

# ENERGY

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# Contents

<b>Oil (石油)</b> .....	<b>3</b>
Putin backing for output cap lifts oil to highest level in a year .....	3
普京支持限产推升油价至一年高位 .....	3
Energy companies must act to avoid banks' mistakes .....	4
未开发石油储量该怎么估值? .....	5
<b>New Energy (新能源)</b> .....	<b>6</b>
Hanwha Q CELLS retains InnoLas laser technology for next-gen PERC cells .....	6
韩华 Q Cells 保留 InnoLas 新一代 PERC 电池的激光技术 .....	6
EDF and Canadian Solar start work on 191MW Brazil project.....	7
阿特斯瞿晓铤: 项目销售做“缓冲”, 以弥补其组件销售懈怠之势 .....	7
BNDES rules for Brazilian solar financing to 'restore investor confidence' .....	8
BNDES 颁布新规, 以帮助巴西太阳能经济产业“重塑投资者信心” .....	8
400 companies call for end to MIP as new trade associations join lobbying efforts .....	9
400 家企业呼吁终止 MIP, 晶科、晶澳主动退出该协议.....	10
JinkoSolar supplying 300MW of modules to low income projects in Henan province.....	11
晶科能源为河南低收入项目提供 300MW 组件 .....	11
JinkoSolar's founder to purchase majority stake in Jinko Power for US\$250 million .....	11
晶科能源创始人拟以 2.5 亿美元购买晶科电力股份.....	12
Taiwan ripe for floating PV .....	13
PV Taiwan: 新 FiTs 政策为漂浮式水面光伏打开一扇新大门.....	14
Hanergy Thin Film to appoint financial advisers on efforts to restart stock trading.....	15
汉能薄膜拟委派财务顾问, 以谋求复牌.....	15
The economics of the future energy system.....	15
未来能源系统经济学 .....	24
<b>Natural Gas (天然气)</b> .....	<b>30</b>
Russia and Turkey agree gas pipeline deal .....	30
俄土签署天然气管道协议 .....	31
Why Japan's Liquefied Natural Gas Demand Will Increase .....	31
为何日本液化天然气需求将上升 .....	34
China requested to construct third LNG pipeline .....	37
中国要求建设第三条 LNG 管道 .....	37
Russia and Turkey agree gas pipeline deal .....	38
俄土签署天然气管道协议 .....	38
<b>Minerals (矿产)</b> .....	<b>39</b>
In Australia, China's Appetite Shifts From Rocks to Real Estate .....	39
澳大利亚的中国“金主”: 矿业冲击波.....	41
China mergers shake up steel sector .....	43

## Mcanxixun Information

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破产与合并冲击下的中国钢铁业 .....	45
EU Steel.....	46
欧洲钢铁制造商呼吁强化贸易防御 .....	47
<b>Clean Energy（清洁能源） .....</b>	<b>48</b>
Can India walk its climate talk?.....	48
印度能够实现其气候承诺吗？ .....	51
Britain’s atomic waste legacy .....	53
英国的原子废料遗产 .....	55
Paris climate deal to enter into force next month .....	56
《巴黎协定》将于下月正式生效 .....	58
Global clean energy investment slumps 43% in Q3, year-on-year .....	59
全球清洁能源投资在第三季度同比下降 43% .....	60
<b>Coal（煤炭） .....</b>	<b>61</b>
China pushes back against US bid to tighten UN coal sanctions on North Korea.....	61
美国试图收紧对朝鲜的煤炭制裁遭中国反对.....	62
Coal Mining Update Indonesia: Production Down, Consumption Up .....	63
印尼采煤：产量下降，消费提高 .....	65
The coal industry is dying — no matter what the president does .....	67
美煤炭产业衰败中 .....	68
<b>Electricity（电力） .....</b>	<b>69</b>
U.S. residential electricity prices decline for the first time in many years .....	69
美国住宅电价多年来首次下降 .....	71
How gas generators cashed in and exploited hot water load .....	72
天然气发电机如何利用以及从热水负荷中获利.....	75

# Oil (石油)

## Putin backing for output cap lifts oil to highest level in a year

Oil rose to its highest level in a year after President Vladimir Putin said yesterday that Russia was prepared to join Opec efforts to stem the decline in crude prices through a production cap.

Speaking at the World Energy Congress in Istanbul, Mr Putin said that he hoped that the producers' group would decide at its next ministerial meeting in November to adopt quotas for member countries' output.

Last month, Opec countries reached an agreement in Algiers to curb production to between 32.5m and 33m barrels a day. But details for a binding deal to reduce supply, which would be the first since the financial crisis, still need to be ironed out.

Mr Putin said that the fall in prices by more than 50 per cent since mid-2014 had triggered the longest period of investment decline in 45 years. The drop in funding into future production could lead to "unpredictable jumps" in prices, he said.

"That's why in the current situation we think that [an oil output] freeze or even an oil production cut is likely to be the only right decision to maintain the stability of the global energy sector," Mr Putin said, according to Reuters. He added: "Russia is ready to join the joint measures to cap production and is calling for other oil exporters to join."

Brent crude, the international benchmark, increased as much as \$1.47 to \$53.50 a barrel after Mr Putin's remarks. This is the highest level since October 9 last year.

West Texas Intermediate, the US marker, rose \$1.46 to a high of \$51.31 a barrel, the highest since June. Earlier in the day, Khalid Al Falih, Saudi Arabia's energy minister, said that he was optimistic that a deal would be struck but any Opec output curbs should not be too severe.

"Opec needs to make sure we don't crimp too tightly and create a shock to the market," he said.

Mr Falih said the current supply and demand picture was still unclear, so Opec should not cut production more than is necessary. "We don't want to give the market the wrong signal," he said.

## 普京支持限产推升油价至一年高位

俄罗斯总统表示，俄罗斯愿意配合欧佩克限产以稳住油价，希望这个产油国组织在 11 月部长级会议上作出限产决定。

油价涨至一年来最高水平，此前俄罗斯总统弗拉基米尔·普京(Vladimir Putin)昨日表示俄罗斯准备加入石油输出国组织(OPEC)通过限产来遏制原油价格下滑的努力。

普京在伊斯坦布尔的世界能源大会(World Energy Congress)上发言时表示，他希望这个产油国组织能在 11 月举行的下一次部长级会议上做出对成员国产出实施配额制的决定。

上月，欧佩克国家在阿尔及尔达成一致，将日产量减至 3250 万桶到 3300 万桶之间。但要达成金融危机以来首个具有约束力的减产协议，还需要敲定一些细节。

普京表示，自 2014 年中期以来油价下跌逾 50%，引发了 45 年来持续最久的投资下滑。他说，对未来

石油生产的投资下滑可能导致油价出现“不可预测的跃升”。

“这就是为何在当前情况下我们认为冻结（石油产出）甚至减产可能是维持全球能源业稳定的唯一正确决定，”路透社(Reuters)援引普京的话表示。他补充道：“俄罗斯已经准备好加入联合限产举措，并呼吁其他石油出口国加入。”

在普京发言后，国际原油基准布伦特原油上涨多达 1.47 美元，至每桶 53.50 美元。这是自去年 10 月 9 日以来的最高水平。

美国原油基准西得克萨斯中质原油(West Texas Intermediate)上涨 1.46 美元，至 51.31 美元的高点，这是自 6 月以来的最高水平。昨日早些时候，沙特石油部长哈利德·法立赫(Khalid al-Falih)表示，他对达成协议抱乐观态度，但任何欧佩克限产举措都不应过于严厉。

“欧佩克需要确保我们没有限制得太紧以致对市场产生冲击，”他说。

法立赫表示，当前供给和需求的情况尚不明朗，因此欧佩克的减产不应超过必要的程度。“我们不想向市场发出错误的信号，”他说。

## Energy companies must act to avoid banks' mistakes

A decade ago the phrase “level-three assets” made bankers wince. The reason? Back then it referred to an accounting category of securities so fiendishly hard to value with mark-to-market metrics that bankers were in effect allowed to create their own valuations.

No one cared about this oddity when times were good. But when the credit crisis exploded, investors realised that the valuations of those pesky level-three assets, which included products such as collateralised debt obligations, could vary wildly and could prove to be hopelessly wrong. So confidence crumbled — and with it the banks' share prices.

Some of that opacity and anxiety has since been reduced at the US banks, at least in relation to items such as mortgage securities.

But a small echo of the “level-three problem” has appeared, this time in the energy world. The US Securities and Exchange Commission is probing whether ExxonMobil has appropriately valued items such as untapped energy reserves in its corporate accounts, according to a Wall Street Journal report this week. This mirrors a separate investigation into Exxon's reporting that Eric Schneiderman, the New York state attorney-general, launched last year.

While regulators have been tight-lipped about the details of these probes, they are understood to be focusing on at least two questions: first, whether the energy company has properly adjusted its books to reflect the 60 per cent plunge in oil prices in the past two years; and, second, whether Exxon has appropriately revalued its assets to reflect the current and future impact of the shifting climate change debate.

In particular, regulators want to know whether it has made enough writedowns to recognise the fact that environmental activism could cut demand for fossil fuels and impose costly new regulations. Unsurprisingly, Exxon executives deny wrongdoing. They insist they are “fully complying with the SEC request for information and are confident our financial reporting meets all legal and accounting requirements”. Indeed, some energy executives blame the entire saga on grubby politics. Most notably, the rumour circulating in the energy world is that Mr Schneiderman is using Exxon to make a splash in Democrat politics — and Exxon makes an easy target because it has taken an aggressive line on climate change.

What makes the saga fascinating, and problematic for the industry, is that it has exposed an accounting Achilles heel. Even when oil prices are stable, it is tough to measure the real value of future reserves. But, when it comes to calculating the cost of future climate change regulations, the task is doubly hard. As this week's debate at the UN shows, the political fights are complex; indeed, measuring level-three bank assets seems simple by comparison.

Some companies try to deal with the uncertainty by factoring a putative “price of carbon” into their investment calculations, to show the future cost of meeting regulations such as carbon tax. Shell and BP even reveal this number, currently estimated to be about \$40 a metric tonne, to shareholders. Exxon has its own estimates (up to \$80) but has released less data — partly because it argues, with some validity, that such estimates of the carbon price are too vague. In any case, the US Generally Accepted Accounting Principles system that Exxon uses has more flexible valuation standards than the International Financial Reporting Standards.

This uncertainty could end up working in Exxon’s favour: it would be hard for prosecutors to prove that anybody deliberately misstated assets. But it may also mean that regulators find numerous targets to attack, just as they did with the banks. The one thing that is clear is that the investigations, and the uncertainty, could drag on a long time.

Some companies are trying to get ahead. Last October, Royal Dutch Shell reported an \$8.2bn writedown of its assets. Chevron has reported impairment charges of almost \$5bn in the past two years. What is needed now is a much bigger step — one that banks never took. Executives need to start an industry-wide debate about how to measure and report the financial consequences of climate change in a harmonised and clear way. This must include regulators, auditors and shareholders, along with the C-suite.

It will not be easy. And it might never provide the levels of clarity that shareholders and climate change activists want to see. But being reactive and defensive is not an effective strategy, as the history of the banks in the past decade shows. Exxon and other energy companies should look at that level-three tale — and act.

### 未开发石油储量该怎么估值？

郇蒂：监管者担心能源企业资产两个问题：一是它们是否反映油价大跌影响；二是它们是否反映气候变化法规冲击。

十年前，“第三级资产”这个短语让银行家们感到面部肌肉抽搐。因为当时这个短语指的是会计方面的一个证券类别，这些证券特别难用市价指标去估值，银行家们实际上被允许自由估值。

市况良好时，谁也不关心这件怪异小事。但当信贷危机爆发时，投资者意识到，这些恼人的第三级资产（包括担保债务凭证(CDO)等产品）的估值可能相差很大，最终可能被证明错得离谱。结果，信心崩溃了——银行股价随着大跌。

自那以来，在美国银行业，不透明和焦虑在一定程度上得到了缓解，起码在有关抵押贷款证券等资产上是这样。

但是，目前出现了“第三级资产”的轻微回声——这一次是在能源领域。《华尔街日报》(WSJ)不久前的一篇报道称，美国证交会(SEC)已开始调查埃克森美孚(ExxonMobil)的公司账目对于未开发能源储量等项目的估值是否合适。此次调查的目的类似于去年纽约州总检察长埃里克·施奈德曼(Eric Schneiderman)对该公司会计报告发起的另一次调查。

尽管监管者对这些调查的细节守口如瓶，但据悉他们起码针对两个问题：一是这家能源公司是否恰当调整了账目、以反映过去两年油价大跌 60% 的影响；二是这家公司是否恰当重估了资产、以反映不断演变的气候变化辩论在当前和未来产生的冲击。

尤其是，监管者想要知道，埃克森美孚是否进行了足额减记，以计入如下事实——环境行动主义可能会减少化石能源需求，并带来代价高昂的新监管规定。不出意外的是，埃克森美孚的高管否认存在任何过错。他们坚称，他们“完全遵守了美国证交会对于信息的索取要求，并相信，我们的财务报告达到了所有的法律和会计要求”。的确，有些能源业高管把整件事情归结为肮脏的政治。最引人注目的是，能源领域的传闻称，施奈德曼正在利用埃克森美孚在民主党政治中引起关注——埃克森美孚之所以是一个容易被盯上的靶子，是因为该公司在气候变化问题上采取强硬立场。

让整件事令人着迷、并给能源业造成麻烦的是，它暴露了会计方面的一个致命要害。即便当油价稳定时，要衡量未来储量的真实价值也是很难的。但是，若要计算未来气候变化监管带来的成本，这个任务就难上加难了。正如最近联合国(UN)辩论所显示的那样，政治角力十分复杂；的确，相比之下给银行的第三

级资产估值似乎是简单的。

有些公司正努力应对不确定性，把推定“碳价”纳入他们的投资考量，以显示未来满足碳税等监管规定的成本。荷兰皇家壳牌(Royal Dutch Shell)和 BP 甚至向股东披露了这个数字——目前估算额为每吨 40 美元。埃克森美孚也有自己的估算（最高 80 美元），但其公布的数据更少——部分原因在于，该公司或多或少正确地辩称，这种对碳价的估算太过模糊了。不管怎么说，埃克森美孚所使用的美国公认会计原则(GAAP)的估值标准比国际财务报告准则(IFRS)更灵活。

不确定性最终可能有利于埃克森美孚：这将让检方很难证明，有人故意误述了资产。但这或许也意味着，监管者找到了数不清的可攻击对象，正如他们对待银行那样。有一件事是明确的——调查和不确定性可能会延续很久。

有些公司正努力走在前面。去年 10 月，壳牌报告称，已减记 82 亿美元资产。雪佛龙(Chevron)报告称，过去两年的减损支出接近 50 亿美元。现在需要的是一项力度大得多的措施——银行业从未采取过的措施。高管们需要开启一次全行业的辩论，探讨如何以一致和明确的方式衡量并报告气候变化的财务后果。辩论各方必须包括监管者、审计者、股东，以及企业高管。

这将并非易事。辩论或许永远无法提供股东和气候变化活动人士们所希望看到的那种清晰度。但是，反应与防御并非有效的策略，正如过去十年银行业的历史所显示的那样。埃克森美孚和其他能源公司应当考察一下第三级资产的状况——并行动起来。

## *New Energy* (新能源)

### **Hanwha Q CELLS retains InnoLas laser technology for next-gen PERC cells**

PV laser technology equipment specialist InnoLas Solutions has supplied its ILS-TT rotary table laser production tool to ‘Silicon Module Super League’ (SMSL) member, Hanwha Q CELLS R&D facility in Germany to support next-generation PERC (Passivated Emitter Rear Contact) development.

InnoLas noted that it had previously supplied its ILS-TT laser machine to former Q-Cells but had been chosen to become the partner of Hanwha Q CELLS. The laser tool was delivered to Hanwha Q CELLS’ in September, 2016, according to InnoLas.

Dr. Markus Ficher, Vice President R&D Processes at Hanwha Q CELLS GmbH said: “InnoLas is enabling us to achieve our ambitious efficiency milestones on our roadmap faster and more reliably. We look forward to continue our trustworthy partnership by evaluating innovative technologies together.”

According to Markus Nicht, CEO of InnoLas Solutions, Hanwha Q CELLS retained its laser technology after evaluating other options on the market.

“It shows that we remain the technology leader in advanced laser processing for the PV industry,” noted Nicht.

THE SMSL member recently announced it would start production of monocrystalline PERC solar cells and half-cut cells. InnoLas provides laser cutting tools for half-cut cells.

### **韩华 Q Cells 保留 InnoLas 新一代 PERC 电池的激光技术**

光伏激光技术设备专门企业 InnoLas 已向“硅基组件超级联盟”成员韩华 Q Cells 位于德国的研发部门提供 ILS-TT 旋转盘激光生产工具，以为其新一代 PERC 产品的开发提供支持。

InnoLas 表示，其此前曾向该客户前身 Q-Cells 公司提供 ILS-TT 激光设备，并再次决定成为韩华 Q CELLS 的合作伙伴。据 InnoLas 表示，相关激光设备计划在 2016 年 9 月交付韩华 Q CELLS。

韩华 Q CELLS 的研发工艺副总监 Markus Ficher 博士表示，“InnoLas 公司能够帮助我们更快地实现在技术路线图上新的转化率目标，并获得更高的可靠性。我们十分期待通过共同对创新技术进行发展，继续与 InnoLas 公司之间充满信任的合作关系。”

据 InnoLas 公司首席执行官 Markus Nicht 表示，韩华 Q CELLS 在对市场上其他的选择进行了评估之后，选择继续使用激光技术。

“这显示出了我们的激光技术在光伏产业内仍旧保持着领先的地位。”

该硅基组件超级联盟成员日前宣布开始单晶 PERC 太阳能电池和半切电池产品生产。InnoLas 为半切电池提供激光切割工具。

## EDF and Canadian Solar start work on 191MW Brazil project

EDF Energies Nouvelle and 'Silicon Module Super League' (SMSL) member Canadian Solar will collaborate on the 191.5MW Pirapora I project, with the latter selling 80% of its stake in the facility.

