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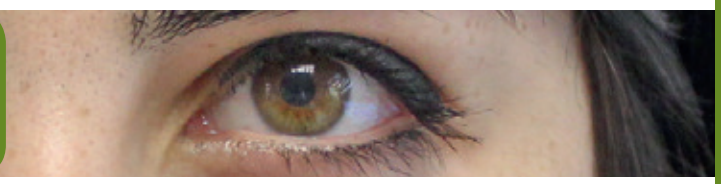


Distributed Energy Supply Using Renewable Energy Sources - The Case for China

基于可再生能源的分布式能源供应——在中国的案例

The Chinese energy market and China's dependence on energy imports will grow rapidly in the coming decades. Electricity produced from coal fired power plants will be increasingly replaced by renewable energy sources and natural gas. While China's energy demand (2013: 33,000 terawatt hours (TWh)) is estimated to grow by more than 60 percent in the next 20 years, the domestic energy production (2013: 28,000 TWh) will only grow by up to 50 percent. In consideration of that fact and in view of declining domestic resources, China's import dependency will increase considerably from 15 percent today to an estimated 27 percent in 2035, thereby overtaking Europe.

Renewable energies are a useful tool in the battle against import dependency and greenhouse gas emissions. Therefore, China aims to become the biggest market for almost all renewable energy sources. The share in primary energy supply will increase from roughly 11 percent today to 15 percent by 2020. Distributed energy will play a crucial role at this. China's ambitious targets in the field of hydropower, wind power, photovoltaics (PV), biomass, geothermal energy, smart grid and energy storage are presented in the following sections.

Renewable Energies in China - Status Quo & Targets

With an installed capacity of roughly 290 gigawatts (GW) in 2015 and an annual production of more than 900 TWh, China is already today the unchallenged global leader in hydropower. Currently, there are more than 45,000 small hydropower stations in operation, producing up to 180 TWh of electricity per year. About 65 GW of small scale hydropower (<50 megawatts (MW)) capacity is already installed and the overall potential is estimated at 120 GW, which is far from fully utilized. Within the 12th Five-Year Plan (2011-2015), the Chinese government plans to invest 15 billion Euros in small scale hydropower. By 2020, the small hydropower capacity should reach 75 GW.

China is the global leader for on-shore wind power. In 2014, there were almost 115 GW of wind power in-

中国的能源市场和中国对能源进口的依赖性在未来的十年中将会急速增长。使用煤炭的火力发电将会逐渐被可再生能源发电和天然气发电取代。据估计，中国的能源需求（2013年：33000千瓦时）在未来的二十年中将增长60%，同时国内能源产量（2013年：28000千瓦时）仅会增长50%。也就是说考虑到日渐减少的国内资源，中国的进口依赖性将会显著增强，从现在的15%增强到2035年的27%，从而超过欧洲。可再生能源是对抗进口依赖性和温室气体排放的利器。因此中国将会成为几乎所有可再生能源最大的市场。它在一次能源供给中的份额将会从现在的约11%上升到2020年的15%。分布式能源供应在其中会扮演重要角色。以下段落展现了中国在水力发电、风力发电、光伏、生物质能、地热能源、智能电网以及能源存储领域的雄心壮志。

Distributed energy supply will be crucial on the way to China's sustainable energy future
分布式能源供应在中国通向可持续能源未来之路上举足轻重
Source / 图片来源： b2b.bjx.com.cn

中国的可再生能源——现状和目标

中国现在已是无可置疑的水力发电全球领导者，2015年装机容量达到约290GW，年度产量超过900千瓦时。目前有超过45000座小型水力发电站正在运作，它们每年产出电量多达180千瓦时。小水电（小于50MW）现装机容量约65GW，估测总潜

stalled. The annual output of 135 TWh in 2013 corresponds to a share of 2.6 percent of the total electricity production. The installed capacity should reach 200 GW by 2020, including 30 GW in the off-shore sector. China is not only the leader in on-shore big scale wind power but also when it comes to small wind and weak-wind power. With roughly 625,000 installations and a total capacity of more than 300 MW in 2013, China is the fastest growing market in this field. About 1.7 million Chinese people are supplied with electricity from small scale wind power today.

The Chinese solar market has developed quickly in recent years and China is ambitious to become the global PV market leader – overtaking Germany in terms of installed capacity this year. However, PV is currently contributing with less than one percent to China's total electricity production. A total of 30 GW were installed in 2014, whereof 5.6 GW represented distributed PV (<20 MW). By 2017, the distributed PV capacity should reach 35 GW. The Chinese government adopted several incentive programs including nationwide feed-in tariffs for ground-mounted and rooftop-PV. The overall PV capacity is expected to rise to 100-150 GW by 2020.

Furthermore, in 2013, the installed capacity of biomass power generation reached 8.5 GW – with an intended capacity of 30 GW by 2020. Besides the 70,000 small biogas units planned until the end of 2015, the utilisation of pellet-driven stoves and boilers will continue to grow. Same accounts for near-surface geothermal energy: 580 million square meters of living and office space will be supplied with heating and cooling from geothermal sources by the end of 2015. Since roughly one third of the overall primary energy demand occurs in the building sector – a sector which grows by 1.5-2 billion square meters per annum – the role of geothermal energy can be crucial on China's way to a low-carbon economy.

Critical on the way to a more sustainable energy future is also a smart integration of the renewable energy sources into the national grid. Therefore, in 2010, China announced the setup of an integrated smart grid by 2020, with a planned budget of 100 billion Euros. By the end of 2013 for instance, there were roughly 50 projects in the field of distribution automation initiated and 15 more announced. Essential in the coming years will be energy storage and the dissemination of battery systems. China is currently the third largest market for energy storage – behind Japan

力达120GW，远未充分开发利用。在“十二五”规划（2011-2015）中，中国政府计划投入150亿欧元到小水电建设。到2020年，小水电容量应达到75GW。

中国是岸上风力发电的全球领导者。2014年风电装机容量约为115GW。2013年度产电量达135千瓦时，相当于总产电量的2.6%。2020年装机容量应达到200GW，其中包括20GW离岸风力发电。中国不仅是岸上大范围风力发电的领导者，同时也是小型及微型风力发电的领导者。中国在2013年粗略估计有625000台装机量及300MW以上装机容量，从而成为小型风电领域增长最快的市场。现今约有170万中国民众由小型风力发电供电。

近年来中国的太阳能市场发展迅猛，中国也非常有信心在今年超过德国的装机容量，成为全球光伏市场领导者。然而，光伏发电目前只占中国总产电量不足百分之一。2014年的总装机容量为30GW，其中分布式光伏（小于20MW）占5.6GW。到2017年分布式光伏产能应达到35GW。中国政府正式通过了一系列包括全国范围内地面和屋顶光伏上网电价在内的刺激性政策。到2020年全部的光伏产能预期达到100-150GW。

此外，2013年生物质能发电装机容量达到8.5GW，计划2020年达到30GW。到2015年底计划建成70000座小型沼气电厂，除此之外，颗粒燃料锅炉的大范围推广也会持续增长。同样对浅层地热能来说，到2015年底将会有580平方千米居住和办公面积使用地热能源来供暖和制冷。因为粗略计算下中国一次能源需求总量的三分之一产生于建筑领域——一个每年增长15-20亿立方米的领域——因此地热能源将会在中国发展低碳经济的道路上扮演重要角色。

为了达到未来的能源可持续发展，将可再生能源智能化地融入国家电网也是十分关键的。因此，2010年中国政府宣布2020年组建融合智能电网，预算投入1000亿欧元。例如说2013年底在分布式自动化领域启动了大约50个项目，公布了超过15个项目。在未来的几年内必须要发展能量存储和电池传输。现在中国是继日本和美国之后的第三大能量存储市场。然而这一领域的增长仍然是不可持续的。人们亟需政策激励支持的独特商业模式。根据官方消息，存储需求占到已安装的风能和太阳能的10-15%。此外，到2020年风能和太阳能的目标是300GW，随之而来会产生30-45GW的巨大的存储需求。

and the United States. However, the sector's growth is still unsustainable. Unique and smart business models supported by policy incentives are highly needed. Official sources state that the storage demand ranges from 10-15 percent of the installed wind and solar capacity. Therefore, with a target of 300 GW for wind and solar until 2020, the storage demand of 30-45 GW will be tremendous.

