。每个传输系统运营商要负责其管辖区域内电网的稳定运行和安全供电。电网的成本以及电网的新投资都要由用户承担，而且是每个人都要承担。这就是需要联邦网络署监督电网扩建项目的原因。德国法律要求四个传输系统运营商提交联合电网发展计划，该计划包含所有需要的投资项目，以确保计划的输电网络一致并且可以在每个传输系统运营商区域内安全运行。

德国的配电系统运营商负责从高压（110 kV）到低压（0.4 kV）的配电网。只有规模较大的配电系统运营商才受联邦网络署的监管，然后联邦网络署接收有关这些配电网的信息和数据。其他小规模的传输系统运营商均由州当局监管。这些数据通常不是国家电网发展计划的一部分。

问题三

传输系统运营商提交计划建设的传输项目，联邦网络署从中选择最需要的项目。那么您的机构如何在经济和技术方面评估这些项目的效率？

传输系统运营商通过应用 NOVA 原则 （德语电网优化、加强和扩展的首字母缩写）来判断电网扩展的程度。这个原则要求传输系统运营商必须弄清楚除了添加新线路之外是否存在更有效的方法来解决电网问题。NOVA 原则的第一步是优化电网－例如，通过改变电网拓扑结构或进行传输线运行监测。第二步是加强电网－例如，通过升高传输线电压。 NOVA 的第三步是通过搭建新输电线路扩展电网。

联邦网络署对提交的项目主要有两个检查标准：技术效率和经济必要性。由于电网需要“n-1”供电安全，因此系统会模拟目标年内 8760 小时内不同故障情况下的潮流计算来检查新项目的效率。如果计算结果表明新项目已解决或缓解了线路过载情况，则该项目的技术效率得到确认。

审查新项目是非常必要的， 通过它可以找出利用率低于 20％的项目。如果一个项目的利用率未达到此值，则可能表明其在配电网的电网扩展可能比将其升级到输电网更具经济效益。在这些情况下，联邦网络署会要求传输系统运营商的数据集来评估替代方案。

Expanding financial support for clean heating pilot cities in North China

Notice on Expanding Central Financial Support for Clean Heating Pilot Cities in Northern Regions, MoF Construction [2018] No. 397

2018-07-23

http://news.bjx.com.cn/html/20180726/915902.shtml.

Zhangjiakou and eleven cities in Fenwei Plain (across Shanxi and Shaanxi) were included in the clean heating pilots in the northern regions. Zhangjiakou will receive RMB 500 million per year, while Fenwei Plain RMB 300 million. Pilots are required to achieve a clean heating rate of 100% in the city after three-year period. Because of gas shortages in 2017, policy-makers are shifting towards promoting a wider variety of clean energy sources for heating.

Industrial and commercial electricity tariff experiences the third reduction

Notice on the Use of Measures of Expanding the Scale of Power Transactions Across Provinces and Other Measures to Reduce the General Industrial and Commercial Electricity Prices, NDRC Pricing [2018] No. 1053

2018-07-19

http://bgt.ndrc.gov.cn/zcfb/201807/t20180725_893071.html.

Since 1 July 2018, electricity price reduction should focus on reducing industrial and commercial electricity prices, which is the third reduction in 2018 and mainly aims at realizing the target set by the Government Work Report that on average industrial and commercial electricity tariffs should decline by 10%. Measures for reducing prices include expanding inter-provincial power transactions, reducing fees for water conservation, and collecting cross-subsidies from captive power plants owned by industry.

NDRC: Enlarge the scale of power market transaction

Notice on Actively Promoting the Marketization of Electricity Transactions and Further Improving the Trading Mechanism, NDRC Operation [2018] No. 1027

2018-07-16

http://www.ndrc.gov.cn/zcfb/zcfbtz/201807/t20180718_892653.html.

The Notice requires that localities further increase the volume of market-based electricity trading. In 2018, the government will open the power market to users down to those connected at 10-kV and above, and to users with annual electricity consumption of more than 5 GWh. The four sectors of coal, steel, non-ferrous metals and building materials will obtain all electricity from market transactions, and will receive quotas for obtaining clean energy.

Government eliminates irregular and unreasonable grid charging fees

Notice to Eliminate Irregular and Unreasonable Grid Charging Fees, NDRC Pricing [2018] No. 787

2018-07-04

http://www.ndrc.gov.cn/zcfb/zcfbtz/201807/t20180710_892208.html.

To reduce the average industrial and commercial electricity tariffs by 10% on average, the NDRC requires cancellation of part of the monopoly service charges of grid companies, as well as elimination of unreasonable price increases by third parties, such as commercial buildings, industrial zones, and office buildings.

Deepen the peak-valley price mechanism to facilitate green development

Opinions on Innovation and Improvement of Price Mechanism for Promoting Green Development, NDRC Pricing & Regulation [2018] No. 943

2018-06-21

http://www.ndrc.gov.cn/gzdt/201806/t20180629_891470.html.

To encourage shifting of electricity usage to off-peak hours, a new policy issued by the NDRC Pricing and Regulation bureau sets out improvements in peak-valley electricity pricing, including developing residential peak-valley electricity price, increasing the difference between peak and valley prices,and widening the range in peak-valley price fluctuation. These measures will help promote off-peak electric-vehicle charging, as well as energy storage services. Through 2025, electricity demand charges will be removed for sewage treatment, centralized EV charging infrastructure, shore power for port operation, and seawater desalination.