Canadian Solar will provide modules for the site from its 360MW factory in Brazil. It is the company's first project in the country. The module production centre is part of a collaboration with white label manufacturer Flextronics International (Flex) designed to allow Canadian Solar access to the local market, which has some domestic content rules in place.

EDF has purchased an 80% stake in Pirapora I from Canadian Solar. In Canadian Solar's latest results call, CFO Huifeng Chang said the company would “deleverage our balance sheet with the proceeds from coming project sales”. On the same call, CEO and chairman Shawn Qu described project sales as a “buffer” to protect it against any slack in module sales.

EDF pipeline

The French company now has a pipeline of 1.4GW of wind and solar in Latin America.

"The investment by EDF...is a demonstration of the strong potential of the solar energy market in Brazil," said Canadian Solar's Qu. "Pirapora I is one of Canadian Solar's three current projects in the country totalling 394MWp with awarded long-term PPAs," he added.

Antoine Cahuzac, senior executive vice president, renewable energy, EDF and CEO of EDF Energies Nouvelles said: “With these new large-scale Latin American projects, EDF Energies Nouvelles has demonstrated its ability to undertake projects through to fruition in these promising and competitive markets alongside local partners possessing proven context knowledge.”

Brazil has ambitious solar plans but economic woes at home and tweaks to the procurement programme has caused delays.

### 阿特斯瞿晓铎：项目销售做“缓冲”，以弥补其组件销售懈怠之势

EDF Energies Nouvelles 公司“硅基组件超级联盟” (SMSL) 成员阿特斯阳光电力将合作开发 191.5MW 的 Pirapora 一期项目，后者将出售其所拥有的 80% 项目所有权。

阿特斯阳光电力将从其位于巴西的 360MW 工厂为该项目提供组件(点击查看 PV-Tech 此前相关报道)。该项目是公司在巴西的首个项目。该组件生产中心是阿特斯与贴牌产品制造商伟创力(Flex)合作业务的一部分,旨在为阿特斯阳光电力的产品提供符合国内生产要求的方式,以进入该国国内市场。

EDF 从阿特斯阳光电力手中购得 Pirapora 项目一期的 80% 所有权。在阿特斯阳光电力最近一次的收益电话会议中,首席财务官张慧峰表示,公司将“通过来自项目销售的收益对资产负债表进行去杠杆化”。在小规模的电话会议中,阿特斯阳光电力首席执行官兼董事长瞿晓铨博士将项目销售描述为“缓冲”,以弥补其组件销售懈怠之势(点击查看 PV-Tech 此前相关报道)。

### EDF 项目储备

这家法国公司目前在拉美州市场上已具有 1.4GW 的风能和太阳能项目储备。

“获得 EDF 的投资展示了巴西太阳能市场所具有的强大潜力。”阿特斯阳光电力的瞿博士表示,“Pirapora 项目一期是阿特斯阳光电力目前在巴西进行的三个项目之一,总量达 394MW,均获得了长期购电合同。”瞿博士补充道。

EDF 能源公司可再生能源部高级执行副总监、EDF Energies Nouvelles 首席执行官 Antoine Cahuzac 先生表示:“凭借拉美州市场上的这些大规模新项目,EDF 展示了自身所具有的项目执行能力,以及在这些具有极大潜力和竞争激烈的市场上,与具有丰富经验的当地合作伙伴共同合作的能力。”

巴西制定了极具野心的太阳能发展计划,但国内的经济困境和采购项目流程的调整导致了计划执行的延迟。

## **BNDES rules for Brazilian solar financing to ‘restore investor confidence’**

Brazil’s development bank BNDES has approved new financing conditions for the energy sector, which favour solar.

The bank has increased its share of financing the Long-Term Interest Rate (TJLP) for solar energy projects from 70% to 80%, the highest rate for all alternative and conventional energy sources.

In a release, BNDES stated: “The priority given to solar energy, reflected in better financial conditions, is due to the fact the technology is in early stage of development in the country.”

As a result, the bank is putting in “demand stimuli” to achieve economies of scale and gains associated with technological diffusion and more competitive prices.

BNDES also aims to contribute to the expansion of other alternative energy sources in the Brazilian energy matrix with wind, small hydro, biomass and cogeneration all receiving up to 70% TJLP. However, hydro power saw its TJLP financing percentage from BNDES decline to 50%.

The new conditions come into effect for the next energy auctions in October and December 2016.

Brazilian solar association (Absolar) executive president Rodrigo Sauer said it would help to restore the confidence of solar investors and domestic entrepreneurs.

“It shows that the bank’s commitment is not only in speech but in action,” he added.

Sauer said the ratification of the Climate agreement in Paris had been a factor in the bank’s decision as well as the fact that 25-30 jobs are created for every 1MW of solar in Brazil, he claimed.

### **BNDES 颁布新规, 以帮助巴西太阳能经济产业 “重塑投资者信心”**

巴西国家社会经济发展银行(BNDES)日前批准了能源产业内的新融资条件，对太阳能产业十分有利。该银行将针对太阳能项目的长期利率(TJLP)的适用比例由 70% 提高至了 80%，在所有可替代能源和传统能源领域内所占比例最高。

在其公告中，BNDES 表示：“太阳能产业能够获得优渥融资条件等优待，是由于该技术在国内仍旧处于发展初期。”

因此，该银行试图创造“需求刺激”，以实现规模经济，并通过技术扩散和根据竞争力的价格获得回报。

BNDES 同时还表示，将继续为巴西能源布局中其他可再生能源的发展壮大做出贡献，并实现风能、小型水电、生物质能和热电联产等发电方式均获得高达 70% 的 TJLP 比例。但是，水力发电产业的 TJLP 融资比例曾被 BNDES 降至 50%。

新的融资条件将在 2016 年 10 月和 12 月的能源项目招标中正式实施(点击查看 PV-Tech 此前相关报道)。

巴西太阳能协会(Absolar)执行总裁 Rodrigo Sauaia 表示，此举有助于重塑太阳能行业投资商和国内企业对行业的信心。

“此举显示了该银行所给出的承诺并不仅仅是口头上的言辞，而且切实地采取了行动。” Sauaia 先生表示。

Sauaia 先生还表示，在巴黎通过的气候协议是促使该银行做出相关决定的原因之一，另外的原因还包括巴西太阳能行业中每 1MW 项目可创造 25-30 个就业岗位这一事实。

## **400 companies call for end to MIP as new trade associations join lobbying efforts**

Anti-minimum import price sentiment has continued to swell this week as more than 400 companies called on the European Commission to put an end to trade duties on solar modules and cells.

Lobbying efforts have also been buoyed by the addition of two new European trade associations to a letter addressed to European commissioner Cecilia Malmström calling for the same conclusion, most notably influential French solar trade association Enerplan.

The intensifying of lobbying against trade duties attached to solar components comes just as the EC expiry review of the tariffs is drawing to a close, with a verdict expected sometime before the March 2017 deadline.

A total of 403 companies from 28 separate member states have co-signed a statement which claimed that the measures are having an “unforeseen consequence of negatively impacting the entire European solar value chain”, impacting on jobs, investment and solar deployment across the continent.

“A policy that was designed to help the few has failed to do so, only serving to harm the very many right across the EU.

“To return sustainable growth to our sector, to see jobs come back to our companies and to see the value of solar grow in Europe again, the trade measures must go.

“We call on you to make a responsible decision and act in the interest of the European Union and end the trade measures on solar modules and cells immediately,” the statement reads.

The list of companies comprises leading European developers, installers, finance firms and manufacturers representing the solar supply chain.

Meanwhile Enerplan and Polish PV association PV Polska have thrown their weight behind lobbying efforts within political circles, signing a letter addressed to European Commissioner Cecilia Malmström calling for the

immediate removal of the anti-dumping and anti-subsidy measures.

This letter, dated yesterday (11 October 2016), puts across various reasons for the measures to be repealed including the negative impacts they have had on total solar deployment across Europe particularly when compared to the progress made by other continents.

“Ending the trade measures and returning to market prices for solar will give Europe an opportunity to decarbonise its power generation in a cost efficient way, in line with the objectives the EU has signed up to in the Paris Agreement,” it states.

The MIP has come under increasing pressure and scrutiny of late with a number of fresh withdrawals from the undertaking. Last month saw both JinkoSolar and JA Solar exit the agreement voluntarily.

Those developments followed a raft of other exits which led SolarPower Europe to conclude that the MIP was “becoming obsolete”.

Meanwhile pro-MIP campaign group EU ProSun last month lashed out at China and Chinese module manufacturers after German module manufacturer SolarWorld, which established the group, made 500 temporary workers redundant, a decision which it squared solely with the “fudging and cheating” by Chinese manufacturers to circumvent the anti-dumping measures.

### 400 家企业呼吁终止 MIP，晶科、晶澳主动退出该协议

对最低进口价格(MIP)的反对情绪目前正不断发酵，已有逾 400 家企业呼吁欧盟终止对太阳能组件和电池产品实施贸易关税。

另外两家欧洲产业协会日前也加入了游说行列，向欧委会委员 Cecilia Malmström 发出一封公开信，做出了相同的呼吁，值的指出的是，这其中包括极具影响力的法国太阳能协会 Enerplan。

反对针对太阳能产品的贸易关税的游说行为随着欧盟对关税期满复审期限的临近而愈演愈烈(点击查看 PV-Tech 此前相关报道)，欧盟须在 2017 年 3 月结束前给出相关裁决。

来自 28 个成员国的共 403 家企业联合签署了一份声明，称相关政策“对整个欧盟太阳能价值链造成了无法预见的负面影响”，波及欧洲大陆上就业、投资、太阳能应用等领域。

“这一旨在为少数企业谋利的政策并未达到预期效果，并且伤害了欧盟内大多数企业的利益。

“如果想恢复太阳能产业的可持续发展、促使就业岗位回流至我们的企业，并促进太阳能产业在欧洲市场上的增值，这一贸易决议必须被取消。

“我们请您做出对欧盟负责、符合欧盟利益的决定，立即终止针对太阳能组件和电池的这一贸易条款。”相关声明中指出。

参与联合署名的企业包括欧洲各领先制造商、安装商、金融机构和制造商等，遍布整个太阳能产业供应链。

同时，发过太阳能产业协会 Enerplan 和波兰光伏委员会 PV Polska 也在政客圈内施加了各自的压力，向欧委会委员 Cecilia Malmström 发出一封公开信，呼吁立即停止相关的反倾向与反补贴规定。

该公开信的发表日期为 10 月 11 日，阐述了多个该规定应被取消的原因，其中包括对欧盟内太阳能应用领域所造成的负面影响，特别是与其他大洲相比较后的结果。

公开信中表示，“停止该贸易规定的实施并允许太阳能产品价格回归市场，可为欧洲提供具有成本效率的实现发电产业脱碳的机会，这与欧盟所签署的巴黎条款的宗旨相一致。”

随着近期不断有企业推出 MIP 协议，该规定正面临着极大的压力和审查压力。就在上个月，晶科能源与晶澳太阳能主动退出了该协议(点击查看 PV-Tech 此前相关报道)。

随后，又有一批企业退出了该协议，SolarPower Europe 进而得出结论，MIP 已然“不合时宜”(点击查看 PV-Tech 此前相关报道)。

同时，赞成 MIP 机制的 EU ProSun 在上个月其创始企业 SolarWorld 解雇 500 名临时工人后，对中国及中国组件制造商进行了抨击，认为导致 SolarWorld 做出这一决定的唯一原因是中国企业为规避反倾销措施所使出的“蒙骗和作弊”手段。

## **JinkoSolar supplying 300MW of modules to low income projects in Henan province**

Leading global ‘Silicon Module Super League’ (SMSL) member JinkoSolar has teamed with electrical engineering and EPC firm, Henan Senyuan Electric Co to provide 300MW of PV modules for a major series of projects targeting low-income households in and around Lankao County, Henan Province, China.

Senyuan Electric gained approval from the local government in August, 2016 to provide a total of 486.5MW of ‘poverty alleviation’ PV power plants that would be implemented in two phases, although timelines were not disclosed in financial filings.

Gener Miao, JinkoSolar's vice president of global sales and marketing said: "Our collaboration with Senyuan Electric will provide thousands of low-income households with the highest quality PV modules that will ensure a sustainable generation of green energy and income for them and raise their standard of living."

The projects are said to cover 451 administrative villages with a total population of 830,000, covering a total area of 1116 square kilometers.

### **晶科能源为河南低收入项目提供 300MW 组件**

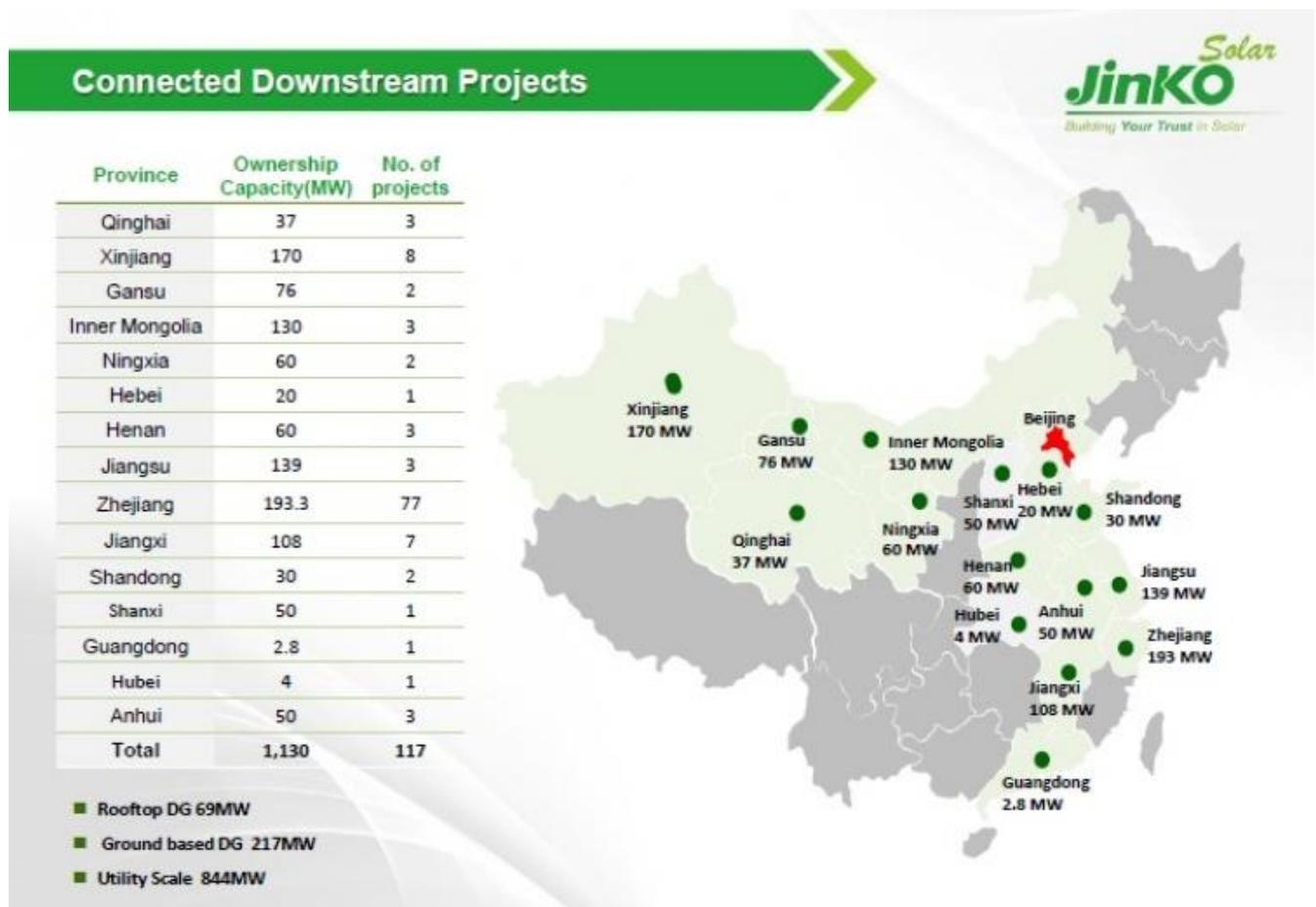
全球领先的“硅基组件超级联盟”(SMSL)成员晶科能源日前携手电子工程与 EPC 企业，河南森源电气有限公司，为河南兰考县的一批以低收入家庭为对象的主要项目提供 300MW 组件。

森源电气在今年八月份获得当地政府批准，在当地分两期建造总量为 486.5MW 的扶贫光伏项目，但项目执行的具体时间并未在财报中详述。

晶科能源全球销售与市场副总监 Gener Miao 先生表示，“我们与森源电气之间的合作，将可为数千个低收入家庭提供最高质量的光伏组件，从而保证这些家庭能够持续产生绿色能源，及其所带来的收入，并提高他们的生活水平。”

相关项目据称可覆盖 451 个行政村，总人口数量达 83 万，地域面积达 1116 平方公里。

## **JinkoSolar's founder to purchase majority stake in Jinko Power for US\$250 million**



JinkoSolar said its founder and chairman, Xiande Li would purchase a major share in the downstream PV power plant business, Jinko Power for US\$250 million.

Leading ‘Silicon Module Super League’ (SMSL) member JinkoSolar said its founder and chairman, Xiande Li would purchase a major share in the downstream PV power plant business, Jinko Power for US\$250 million.