Business Opportunities for Foreign Companies

There are promising market opportunities for German companies operating in the field of renewable energies and related technologies. Opportunities in the hydropower sector occur for subcontractors and system suppliers as well as consulting firms and technology providers specialised on efficiency enhancement. Furthermore, German companies have considerable experience and know-how when it comes to small wind and weak-wind power. Additional opportunities arise in the field of off-shore wind power due to fledgling Chinese manufacturers.

Another fast growing market with attractive business opportunities is China's distributed PV market. Providers of consultation services and solar system components such as inverters and mounting systems have promising market opportunities. Big potential awaits companies also in the sector of biomass, where smart solutions in the field of biogas, pellet production and respective efficiency enhancements as well as efficient pumps, distributed control systems and gas cleaning facilities are needed. Finally, efficient heat pumps, measuring instruments as well as planning and consultancy services in the field of geothermal energy also show promising potential.

China accounts for two-thirds of Asia's smart grid market
中国占亚洲智能电网市场的三分之二
Source / 图片来源: gddg.csg.cn

外国企业的商业机会

德国企业在可再生能源及相关技术领域有很好的市场机会。而分包商、系统供应商以及咨询公司都可以利用水电领域的机会，特别是增强能效方面。此外，德国企业在小微风电方面有相当丰富的的经验和技术。由于中国的制作厂商刚刚起步，额外的市场机会出现在离岸风电领域。另一个极具商业吸引力且快速增长的市场是中国的分布式光伏市场。提供咨询服务和太阳能系统配件如变频器和支架系统的企业在市场上大有可为。生物质能领域的企业也有很大潜力可挖，市场需求主要在沼气的智能解决方案、颗粒生产、能效提升、水泵效率、分布式控制系统和沼气清洁设施。最后，地热能领域的高效热泵、测量工具以及咨询服务等行业同样前景光明。

Event information / 信息提示

On behalf of the Renewable Energies Export Initiative of the German Federal Ministry for Economic Affairs and Energy (BMWi), German Industry & Commerce Greater China Beijing and Shanghai are organising a business trip on distributed energy supply for German enterprises in mid September 2015 to Hebei and Jiangsu province. Please contact econet china for further information.

在德国联邦经济与能源部的可再生能源出口倡议支持下，德国商会北京和上海将于2015年9月组织德国企业来中国的可再生能源主题的商务代表团，如果您希望此代表团拜访您的机构，或参与相关的高峰论坛，请联系我们以获得更多信息。

Building

How to be "Officially" Green - Green Building Labeling in China

如何成为"官方认证"的绿色

Nowadays, a house is more than just a shelter. Apart from protecting you from elements, it must also provide comfortable living and – if current lifestyle trends in China hold true – a "green" experience. Over the past few decades China has added 1.8 to 2 billion m^2 annually to its building stock, establishing itself as the world's largest market for new construction. This development has not come without a price: energy consumption of buildings increased drastically, accounting for roughly 40% of China's total energy use. Since 2004, the government has made efforts to "green" buildings, and the promotion of green building certification systems are among these efforts.

Green Buildings Versus Traditional Buildings

By definition, green buildings reduce the negative impacts on building occupants and the environment that are the traditional results of construction and building use. Certification systems provide a clear way to quantify the "greenness" of a building by assessing a collection of specified sustainable indicators, which help to effectively evaluate and predict the overall performance of the building. Standards cover topics like sustainable site planning, safeguarding water and water efficiency, energy efficiency and renewable energy, conservation of materials and resources as well as indoor environmental quality. These categories are used to evaluate a building throughout its whole life circle, from the acquisition of the raw materials to demolition. Around the world, many countries have created their own green building certification: systems such as the US's LEED, China's Green Building Labeling (GBL), Germany's DGNB, Britain's BREEAM, Australia's Green Star, Singapore's Green Mark, etc.

Chinese Official Standard: the Green Building Labeling System (GBL)

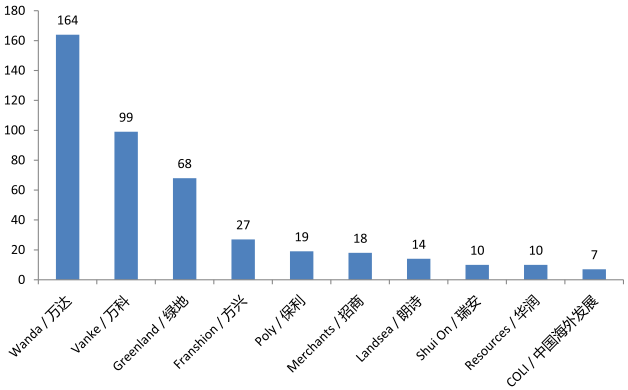
In 2006, China launched a green building labeling system to identify the "greenness" of a building with the award of one to three stars, with three stars being the highest score. Under these national standards, a building can receive two separate labels: the Green Design Label and the Green Operations Label. Applying for

如今,房子不仅仅是一个栖身之所。除了保护您免受外界干扰,它也必须提供舒适的生活和 –如在中国最潮流的生活方式所说 ——个"绿色"的生活体验。

在过去的几十年中,中国的建筑存量以每年18亿到20亿平方米的数量递增,使其成为世界上最大的新建建筑市场。这种发展并不是没有代价的:建筑能源消耗大幅增加,已大约占据中国能源总消耗量的40%。自2004年以来,政府做出大量努力来"绿化"建筑,而促进绿色建筑认证体系的发展和推广正是其中的重要举措之一。

绿色建筑与传统建筑

相较传统的建筑形式,绿色建筑能够极大地减少建筑对环境造成的负面影响。绿色建筑认证体系则通过评估一系列特定的可持续指标,将建筑的"绿色"程度和对环境的影响进行量化,从而有效地评价和预测建筑物的整体性能。这些指标涉及可持续场地规划、水资源保护和节水,能效和可再生能源、材料和资源节约、以及室内环境质量等多个环节。在全球范围内,许多国家都建立了自己的绿色建筑认证体系,如美国的LEED、中国的绿色建筑评价标准(GBL)、德国的DGNB,英国的BREEAM,澳洲的Green Star,新加坡的Green Mark等。



Top ten green building applicants from real estate companies
十大房地产公司绿色建筑申请者
Source / 图片来源: China Academy of Building Research

中国官方绿色建筑评价标准

中国于2006年发布绿色建筑评价标准来评定一座建筑的"绿色"水平。它将建筑物的绿色等级分为一星、

the Green Design Label is already possible right after the launch of the project. In order to apply for the Green Operations Label, on the other hand, the building has to operate for one year after the completion of the project, monitor and record the actual energy consumption in operation throughout four different seasons in China, and then pass the expert panel's on-site inspection. As the design label has a lower threshold than the operation label, it is not surprising that, as of today, there have been 1,471 green design labels and only 99 green operation labels awarded in China. Over 40% of the applications for green building labels in China originate from real estate developers. As indicated by the chart, Wanda, Wanke and Greenland, three major developers in China, take the lead in the development of green buildings. These developers don't all focus on the same building type: Wanke, Greenland and Landsea mainly focus on residential buildings, whereas Wanda and Merchants concentrate primarily on public and commercial buildings.