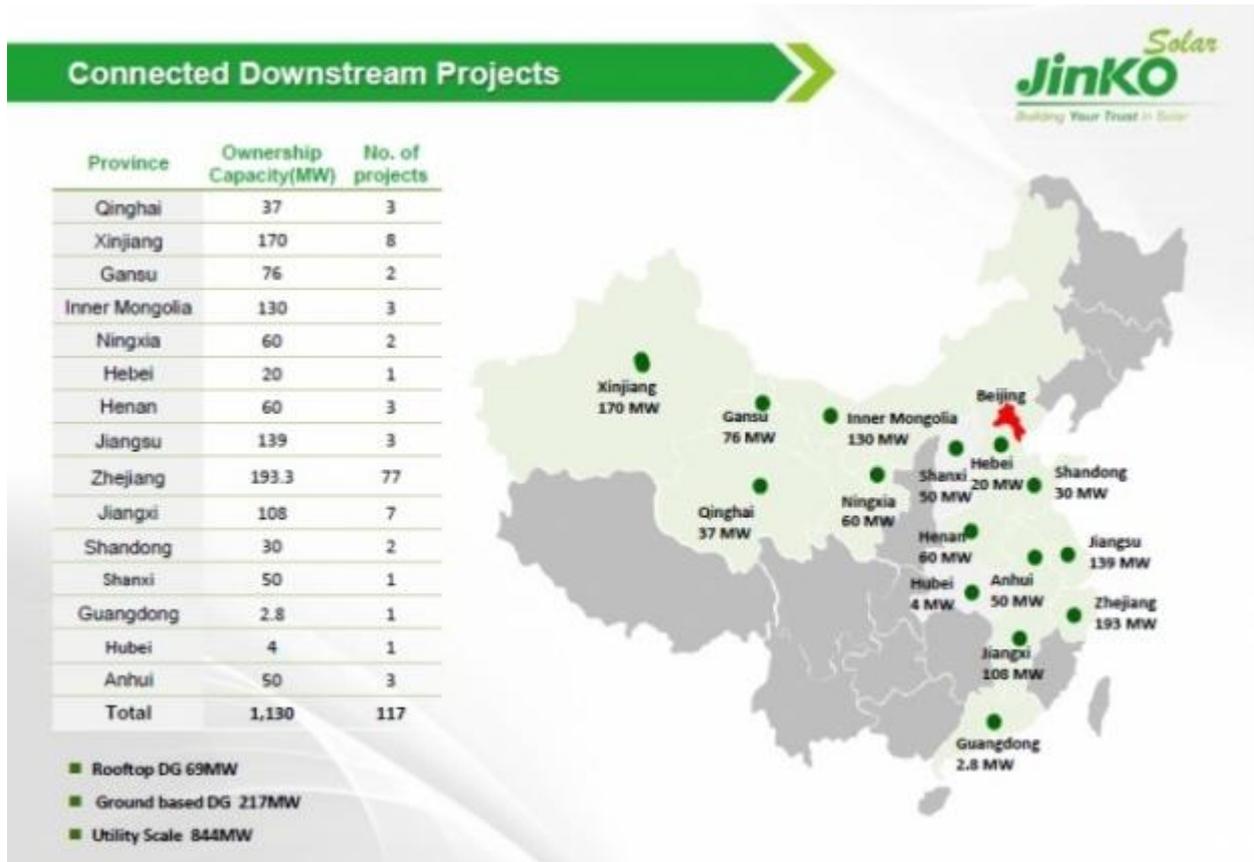
In a convoluted deal, JinkoSolar said that Wide Wealth Group Holding Limited, a 55%-owned indirect subsidiary of JinkoSolar had entered into a Share Purchase Agreement (SPA) with Shangrao Kangsheng Technology Co., Ltd, formed by a consortium led by chairman Li.

As the buyer, Li would acquire all of the 55% equity interest indirectly held by JinkoSolar in Jiangxi JinkoSolar Engineering Co., Ltd., the developer and operator arm of JinkoSolar’s power projects in China, for a total of US\$250 million in cash.

The transaction was expected to close during the fourth quarter of 2016. JinkoSolar had 1.13GW of completed PV power plant projects at the end of the second quarter of 2016.

The company had previously highlighted intentions to spin off the downstream business to provide extra liquidity and deleverage its balance sheet, due to the asset-heavy aspect of PV power plants held on its balance sheet. The debt related to solar power projects was around US\$1 billion at the end of the second quarter of 2016.

## 晶科能源创始人拟以 2.5 亿美元购买晶科电力股份



晶科能源表示，公司创始人兼董事长李仙德先生将以 2.5 亿美元的价格，收购公司旗下晶科电力的下游光伏电站业务中的大多数股份。

领先的“硅基超级联盟”(SMSL)成员晶科能源表示，公司创始人兼董事长李仙德先生将以 2.5 亿美元的价格，收购公司旗下晶科电力的下游光伏电站业务中的大多数股份。

晶科能源表示，在此交易中，公司持有 55% 权益的间接子公司 Wide Wealth Group Holding Limited，与董事长李仙德先生牵头成立的财团所设立的上饶康盛科技有限公司，订立购股协议。

作为买方，李仙德先生将收购晶科能源间接持有的江西晶科能源工程有限公司的全部 55% 股权，该公司负责晶科能源中国境内电站项目的开发与运营，收购总价为 2.5 亿美元现金。

相关交易目前预期将于 2016 年第四季度完成交割。晶科能源截止至 2016 年第二季度末累计拥有 1.13GW 已完成光伏电站项目量。

由于公司资产负债表上光伏电站资产比重较大，晶科能源此前曾高调宣布其分拆下游业务的一项，以获得额外的资产流动性并对其资产负债表进行去杠杆运作。

## Taiwan ripe for floating PV

Taiwan's geographical constraints combined with new Feed-in-Tariffs (FiTs) from the government have opened the door for a significant push for floating solar PV deployment, according to industry members at the PV Taiwan exhibition in Taipei.

Speaking to PV Tech, Thomas Hsu, vice president, SAS Sunrise, said that more than 2,000 lakes and ponds have been identified as having the potential for floating solar, which he estimated could lead to around 500MW of installations. As a small but highly forested country, the government is looking to free up land for ground-mount solar in the coming year, but has also had focus on other segments to achieve its target of 20GW solar by 2025.

## Mcanxixun Information

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Hsu added that land is very expensive in Taiwan and it is difficult to integrate PV, and with 95% penetration of rooftop solar in present day Taiwan, next year will see a new market for floating solar.

Under the new FiTs, floating PV will receive a TWD 4.94/kWh (US\$0.157) FiT rate, which is higher than the TWD 4.547/kWh for ground-mounted projects.

Michael Sun, vice president and general manager, solar business group, AU Optronics said that the firm has recently released a humidity and salt resistant module, the SunPrimo PM060PW1, which suits Taiwan due to its prominent coastline and the new push for floating solar. It is also important to be resistant to typhoons, which are a major issue in Taiwan.

Sun added that floating is “still in emerging stages” and cannot be installed at every reservoir. Small and medium-sized reservoirs are the most suitable. He understands from some customers that Taiwan may expect roughly 50MW to 100MW floating solar to be installed next year, but the industry is waiting for a clearer picture from the government before progressing.

Charles Huang of floating solar mounting rack producer Plus Renewable, which has already installed a 100kW floating system in southern Taiwan, said the government has started to “open up” for this kind of PV floating system and the opportunity for this solar technology is imminent.

However, Sascha Rossmann, vice president, solar BU global sales at Winaico, said: "Every manufacturer needs to consider if they want to carry this liability or not. If you do floating solar, you cannot use standard components in the panel, because there is always a certain amount of humidity that is leaking into the laminate. This will cause corrosion on the soldering and this will cause long-term reliability issues."

## PV Taiwan: 新 FiTs 政策为漂浮式水面光伏打开一扇新大门

据出席台北 PV Taiwan 展会的展商表示，台湾市场在地理特性上所受到的限制，以及政府所颁布的新 FiTs 政策为漂浮式水面太阳能光伏的应用打开了一扇新大门。

在接收 PV-Tech 采访时，SAS Sunrise 公司的副总裁 Thomas Hsu 表示，台湾市场上已有 2000 余个湖泊和池塘被证实有条件进行漂浮式太阳能设备的应用，预计总安装量在 500MW 左右。台湾地区面积较小且森林化程度高，政府希望能够在接下来的一年中找到更多用于地面太阳能设备的土地，但同时也在其他领域内寻求发展机遇，以完成 2025 年实现 20GW 太阳能应用的目标。

Thomas Hsu 补充道，台湾的土地使用成本极为昂贵，并且光伏集成应用也困难重重，目前台湾市场上屋顶太阳能设备渗透率为 95%，因此，漂浮式太阳能将在明年迎来一波新市场。

在新 FiTs 框架下，漂浮式光伏设备将获得 4.94 新台币/kWh(约合 0.157 美元)的不贴率，高于地面支架式项目所获得的 4.547 新台币/kWh。

友达光电太阳能事业群总经理孙绶昶博士表示，其公司近期推出了一款防潮、抗盐腐蚀组件产品 SunPrimo PM060PW1，十分适合台湾市场的多海岸线环境，同时对漂浮式光伏的应用也是已达促进。同时，该产品可经受得住台风气候，而这一气候环境是台湾市场所具有的一大特点。

孙教授还表示，漂浮式四通“仍处于发展初期”，不是每个蓄水库都能够进行安装的。中小型蓄水库是最为合适的。孙教授从客户的角度出发对市场进行考虑，认为台湾可在明年新增 50-100MW 的漂浮式水面太阳能设备，但光伏产业在正式开展任何项目前，仍在等待政府释放出更为清晰的信号。

漂浮式太阳能设备安装架制造商普朗能(Plus Renewable)已在台湾南部安装了 100kW 漂浮式系统，该公司的黄先生表示，政府已经“开放”了此类漂浮式光伏系统的市场，相关太阳能技术的市场机遇近在眼前。

但是，Winaico 公司太阳能事业部全球销售副总监 Sascha Rossmann 表示：“每个制造商均需考虑他们是否希望开展此类业务。如果涉足漂浮式水面太阳能领域，就不能在电池板中使用标准化零部件，因为总是会出现一部分潮气进入密封层的现象。这将对产品焊接点造成腐蚀，并且将导致产品出现长期可靠性问

题。”

## **Hanergy Thin Film to appoint financial advisers on efforts to restart stock trading**

PV thin-film equipment and module producer Hanergy Thin Film Power Group (Hanergy TF) said it would be appointing financial advisers and conduct an audit on its consolidated financial statements through its auditors as it attempts to meet Hong Kong Stock Exchange's Securities and Futures Commission (SFC) demands.

Hanergy TF was forced to update investors on the protracted dealings with the SFC, after news reports that the SFC has made several specific demands ahead of a trading resumption, including the appointment of a financial adviser to submit a resumption proposal and a 'clean' audit report on its accounts.

However, Hanergy TF noted that any dealings with and by the SFC were strictly private but acknowledged it would be appointing financial advisers and its auditors would be conducting a new audit for disclosure to the SFC. The company noted that the audit report would not be required to be a clean report.

Soon after the trading halt in May 2015, reports circulated that the SFC was demanding parent company, Hanergy Group to provide detailed financial accounts despite being a private company. The failure by Hanergy Group to comply had been the key reason for the continued stock trading halt.

Hanergy TF had persistently stated that it had no control or legal ability to force its then chairman and majority shareholder and owner of Hanergy Group to comply with SFC's demands.

Hanergy TF did not make reference to that aspect of the SFC's previous demands.

The company gave no timelines to meet compliance with the SFC.

### **汉能薄膜拟委派财务顾问，以谋求复牌**

光伏薄膜设备与组件产品制造商汉能薄膜日前表示，将委任财务顾问，并通过审计人员对其合并后的财务报表进行审计，以期满足香港证交所(SFC)要求。

在有新闻报道 SFC 对汉能薄膜复牌提出了若干具体要求后，汉能薄膜被强制要求向投资商通报其与 SFC 之间旷日持久的协议过程，SFC 提出的相关要求包括委任财务顾问，并提交复牌申请和账户的“无保留意见”审计报告等。

但是，汉能薄膜表示，任何与 SFC 之间的协议或 SFC 作出的决定均为非公开，但证实公司将委任财务顾问，并且其审计人员也将进行新的审计流程，以向 SFC 提交相关报道。公司支出，该审计报告并未被要求为无保留意见报告。

在 2015 年停止交易后不久，就有报告称，尽管 SFC 要求母公司汉能集团提供详细的财务账户信息，尽管母公司是未上市公司。汉能集团未采取行动来满足 SFC 的要求是汉能薄膜迟迟未能复牌的原因之一。

汉能薄膜坚持表示其对时任公司董事长、大股东及汉能集团所有人并没有任何控制权或法律权限，以使其满足 SFC 要求。

汉能薄膜并未对 SFC 此前在这方面的要求进行表态。

公司也未给出达到 SFC 要求的时间计划。

## **The economics of the future energy system**

## **Mcanxixun Information**

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How can we provide a high degree of energy security in Australia at the lowest possible cost, while contributing our fair share to the global effort to contain the costs of climate change?

I take as my starting point Prime Minister Turnbull's admonition that we put ideology aside as we seek answers to this question.

Putting ideology aside also means putting aside old conceptions of what works best. It means recognising that we are dealing with complex issues that cannot be managed through simple slogans.

Putting ideology aside leads inevitably to the conclusion that the economics of Australia's energy future looks very different from the economics of Australia's energy past.

If we haven't been paying attention to recent technological and economic developments affecting the energy sector, and look again with clear eyes, we are surprised by how different the lowest cost solutions today are from what they were not long ago.

Six sets of changes have been especially important for Australian choices in the electricity sector. Four of these relate to changes in the cost of renewable energy and storage relative to coal - and gas - based electricity. Two relate to perceptions of the costs of climate change and the necessity of mitigating them.

### **FIRST CHANGE: FALLING COSTS OF RENEWABLES AND STORAGE EQUIPMENT.**

There have been massive falls in the costs of producing equipment for generation of low emissions energy and for storing energy of all kinds. So far the cost reductions derive mainly from learning by doing in the course of large - scale production in the world's lowest - cost manufacturing centres. As the improvement in manufacturing efficiency reaches technical limits, costs will continue to fall for some time through application of new technologies. In the massive modelling effort on the Australian transition to a low carbon economy for the 2008 Garnaut Climate Change Review, we consulted widely and formed the view that costs of capital goods for PV solar generation would fall by a few percent per annum.

In practice, costs have fallen by about five sixths since those views were embodied in the modelling nine years ago. Similarly large reductions have occurred in the cost of lithium ion batteries and related systems for storing energy and balancing grid instability. There have been less dramatic but substantial reductions in costs of equipment for electricity from wind, nuclear, hydro and solar - thermal sources, in co - generation of power from industrial processes, and for increasing energy efficiency. Learning by doing has also been important in reducing installation costs for wind and solar PV power generation in Australia.

### **SECOND CHANGE: IMPROVEMENTS IN THE GRID BALANCING CAPABILITIES OF NEW TECHNOLOGIES.**

There have been transformational improvements in the technology applied to the integration of the electricity grid with batteries for storing and balancing supply of intermittent energy. The improvements relate to decentralised deployment of renewable energy and storage, as well as grid level applications. These improvements are at once effect and cause of the early deployment of grid - level battery storage in the United States, Europe, Japan and Korea. Australian small business is contributing to innovation for decentralised energy systems.

### **THIRD CHANGE: DRAMATIC REDUCTIONS IN COSTS OF CAPITAL REDUCE COSTS OF RENEWABLES.**

Similarly transformational in its effects, there has been a dramatic reduction in the cost of capital. Real interest rates are by far the lowest in recorded history. Interest rates on long - term bonds issued by Governments are below zero in a majority of developed countries. Real interest rates on ten - year bonds are below or near zero in all developed countries including Australia. These exceptionally low costs of capital are driven by fundamental changes in underlying economic conditions and are with us for a long time.

The huge fall in the cost of capital is important for energy sector choices because the costs of producing renewable energy and of storing and transporting energy are overwhelmingly capital costs, while the costs of producing

energy from fossil fuels are mainly recurrent. Low capital yields reduce the costs of renewable energy and storage relative to the costs of thermal energy from fossil fuels. The large reductions in the cost of capital in recent years have greatly reduced the cost of renewable relative to fossil thermal energy.

### FOURTH CHANGE: DRAMATIC INCREASE IN AUSTRALIAN COST OF GAS.

A fourth change is specifically related to Australia. When I was working on the first climate change review in 2007 and 2008, Australia had the developed world's cheapest natural gas available for domestic use—about one third of United States prices. The first climate change review recognised a major role for gas - fired electricity as a transitional fuel and for balancing the intermittency of renewable energy. My 2011 review update continued that recognition but introduced a note of caution: the development of an LNG export industry in eastern Australia would lift domestic gas prices to export parity levels and increase the cost of gas - based electricity.

Since then, the development of LNG export capacity in Queensland beyond current gas availability has led to gas shortages and lifted prices at times to well above export parity. Domestic gas prices are now about three times as high in Australia as in the United States—and during the period of high South Australian electricity prices in July 2016 were sometimes six times as high, and higher even than in Japan and other countries to which Australia was exporting gas. This is before the sixth and last of the LNG trains in Queensland comes into full production later this year. High and occasionally unstable gas prices are with us for the foreseeable future. That increases the cost and diminishes the economically rational role of gas in balancing the intermittency of solar and wind energy.

Let me illustrate the extent of change in costs of renewable energy and deployment of storage with two facts, one related to the cost of solar energy, the other related to deployment of grid - level battery storage in the United States.

Last month, the lowest tenders for supply of power from new large - scale solar storage facilities in the Middle East came in at about US3 cents per kilowatt hour—around half the cost of fuel alone for most gas thermal generation in Australia. Large - scale deployment of solar and wind at favourable locations now generates power at low cost. This is a powerful factor causing a rapid increase in intermittent energy supply in many countries.

Right now, the US has over 44 grid - connected batteries with greater than 10MW power capacity, with a total of over a Gigawatt. California has a mandated grid - connected storage target of 1.3 Gigawatt by 2020. Large - scale deployment of battery storage is now an established way of balancing intermittent energy supply.

And then there are two changes in perceptions of the costs of climate change and the importance of containing them.