To promote the official standards, the central and local governments have launched a number of fiscal incentives for the developers of green buildings. For example, for two star rated buildings, each square meter of construction area will get a subsidy of RMB 45 per m^2, while for three-star buildings the rate is RMB 80 per m^2. Parallel to the subsidy from the central government, regional more flexible incentives are also available in most major cities. In Shanghai, green buildings of two and three stars will get a subsidy up to RMB 60 per square meter. In Changsha, building projects that apply ground-source, sewage-water-source and water-source heat pumps are respectively entitled to a subsidy of RMB 40, 35 and 30 per m^2.

What is New for China's Labeling System?

A new version of the labeling system with some fundamental updates has come into effect as of January 2015. The new scope expands the coverage of the standards from residential buildings and public buildings (office buildings, shopping malls and hotels) to all types of civil construction. Six categories of indicators are embedded in the old standards: land and outdoor environment, energy conservation and energy use, water conservation and water use, materials-saving and material resources, indoor environmental quality, and operations management.

In the 2015 version, a new category, construction management, was added. The change from a qualitative to a quantitative assessment underlines the government's increased interest in transparency and

二星和三星三个级别，其中三星最高。该国家标准下有两个细分标识，即绿色设计标识和绿色运营标识：绿色设计标识在项目的设计阶段就可进行申请；而绿色运营标识的申请则要求建筑持续运行一年，对四个季节中的实际能耗做跟踪监测和记录，并通过最后的专家现场考核，综合各项结果才能给出最终判定。也正因为如此，截至今天，全国获得绿色设计标识的项目有1471个，而获得绿色运营标识的项目只有99个。

绿色建筑申报单位中，房地产开发商至少占40%。如上图所示，万达、万科和绿地在绿色建筑的开发领域占据领头羊的位置。但是，他们所擅长的领域有所不同：万科、绿地和朗诗集团在住宅类项目中申报较多；万达、招商等集团在公建类项目中申报较多。

为了促进标准的推行，中央和地方政府发布了一系列的财政鼓励措施：按照建筑面积计算，获得二星的建筑给予45元/平方米的补贴，三星则增加到80元/平方米。平行于中央政府的补贴，大多数主要城市也发布了区域性的鼓励政策。在上海，两星和三星级绿色建筑将获得最高60元/平方米的补贴。在长沙，使用土壤源、污水源和水源热泵的建设项目按照建筑应用面积分别补助40、35和30元/平方米。

econet china holding a Focus Greentech workshop on green building certifications in November 2014
econet china 举办以“绿色建筑标准”为主题的聚焦绿色科技系列讲座活动
Source / 图片来源: econet china

中国绿色建筑标价标准最新版有什么不同？

中国绿色建筑标价标准最新版已于2015年1月生效。新的标准将适用的建筑类型从住宅建筑和公共建筑（写字楼，商场及酒店）扩展到了各类民用建筑。除了旧版本中原有的六个标准，包括节地与室外环境、节能与能源利用、节水与水资源利用、节材与材料资源、室内环境质量、运营管理，在2015年生效的标准中还增加了一个新的类别，即施工管理。从定性到定量评估的变化彰显了政府对透明度和效率提高的关注。此外，标准还新增激励项，旨在鼓励先进的绿色建筑技术和管理方法的创新。

efficiency. In addition, a bonus category was newly set up, to encourage innovative and advanced green building technology and management methods.

Future Prospects

For the future, the following developments are to be expected as proposed by the China Academy of Building Research. Green building will increase, especially in government-related public projects. In Shanghai, for example, the government requires the percentage of green buildings to surpass 30% by the end of this year. To this end, all government invested public buildings and affordable housing projects will be built in accordance with green standards. The government is continuing to push the concept of eco-cities. It also provides a special subsidy of up to RMB 50mn for eco-industrial parks. Almost 100 cities in China have launched their own eco-city development plans. In Shanghai, six ecoparks have been set up as pilot projects to further promote green building practices.

The concept of the lifecycle of the building will be gradually adopted. The green refurbishment of existing buildings will turn into a major business in China as the construction boom is slowing down and existing buildings have tremendous energy saving potential. In Shanghai, by the end of 2016, for example, 7mn m^2 of existing public buildings' energy efficiency renovation will be completed. Attention will shift towards the operation and management of green buildings and the actual performance of the buildings becomes a key indicator in assessment. Construction management now is recognized as a key component of green building assessment. This is important to China's fight against PM 2.5 pollution, as construction sites are major contributors of dust in cities like Shanghai and Beijing. Due to government subsidies, local developers generally prefer the Chinese GBL system. For some international developers and locals that are looking for wider recognition, LEED is preferred or applied in parallel to GBL. DGNB is on the rise as well in recent years, but the German government and business community will need to expend more effort on its marketing in order to make its usage more widespread, which will in return potentially benefit the whole German building construction sector. The next few years will offer many possibilities for German firms to access the growing market in China, as government regulations focus more strongly on green buildings and eco-cities.

Source: German Chamber Ticker / Issue: April-May 2015. Reproduced with permission.

前景

根据中国建筑科学研究院的预测，建筑市场将有如下的发展趋势:

绿色建筑的数量将会持续增加，特别是政府相关的公共项目。比如在上海，政府要求绿色建筑的比例到今年年底要超过30%。为此，所有政府投资的公共建筑和保障性住房项目将按照绿色标准进行建造。政府还将继续推动生态城市的概念，并为绿色工业园区提供高达5000万元的资金补助基准。目前，已有近100个城市推出了自己的生态城市发展计划。在上海也已设立了六个绿色园区的试点项目。建筑全生命周期的概念逐渐被采用。随着建筑热潮在中国的放缓，既有建筑的绿色改造将成为一个主要市场，释放巨大的节能潜力。截止到2016年年底，上海将完成700万平方米的既有公共建筑的节能改造。市场的注意力也将转向绿色建筑的经营和管理，建筑物的实际性能将成为考核的重要指标。施工管理也成为绿色建筑评价的重要组成部分。在上海、北京等大型城市中，建筑工地是粉尘的重要来源，新的绿色施工管理标准的实施将对中国对抗PM2.5的努力产生重大的影响。

Voith Factory Extension, completed in 2014, achieved LEED Gold Certificate
福伊特公司于2014年完成的工厂扩建项目获得了LEED金级认证
Source / 图片来源: energydesign / econet china

出于对政府补贴的考虑，当地开发商普遍采用中国官方发布的绿色建筑评价标准（GBL）。对于一些国际开发商和寻求更广泛的国际声誉的当地项目，美国的LEED认证的认可度较高。来自德国的DGNB标准在最近几年集中发力，市场认可度也越来越高。但是德国政府和相关行业还需投入更多的努力，加强该标准的市场推广力度，这也将反过来推进整个德国建筑行业在中国的发展。随着中国对绿色建筑和生态城市理念的进一步关注，未来的几年将给德国相关企业进入日益增长的中国市场带来契机。

来源：German Chamber Ticker / 刊号：2015年4-5月刊。转载许可。

Energy

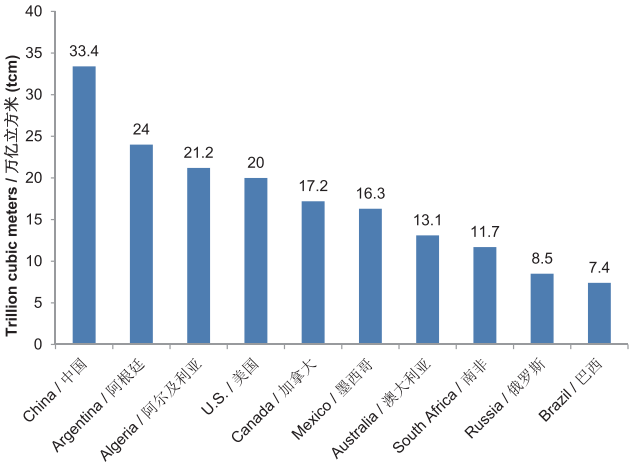
Water Scarcity and Hydraulic Fracturing - A Contradiction?
水资源短缺与水力压裂技术是否矛盾?

Since 2011, China has closely observed the shale gas revolution in the US and the opportunities this has brought to American businesses through cuts in energy costs and imports. China is eager to experience a similar revolution and potentially emerge as the world's most powerful gas supplier. The estimations of China's shale gas resources vary from 26.6 trillion cubic meters (tcm) to 38.3 tcm. The upper estimates reveal that China has more shale gas than the U.S. and Canada combined. If current projections are correct and the price of gas remains high, shale gas could supply up to 10% of total Chinese energy demand. Thus, shale gas could contribute to an energy boom and support China's ambitious growth targets. Furthermore, as shale gas has only about 50% of coal's carbon content, China could, by replacing coal with gas, reduce CO_2 emissions.

Hydraulic fracturing is a multi-stage process which stimulates the flow of natural gas more efficiently and economically than conventional methods. The drilling process starts with a three to six kilometres drilling into the ground, followed by two kilometres long horizontal drillings. After the drilling fractures are blasted creating fissures that release the trapped natural gas. The fractures are created by pumping fluids – a mixture of water, proppants and chemicals – at high pressure into the target area. The proppants (sand, ceramic pellets, etc.) prevent the fractures from closing, while other fluids called flowback, flow back to the surface. The flowback for each extraction contains one to three million gallons of water including chemicals and natural materials such as brines, metals, radionuclides, and hydrocarbons. The flowback is then carried back underground, reused or cleaned in a wastewater management system before being reintroduced as surface water.

From 2015 onwards, China plans to extract 6.5 billion cubic meters (bcm) of shale gas annually, increasing to 100 bcm per year by 2020. During the 12th Five Year Plan (2011-2015), China is aiming for an initial assessment and confirmation of reserves. Under the Shale Gas Development Plan (2011-2015), China is establish-

自2011年以来，中国一直密切关注美国的页岩气革命以及通过削减能源成本、减少进口给美国企业所带来的机遇。中国也渴望着一场类似的革命并希望借此逐步成为世界天然气供应强国。据估计，中国的页岩气资源介于26.6万亿立方米至38.3万亿立方米之间，超越了美国与加拿大总和。如果当前的预测正确，天然气价格走势依然强劲，页岩气将能满足中国能源需求总量的10%。因此，页岩气作为中国宏伟发展目标的支持，势必能带起一股能源热潮。此外，由于页岩气的碳含量只有煤的50%，中国可以通过利用页岩气代替煤的方式来减少二氧化碳排放。



Estimated technically recoverable shale gas resources by country
各国预计页岩气技术可采资源量
Source / 图片来源: U.S. Energy Information Administration

水力压裂法采用多级技术，能够更经济有效地增加页岩气流量。在地表下3-6公里处钻井，接着水平钻井2公里，使用掺入化学物质的高压水流对页岩层进行压裂，人为造成很多缝隙，同时用砂或其他物质支撑裂口，将石油或天然气从岩石缝隙中释放出来，并顺着井筒回流到地表。页岩气单井回收的废水约100万-300万加仑，含有碳氢化合物、重金属、污垢以及化学盐分。在此过程中，它们会回流到地下先储存，然后再进行处理回收和再利用为地表水。

2015年起，中国计划每年提取65亿立方米页岩气，到2020年计划增长至1000亿立方米。"十二五" 期间，中国主要的目标是进行储备的初步评估和确认。根据

ing a pilot area for shale gas, adopting a market price for shale gas producers, reducing shale gas exploration and exploitation royalties and encouraging foreign investment.

Through a legally defined separation of shale gas from conventional hydrocarbons by the Ministry of Resources and Land (MRL), shale gas has become an independent object for investments. This allows free distribution of exploration contracts outside the big three state-owned enterprises (SOEs) CNPC, Sinopec and CNOOC, thus, breaking the oligarchy and encouraging competition. Furthermore, as shale gas reserves overlap with current oil and gas blocks held by oil SOEs, more blocks with shale gas resources could be released into the market. Although, the two rounds of open tender on shale gas exploration rights have resulted in joint ventures and newcomers winning bids for shale gas blocks, this was not unproblematic as newcomers failed to meet the minimum spending requirements and underestimated the oligarchic dominance of the SOEs.

The biggest risks fracking entails are potential contamination of water and soil due to cement-casing failures that allow hazardous chemicals to mix into bodies of water, spillage during transport, and fugitive gas from the rock fractures into the ground. Furthermore, fracking chemicals, such as the BTEX compounds (benzene, toluene, ethylbenzene, and xylenes) are carcinogens and air pollutants. Also, wastewater causes serious problems. For every million gallons of chemical-laced frack fluid injected down the drill wells, 20-40% will be regurgitated back to the surface, bringing with it chemicals, traces of oil-laced drilling mud, and other toxic substances previously trapped in the rock (iron, chromium, salt, and radioactive materials). Problematically, most water treatment facilities are not designed to treat wastewater produced from fracking. Consequently, much of it ends up sitting in large ponds, or entering rivers and streams. Furthermore, chemicals like radioactivity trackers that are added to the water as extraction stabilisers raise environmental concerns. Strict regulations are necessary for the trackers, for wastewater treatment, and for the disposal of any radioactive particles from the flowback. Failing such precautions surface water could become contaminated.

Hydraulic fracturing requires large amounts of water. To achieve the 6.5 bcm shale gas target, China will require no less than 14.5 million cubic meters water. So while contributing to solve China's energy problem,

页岩气发展计划(2011-2015),中国正设立一个页岩气试点地区,为页岩气生产商设定市场价格,降低页岩气勘探与开采特许权使用费并鼓励外商投资。中国能源规划方意识到技术及财政方面的挑战诸如水资源短缺及针对页岩气开采所必要的大量水资源问题。为了支持页岩气开采的发展,中央和地方政府可以合法提供补贴,但仅仅是偶尔,因此近期国内技术的发展未见突破。

Unconventional gas reserves in China
中国非常规天然气储量
Source / 图片来源: China National Petroleum Corporation

国土资源部将页岩气从常规碳氢化合物中分离出来,使其成为独立的投资对象。这使勘探合同得以打破三大国有企业(中石油、中石化、中海油)的寡头垄断进行自由分配,鼓励竞争。此外,由于页岩气储备与国有企业目前持有的石油和天然气区块重叠,这可能会释放出更多的页岩气资源给到市场。虽然页岩气勘探权的两轮公开招标使合资企业和新进企业赢得页岩气区块的竞标,但由此带来的问题是新进企业不符合最低消费要求并且低估了国有企业的垄断和主导地位。

中国的储层埋藏深,同时面临着一些地质难点,因此对所需技术资源的要求相应变高。2011年以来,中石油已建立了自己的技术能力并在长宁——威远示范区中提升了相关技术知识。在中国,壳牌投资了约10亿美元用于开发最优质的井。此外,中石化在四川盆地取得的成功为中国页岩气生产重燃了生的希望。然而,根据目前的前景,页岩气的生产可能无法满足在不久的将来不断增长的能源需求。

水力压裂法的最大风险在于水和土壤可能遭受的污染。污染原因包括水泥套管爆裂使危险化学物质流入水体、运输途中的意外泄漏以及岩石裂隙的气体挥发至地里。此外,水力压裂的化学物质如苯系化合物是已知的致癌物质和空气污染物。废水会造成严重问题,每百万加仑注入钻井的压裂液中20%-40% 将会

it increases the strain on the water supply. The water usage by hydraulic fracturing which is partially lost and polluted is particularly disconcerting because the International Finance Corporation (IFC) finds that by 2030 China's water demand will surpass current supply. Competing water-intensive industries, low rainfall in the northwest (where most shale gas resources are suspected) combined with already highly polluted rivers, this indicates that shale gas exploitations are likely to increase water scarcity. Water scarcity is addressed in the 'Shale Gas Development Plan' and the Chinese government is working on possible solutions. Consequently, China has to either move water to the areas it wants to explore shale gas or develop less water-consuming technologies.