### FIRST CHANGE FROM CLIMATE CHANGE: MORE INTENSE EXTREME WEATHER EVENTS.

There is greater awareness of the risks from climate change to large scale infrastructure, and of the costs of building infrastructure to withstand the intensification of extreme weather events. In Australia, there have been recent examples of unusually strong heat waves, bushfires, winds and floods disrupting electricity transmission infrastructure. Adjustments in the design and construction of transmission systems can reduce the risks and extent of disruption: stronger and higher towers; placing cables underground. But greater resilience comes at considerable cost. For many years, the science has advised us that climate change would cause conventional infrastructure to be more vulnerable to damage from the intensification of extreme weather events, and higher costs of making infrastructure more resilient to reduce the costs of damage.

The modelling for my 2008 review suggested that damage to or increased costs of infrastructure would be an important source of loss for Australia from failure of climate change mitigation. What has changed recently is that the actual experience of greater intensity of extreme weather events has made this risk tangible to Australians who had not been exposed to or persuaded by the scientific evidence. It is now more common to recognise the greater costs of building infrastructure to withstand extreme weather events, and the greater risks of failure of conventional infrastructure as a result of climate change.

### SECOND CHANGE FROM CLIMATE CHANGE: GREATER AWARENESS OF NEED TO REDUCE EMISSIONS.

## Mcanxixun Information

There is now greater awareness that Australia has to do a great deal to reduce greenhouse gas emissions if it is to do its fair share in the climate change effort. The lead up to the December 2015 meeting of the United Nations Framework Convention on Climate Change and the agreement in Paris were decisive. The lead - up to Paris saw influential interventions in public discussion of climate change by Pope Francis, including in his encyclical letter *Laudato Si*; forceful United States diplomacy on climate change led by President Obama and Secretary for State Kerry, including at the time of the G20 meeting in Brisbane in 2014; acceptance of the need for developed countries to have zero net emissions from electricity generation soon after the middle of the century at the G7 meeting hosted by Chancellor Merkel in Berlin in July 2015; an agreement to cooperate on climate change mitigation between Presidents Obama of the United States and Xi of China in November 2015; forceful interventions in support of a strong outcome in Paris by the heads of government of the major European countries, Germany, France and the United Kingdom; and acceptance by the major developing countries, led by Brazil and India, that they would be part of a major global mitigation effort.

The Paris agreement, accepted by all major countries, seeks to hold human - induced increases in average temperatures to as far as possible below 2 degrees, and if possible to 1.5 degrees. The major countries have ratified the Paris agreement since last December—in the case of the United States, making Paris different from the Kyoto agreement that was signed by the Clinton - Gore Government but never officially ratified.

Achievement of the 2 degree objective requires developed countries to reduce net emissions from electricity generation to zero by the middle of the century. Keeping alive the possibility of 1.5 degrees would require zero net emissions from electricity in the developed countries well before mid - century.

Australia faces special challenges in meeting the Paris objectives, as the developed country with the highest emissions per person and by far the highest emissions per person from electricity generation. A slow start on reducing electricity emissions has to be followed by a fast finish. The current 2020 and 2030 targets represent a slow start. The rate of emissions reduction has to accelerate sharply at some time well before mid - century. Analysis by the Climate Change Authority and others shows that the total cost of eliminating emissions is likely to be lower the sooner an acceleration begins. This will be an important consideration in the proposed 2017 review of Australian targets prior to the formal review of progress within the United Nations Framework Convention in 2018.

### RENEWABLES AND CLIMATE CHANGE IN THE AUSTRALIAN ENERGY SYSTEM

Solar PV and wind are now relatively low cost sources of electricity in environments suited to them—including most of southern Australia and parts of northern Australia. Nowhere in the developed world are solar and wind resources together so abundant as in the west - facing coasts and peninsulas of southern Australia. The South Australian resources are particularly rich. The Upper Eyre Peninsula and Spencer Gulf in particular reveal unique combinations of intense insolation and access to diverse and strong wind patterns.



The growth of wind and rooftop solar energy at the expense of coal played an important role in the reduction by about 8% in Australian electricity emissions from late 2010 to June 2014 (see chart above) . The other major source of reduction in emissions over this period was a shift from coal to gas. The period of carbon pricing from

July 2012 to June 2014 saw strong expansion of the role of gas at the expense of coal, and of black coal at the expense of emissions - intensive brown coal.

Since the end of carbon pricing, electricity emissions have resumed their upward march. Solar and wind generation have continued to expand, after a pause in wind in response to uncertainty about the future of the Renewable Energy Target. The continued expansion is driven by falls in the costs of solar and wind equipment and by incentives within the Commonwealth’s Renewable Energy Target.



The expansion of solar is accelerating and has great momentum following major reductions in costs of larger systems. However, the reduction in emissions from increased wind and solar generation has been outweighed by changes within the mix of fossil fuels: the expansion of coal, especially brown coal, and contraction of gas. The changes in the fossil energy mix have been driven by higher gas prices and the end of carbon pricing.

South Australia has by far the highest proportion of solar and wind amongst Australian states. This has emerged through competitive processes, principally as a result of superior renewable resources being used to take advantage of similar Commonwealth incentives across the States. The high renewables share in South Australia is also assisted by lesser availability of low - cost coal resources than in Victoria, Queensland and New South Wales. These underlying conditions will remain, so that South Australia is likely to continue to be the Wind and Solar State. Only deliberate distortion of policy to promote location of renewable generation in other states at the expense of South Australia would avoid that outcome. The resulting high penetration of intermittent renewables mean that South Australia has to find the answers first to questions that will soon arise all over the country.

Australia is relatively well endowed with most other forms of renewable energy. The hydro - electric resource is not particularly rich, although the Tasmanian and Snowy Mountains systems are significant on a global scale and have potential for playing an important role in balancing intermittent solar and wind energy supply. There is increasing deployment of solar thermal technologies in other countries, which combine generation and storage, and Australian research is opening new avenues to reducing costs.

Australian research and development on use of sea water in pumped hydro - electric generation is revealing opportunities for large pumped hydro storage at low cost by global standards to balance intermittent energy supply and provide grid stability services. Biomass from sugar processing is a particularly rich renewable energy resource, that could generate large amounts of electricity in Queensland at relatively low cost while balancing intermittency in a similar way to fossil thermal energy.

Famous Australian economist Colin Clark’s observed in 1942 in his classic book *Conditions for Economic Progress* that the Australian eucalypt was an unusually efficient machine for producing renewable energy. Algae with its preference for intense sunlight and line environments is even more efficient—and there is plenty of sun and salt in South Australia. Advances are being made in wave and tidal energy. The southern coast of Australia is as good as anywhere for wave, for much the same reasons that it has superior wind resources. The northern coasts of western Australia have exceptional potential for tidal power, that one day may justify the huge investments in transmission or local industrial infrastructure that would be necessary to give them value.

The deep hot rocks of South Australia and adjacent parts of this ancient continent await the clever applied earth

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science and engineering that is necessary to unlock commercial value. Australia has the world's largest natural resource endowment of high grade uranium oxide, which will play an important role in global progress towards zero net emissions from electricity. However, current costs of nuclear relative to renewable energy alternatives suggest that it is unlikely that nuclear energy will be competitive in this country for the foreseeable future.

The Australian Government is wise to make resources available to test the alternative forms of zero emissions energy that have good prospects for eventual large - scale commercial deployment in Australia. This is a role for ARENA, substantial funding for which has been continued in the recent budget agreement. Nevertheless, from what we know now, the achievement at reasonable cost of current 2030 emissions reduction targets, and the stronger targets that are necessary for Australia to meet its Paris commitments, require rapidly increasing contributions from solar PV and wind. This means that all Australian States must come to grips with the intermittency of these forms of renewable energy.

### BALANCING INTERMITTENT RENEWABLES.

High penetration of intermittent renewables introduces high variability in wholesale prices, and the potential for destabilising variation in systemic frequency and voltage. The maintenance of systemic stability requires countervailing variations in volumes of wholesale power supply, and new sources of frequency control and ancillary services (FCAS).

Let me focus at first on the wholesale power market.

High penetration of renewables leads to low wholesale power prices at times when renewable energy is able to meet local demand, and high prices when the market has to be balanced by gas peaking power.

The three charts below illustrate the point with data from three months in last financial year—months for which I had taken out data for other purposes, and not selected deliberately for this presentation. In July, December and February of last financial year, the times of lowest wholesale prices each day—typically the early hours of the morning—revealed substantially lower wholesale prices in South Australia than in the two states with the lowest cost thermal coal resources—Victoria and Queensland.

SA prices more variable: higher in high times, lower in low times:

February 2016	QLD	VIC	SA
Average RRP	91.8	30.9	34.7
Bottom 10%	26.0	14.3	7.9
Middle 80%	49.5	29.9	33.0
Top 10%	494.9	55.2	75.2

December 2015	QLD	VIC	SA
Average RRP	43.1	48.0	66.8
Bottom 10%	23.0	12.1	9.9
Middle 80%	40.8	41.4	49.3
Top 10%	81.4	136.7	263.9

July 2015	QLD	VIC	SA
Average RRP	46.7	34.8	73.5
Bottom 10%	20.7	14.7	8.1
Middle 80%	34.7	33.0	49.3
Top 10%	168.2	68.6	332.3

These were times when wind, supported by solar power in daytime hours, largely met requirements. The times of highest wholesale prices each day—typically the morning and evening peaks when gas provided the incremental supply to meet higher demand— prices were highest in South Australia. Queensland had even higher high prices in February 2016, as demand was lifted by commissioning of new LNG capacity. In the intermediate hours, prices tended to be a bit lower in Victoria than the other States, but not wildly different.

The expansion of intermittent energy supply in South Australia will tend to increase the number of hours each day with very low prices. The challenge is how to reduce prices at times when demand is strong and intermittent energy supply weak. Price volatility is not a problem in itself. Volatility provides the incentive to reduce demand, or to invest in new sources of electricity generation that produce power when prices are highest, or for investment in storage. Volatility provides the signal that increased transmission capacity may be warranted and should be considered alongside other means of balancing intermittency. Large users of power have opportunities to hedge against price uncertainty, and retailers can hedge to insulate their customers from variable prices.

The main sources of countervailing variation are demand management, storage, gas peaking generation, long - distance transmission, and diversity in renewable energy supply. Each has its strengths and limitations. Each has an important role to play through the transition to a low carbon economy. Demand management, co - generation from industrial processes, storage, long distance transmission and renewables diversity all have important roles in the zero carbon economy of the future. Whether or not gas peaking has a role after the transition depends on the availability of commercially viable sequestration of carbon dioxide wastes from gas combustion.

The challenge of policy is to allow and to facilitate good use of all means of balancing intermittent energy, and to ensure that reliance is placed on the most cost - effective of them in particular circumstances. Exclusive emphasis on only one or two of them alone will greatly increase the cost of the balancing.

Efficiently operating markets embodying a carbon price in some form—perhaps the baseline and credit scheme favoured in the recent Climate Change Authority report—can sort out the economically efficient contributions of alternative forms of generation and storage in wholesale power supply.

The wholesale power market currently contains distortions that block efficient use of new storage technologies. The most damaging of these distortions is the averaging of settlement prices over 5 minute periods. Suppliers and users of wholesale power bid into the market each 5 minutes. However, contracts between buyers and sellers are settled by averaging prices over half hour periods. This dulls incentives to expand output in short periods of exceptionally low supply, and to reduce them in short periods of high supply. The importance of this distortion is demonstrated by experience through July 2016, when average South Australian prices were exceptionally high.

A large part of the exceptionally high average prices came from less than 40 five minute periods when prices were at or close to the regulated maximum of \$14,000 per MWH. Some of these high price episodes occurred within the same half hour as other 5 minute periods with negative prices down to the regulated limit of minus \$1000. Battery systems, unlike thermal generators, respond fast enough to contribute to stabilisation by absorbing energy in one 5 minute period when prices are low and expanding wholesale supply in an adjacent 5 minute prices when prices are high. Averaging over 30 minute periods removes incentives for stabilising behaviour, and actually introduces incentives to destabilise the market.

ZEN Energy’s partner company in grid level battery storage and grid stabilisation, Greensmith, has installed more

## **Mcanxixun Information**

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than one third of the large and rapidly growing battery storage capacity in the United States. This morning I asked its senior officers what contribution a battery storage system would have made to easing the recent power problems of South Australia. Greensmith's assessment from reading public materials including the AEMO report is that the system - wide problem is likely to have derived from variations in frequency, which batteries are particularly well placed to manage.

It is not clear from the published material what caused the wind turbine trips. If later analysis suggests that the cause was systemic variation in frequency, then batteries would have provided the most cost - effective remedy. If the problems derived from local voltage issues, batteries located with wind farms could have avoided the problem. Once the system had tripped, and the challenge was to bring gas generators back into service as quickly as possible, a battery would have provided reliable and quick - acting black start services. By contrast, both contracted black start providers failed to restart the South Australian system last week.

Other characteristics of Australian market regulation discourage use of decentralised battery storage that has the potential to contribute to evening out demand and supply of wholesale power, and also to reduce peak demand for network services.

While more efficient markets can help in the allocation of resources among types of power generation and storage, they cannot play this role in defining efficient allocation of resources between network expansion and new forms of generation and storage. Electricity distribution and transmission networks are natural monopolies that require planning decisions in the public interest. The Australian regulatory system is poorly designed for taking decisions on maintenance and expansion of the networks.

Major reform is required. It is important to shift the initiative in putting forward proposals for investment in network maintenance and expansion in the hands of a public body charged with taking decisions in the national interest. That would remove the conflict of interest embedded in current arrangements. Such a body would be charged with assessments of whether investment in network maintenance and expansion is likely to yield higher returns than investment in decentralised generation and storage. To do its important job well, the energy planning agency would need to have deep professional capacities, and insulation from the day to day vicissitudes of partisan politics. The Australian Energy Market Operator could be strengthened to perform this planning role.

It is impossibly unlikely that such a planning process would have led to the \$85 billion of investment in expansion of transmission and distribution capacity that Australia has seen over the past decade of mostly declining total demand for wholesale power through the network. At the same time, it may have led to greater investment in some forms of long distance transmission. Australia has made massive investment in its power networks over the past decade, which has been added with high margins to the bills of power users. Recent experience suggests that this massive expenditure has not purchased energy security.

Rational network design in contemporary circumstances would see evolution towards greater use of decentralised power, supported by a central transmission network designed to play a large role in balancing intermittent energy from different sources. It might not necessarily lead to reduced power flows through the grid. An efficient electricity system may see the electrification of transport gathering pace in the years ahead. An efficient system is more likely to see Australia's advantages as a low - cost producer of renewable energy reflected in expansion of energy - intensive industries as the whole world shifts to greater reliance on renewable energy. These developments would mean an expansion of total power demand as the proportion of supply through the networks declined.

The new technology and economics of energy suggest that judicious application of local renewable energy supply technologies such as solar and battery storage can greatly reduce peak demand for power through the networks and therefore the costs of providing network services. At the same time, it can reduce vulnerability to disruption of networks from extreme weather events. The lights that stayed on in South Australia through last week's blackout were in homes and businesses which had invested in local battery storage, and on Kangaroo Island where the anticipation of failure of the submarine cable had led to provision for decentralised back - up generation.

Judicious investment in solar and wind generation, co - generation from industrial processes supplemented by gas

generation where adjacent pipelines make this feasible, demand management and battery storage, supported by efficient integration into established networks, can reduce power costs for users outside Adelaide below what is available from reliance on the grid alone. Decentralised provision of power also provides security against future disruption from extreme weather events.

There are gaps in current markets for Frequency Control Ancillary Services that have become more important and costly with the expansion of intermittent energy supply. Fast response stabilisation services are required. These are much more likely to be made available at low cost if their supply is secured through introduction of new competitive markets, designed so that the new technologies can compete on a level playing field with incumbent thermal generators.

The costs and technological capability of battery storage has fallen to the point where it can contribute substantially to price stabilisation and grid stability alongside high and rising penetration of renewable energy. It can be introduced quickly. United States experience suggests the possibility of full deployment of grid level batteries within six months from commercial decisions to invest in them.

Pumped hydro - electric facilities have longer lead times. Recent commercial research and development suggests that this form of storage will be able to play a major role in low - cost balancing of intermittent electricity supply as eastern Australia moves towards much higher penetration of intermittent renewables.

Increased interconnection between South Australia and other States would not remove the requirement for investment in storage to stabilise wholesale prices and the grid. Long distance trade in renewable energy will reduce price volatility to some extent. However, the national expansion of renewable energy supply will make the balancing of intermittency as important to Australia as a whole as it is to South Australia now.

### RENEWABLES AND THE SOUTH AUSTRALIAN ELECTRICITY CRISIS

We are here today because South Australia has been through an electricity crisis. Emergency workers are still out in the floods helping people in distress—a week after the troubles began. Through a massive effort from emergency workers, power has been restored to almost all homes and businesses. The electricity blackout occurred in an era in which households depend on electricity not only for their light and warmth and cooling and cooking, but for finding their way around the city, managing their appointments, paying their bills, doing every computation and keeping in touch with friends. For those with disabilities and illness, electricity plays a vital role in day to day living as well as the maintenance of life.

The electricity grid and the regulatory systems that guide its investment and operations are poorly suited for the challenges of contemporary Australian energy requirements, let alone for the transition to a low carbon economy. The regulatory arrangements are part of the cause for utilities having the worst productivity growth of all sectors through the past decade of miserable performance in the Australian economy as a whole. That has little to do with renewable energy. Network costs per connection in Australia have moved over the past decade from the better half of global performance, to close to the highest costs in the developed world.

While the growing role of renewables has not been anything like the main contributor to strongly negative productivity growth and the blow - out in costs in the electrical utilities, the prospect of a much larger role of intermittent renewable in the electricity sector in future is good reason for making the efficient integration of wind and solar one focus of thorough review of governance in the sector.