Other hurdles facing hydraulic fracturing in China are accessibility, know-how, lack of support from the public, and other intangibles. First, geographically speaking, Chinese reserves are difficult to access, and there are other infrastructural limitations such as few readily available pipelines, gas liquidation or compression plants. Second, though Chinese firms are catching up, the necessary expertise and experience in the field is still limited. Third, heavy competition from numerous small and medium sized firms made the shale gas revolution possible in the US; the market domination of the state-owned enterprises makes this challenging in China. Fourth, increasingly frequent and successful protests by Chinese citizens have to be also taken into account.

Shale gas can be a way for China to decrease its energy dependence, costs and reduce its air pollution, and thus, help to achieve China's environmental targets. However, a US-style hydraulic fracturing revolution cannot easily be achieved in China until certain barriers are cleared – low competition in the industry and the limited scope for local initiative. Besides these difficulties, China's limited water resources serve as the most daunting obstacle. Furthermore, experts warn that shale gas may also result in reduced investment in renewable energy sources. Nevertheless, the Chinese government is determined to increase the percentage of natural gas in its energy mix, shale gas particularly. Thus, a variety of subsidies have been set up and incentives for foreign investment have been provided. For German firms in particular, opportunities with regards to wastewater treatment in a growing water recycling market are highly promising.

回流至地表，其中含化学品及其它被困在岩石中的有毒物质如铁，铬，盐和放射性材料。大多数的污水处理设施不用于处理压裂废水，因此，大量的压裂废水流入池塘、河流和溪涧。此外，化学物质例如放射性追踪器被添加进水中作为水萃取稳定剂，这将造成严重的环境问题。因此针对追踪器、废水处理及去除回流中的放射性粒子有必要制定严格的规定。缺少这样的预防措施将可能使地表水遭受污染。

水力压裂法需要大量的水，为了实现6.5亿立方米的页岩气目标，中国的水需求将不低于1450万立方米。因此，页岩气的开采虽然有助于解决中国的能源问题，但同时也使中国水资源短缺问题变得日益严重。

水力压裂法造成的部分水流失以及水污染将引起不安，因为国际金融集团认为，到2030年中国的用水需求将超过目前的供给。水密集型产业之间的竞争、西北（拥有大部分页岩气储量）的低降雨量，以及高度污染的河流，这一切都表明页岩气的开采极有可能加剧水资源短缺问题。《页岩气发展规划纲要》中强调了水资源短缺的问题，对此中国政府正在积极研究应对方案：将水输送到页岩气开采地或寻找出有效的节水技术。

在中国，水力压裂法还面临着一些其它的阻碍诸如可开采性、专业技术、缺乏公众支持等。首先，中国的页岩气储备由于地理原因很难开采，同时还受其它基础设施如现成管道、气体液化及压缩装置等的限制。其次，虽然中国企业正在迎头赶上，但是领域内的专业知识和经验仍然有限。再次，美国页岩气革命源于中小型企业间的激烈竞争，而中国国有企业在市场上的寡头垄断使页岩气革命在中国举步维艰。最后还需考虑到中国公民日益频繁进行且获得成功的抗议活动。

页岩气可以帮助中国减少能源依赖、降低成本以及缓解空气污染问题，从而有助于中国实现环境政策目标。然而，美国式的水力压裂技术革命在中国无法轻易实现，除非克服某些特定障碍如行业竞争低、地方积极性不够等。除了以上这些困难，中国有限的水资源是目前最大的障碍。此外，专家警告称，页岩气可能会导致对可再生能源的投资减少。尽管如此，中国政府仍决心提高天然气，尤其是页岩气在能源结构中的比重，因此出台了各种补贴政策及针对外国投资的激励措施。尤其对于德国企业来说，不断增长的废水处理循环利用的需求也给他们带来了更多的市场机遇。

Environment

Research and Application of Windows for Passive Houses in China

A contribution by Lin Shaozhong, Orient Sundar Windoor Group

关于中国被动式建筑用窗的研究与应用

来自奥润顺达窗业集团林少中的客邀文章

The term “passive house” refers to buildings that receive and store natural energies to keep them warm in winter and cool in summer, thoroughly through their own designs such as energy-saving technologies, sun-shading systems and natural ventilation of building envelopes, building materials as well as efficient doors and windows. To research and promote the related technologies is of great significance for energy conservation and emission reduction.

The building envelope (doors, windows, walls and roof etc.) is the major component of overall energy consumption of buildings, among which doors and windows form the weakest link. Because the area of doors and windows accounts for approx. 20% of the wall area and the energy consumption dissipated through doors and windows exceeds 50% of the overall building energy consumption, energy-saving levels of doors and windows directly affect the energy-saving index of houses. Generally speaking, low-energy building requirements can only be met when thermal conductivity (K) of doors and windows reaches at least 0.8 w/(m^2·k). Presently, however, the thermal conductivity of doors and windows in most regions of China still remains within the range of 2.8-3.5 w/(m^2·k). “If the doors and windows currently used in China are replaced by those with thermal conductivity lower than 2.0, 420 million tons of standard coal can be saved every year”, stated China’s Xinhua News Agency recently in an analysis.

China’s energy-saving passive house systems are mostly introduced from Germany. However, as China’s climate characteristics are much more complex than those of Germany, it is required to redesign such systems according to higher standards for weather ability for regions with complex climates. It is also required to ensure that the systems can achieve long-term (about 30 years) physical stability under different conditions such as hot and humid as well as extremely cold and dry environments.

被动式节能建筑技术，是指完全通过建筑自身的围护结构、建筑材料、节能门窗、遮阳系统、自然通风等设计，被动接收和存储自然能量，使建筑冬暖夏凉。被动式建筑是未来的绿色建筑，研究推广该技术，在节能减排方面具有重要的意义。建筑外围结构（门窗、墙体、屋顶等）的能耗是建筑整体能耗的主要组成部分，其中门窗又是最薄弱的部分，其面积平均占墙体的20%，而通过门窗散失的能量却超过建筑总能耗的50%，因此，门窗节能水平的高低，直接影响到被动式建筑的节能指标。一般来说，当门窗的传热系数K不大于0.8w/(m^2·k)时，才能满足低能耗建筑要求。目前中国绝大多数地区的门窗传热系数K值还基本停留在2.8-3.5w/(m^2·k)之间。根据中国新华社调研得出的结论，如果把中国现有门窗都换成传热系数低于2.0的门窗，每年可节约标煤4.2亿吨。

Dr. Wolfgang Feist of Passive House Institute Darmstadt visits Orient Sundar Window Group in August 2014
德国达姆城被动房研究所的费斯特教授于2014年8月参观奥润顺达集团
Source / 图片来源: Orient Sundar Window Group

目前，中国的被动式房屋节能系统多引自德国，但是中国的气候特性远比德国复杂，因此需要针对各种气候复杂的地区重新设计，使之符合更高的耐候性标准，同时也需要保证系统在高温高湿、极寒干燥、强台风等不同条件下，达到一个长期的（30年左右）物理稳定性。这对系统设计的完善和新材料技术都是一个全新的挑战。要达到被动式用窗的要求，最主要的关键技术是保温隔热系统设计，内容包括框体和窗扇的内部结构设计、密封系统设计以及玻璃组合形

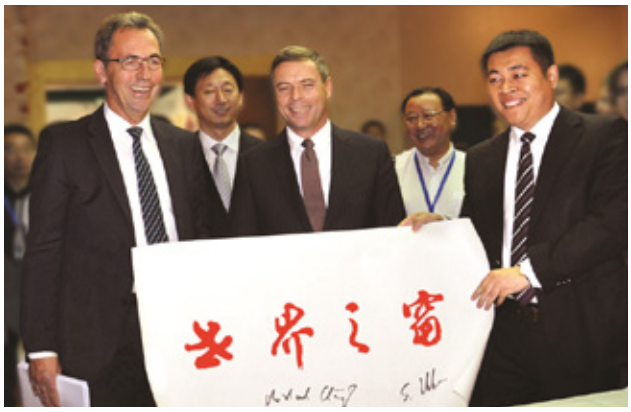
To meet passive window requirements, the major key technology is the system design of heat preservation and thermal insulation. The contents are divided into three parts: internal structural design of frames and sashes, design of sealing system and design of glass combination form. For instance, glued-laminated timber with high thermal resistance performance is more suitable for passive windows when it comes to internal structural design of window frames, since timber has better heat preservation and thermal insulation properties than aluminum profiles. Nevertheless, timber, as an active material, is not as weather-resistant as metals. Therefore, it will be perfect if the two are combined together in the form of aluminum outside and wood inside. In this respect, one critical technical difficulty needs to be solved: under extreme conditions, as contraction coefficients and expansion coefficients are different for timber and metals, if the two materials are to be synchronized in an ultra stable structure, unique structural design and intermediate connection buffer units are required.

The Chinese company Orient Sundar Windoor Group is one of the first enterprises to implement passive window research and application in China. Through many years of cooperation with Germany, it has developed more than 20 categories of internationally advanced energy-saving product series. The maximum thermal conductivity of its products can be up to 0.5 w/(m^2·k), reaching the highest level of international energy-saving standards for external building windows. Orient Sundar Windoor Group is also one of the initiators of the China International Window City, which is located in Gaobeidian, 70 km south of Beijing. As an international windows, doors and curtain wall exhibition and trading center, China International Window City offers many high-end products and cutting-edge technologies of the whole industrial chain from German and other renowned windows, doors and curtain wall enterprises. Since its launch in 2012, it has successively held two sessions of the China Gaobeidian International Doors & Windows Festival and organized more than 60 international and domestic industry summits, receiving 100,000 visitors and purchasers.

In order to further promote the development of the energy-saving building industry and passive houses in China, the next China Gaobeidian International Doors & Windows Festival will be held at the China International Window City from September 19 to 21, 2015. A large number of enterprise and industry representatives from 16 countries, including Germany, are expected at the festival and its accompanying exhibitions and forums.

式设计三大部分。以框体内部结构设计为例，一般来说，阻热性高的胶合木材更适合用来做被动式窗，因为它比铝型材的保温隔热性更好，但是作为活性材料的木材，耐候性又远不如金属。如果把两者以外铝内木的形式有机地结合起来那就非常完美了。这一方案还需克服一个关键技术难点：在极端气候条件下，木材与金属的收缩和膨胀系数不同，要让木材与金属在超稳定结构中达到同步，就需要独特的结构设计和中间连接缓冲部件。

中国河北奥润顺达窗业集团是中国最早开展被动窗研究和应用的企业之一，通过多年对德合作，已开发出了国际先进的二十多类节能产品系列，包括构件式木质幕墙、木索系统窗、钢木铝复合系统窗、高性能塑钢窗、阳光房等多个品种，并应用于全国上千项建筑工程。产品最高传热系数可达0.5w/(m^2·k)，达到了零能耗建筑外窗的节能标准国际最高水平。河北奥润顺达窗业集团，是位于北京以南70公里的高碑店市的中国国际门窗城的发起集团。它作为亚洲首家长期设展的国际性门窗幕墙展览交易中心，汇集了德国以及世界知名门窗幕墙企业的全产业链高端产品与前沿技术。



Mr. Michael Clauss (German Ambassador to China) and Mr. Stephan Kohler (Representative of German Energy Agency) visit China International Window City in September 2014
德国驻华大使馆大使柯慕贤，德国能源署前署长斯蒂芬·科勒于2014年9月参观中国国际门窗城
Source / 图片来源: Orient Sundar Window Group

门窗城自2012年投入运营以来，相继成功举办两届中国（高碑店）国际门窗节，主办国际国内行业峰会60余场，累计接待国内外政府机构、行业协会领导、国内外客户、房地产商、设计院专家等来访、参观、采购人员10万人次，形成了具有知名度和影响力的产业集群。为了进一步促进建筑节能产业和中国的被动房的发展，下一届中国高碑店国际门窗节将于2015年9月19日至21日在中国国际门窗城举行。来自包括德国在内的16个国家的大量企业和行业的代表，将会出席国际门窗节以及与之配套的展览和论坛。

Politics

The Role of National and Provincial Development and Reform Commissions in China's National Carbon Market

A contribution by Liu Ying, Lin Yuwei and Wang Wenqiang, SinoCarbon Innovation & Investment

国家发改委和省级发改委在中国国家碳市场中的角色

来自中创碳投的刘颖，林宇威和王文强的客邀文章

Against the backdrop of the upcoming implementation of a national carbon market in China, the National Development and Reform Commission (NDRC) released the "Interim Measures on Management of Emissions Trading Scheme" at the end of last year and published them on the website of its Climate Change Department. The regulatory measures, that took effect in January 2015, are the first of its kind and represent a milestone in China's carbon market development. They send a clear signal regarding the operation of the upcoming national carbon market in China and serve as a foundation for future work. According to NDRC's work plan, 2015 will be the year for preparation of laws, regulations, standards as well as infrastructure. The national carbon market will then operate in full swing and improve gradually over the period 2016 to 2020. The measures focus on the responsibilities of multiple administrators and specify the covered scope, total allowance and allowance allocation, emissions trading, registry systems, reporting and verification as well as allowance surrendering under a two-level administration. A detailed interpretation is provided below.

The carbon market is managed on the following two levels: The national emissions trading supervisor and the provincial emissions trading supervisor. The former refers to the NDRC and the latter to the provincial Development and Reform Commissions (provincial DRCs). NDRC on the one hand, is responsible for formulating guidelines covering the scope, total allowances, allocation methods, standards and procedures for reporting and verification. On the other hand, NDRC is supervising the registry systems, exchanges as well as qualification of verifiers, and establishing the market regulation mechanism. The provincial DRCs are responsible for implementing the regulations and managing activities related to emissions trading within their jurisdiction, including identifying key emitters, developing allocation programs and

在中国的七个碳排放权交易试点陆续启动之后，去年年底国家发改委发布了《碳排放权交易管理暂行办法》（以下简称"管理办法"），并在国家发改委应对气候变化司网站正式对外公布。该管理办法在今年一月生效实施。这是国内首次推出相关立法，这一举措具有里程碑的意义它释放了国家碳市场起步的明确信号，为后续一系列相关工作的开展提供了重要支撑，因此受到国内外的广泛关注。中国的碳市场交易对于未来的国际市场具有举足轻重的作用，深入研究解读该权威指导性文件对于相关机构和企业的重要性不言而喻。根据国家发改委规划在发布全国碳市场管理办法后，2015年将为准备阶段，完善法律法规、技术标准和基础设施建设。全国碳市场拟于2016-2020年间全面启动实施和完善。管理办法的核心内容是对碳排放权交易中的各主管部门的管理职能进行了明确划分，在两级管理的框架下，确定了覆盖范围、配额总量和配额分配、碳排放权交易、注册登记系统、碳排放核算报告和核查、配额清缴的管理。以下是对其内容的详细解读。

国家碳市场实行国家级和省级两级管理制度。前者为国家发展改革委（以下简称"国家发改委"），后者为省、自治区、直辖市发展改革委（以下简称"省级发改委"）。国家发改委一方面负责国家碳市场基本规则的制定，包括覆盖范围、配额总量、配额分配方法标准、排放核算报告方法标准和流程等，另一方面统一管理国家注册登记系统和交易机构、核查机构资质、建立市场调节机制。省级发改委负责本行政区域内碳交易相关活动的具体执行和管理，包括确定重点排放单位名单、确定配额分配方案并对重点排放单位进行配额免费分配和有偿分配、管理碳排放的报告和核查、管理重点排放单位的配额清缴、管理辖区内的交易情况等。从分工来说，国家发改委偏重于管理规划层面，省级发改委偏重于操作执行层面，主要管理职能对比如下表所示。

allocating free allowances or selling allowancesthrough auctions, managing reporting and verification, supervising allowance surrendering of key emitters and emissions trading. Overall, NDRC focuses on the general management, whereas the provincial DRCs focus on the implementation. The responsibilities of NDRC and the provincial DRCs are outlined below.