It is good that we now have a Federal Minister responsible for both Climate and Energy policy, with responsibility to reconcile the two. It is good that he has called a meeting of Ministers tomorrow to discuss the implications of the SA power crisis for both climate and energy policies.

It is important that the meeting tomorrow is guided by the Prime Minister's admonition to put ideology aside. It is important that the reconciliation of energy security with climate objectives and grid stability is seen as a complex challenge requiring a new look at our regulatory framework. That new look, in turn, will lead to recognition that the energy system that will perform well in the future will be very different from the energy system of the past. It will contain much more renewable energy. It will embody a different balance between centralised and

decentralised power. It will draw security from decentralisation as well as from effective provision of network services.

Play our cards right, and Australia's exceptionally rich endowment per person in renewable energy resources makes us a low cost location for energy supply in a low carbon world economy. That would make us the economically rational location within the developed world of a high proportion of energy - intensive processing and manufacturing activity. Play our cards right, and Australia is a superpower of the low carbon world economy.

As we work through the challenges in the aftermath of South Australia's electricity blackout, lets make sure that our responses enhance rather than truncate Australia's and South Australia's opportunities.

## 未来能源系统经济学

我们如何以尽可能低的成本为澳大利亚提供一个高度的能源安全的同时，为全球遏制气候变化成本的努力做出我们应有的贡献。

我将总理的训诫作为出发点，那就是在寻求答案的过程中将意识形态放在一边。

将意识形态放在一边同时也意味着将曾经最有效的旧观念跑抛开。这就是说要认识到我们正在处理一些无法通过简单口号就能够解决的复杂问题。

将意识形态放在一边必然会导致澳大利亚未来的能源经济学与过去的相比有很大不同。

如果我们还没有关注近期影响能源领域的科技和经济发展，那就擦亮眼睛再看，我们会很惊讶，今天的最低成本解决办法与不久之前的方案是多么的不同。

澳大利亚电力领域有六类变化是特别重要的。其中有四类是与可再生能源成本和煤、气发电储存的变化有关。有两类变化与气候变化成本理念和削减成本的必要性有关。

第一类变化：可再生能源和能源存储设备的价格下跌

低排放能源生产设备和各类能源存储设备的生产成本已有大幅下降。迄今为止，成本的降低主要依靠在世界上最低成本的生产中心进行大批量生产。随着生产效率提高到了技术极限，新技术的运用会使成本在一段时间内继续降低。为了 2008 年加诺特气候变化评估，在澳大利亚向低碳经济转变的大量建模工作中，我们广泛咨询，我们形成了这样的观点，太阳能光伏发电的资本货物成本每年会降低几个百分点。

实际工作中，自九年前这些观点在建模工作中得到体现后，成本已经降低了六分之五。同样，锂电池、存储能源及平衡电网不稳定性的相关系统的成本也大幅降低。风能、核能、水力和太阳能-热源发电、工业过程联合发电设备，以及提高能源效率的成本也有了不太明显但大幅度的减少。从实践中学习，对于澳大利亚降低风能和太阳能光伏发电设备的安装成本同样重要。

第二类变化：新技术在网格平衡能力方面的改进

用于间歇式能源存储和平衡供应的电池电力网一体化技术已经实现了转型提升。这些改进与可再生能源的分散调度和存储相关，也与网格应用有关。这些改进迅速影响和导致了美国、欧洲、日本和韩国早期的网格蓄电池储能调度。澳大利亚的小企业为分散式能源系统的创新做出了贡献。

第三类变化：可再生能源资本降低成本的显著减少

在影响方面也有同样转型，资金成本有了大幅度减少。迄今为止，实际利率是历史上最低的。大多数发达国家政府制定的长期债券利率都在零以下。在所有发达国家，包括澳大利亚的十年期债券的实际利率都低于或接近零。这些极低的资本成本由经济条件的根本变化驱动，并伴随我们很长时间。

资本成本的大幅下降对于能源领域是很重要的，因为可再生能源的生产、存储和运输成本需要耗费大量资本，而化石燃料发电成本主要是周期性的。较低的资本收益率降低了可再生能源成本和化石燃料热能成本相关的存储成本。近几年资本成本的大幅降低已经极大减少了与化石热能相关的可再生能源成本。

第四类变化：澳大利亚天然气成本的显著增加

第四类变化与澳大利亚特定相关。当我在 2007 年和 2008 年进行第一次气候变化评估时，澳大利亚是

发达国家中国内天然气价格最低的，大约是美国价格的三分之一。第一份气候变化评估发现了燃气发电作为过滤性燃料以及平衡可再生能源间歇性的一个重要作用。我在 2011 年新的评估中也同样有这样的发现，但也提出一个警告：澳大利亚东部液化天然气行业的发展会使国内天然气价格提高到出口平价水平，并提高天然气发电的成本。

从那以后，昆士兰液化天然气出口容量的发展已超出目前天然气供应，导致天然气短缺，有时会使价格远高于出口平价。澳大利亚国内的天然气价格目前是美国的三倍，在 2016 年 7 月澳大利亚南部高电价期间，价格有时是六倍，甚至比澳大利亚的出口国家日本和其他国家还要高。这发生在昆士兰第六个和最后一个液化天然气生产线在后半年进入全面生产前。在可预见的未来伴随我们的是高的和偶尔不稳定的天然气价格。这会增加成本和降低天然气在平衡太阳能和风能间歇性方面的经济理性作用。

让我用两个事实来描述下可再生资源 and 存储配置成本的变化幅度，其中一个与太阳能成本有关，另一个与美国网格蓄电池储能配置有关。

上个月，中东地区新的大型太阳能存储设施供电的最低投标约为 3 美分每千瓦小时，是澳大利亚大部分天然气热力发电燃料成本的一半。在合适地点的大型太阳能和风能调度目前发电成本较低。这是许多国家间歇性能源供应快速增加的一个有力因素。

现在，美国有超过 44 个网格连接的蓄电池，发电容量大于 10 兆瓦，总发电量高于千兆瓦。加利福尼亚有个托管的网格连接存储设施，目标是到 2020 年总发电量为 1.3 吉瓦。目前，大型的蓄电池储能调度是平衡间歇性能源供应一个已建立的方式。

对气候变化成本的看法及控制的重要性方面有两个变化。

气候变化带来的第一个变化：更严重的极端气候事件

在气候变化对大型基础设施和建造能够抵挡加剧的极端天气事件的基础设施成本方面，人们已经有了更多的风险意识。在澳大利亚，目前已发生了异乎寻常的强烈热浪、林区大火、风和洪水破坏电力传输基础设施事件。传输系统设计和建造方面的调整可以降低破坏的风险和程度：更强、更高的塔；将电缆埋在地下。但是更好的适应性带来的是成本的巨大提高。很多年前，科学研究就已经告诉我们，气候变化会导致传统的基础设施在加剧的极端天气事件中更容易收到损害，降低损害成本就需要花费更多来提高基础设施的适应性。

2008 年评估报告使用的模型指出，基础设施损害或成本的增加是澳大利亚减缓气候变化失败后造成损失的一个重要来源。最近发生的变化是，实际发生的更为极端的天气事件让没有经历过或还未被科学证据说服的澳大利亚人更为真切地感受到这个风险。现在人们已经普遍认识到抵挡极端天气的基础设施建设需要投入更大成本，气候变化导致基础设施存在更大风险。

气候变化带来的第二个变化：减排意识的增加

现在人们已广泛认识到，为了在气候变化工作中作出应有贡献，澳大利亚不得不加大减排温室气体的力度。为此，2015 年 9 月在巴黎召开了联合国气候变化框架公约会议，并达成共识。这包括教皇弗兰西斯对公众讨论气候变化的有力干预，发表了《赞美你》教皇通谕；美国总统奥巴马和国务卿克里领导的在气候变化方面强有力的外交政策，包括在 2014 年布里斯班召开 20 国集团会议期间；2015 年 7 月在柏林召开的由默克尔总理主持的七国会议，一致同意发达国家要在本世纪中期后不久实现发电零排放；2015 年 11 月美国总统奥巴马和中国主席习近平达成在减缓气候变化方面共同协作；主要欧洲国家，包括德国、法国和英国政府首脑对巴黎会议结果的有力支持；以巴西和印度为首的发展中国家将会成为全球减缓气候变化工作的一份子。

这项巴黎协议，被所有大国接受，试图将人类活动导致的平均温度升高尽可能控制在 2 度以内，可能的话 1.5 度。自去年 12 月，主要国家就批准实施巴黎协议，而在美国，这项协议与克林顿-戈尔政府签署的京都议定书不同，从未正式批准。

为了完成这个 2 度的目标，发达国家需要在本世纪中叶实现发电净排放。而要控制在 1.5 度，发达国家要在本世纪中叶前实现发电零排放。

澳大利亚在实现巴黎协议目标时面临特殊挑战，因为到目前为止，这个国家人均排放量和人均发电排放量最高。发电减排工作的缓慢开始不得不快速收尾。目前制定的 2020 年和 2030 年目标代表着一个缓慢的开始。在本世纪中叶前的某个时候一定要急剧加快减排率。气候变化管理局和其他机构进行的分析表明，越早开始减排加速，减排总成本就会越低。在 2018 年联合国框架公约内的进展评估之前，这是澳大利亚 2017 年的评估报告中一项很重要的考虑因素。

### 澳大利亚能源系统中的可再生资源 and 气候变化

目前，太阳能光伏和风能发电是相对低成本的电力来源，这在澳大利亚南部大部分地区和北部部分地区使用。西海岸和半岛地区大量使用的是太阳能和风能。澳大利亚南部地区的资源特别丰富。尤其是上艾尔半岛和斯宾塞湾，将强烈的日照和易于获得的多样化强风模式结合在一起。



代替煤的风能和屋顶太阳能的增加，在澳大利亚 2010 年末到 2014 年 6 月的 80% 的电力减排中起到重要作用（见上表）。这段时期内减排的另外一个主要来源是由煤转向使用天然气。从 2012 年 7 月到 2014 年 6 月期间的碳排放价格显示出天然气在替代煤上不断增加的作用，以及黑煤替代排放密集型的褐煤的作用。

自碳定价结束后，电力排放量又恢复了上升势头。为了回应可再生能源目标计划未来的不确定性，风能发电暂停了一段时间，之后太阳能发电和风能发电持续增加，这受到太阳能和风能发电设备成本降低的驱动以及英联邦可再生能源目标计划的激励。



太阳能发电的扩大正在加速，随着大型系统成本的大幅降低，正呈现出更强劲的发展势头。但是，化石燃料结构发生的变化已经超过了对不断增加的风能和太阳能发电减排：煤炭使用的扩张，尤其是褐煤，以及其他压缩。化石能源结构的改变由天然气的高价格和碳定价的结束驱动。

目前澳大利亚南部地区拥有全国最高的太阳能和风能发电量。这是通过竞争过程实现的，主要是为了利用英联邦的激励措施而使用了优越的可再生资源的的结果。澳大利亚南部可再生资源的高份额也是由于该地区比维多利亚、昆士兰和新南威尔士拥有更少的低成本煤资源。这样潜在的状况将会继续存在，所以澳大利亚南部可能会继续成为以风能和太阳能发电为主的地区。只有故意歪曲政策来促进其他州的可再生能

源发电才能改变这一结果。由此带来的高普及率的间歇性可再生能源意味着，澳大利亚南部必须首先要找到很快就会在全国各地出现的问题的答案。

相对来说，澳大利亚拥有大部分其他类型的可再生能源。水电资源并不是特别丰富，尽管塔斯马尼亚和雪山系统在全球范围内举足轻重，对平衡间歇性的太阳能和风能供应方面具有潜在的重要作用。其他国家正在不断部署太阳热能技术，这种技术将发电和存储结合在一起，澳大利亚的研究为降低成本开辟了新的途径。

澳大利亚在研究和开发使用海水进行抽水发电过程中发现，符合全球标准的低成本大型抽水蓄能有机会平衡间歇性能源供应，并提供网格稳定服务。糖加工过程产生的生物量是一个特别丰富的可再生能源资源，在昆士兰它可以产生大量的低成本电力，同时可以用相似的方式来平衡间歇性的化石热能。

澳大利亚著名的经济学家科林·克拉克在他经典的《经济发展条件》一书中指出，澳大利亚的桉树是一个异常高效的生产可再生能源的机器。偏好强烈日光的藻类效率更高，澳大利亚南部阳光和盐分都很充足。潮汐能和波浪能利用也有了进展。澳大利亚南海岸拥有和其他地方一样好的波浪能，原因是都拥有优越的风能资源。澳大利亚西部地区的北海岸拥有潮汐能的特殊潜力，有一天会证明在传输或当地工业设施的巨大投资是有必要的。

澳大利亚南部的深热岩以及与这片古老大陆相连的部分，正等待开发商业价值所必需的地球科学和工程的巧妙应用。澳大利亚拥有世界上最多的高品位铀氧化物资源，这种物质将在全球电力零排放进程中起到重要作用。然而，目前与可再生替代能源相关的核成本显示，在可预见的未来，核能源在这个国家将会很有竞争力。

澳大利亚政府很明智，将可用资源用于寻找零排放能源的替代形式，这在澳大利亚大规模商业化应用中很有前景。这是舞台上的一个角色，最近的预算协议继续为它提供了大量资金。然而，正如我们现在了解的，为实现 2030 年减排目标所耗费的合理成本，以及为了让澳大利亚实现巴黎协定而必须完成的更远大目标，需要太阳能光伏和风能发电快速发展。

平衡间歇性可再生能源

间歇性可再生能源的广泛普及带来了趸售物价很大的波动性，以及系统频率和电压潜在的不稳定变化。系统稳定性的维持需要电力批发供应市场反倾销政策的改变，及新的频率控制和辅助服务（FCAS）方法。

让我首先关注下电力批发市场

February 2016	QLD	VIC	SA
Average RRP	91.8	30.9	34.7
Bottom 10%	26.0	14.3	7.9
Middle 80%	49.5	29.9	33.0
Top 10%	494.9	55.2	75.2

December 2015	QLD	VIC	SA
Average RRP	43.1	48.0	66.8
Bottom 10%	23.0	12.1	9.9
Middle 80%	40.8	41.4	49.3
Top 10%	81.4	136.7	263.9

July 2015	QLD	VIC	SA
Average RRP	46.7	34.8	73.5
Bottom 10%	20.7	14.7	8.1
Middle 80%	34.7	33.0	49.3
Top 10%	168.2	68.6	332.3

可再生能源的广泛普及，使得在能够满足当地需求时，能源的批发价格降低，当市场需要天然气调峰电力平衡时能源的批发价格就会上涨。

下面的三张表格描述了上一财政年度三个月的数据，我将这几个月的数据挑出用作其他用途，并不是专门为这次的演讲准备的。在上一财政年度的7月、12月和2月，每天批发价最低的时间，特别是早晨这几个小时，显示了澳大利亚南部地区批发价格大幅降低，比维多利亚和昆士兰这两个州动力煤资源的最低成本还要低。

**澳大利亚南部电力价格更多变：高峰时更高，低谷时更低**

这些时间内由白天太阳能驱动的风能大部分都可以满足需求。每天批发价格最高的时间，通常是早晨和晚上高峰时间，是由天然气提供增量供应来满足更多需求，此时澳大利亚南部的价格是最高的。随着新液化天然气产能调试导致的需要增加，昆士兰2016年2月的价格甚至更高。在中间的时间，维多利亚的价格要比其他州稍低，但并不是完全不同。

澳大利亚南部间歇性能源供应的扩大，会增加每天低价的时间。面临的挑战是如何在需求旺盛而间歇性能源供应不足时降低价格。价格波动本身不是个问题。价格波动提供了降低需求的动机，或是投资到在高价时可以发电的新能源，或是在存储方面进行投资。价格波动发出了一些信号，输电能力的提高可能是必要的，应该和其他平衡间歇性的方法一起考虑在内。用电大户有机会规避价格波动，而零售商可以让他们的顾客避免受到价格波动的影响。

反倾销改变的主要来源在于需求管理、储存、天然气调峰发电、远距离输电以及多类型可再生能源供应。每一种都有它的优势和局限性。每一种都在向低碳经济转变过程中发挥重要作用。需求管理和工业过程的联合发电、存储、长距离输电和可再生能源多样性都会对将来的零碳经济发挥重要作用。天然气调峰发电是否能发挥作用，在于对天然气燃烧产生的二氧化碳的商业性封存是否可行。

政策的目的是，准许和促进所有平衡性间歇能源的有效利用，并保证在特定环境中对最具成本效益的能源保持信心。只重视其中一个或两个将会极大增加平衡的成本。

有效的市场运作体现了某种形式（可能是最近气候变化管理局报告青睐的基线和信贷计划存在）的碳价，可以将电力批发供应中发电和储存的替代形式进行经济效率贡献分类。

电力批发市场目前存在扭曲现象，限制了新的储存技术的有效利用。这些扭曲最大的破坏性在于，结算价格平均超过5分钟。批发电力的供应方和用户每5分钟进入市场。然而，买方和卖方之间的合同每半小时以上就以平均价格结算。在短时间内供应极低时会刺激扩大输出，在短时间的高供应时减少输出。这个扭曲的重要性被2016年7月的经验证明，当时澳大利亚南部的价格异常高。

异常高的平均价格大部分来自于不到40个5分钟的时间，价格是或接近于调控的最大1.4万美元/千瓦时。这些高价格时段发生在相同的半小时内，而其他5分钟时段内的负价格下降到调控极限的负1000美元。电池系统，不像火力发电机组，有足够快的响应速度用于稳定电力供应，当价格低时通过一个5分钟的时段吸收能量，当价格高时，在接下来的一个5分钟扩大电力批发供应。超过30分钟的平均时间消除了对稳定行为的刺激，实际上引入了扰乱市场的诱因。

ZEN能源在网格级别电池存储和网格稳定方面的合作伙伴格林史密斯，已经在美国安装了超过三分之一的大规模和快速增长的电池存储容量。今早，我询问了该公司的高层人员，电池存储系统在缓解近期澳