Covered Scope

NDRC will first set standards related to covered types of greenhouse gas (GHG) emissions, industry sectors and key emitters. Then, the provincial DRCs will determine key emitters based on NDRC-designed standards and submit them to NDRC for approval. The provincial DRCs can expand the scope to cover more key emitters. In other words, local coverage can go beyond the overall national scope. The flexibility of the provincial DRCs in determining covered industries and enterprises provides a basis for the seven pilot schemes to retain the current scope in whole or in part during their transition to a national carbon market. And for other regions, which are not part of the pilot schemes, it offers more flexibility in expanding the scheme to cover more sectors. In addition, based on the definition of the measures, the GHG include CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3, which is consistent with the second phase of the Kyoto Protocol. The "Guideline on Measuring and Reporting GHG Emissions" released earlier only includes the first six GHG, which is consistent with the first phase of the Kyoto Protocol. In practice, the GHG covered by the national carbon market mainly refers to CO_2.

Total Allowances and Allowance Allocation

The allowance allocation method is designed by NDRC, which on the one hand determines the method and standards used for free allocation and thus calculation of local allowances based on the method. On the other hand, the allocation method identifies national allowances reserved for auction, market regulations and key construction projects. The sum of local allowances and national allowances reserve amounts to the total national allowances. The amount of auctioned allowances depends on the provincial DRCs, which can have excess balance by drafting tighter methods and standards. If the provincial method is consistent with the national one, then all allowances are allocated freely. Thus, the fundamental principle can be summarized as "most allowances are allocated freely at the initial stage and auctioned allowances are introduced at the appropriate time with gradual increase in proportion".

覆盖范围

管理办法在规则全面详尽的基础上，充分考虑到了各地因发展水平差异、产业规划布局等产生的因地制宜的需求，给地方政府留有一定自主权，鼓励当地政府节能减排、建设碳市场的积极性。国家发改委为纳入的温室气体种类、行业范围和重点排放单位设立标准。然后，省级发改委根据以上标准确定重点排放单位名单，并报国家发改委审批。省级发改委可适当扩大行业覆盖范围，增加纳入的重点排放单位。换言之，地方的行业覆盖范围可大于国家统一的覆盖范围。省级发改委在确定覆盖范围上的灵活性，对于目前的七个试点地区来说，为其在向国家碳市场衔接转换中保留现有全部或部分覆盖范围提供了依据；对于其它非试点地区来说，也为其提供了根据自身特点增加覆盖行业的操作空间。另外，根据管理办法的术语解释，本办法所指的温室气体包括二氧化碳（CO_2）、甲烷（CH_4）、氧化亚氮（N_2O）、氢氟碳化物（HFCs）、全氟化碳（PFCs）、六氟化硫（SF_6）和三氟化氮（NF_3）七种，与京都议定书第二承诺期一致。之前发布的企业温室气体核算报告指南则针对前六种温室气体，与京都议定书第一承诺期一致。实际执行中，国家碳市场纳入的温室气体主要指二氧化碳。

配额总量和配额分配

对于最受关注的配额分配问题，地方同样具有相应的自主权和灵活性。根据管理办法，由国家发改委制定国家配额分配方案，一方面确定统一的配额免费分配方法和标准，继而由该方法计算得出各地方的排放配额总量，另一方面确定国家预留排放配额数量，用于有偿分配、市场调节、重大建设项目等。各地的配额总量和国家预留配额数量之和即为国家配额总量。地方有偿配额的数量主要取决于省级发改委在国家统一免费分配标准基础上进一步削减的力度，即如果采用统一的免费分配方法和标准，则地方无有偿配额，配额总量等于免费配额数量。因此，配额分配的基本原则被概括为"排放配额分配在初期以免费分配为主，适时引入有偿分配，并逐步提高有偿分配的比例"。地方有偿分配所取得的收益，可用于促进地方减碳以及相关的能力建设；因此，分配越严格的地方，可通过碳市场直接获得更多的专项资金开展减碳工作，形成正向发展。对于特殊配额的处理，一方面，对于新的重大建设项目的新增排放的配额分配，来自国家预留配额。另一方面，重点排放单位关闭、停产、合并、分立或者产能发生重大变化的，由省级发改委对其已获得的免费配额进行调整。

Local gains from auctioned allowances can be invested into emissions reduction and capacity building. Therefore, regions with stricter standards tend to have more funds earmarked to facilitate emissions reduction and thus forming a favorable environment. As for the management of special allowances, on the one hand new key construction projects get emission allowances from the national reserve. On the other hand, if key emitters close down, merge or split or have major changes in their production capacity, the provincial DRCs will adjust free allowances already allocated to them.

Emissions Trading

NDRC is responsible for designating emission exchanges and exercising supervision upon their operation. If violation occurs, NDRC will order rectification or impose administrative penalties. The trading shall be carried out in the designated exchanges which formulate trading rules and submit them to NDRC for registration. The trading subjects are key emitters, qualified institutions and individuals. For now, trading products include emission allowances and Chinese Certified Emission Reductions (CCER). The above rules indicate that the national carbon market adheres to the principle of trading within the exchanges in order to enhance supervision. There is not much restriction imposed on the subject and both institutional and individual investors are allowed to participate in the carbon market.

Reporting and Verification

The right to supervise reporting and verification of key emitters is mainly in the hands of the provincial DRCs, which also monitor the verifiers' work. NDRC is required to harmonize the technical standards applied for verification reports and manage the qualification of verifiers. Key emitters are required to submit measuring plans, emissions reports and verification reports issued by verifiers to the provincial DRC annually. Then, the provincial DRCs will review the emissions and verification reports upon NDRC's request or of those with problematic emissions or spot check the reports. Finally, the provincial DRCs will confirm the emissions of all key emitters within their jurisdiction and notify their results. For key emitters that fail to meet reporting and verification obligations, the provincial DRCs will order rectification. If non-compliance still exists after the prescribed period, administrative penalties shall be imposed. If verifiers violate the regulations, the provincial DRCs, where the verifier is based, will impose administrative penalties and report to NDRC.

碳排放权交易

不同于7个试点市场各自交易的现状，全国市场的交易场所和方式将更为统一，并由国家发改委负责确定碳排放权交易机构并对其业务实施监督。交易机构存在违法行为的，由国家发改委责令改正或给予行政处罚。交易原则上应在确定的交易机构内进行。交易规则由交易机构负责制定，并报国家发改委备案。交易主体为重点排放单位及符合交易规则规定的机构和个人。初期的交易产品为排放配额和国家核证自愿减排量（CCER），适时增加其他交易产品。国家发改委负责建立碳排放权交易市场调节机制，维护市场稳定。市场调节配额来自国家预留配额。

以上规定表明国家碳市场为加强监管，延续了试点碳市场强制场内交易结算的特点。对于交易主体的范围，原则上没有过多限制，机构投资者和个人投资者均可以参与国家碳市场，但根据试点经验，技术层面能否实现要等到政策实际落地才可见分晓。

碳排放核算报告和核查

碳排放报告和核查的管理权主要在省级发改委，由其管理辖区内重点排放单位的排放报告、核查报告报送情况，并监督管理核查机构的核查工作。国家发改委则主要负责统一核算报告的技术标准，并对核查机构的资质进行统一管理。重点排放单位每年向省级发改委提交监测计划、排放报告和核查机构出具的核查报告。其次，省级发改委负责对排放报告与核查报告进行复查,包括国家发改委要求复查的、核查报告显示排放存在问题的、以及一定比例的抽查。复查的相关费用由省级财政予以安排。最后，省级发改委对其行政区域内所有重点排放单位上年度的排放量予以确认，并通知确认结果。重点排放单位未按时履行配额清缴义务的，由省级发改委责令其履行配额清缴义务；逾期仍不履行的，给予行政处罚。核查机构存在违法行为的，由其注册所在地省级发改委给予行政处罚，并上报国家发改委。

国家发改委已经公布和未来将要公布的企业温室气体排放核算与报告指南或根据这些指南制定的国家标准，将成为重点排放单位制定排放监测计划、编制排放报告以及核查机构开展核查工作的依据。2013年底，国家发改委已发布首批10个行业的《企业温室气体排放核算与报告指南》，包括发电、电网、钢铁、化工、电解铝、镁冶炼、平板玻璃、水泥、陶瓷和民航。目前，正在根据这些指南制定相应的国家标准。另外，

	NDRC 国家发改委	Provincial DRCs 省级发改委
Covered Scope 覆盖范围	Set coverage standards 确定纳入标准	Draw up key emitters list based on standards and expand scope if necessary 根据标准确定辖区内重点排放单位名单，如有需要可扩大范围
Total Allowance 配额总量	Set total national and provincial allowance 确定国家和地方配额总量	-
Allowance llocation 配额分配	Set method and standards for free allocation 确定免费分配方法和标准	Allocate allowance freely and auction allowance based on tighter standards 根据标准进行免费分配，可从严并进行有偿分配
Emissions Trading 碳排放权交易	Designate exchanges 确定交易机构	Monitor trading 监管辖区内的交易情况
Registry System 注册登记系统	Establish and manage registry system 负责建立和管理系统	Manage allowance allocation and surrendering with provincial administrators 利用省级管理员账户管理辖区内的配额分配和清缴
Reporting and Verification 碳排放核算报告和核查	Set technical standards and supervise verifiers 确定技术标准，负责核查机构资质管理	Supervise reporting and verification of key emitters as well as monitor verification bodies 负责管理辖区内的重点排放单位报告、核查工作以及核查机构工作
Allowance Surrendering 配额清缴	Publish surrendering information 公布清缴情况	Monitor allowance surrendering of key emitters 负责监管辖区内重点排放单位的配额清缴

Responsibilities of NDRC and provincial DRCs
国家发改委和省级发改委主要管理职能对比
Source / 图片来源：SinoCarbon Innovation & Investment

By the end of 2013, NDRC has published ten sector specific guidelines on measuring and reporting GHG emissions, including power generation, power grid, steel, chemicals, aluminum and magnesium smelting, glass, cement and ceramics manufacturing as well as civil aviation. Now, the national standards are being developed according to the guidelines. Furthermore, NDRC will soon release a second group of guidelines for verification and reporting of more sectors, namely mining, transport, mechanic and electronic devices, food, beverage and tobacco, building, non-ferrous metals as well as paper manufacture.

Allowance Surrendering

The provincial DRCs will manage the surrendering of emission allowance, whereas NDRC will only publish the surrendering information. Key emitters are required to surrender permits annually. In addition, key emitters are allowed to use CCERs to offset part of their confirmed emissions. If key emitters fail to comply with surrendering requirements in time, the provincial DRCs will order compliance and if non-compliance still exists after the prescribed period, administrative penalties shall be imposed.

The regulatory measures specify that NDRC and the provincial DRCs are required to set up credit records for key emitters, verifiers and exchanges as well as other participants and individuals and include the records in relevant credit management systems. NDRC will establish a “black list” and expose institutions and individuals that are violating the rules. This should enhance transparency and further improve the implementation of the measures.

国家发改委马上将发布第二批核算和报告指南，包括采矿、交通、机械电子设备、食品饮料烟草、建筑、有色金属、造纸、其他工业（通用）等8个行业。

配额清缴

配额清缴的管理权主要在省级发改委。国家发改委只负责配额清缴情况的公布。重点排放单位每年应向所在地的省级发改委提交不少于其上年度经确认排放量的排放配额，履行上年度的配额清缴义务。另外，重点排放单位可按照有关规定，使用国家核证自愿减排量（CCER）抵消其部分经确认的碳排放量。重点排放单位未按时履行配额清缴义务的，由省级发改委责令其履行配额清缴义务；逾期仍不履行的，给予行政处罚。

管理办法要求，国家发改委和省级发改委应建立重点排放单位、核查机构、交易机构和其它从业单位和人员参加碳排放交易的相关行为信用记录，并纳入相关的信用管理体系。对于严重违法失信的碳排放权交易的参与机构和人员，国家发改委应建立“黑名单”并依法予以曝光。这一新型的管理模式从国家和地方层面对相关人员和单位加强了约束，与国家目前建设完善社会征信管理的政策相辅相成。信用的积累是一个长期的过程，此项规定要求相关人员和单位全面而持续地进行自我约束和监督。总体来说，管理办法给国家碳排放权交易市场设定了全面的框架，使整个市场有法可依，而具体的细节会在后续的实施过程中进一步通过配套文件来进行细化。管理办法体现了政府建设碳市场的决心和力度。让我们拭目以待它在碳市场未来发展中的作用。

Fairs & Events 展会与活动

7th Guangzhou International Solar Photovoltaic Exhibition
Guangzhou, China · 18.08.2015 - 20.08.2015
第7届广州国际太阳能光伏展览会
广州，中国 · 2015年8月18日 - 8月20日
pvguangzhou.com

11th Forum on Environment and Development
China International Ecological Environment Technology & Equipment Expo 2015
Beijing, China · 14.09.2015 - 16.09.2015
第11届环境与发展论坛
2015中国国际生态环境技术与装备博览会
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lcesummit.com

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emca.cn

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alternative-energy-news.info

China Energy Web 中国能源网
china5e.com

China Greentech Initiative 中国绿色科技
china-greentech.com

China Renewable Energy Society (CRES) 中国可再生能源学会
cres.org.cn

China Renewable Energy Centre 国家可再生能源中心
cnrec.org.cn

German Energy Agency 德国能源署
dena.de

German Federal Ministry for Economic Affairs and Energy (BMWi) 德国联邦经济和能源部
bmwi.de

Energy Efficiency Export Initiative 能效出口倡议
efficiency-from-germany.info

Renewable Energies Export Initiative 出口计划网
export-erneuerbare.de

Europe-China Clean Energy Centre 中欧清洁能源中心
ec2.org.cn/en

RETech 回收技术
retech-germany.net

Renewable Energy World 可再生能源世界研讨会暨博览会
renewableenergyworld.com

Renewables International 国际可再生能源
renewablesinternational.net

Environment 环境

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Federal Agency for Nature Conservation 联邦自然保护局
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nachhaltiges-china.de

Federal Environmental Agency 德国联邦环境局
umweltbundesamt.de

The Guardian 卫报
guardian.co.uk/environment

Climate Protection & CDM 气候保护与清洁发展机制

CDM in China中国清洁发展机制
cdm.ccchina.gov.cn

China Climate Change Info-Net 中国气候变化信息网
en.ccchina.gov.cn

Chinese Renewable Energy Industries Association (CREIA)
中国可再生能源行业协会
creia.net

Climate Focus 气候聚焦
climatefocus.com

Climate Works Foundation 气候工作基金会
climateworks.org

CO2 Trade 二氧化碳交易
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German Emissions Trading Authority
德国温室气体排放量交易处
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cdm.unfccc.int

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