大利亚南部能源问题方面做了哪些贡献。格林史密斯通过阅读包括澳洲能源市场运营商报告在内的公共材料形成的评估是，全系统问题很可能来自于频率的变化，这是电池特别要注意管理的。

发表的材料无法明确是什么导致了风力涡轮机出现故障。如果后来的分析表明，这是由于系统频率变化引起的，而电池将会提供最有效的改进。如果这个问题来自于当地电压问题，位于风电场的电池会避免此问题发生。一旦系统出现问题，面临的挑战是尽快将天然气发电机组重新投入使用，蓄电池将会提供可靠的、快速反应黑启动服务。相比之下，上周黑启动供应商未能重启澳大利亚南部系统。

澳大利亚市场调控的其他特征抑制了分散性蓄电池储能的应用，这一应用可能会对平衡电力批发市场的需求和供给作出贡献，同时也可以降低对电网服务的峰值需求。

虽然更高效的市场有助于对不同类型发电和储存资源进行配置，却不能在电网扩展和发电、储存资源之间定义有效配置。电力分配和传输网络属于自然垄断，需要为了公众利益进行规划决策。澳大利亚调控网络在网络维护和扩展决策方面设计不良。

重大改革是必需的。重要的是将主动权转移到从国家利益出发做决策的公共机构手中，他们要在电网维护和扩展投资方面提出建议。这将会排除目前部署中的利益冲突。这种机构将会负责评估投资到电网维护和扩展是否能比投资到分散式发电和存储产生更高的回报。为了很好地完成这一工作，能源规划机构需要深厚的专业能力，并且独立于不断更替的政治派别之外。澳大利亚能源市场运营商需要加大力度发挥规划作用。

这样一个规划过程将很可能带来对电力输送和分配的 850 亿美元投资，在过去的几十年里，澳大利亚电力批发电力市场需求下降。同时，也会在几种形式的长距离输电上进行投资。澳大利亚在过去的几十年里在电力网络中做了大量的投资，也从用户账单那里得到了丰厚的利润。最近的经验表明，如此大的开销并未获得电力安全。

目前条件下，合理的电网设计能够更好地利用分散式电力，其中的中央传输电网在平衡不同来源的间歇式电力供应方面发挥重要作用。它可能不一定会减少电网中的电流量。一个有效的电力系统会在未来几年实现收集传输电气化。一个有效的系统很可能会使澳大利亚成为低成本可再生能源的生产国，反应在能源密集型产业的不断增加，而全球都在转而依赖于可再生能源。这些发展意味着总电力需求的扩大，尽管电网供电比例却在下降。

新能源技术和经济学指出，正确应用当地的可再生能源供应技术，如太阳能和蓄电池，可以极大降低对电网的峰值需求，从而降低提供电网服务的成本。同时，也可以降低极端天气对电力网络的干扰。在上周停电期间，澳大利亚南部地区有电力供应的地方是在当地蓄电池进行投资的家庭和企业，以及在袋鼠岛，由于对海底电缆发生故障的预测，而提供了分散式的后备发电。

在太阳能和风能发电、天然气发电为辅助（管道相邻让这种方式成为可能）的工业过程联合发电、需求管理和蓄电池蓄能（通过与现有电网有效结合）方面明智的投资，可以将阿德莱德以外用户的用电成本降到只依赖电网供电的成本以下。分散式电力供应也会抵挡将来极端天气对电网的干扰，从而保证供电安全。

随着间歇性能源供应的扩大，目前市场上的频率控制辅助服务的差距越来越重要和昂贵。快速响应稳定服务是必需的。如果他们的供应是通过引进新的竞争市场，这个市场的设计是新技术能在一个与现任热发生器在一个公平的竞争领域，这些都更可能是以低成本提供。

电池存储的成本和技术能力下降到了一个点，在这个点上随着很高的不断上升的可再生能源的渗透，它可以为价格稳定和电网稳定做出重大贡献。它可以很快被引进来。美国的经验建议在从商业决策投资于他们的六个月内全面部署网格级电池的可能性。

抽水蓄能 - 电气设备有较长的交货时间。最近的商业研究和发展表明，由于澳大利亚东部转向了渗透性更高的间歇性可再生能源，这种形式的存储在低成本间歇性电源平衡中起重要作用。

南澳大利亚和其他国家之间增加的互相联系将不会消除对存储投资的要求，以稳定批发价格和电网。可再生能源的长途贸易将在一定程度上降低价格波动。然而，可再生能源供应全国性的扩张将使间歇性的

平衡对澳大利亚来说就如一个整体，就像对现在的南澳大利亚是一样的。

可再生能源和南澳大利亚电力危机

我们今天在这里是因为南澳大利亚经历了一次电力危机。紧急救援人员仍在洪水中帮助遇险的人——麻烦开始一周之后。通过紧急工人的大量努力，几乎所有的家庭和企业都已恢复电力。停电发生的这个时期，家庭依赖于电力不仅为了光和温暖和冷气以及做饭，也为了找到城市周围的路，进行约会，支付账单，做每一次计算并好人朋友保持联系。对于那些有残疾和疾病的人，电在日常生活和维持生活中起着至关重要的作用。

指导投资和运作的电力电网和监管系统很难应对当代澳大利亚能源需求的挑战，更不用说为低碳经济进行过渡了。通过过去十年在澳大利亚经济中糟糕的表现，所有行业的生产力增长最差的公用事业是实行监管安排的部分原因。这与可再生能源几乎没有什么关系。在过去的十年中，澳大利亚的网络成本从全球表现的一半到了接近发达国家的最高成本。

虽然可再生能源越来越重要的作用在电力公用事业中对强烈的消极生产率增长和成本崩盘没有很大贡献，未来电力部门的间歇可再生能源更大的一个作用对该部门中审查治理的风能和太阳能的有效整合是一个很好的理由。

我们现在有联邦部长负责气候和能源政策，并有责任对这两者进行调和，这是非常好的。他呼吁明天召开部长级会议，以讨论气候和能源政策对南非电力危机的影响，这也是很好的。

明天的会议由首相劝诫把思想放在一边为指导是非常重要的。能源安全与气候目标和电网稳定的调和被视为是需要全新看待我们的监管框架的一个复杂的挑战，这也是非常重要的。这个新貌，反过来，将引起对在未来表现很好的能源系统过去的能源系统是不同的这个认识。它将包含更多的可再生能源。它将体现在集中式和分散式电源中的不同平衡。它将从分散式以及网络服务的有效供给中获得安全。

发挥好的话，澳大利亚的特别丰富的人均可再生能源资源使我们处于在低碳世界经济的能源供应低成本的位置。那将使得我们在拥有高能源比例 -精深加工和制造业活动的发达世界中处于一个经济合理的位置。发挥好的话，澳大利亚将是一个低碳世界经济的超级大国。

由于我们在南澳大利亚大停电后的挑战，让我们确保我们的反应增强而不是截断澳大利亚和南澳大利亚的机会。

## *Natural Gas* (天然气)

### **Russia and Turkey agree gas pipeline deal**

Russia and Turkey have put tensions over Syria behind them to agree a gas pipeline deal which would open a new route for Russian energy to western Europe.

The TurkStream agreement between Russian president Vladimir Putin and Turkish president Recep Tayyip Erdogan in Istanbul on Monday would, if implemented, redraw the energy map of Europe by allowing Russia to bypass some of its gas around Ukraine.

It would also strengthen ties between Moscow and Ankara at a time of growing mistrust between Turkey and the west in the wake of the coup attempt that plunged the country into turmoil three months ago and killed 270 people.

Monday's agreement committed the pair to construction of two lines of pipes beneath Turkish waters on the bed of the Black Sea, with a combined capacity of 30bn cubic metres of gas. One would serve the Turkish market and the other the rest of Europe.

TurkStream, to be operated by Gazprom, the Russian state-owned gas monopoly, was proposed by Mr Putin two years ago as a replacement for the abandoned South Stream pipeline which had involved co-operation between Russia and several EU countries.

Talks faltered after the crisis triggered by the shooting down of a Russian Su-24 war plane by Turkish forces over the Syrian border in November 2015. But relations have thawed rapidly since June when Mr Erdogan voiced regret for the downing of the Russian jet.

### 俄土签署天然气管道协议

普京和埃尔多安周一在伊斯坦布尔达成“土耳其溪”协议。协议若得到落实，将使俄能够绕过乌克兰向欧洲输送部分天然气。

俄罗斯和土耳其将双方在叙利亚问题上的矛盾搁置在一旁，达成了一项天然气管道协议，该协议将为把俄能源输送到西欧开辟一条新通道。

周一，俄总统弗拉基米尔·普京(Vladimir Putin)和土总统雷杰普·塔伊普·埃尔多安(Recep Tayyip Erdogan)在伊斯坦布尔达成了“土耳其溪”(TurkStream)协议。协议若得到落实，将使俄能够绕过乌克兰输送部分天然气，重绘欧洲能源版图。

该协议还将在土与西方之间猜忌与日俱增之际加强俄土两国政府之间的关系。三个月前，土国内发生未遂政变，导致 270 人丧生，国家也因此陷入动荡，此后土与西方之间的互不信任加深。

根据周一达成的协议，两国将致力于在黑海土耳其水域下方的海床上铺设两条天然气管道。两条管道的总输送能力为 300 亿立方米。一条将服务土耳其市场，另一条供应欧洲其他地区。

“土耳其溪”将由俄罗斯国有天然气垄断企业——俄罗斯天然气工业股份公司(Gazprom)运营。该项目是普京在两年前提议的，用于取代遭废弃的“南溪”(South Stream)管道，该管道涉及俄与几个欧盟国家之间的合作。

2015 年 11 月，俄一架苏-24 战机(Su-24)在土叙边境上空被土军击落，引发了一场危机，“土耳其溪”项目谈判因此陷于停滞。但自今年 6 月埃尔多安对俄机被击落事件表示遗憾以来，俄土两国关系已迅速解冻。

## Why Japan's Liquefied Natural Gas Demand Will Increase

Japan is the world's largest LNG importer at about 35% of global demand, or 12.7 Bcf/day, with pretty much all of the country's gas use met via LNG. Japan's LNG imports fell 6.2% in in the fiscal year that ended March 31. And as a mature LNG market with a declining population base and the slowest predicted economic growth in all of Asia, the common assumption is that Japan's incremental demand is either flat or negative. In fact, a Japanese government estimate itself has LNG use falling 30% by 2030 from the 2014 peak.

But, it's worth noting that EIA has broken ranks with other key forecasters and has Japan's gas demand rising by nearly 1% per year, which is really interesting because that's double the expectation for U.S. growth (here). Sunken LNG prices and a global oversupply that will continue for at least a few more years should help. FERC reports LNG prices in Japan have dropped to \$5.50 in mid-September, compared to over \$14 two years ago. Indeed: "Analysis: Japan still dominates Asian LNG imports." "Japan's August LNG Imports Rise 9.4%."

Japan is now probing "into whether the resale restrictions in most of its liquefied natural gas contracts violate fair trade laws may lead to the renegotiation of more than \$600 billion worth of deals that run until almost the middle of the century." It's estimated that about 70% of Japan's LNG supply is bought via long-term deals with

## **Mcanxixun Information**

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destination clauses. If this can be changed, new potential suppliers in the U.S. would greatly benefit.

Not being able to re-sell is a major problem: Japan is projected to have an LNG surplus of about 1.2 Bcf/day in 2017, 0.8 Bcf/day in 2018, and 0.84 Bcf/day in 2019. In turn, Japan is advancing its strategy to lower LNG procurement costs and move away from oil-indexation to upgrade its energy security, which has been ranked nearly 20% lower than other OECD members (here). “Japan’s Jera plans 42 percent cut in long-term LNG contracts by 2030.”

The one certainty is that there’s lots more room for even more natural gas consumption in Japan.

Japan is overly reliant on oil, at about 45% of all energy use, versus under 30% in the other developed nations. Japan is unique in that 12% of its electricity still comes from oil, which is very high for such an advanced economy. And coal, which has supplied some 30% of power, faces increased public criticism at home and abroad.

In fact, pressure for Japan to use less coal is the highest in Asia because both China and India, the latter in particular, are much less developed and understandably face less scrutiny in getting energy access for their huge populations.

Japan has some of the most reliable, modern gas plants in the world, with nearly 40% of its current gas power capacity constructed since 2007. To illustrate their effectiveness, gas accounts for just 27% of Japan’s capacity, but actually generates 40% of electricity, a “punching above the weight” that I have discussed in other articles. A decade ago, gas was just 20% of Japan’s power.

Japan also knows that it can easily cut GHG emissions in the industrial and commercial sectors evolving from coal and oil to natural gas (here). Remember that gas has 50% less CO<sub>2</sub> emissions than coal and 30% less than oil. Gas is only 9% of energy use in Japan’s industry, for instance, which is far below the OECD average of 33%. Even for transport, Japan “could have 500,000 vehicles running on LNG or CNG by 2030, about 20% of all trucks.”

As for nuclear, it was LNG that compensated for the decline of nuclear power after the Fukushima accident in March 2011 and subsequent nuclear shutdown. Japan’s LNG demand quickly increased by 30% despite a near doubling in price (here). Now, “Japanese institute sees 19 reactor restarts by March 2018.” The nuclear re-start program could curb LNG demand, but there are a number of factors that go against more nuclear in Japan (here).

And the Institute for Energy Economics, Japan says the impact of the nuclear re-start will “fall entirely on oil rather than LNG “(here). Cutting oil dependence is a critical part of Japan’s goal to improve energy security: Japan relies on the precarious Middle East for about 80% of its oil supplies, unlike LNG where no single source has accounted for more than a 20% share of imports.

Indeed, “environmental concerns have led the government to encourage natural gas consumption, making LNG a fuel of choice for power generation.” Renewables are likely to be LNG’s largest competitor: “Japan’s New Energy Rules Could Make It a Paradise for Renewables.” But no, not really. As I have continually cited, contrary to what you’re being told, gas and renewables actually complement each other: “Shale & renewables: a symbiotic relationship.”

Japan’s plan to cut GHG emissions by 26% from 2013-2030 will also favor natural gas, especially as the global LNG market grows and adds needed flexibility and liquidity that Japan now wants to capitalize on. LNG overall is an increasingly attractive market: precisely why the LNG importers are expected to nearly double to 70 over the next 15 years or so. As for the typically oil-based, long-term contract LNG Asian market, “Singapore’s LNG Trading Hub Ambitions Press Forward” will be the centerpiece for the spot trade gaining market share in the region.

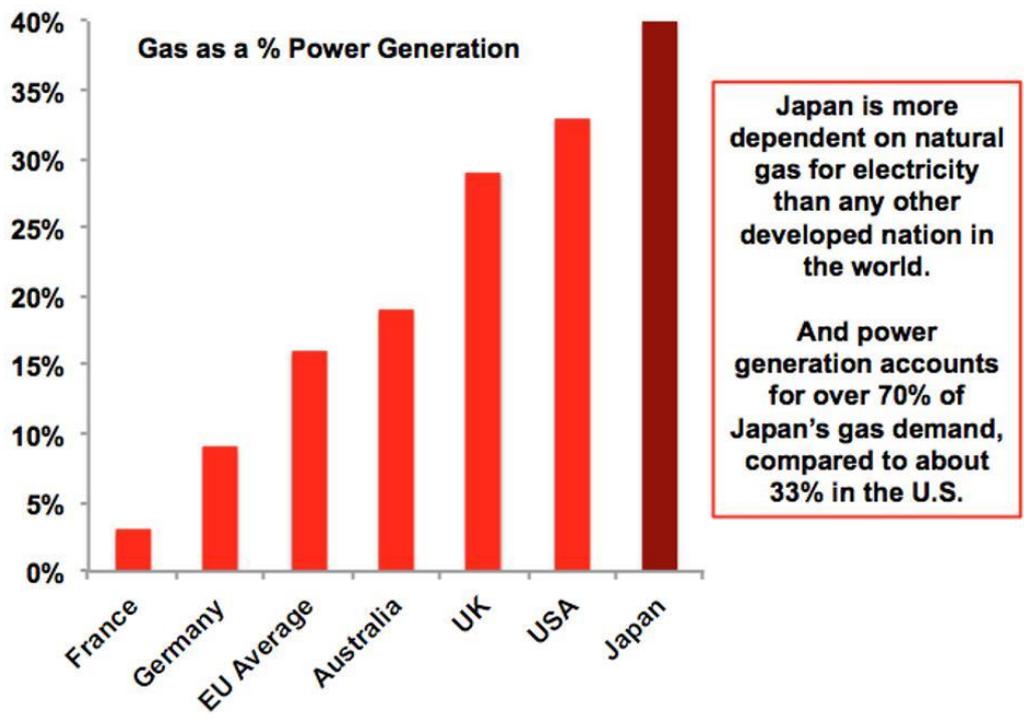
Already with 32 on-stream, Japan has two re-gasification under construction (here). One positive of the Trans-Pacific Partnership, a massive Free Trade Agreement with the countries involved contributing 40% of the global GDP, would be that it would expedite the approval process of exporting U.S. LNG to Japan. Sending U.S. LNG to Japan on the spot market would require an oil price of \$60 per barrel for American shippers. This is fine

because we know that at some point oil prices are destined to rise (here). OPEC’s chief, for instance, can’t hold out much longer: “Kingdom Comedown: Falling Oil Prices Shock Saudi Middle Class.”

The Panama Canal expansion cuts down on the shipping time for U.S. Gulf Coast LNG to Japan by 40%. And don’t forget that the widening did nothing to make our shippers closer to India, so Japan will remain a highly desirable market for the 550 U.S. LNG tankers projected to be passing through the Canal in 2020. The share of U.S. LNG imports to Japan is expected to grow to 20-30%.

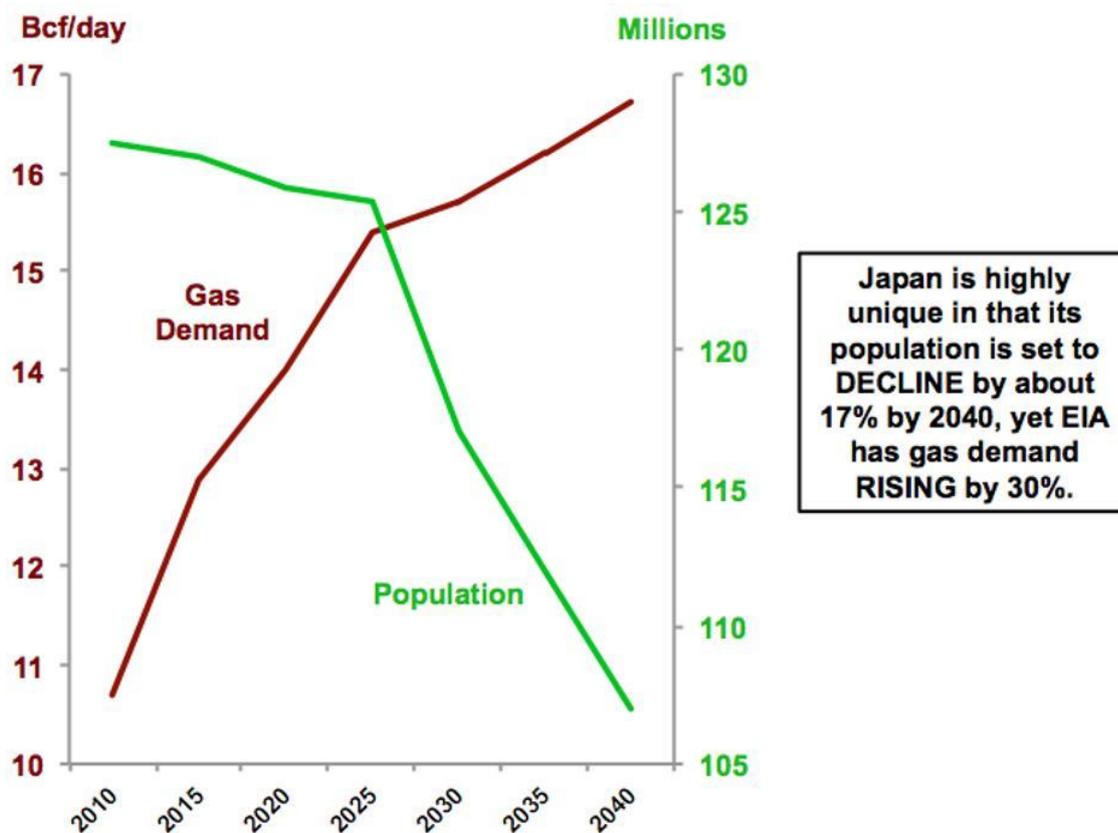
Yet, U.S. policymakers and the LNG exporters in general should know that time is always of the essence in such a fast growing business: “Japan warns Canada LNG delays could cost contracts.”

**Japan Is Highly Dependent on Natural Gas**



Sources: JTC

**Japan’s Rising Gas Demand, Despite Falling Population**



Sources: EIA: JTC

## 为何日本液化天然气需求将上升

日本是世界上液化天然气最大进口国，进口量占全球需求的 35%，平均到每天要 127 亿立方英尺，这个国家几乎所有天然气使用都是液化天然气来满足。在 3 月 31 截止的财政年度中，日本液化天然气进口下跌了 6.2%。在成熟的液化天然气市场中，整个亚洲地区人口基数下降，经济增长率预计将放缓到最低点，由此会习惯假设日本的需求增量会持平或下降。事实上，日本政府估算到 2030 年本国液化天然气使用量从 2014 年的峰值跌落 30%。

但值得注意的是，电子工业协会（EIA）有着其他主要预测者无法打破的地位，它的数据表明日本天然气需求每年增长近 1%，这个数字很巧合，是美国预期增长率的双倍。下沉的液化天然气价格和全球性过度供给起到一定作用，这情形还将会持续很多年。联邦能源管理委员会（FERC）报告，两年前日本液化天然气价格超 14 美元，今年 9 月中旬已经跌到 5.5 美元。的确，很多报道也定题为“分析贴：日本仍然主导亚洲液化天然气出口”“日本 8 月液化天然气进口上升 9.4%”。

日本正在调查，“是否大部分本国液化天然气合约中对转售的限制违背了自由贸易法，这可能会使总价值超 6000 亿美元的交易重新协商，这些交易一直持续到近本世纪中期”。估算出有约 70% 的日本液化天然气由附有目的地条款的长期交易提供。如果当下情形发生改变，美国的新潜在供应商将会获巨大利益。

无法转售是日本的一个主要难题。日本预计在 2017 年有每日约 12 亿立方英尺的液化天然气过剩，在 2018 年有每日 8 亿立方英尺，在 2019 年有每日 8.4 亿立方英尺。另一方面，日本在优化策略来降低液化天然气的采购成本，并且为提升其能源安全系数，日本也在策略上避开石油指数化。日本能源安全系数比经济合作与发展组织（OECD）其他成员国低近 20%。“日本杰拉集团计划到 2030 年缩减 42% 的长期液化天然气交易”。

有一点肯定的是日本天然气消耗量还有很多增加空间。

日本过度依赖石油，石油使用量占有所有能源使用的约 45%，其他发达国家该占比低于 30%。日本还独特在本国 12% 的电力依旧来自石油，该比例对于一个先进经济体而言是非常高的。而且煤炭也提供了约 30% 的电力，煤炭使用还面临国内外公众不断涌现的指责。

实际上，在亚洲地区受到减少煤炭使用的压力最大是日本，因为中国和印度，特别是后者，发展非常不成熟，他们需要获得能源供给庞大的人口，煤炭使用情况审查较松，这也是可理解的。

日本拥有世界上许多最可靠、最先进的天然气工厂，自 2007 年它们打造了近 40% 的当前天然气输电功率。它们的效用可见事实，天然气只占日本功率的 27%，但事实上创造了 40% 的电力。我在其他文章中讨论过这一“超常发挥”的现象。十年以前，天然气只占日本发电的 20%。

日本明白，若工业和商业部门从煤炭和石油改革到天然气，温室气体（GHG）排放量会很轻松降下。要知道天然气比煤炭少 50% 的二氧化碳排放量，比石油少 30%。天然气使用仅占日本工业能源使用的 9%，远低于经济合作与发展组织（OECD）的平均水平 33%。在交通领域，日本到 2030 年甚至“能有 50 万辆勇士液化天然气或压缩天然气的汽车，所有卡车中约 20% 也会使用”。

对于核领域，液化天然气弥补了 2011 年 3 月福岛事故后减产的核能和随之的核停工。尽管液化天然气价格涨了近一番，日本方面的需求仍快速增长了 30%。目前，“日本的协会观望 2018 年前 19 处核反应堆重启”。核重启项目能够抑制液化天然气需求，但日本国内有很多反对过量核使用的因素。

日本能源经济协会发声，核能源重新开启的影响“全部会作用于石油而非天然气”。减少对石油的依赖度是日本实现能源安全系数提升中重要的一环：日本 80% 的石油供给依靠国家形势动荡的中东，和液化天然气不同，没有一个液化天然气的来源占比超过进口总量的 20%。

的确，“环境上的顾虑已促使政府鼓励消费天然气，使得液化天然气成为发电燃料之一”。可再生能源可能是液化天然气的最大竞争对手，因为“日本新能源法是可再生能源的温床”。但并非如此，和前文相反，如我一贯认同，天然气和可再生能源实际上互相补助，正如“页岩和可再生能源是共生关系”。

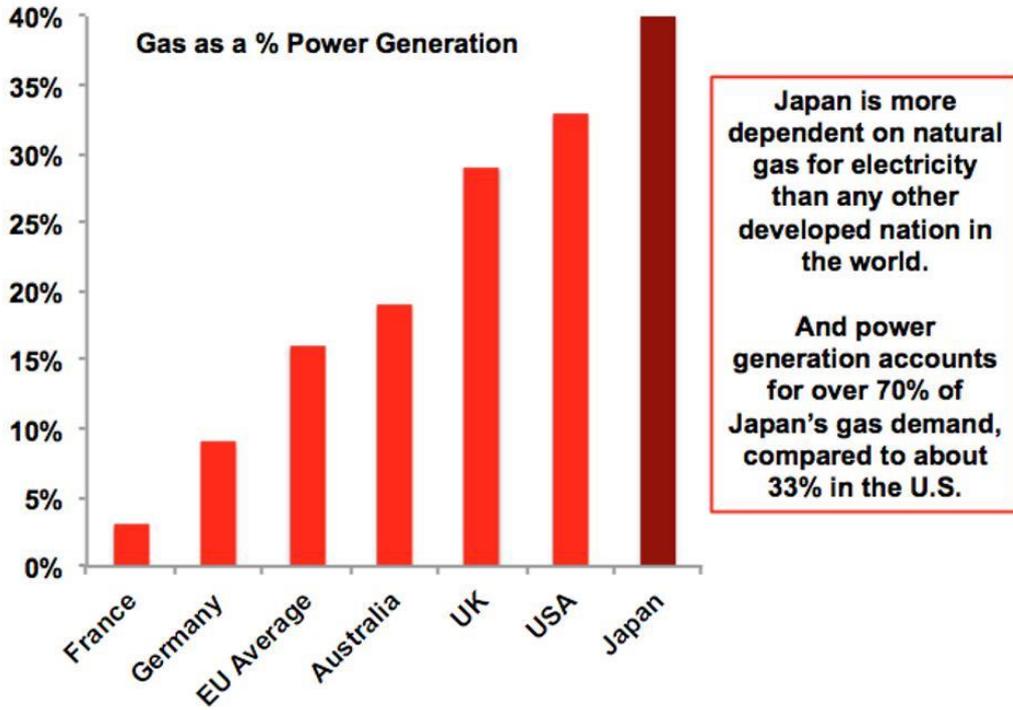
日本计划在 2013 年到 2030 年间减少 26% 的温室气体（GHG）排放量，此计划也振兴天然气，特别当全球天然气市场发展，并增加目前日本想利用的所需灵活性和流动性。液化天然气整体上是一个不断有吸引力的市场，这恰恰说明为何会在下一个 15 年或更久，期待液化天然气进口商人数翻倍至 70 户。对于典型的以石油为基础，偏好长期合约的液化天然气亚洲市场，“新加坡构建液化天然气交易中心的雄心势头强劲”，新加坡将会是亚洲地区获取市场份额的即期交易中心。

日本有两处再气化场地在建造中，再气化已有 32 道系统工序。跨太平洋合作伙伴协定是一个重要的自由贸易协定，成员国贡献了 40% 的全球国内生产总值（GDP）。协定的一点优势是能加快美国液化天然气出口到日本的审批程序。美国液化天然气出口到日本需付美国托运人每桶 60 美元的石油价格。该定价还是可接受的，因为我们知道很多时候石油价格会指定抬高。石油输出国家组织（OPEC）不能隐瞒“王国落魄：下跌中的石油价格震惊沙特阿拉伯中产阶级”这件事太久。

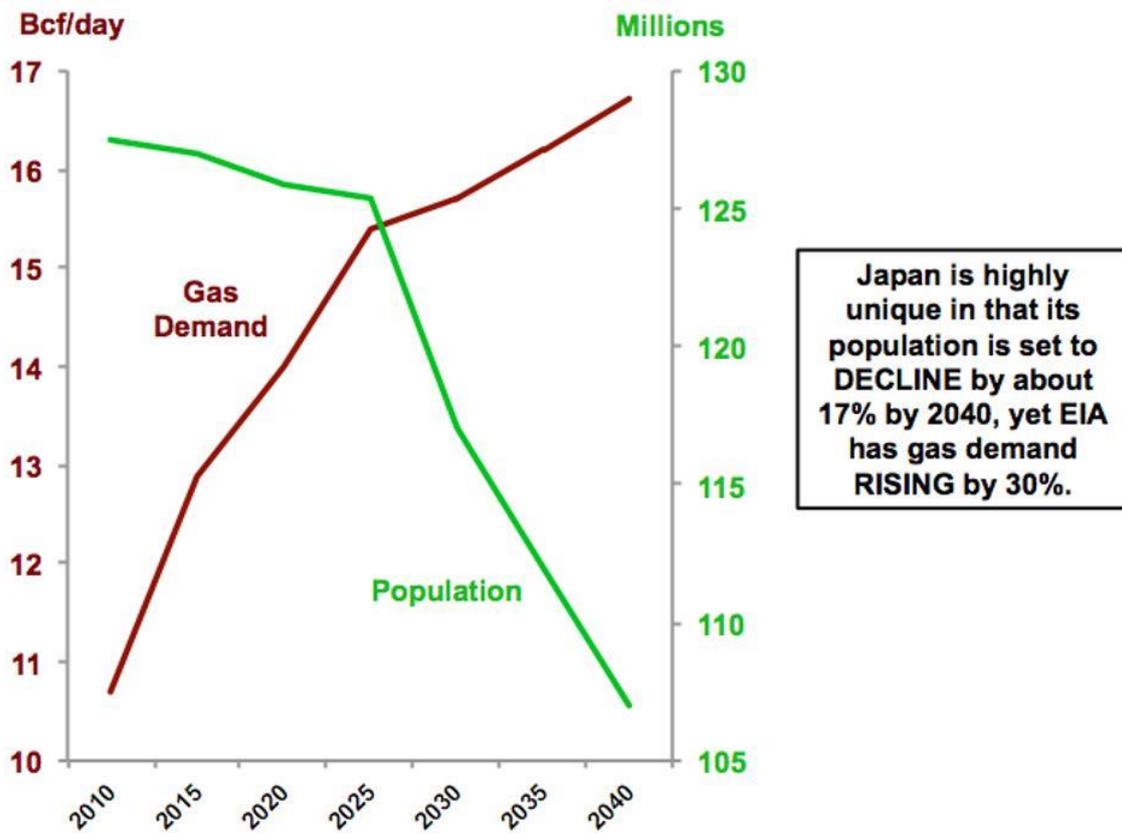
美国从墨西哥海湾沿岸运天然气到日本，巴拿马运河扩张将液化天然气运送时间缩短了 40%。不能忽视巴拿马运河拓宽并不会让托运人更靠近印度，所以日本仍然高度需求美国液化天然气游轮，在 2020 年预计有 550 艘油轮途经巴拿马运河。美国液化天然气对日出口份额预计增至 20%-30%。

然而，美国决策者和液化天然气出口商应基本须知，时间是在这个快速发展交易中最核心的，“日本提醒加拿大，液化天然气延误会增加合约费用偿付”。

日本高度依赖天然气



来源：电子工业协会：JTC 能源研究合伙企业



来源：电子工业协会：JTC 能源研究合伙企业

日本人口下降 天然气需求却上升

## China requested to construct third LNG pipeline

Islamabad—The authorities in Pakistan have carved out a plan under which a third LNG pipeline will be laid and to this effect, the government has contacted Beijing for materializing the project.

The said LNG pipeline will also be laid from the port city of Sindh to Lahore keeping in view of the massive surge in demand from private sector, a senior official privy to the development told Pakistan Observer.

“We have placed the request with authorities concerned in China for deliberating the details of the project. Initially the private sector itself desired to build the pipeline, but in the wake of technical and some financial constraints, the ministry came forward and submitted the request with Chinese authorities seeking help for making the project a success story.

“We are hopeful of positive reply within days”. The official said the pipeline may be built on PPP (public private partnership) mode. China is already upbeat in initiating the construction of 700 kilometers gas pipeline to be laid from Gawadar to Nawabshah at the cost of \$1.35 billion and to this effect Inter-State Gas System (ISGS) on behalf of Pakistan and China National Petroleum Corporation (CNPC) on behalf of China have already signed the agreement. Apart from it, Russia is working on South-North (S-N) LNG pipeline with capacity to carry 1.2 billion cubic feet of gas from Karachi to Lahore to cater to the burgeoning needs of energy of load center — Punjab.

Russian team is due tomorrow (Wednesday) for crucial talks on the pipeline, the relevant official told saying the two to three more sessions of talks may be held between the two countries. The third LNG pipeline which the private sector had desired to construct has now been taken up with the Chinese authorities. The said pipeline will also be having the capacity to transport the re-gasified LNG of 1.2 bcf/d.

Mentioning the Gawadar-Nawabshah LNG pipeline, the official said that the project will be constructed with 85 percent financing from Chinese Company and 15 percent from government of Pakistan, and the price at which the gas line will be laid is much below from the estimated cost. The government of Pakistan will arrange the financing of Rs15-12 billion for the project from the head of GIDC (gas infrastructure development cess). The project will be completed under EPC Financing mode.

Once the pipeline is completed, then Pakistan will extend the same pipeline with three compressor stations by 81 kilometer backward from Gawadar to Iranian border as part of IP gas line. The pipeline when it is connected with Iran will economically become more feasible as the said pipeline will transport the gas of 750 mmcf/d from Iran and 500 from LNG terminal. Later on Iran will increase the gas export up to 1 billion out of which 250 mmcf/d gas will be earmarked to cater to needs of Gawadar.

However, the sources said, LNG terminal with 12 kilometer pipeline will be built at Gawadar port with capacity to handle LNG of 500 mmcf/d by the same Chinese company on BOOT (build, own, operate and transfer) basis.

### 中国要求建设第三条 LNG 管道

巴基斯坦当局已经制定了一项计划，根据该计划，第三条液化天然气（LNG）管道将会铺设，并且为此，政府已经联系了北京以实施该项目。

一位发展部门的高级官员私下知情人告知巴基斯坦观察员称，鉴于私营部门的需求的大量增加，所述的 LNG 管道也将从信德省的港口城市铺设到拉合尔。

“我们已经向中国相关当局提出了要求，审议项目的细节。最初，私营部门自身希望建设该管道，但是由于技术和一些财政的限制，该部门出现并且向中国当局提出了这项请求，寻求帮助令该项目成为佳话。”

“我们希望在几天内获得肯定的答复”。这名官员表示，管道有可能建立在 PPP（公私合作伙伴关系）的模式基础之上。中国在开始建设 700 公里的从瓜达尔到讷瓦布沙阿的铺设成本达 13.5 亿美元的天然气管

道方面非常乐观，并且带着这个意思，代表巴基斯坦的国内天然气系统（ISGS）和代表中国的中国石油天然气集团公司已经签署了该协议。除此之外，俄罗斯将致力于南北（S-N）LNG 管道的建设，该管道具有从卡拉奇到拉合尔承载 12 亿立方英尺的天然气的容量，用于满足负荷中心——旁遮普邦——日益增长的能源需求。

俄罗斯团队预计在明天（周三）举行有关管道的重要会谈，相关官员告知称，在两国之间可能还会举行两到三次会谈。私营部门希望建设的第三条 LNG 管道目前收中国当局处理。所述的管道也将拥有传输 1.2bcfd 再气化 LNG 的能力。

在提到瓜达尔-讷瓦布沙阿 LNG 管道时，官员表示，该项目的建设将得到中国公司 85% 的融资，剩余的 15% 来自巴基斯坦政府，并且天然气管道铺设的价格远远低于估计成本。巴基斯坦政府将从 GIDC（天然气基础设施发展中心）的总部为该项目安排 150-120 亿卢比的融资。该项目将在 EPC 融资模式下完成。

一旦管道建成，巴基斯坦将通过三个压缩机站扩展相同的管道，从瓜达尔向后伸展 81 公里到达伊朗边境，作为 IP 天然气管道的一部分。当该管道与伊朗连接时将在经济上变得更加可行，因为所述管道将从伊朗传输 750mmcfcd 的天然气，并且从 LNG 终端传输 500mmcfcd 的天然气。之后，伊朗将令天然气出口量增加至 10 亿，其中 250mmcfcd 的天然气将专门用于满足瓜达尔的需求。

然而，消息人士称，具有 12 公里管道的 LNG 终端将由相同的中国公司在 BOOT（建设、拥有、运营和转移）的基础上建造在瓜达尔港口，该终端具有处理 500mmcfcd 的 LNG 的能力。

## Russia and Turkey agree gas pipeline deal

Russia and Turkey have put tensions over Syria behind them to agree a gas pipeline deal which would open a new route for Russian energy to western Europe.

The TurkStream agreement between Russian president Vladimir Putin and Turkish president Recep Tayyip Erdogan in Istanbul on Monday would, if implemented, redraw the energy map of Europe by allowing Russia to bypass some of its gas around Ukraine.

It would also strengthen ties between Moscow and Ankara at a time of growing mistrust between Turkey and the west in the wake of the coup attempt that plunged the country into turmoil three months ago and killed 270 people.

Monday's agreement committed the pair to construction of two lines of pipes beneath Turkish waters on the bed of the Black Sea, with a combined capacity of 30bn cubic metres of gas. One would serve the Turkish market and the other the rest of Europe.

TurkStream, to be operated by Gazprom, the Russian state-owned gas monopoly, was proposed by Mr Putin two years ago as a replacement for the abandoned South Stream pipeline which had involved co-operation between Russia and several EU countries.

Talks faltered after the crisis triggered by the shooting down of a Russian Su-24 war plane by Turkish forces over the Syrian border in November 2015. But relations have thawed rapidly since June when Mr Erdogan voiced regret for the downing of the Russian jet.

## 俄土签署天然气管道协议

普京和埃尔多安周一在伊斯坦布尔达成“土耳其溪”协议。协议若得到落实，将使俄能够绕过乌克兰向欧洲输送部分天然气。

俄罗斯和土耳其将双方在叙利亚问题上的矛盾搁置在一旁，达成了一项天然气管道协议，该协议将为把俄能源输送到西欧开辟一条新通道。

周一，俄总统弗拉基米尔·普京(Vladimir Putin)和土总统雷杰普·塔伊普·埃尔多安(Recep Tayyip Erdogan)在伊斯坦布尔达成了“土耳其溪”(TurkStream)协议。协议若得到落实，将使俄能够绕过乌克兰输送部分天然气，重绘欧洲能源版图。

该协议还将在土与西方之间猜忌与日俱增之际加强俄土两国政府之间的关系。三个月前，土国内发生未遂政变，导致 270 人丧生，国家也因此陷入动荡，此后土与西方之间的互不信任加深。

根据周一达成的协议，两国将致力于在黑海土耳其水域下方的海床上铺设两条天然气管道。两条管道的总输送能力为 300 亿立方米。一条将服务土耳其市场，另一条供应欧洲其他地区。

“土耳其溪”将由俄罗斯国有天然气垄断企业——俄罗斯天然气工业股份公司(Gazprom)运营。该项目是普京在两年前提议的，用于取代遭废弃的“南溪”(South Stream)管道，该管道涉及俄与几个欧盟国家之间的合作。

2015 年 11 月，俄一架苏-24 战机(Su-24)在土叙边境上空被土军击落，引发了一场危机，“土耳其溪”项目谈判因此陷于停滞。但自今年 6 月埃尔多安对俄机被击落事件表示遗憾以来，俄土两国关系已迅速解冻。

## *Minerals* (矿产)

### **In Australia, China's Appetite Shifts From Rocks to Real Estate**

A lanky, dark-haired surfer, Lee Meadowcroft modeled on the runways of London, Milan and Singapore, then followed his dream of going home to Australia to sell herbal medicines. His store failed — he had chosen the wrong street, he says — and he lost almost all his savings. By then, the fashion world had found fresher faces.

So like tens of thousands of other Australians, Mr. Meadowcroft went to the mines.

It was late 2004. He plowed his last \$4,000 into a two-week course on how to operate a crane. He found companies so desperate for workers that they would send chauffeured cars to pick up prospective welders, electricians and crane operators and deliver them to the nearest airport for their flights to mining country, here on Australia's remote northwestern coast.

China back then was growing at a breathtaking pace and needed all the Australian rocks it could get. Mine workers like Mr. Meadowcroft kept a punishing schedule: 13 consecutive days of 12-hour shifts, a day off, then another 13 consecutive days of 12-hour shifts. Mining fueled Australia's surging exports to China, which at their peak reached nearly \$100 billion a year — a figure representing \$4,300 for every man, woman and child in the country.

Resource-rich places around the world prospered thanks to China, and Mr. Meadowcroft and his fellow Port Hedland equipment jockeys were no exception. By 2011 he was earning \$250,000 a year. He watched idle miners sketch circles in the dust and place cockroaches inside, at times betting more than \$100 on which one crawled out first. One welder bought a Ferrari 308 sports car, quickly tired of it and sold raffle tickets for \$1,000 apiece to get rid of it.

“Everyone just went crazy,” Mr. Meadowcroft said.

The bust came just as hard and just as fast. China's economic slowdown left too many mines to feed too many dormant Chinese steel mills. Construction of new mines stopped. Port Hedland's economy slumped. Mr.

## Mcanxixun Information

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Meadowcroft lost his job, then lost a second job. Like thousands of others, he went back home.

Mr. Meadowcroft's tale could serve as yet another boom-and-bust cautionary tale of the limits of China's rise. From Russia to Brazil, and Nigeria to Venezuela, resource-rich countries that boomed during China's surge found their economies shaken when Chinese demand slowed.

Except something unexpected has happened to Australia: It has withstood the global rout. Most mines — lower-cost compared with mines elsewhere — have stayed open. But Australia has also kept thriving, against all expectations, with a different kind of money flowing in from China.

Attracted by clean air, a strong education system and worries about China's future, more Chinese are spending their money in Australia. Thousands of Chinese families have sent their children to study at costly Australian universities, and Australian food exports to China have boomed. Chinese investment in Australian real estate has increased at least tenfold since 2010; Chinese investors have purchased up to half the new apartments in downtown Melbourne and Sydney.

That has led to some soul-searching about the role of Chinese money in the country's political and economic life. Businesses linked to China have become sizable donors to Australian political parties, and a company said to have links to the Chinese military obtained a 99-year lease last year for a port next to a base that often houses United States Marines.

But for people like Mr. Meadowcroft and others in Western Australia who were cut loose by the mining slump, Chinese money is a blessing. He now lives in the Western Australia capital city of Perth and works as an apprentice plumber in new housing developments aimed at Chinese buyers. He earns just \$21,000 a year, but that could double or triple when he finishes his apprenticeship.

When visitors from China enter his construction site, he knows they may be the eventual buyers. "If you see a group of Chinese people," he says, "they're the money."

### The Color of Prosperity

In Port Hedland, the color of money is pinkish red.

At the docks, the salmon-hued dust coats everything, from the yellow railings atop the cranes to the rims of the fast-moving conveyor belts that hurtle rocks toward the bellies of giant cargo vessels. When the mining boom started 50 years ago, it covered the streets, too.

"It made all your clothes go pink," said Julie Arif, a city council member who was still a girl when workers began digging mines in the nearby Pilbara desert and hills. "Pilbara pink, we used to call it."

Back then, local leaders did not mind. "We'll worry about our dust when it clogs the cash registers," said the city's mayor in the early 1970s, according to Ms. Arif, who also runs the town's small history museum.

The pink dust comes from iron ore. And nobody sends more iron ore abroad than the state of Western Australia.

Iron ore transformed Port Hedland. Named "Marapikurrinya" by the local Aboriginal people, it subsisted for years on wool exports and a few pearls gathered from oysters at low tide. Until the mining boom, its claim to fame was a late-1940s three-year strike by nearby ranch workers that became a pivotal moment in the assertion of Aboriginal rights in Australia.

The iron ore deposits were far from Australia's steel industry on the country's southern coast. But the Australian government began allowing large-scale iron ore exports in the 1960s, opening up the region to buyers from Japan and Europe.

As foreign money trickled in, Port Hedland remained rough around the edges. When Cyclone Joan flattened half of Port Hedland in 1975, the state government replaced the shattered hospital with a prefabricated structure propped up on the dirt with thin, foot-high steel poles. It stayed in use for nearly 40 years before it was abandoned, and now stands vacant on its oceanfront site.

For entertainment, there were the “skimpies” — stripper shows by young women who barely complied with state regulations against full nudity at the start of each evening, and were even less likely to comply as the hour grew late.

The ore is mined several hours’ drive into the desert from Port Hedland. Workers use explosives to shatter the rock at open-cut mines, then scoop it up with huge bulldozers. The ore is crushed and sorted by machines bigger than a house, then hauled to Port Hedland either by train or by enormous trucks — so-called road trains — pulling three or sometimes four trailers.

During a crimson Indian Ocean sunset at Port Hedland’s Utah Point berth recently, a conveyor belt dumped iron ore into one of the seven large holds of a Chinese-owned freighter held in place by mechanical suction cups the size of minivans. A red gravel torrent rocketed downward at two tons a second, in a low, dull roar. Each hold was big enough for a capacious American home, with room to spare.

The crane lurched to one side, stopped disgorging iron ore, rumbled sideways to a position over a different hold, near the middle of the vessel, and resumed pouring.

Iron ore sometimes means dangerous work. Mr. Meadowcroft once saw a taut, inch-thick steel cable snap and sweep a man into a pile of steel pipes. Another time, he saw a 50-pound steel cable block fall on a worker, shearing off part of his face and shoulder and hurling him to the floor.

“It bounced him off the ground like a basketball,” Mr. Meadowcroft said. “There was a lot of blood.”

But life was mostly quiet — and inexpensive. The town had eight amateur baseball teams, and many of the workers played after their shifts. Housing was affordable. Sharon Ramirez, 40, remembers that her parents had a chance in the late 1980s to buy the bungalow they were renting for \$20,000, but decided not to.

“We didn’t jump at it,” she said, “because it was a lot of money in those days.”

### China Shock Wave

Everyone in Port Hedland has a story about a moment when the boom struck them.

For Mrs. Ramirez, it was when that rental home sold to an out-of-town investor for \$1 million. For Dave McGowan, it was when four of the eight baseball teams disbanded because workers were putting in 12-hour shifts instead of eight-hour shifts. For Daniel Connors, it was when a local garage, short on workers, told him that he had to make a reservation four months in advance to get the oil in his car changed.

China was changing — and it changed Port Hedland.

Three decades of economic reform in China, plus lower trade barriers after the country joined the World Trade Organization in 2001, lit a fire under the economy there. Skyscrapers blossomed by the hundreds in obscure cities. The nation has built 77,000 miles of expressway, almost all of it since 1997 and two-thirds more mileage than the Interstate highway system in the United States, on which China’s network is modeled.

All that construction meant China produced and consumed last year almost as much steel as the rest of the world combined.

To supply its steel mills, China needed Australia’s iron ore. Iron ore prices surged tenfold. Big companies like BHP Billiton, Rio Tinto and Fortescue Metals Group rushed to build mines and add port berths as fast as possible.

## 澳大利亚的中国“金主”：矿业冲击波

澳大利亚黑德兰港——身材瘦长、一头黑发的冲浪玩家李·梅多克罗夫特(Lee Meadowcroft)曾作为模特在伦敦、米兰和新加坡的伸展台上走秀，而后他为了实现梦想回到祖国澳大利亚，做起草药生意。他的店倒闭了——他说他不该选在那条街开店——他亏掉了几乎全部的积蓄。而时尚界在那时已经找到了更新

鲜的面孔。

于是，梅多克罗夫特和数万澳大利亚人一样，选择去煤矿工作。

那是 2004 年底。他上了一个为期两周的吊车操作培训班，把手头最后的 4000 美元交了学费。他发现企业对工人极度渴求，以至于会派专车去接这些未来的焊工、电工和吊车操作员，把他们送到最近的机场，然后飞往矿场所在地，其中就包括这里，偏远的澳大利亚西北部沿海地区。

当时的中国正在以令人惊叹的速度向前发展，希望得到澳大利亚的每一块矿石。像梅多克罗夫特这样的矿工要超负荷工作：连续工作 13 天，每天 12 小时，休息一天，然后再连续工作 13 天，每天 12 小时。矿业推动了澳大利亚向中国出口的猛增，最高时达到一年将近 1000 亿美元——相当于全国男女老少每个人 4300 美元。

全球资源丰富的地方都借中国致富了，梅多克罗夫特和黑德兰港的其他设备操作员也不例外。2011 年他的年收入达到 25 万美元。他曾见到矿工们闲暇时在地上画个圈，把蟑螂放进去，赌哪只先爬出来，有时候赌注可达 100 美元以上。有一个焊工买了一辆法拉利 308 跑车，很快就厌倦了，于是办了一场 1000 美元一张票的抽奖把车处理掉。

“大家都很疯狂，”梅多克罗夫特说。

崩溃的到来同样是迅速而猛烈的。中国的经济放缓导致太多的矿场在向太多已经停产的中国炼钢厂供应矿石。新矿建设项目停工了。赫兰德港的经济陷入低谷。梅多克罗夫特丢了工作，而后下一份工作也丢了。他和其他几万人一样，回到了家中。

梅多克罗夫特的经历，是有关中国崛起局限性的又一则盛衰寓言。从俄罗斯到巴西，从尼日利亚到委内瑞拉，随着中国崛起而繁荣的资源大国，也因中国需求放缓而遭到经济打击。

不过在澳大利亚发生了一些意想不到的事情：它没有被全球崩溃打倒。这里的矿场成本比别的地方低，多数矿依然在作业。而澳大利亚的这种出人意料的持续繁荣，还因为有另一种完全不一样的资金正从中国流向这里。

在清洁的空气、优质的教育系统吸引下，再加上对中国未来的担忧，越来越多的中国人正把钱花在澳大利亚。数以万计的中国家庭把子女送到昂贵的澳大利亚大学读书，澳大利亚向中国的食品出口也在猛增。中国在澳大利亚的房地产投资自 2010 年以来增加了至少 10 倍；在墨尔本和悉尼市中心的新住宅单位有近一半被中国投资者买下。

这让一些人开始反思中国资金在这个国家的政治、经济生活中所扮演的角色。与中国有关联的企业向澳大利亚的政党做出了可观的捐献，一家据称与中国军方有关联的公司，去年拿到了一个港口的 99 年期租约，而港口就在一个经常驻扎着美国海军陆战队的基地附近。

但是对梅多克罗夫特这样的人以及西澳大利亚州其他因矿业衰落而失去生计的人来说，中国的钱是一种赐福。现在他住在西澳大利亚州首府珀斯，在一个瞄准中国买家的新住宅开发项目中做水管工学徒。他一年只能挣 2.1 万美元，不过出师之后，他的收入可能翻两三倍。

当中国游客进入他工作的建筑工地时，他知道，他们可能是最终的买家。“如果你见到一群中国人，”他说，“那你就是见到了金主。”

繁荣的颜色

在黑德兰港(Port Hedland)，钱的颜色是粉红色的。

码头上所有的东西都蒙上了鲑鱼色的尘土，从起重机顶部的黄色栏杆到快速转动的传送带的边缘——传送带把岩石快速送入巨型货轮的肚子里。50 年前采矿业兴起时，这里的街头也蒙着这样的尘土。

“它把你所有的衣服都变成粉色，”市议会议员朱莉·阿里夫(Julie Arif)说。当年，工人们开始在附近的皮尔巴拉沙漠和山丘上挖矿时，她还是个小女孩。“我们过去称它为皮尔巴拉粉色。”

当时，当地领袖也并不介意。据阿里夫讲，在 20 世纪 70 年代初，该市市长曾说，“尘土把收银机堵塞了，我们才会担心。”阿里夫也主管该市的一座小型历史博物馆。

那些粉色尘土来自铁矿石。西澳大利亚州出口海外的铁矿石数量比澳大利亚其他任何一个州都要多。

铁矿石改变了黑德兰港。原住民称这个港口为 Marapikurrinya，有过去很多年时间里，它的经济全靠羊毛出口以及从落潮时的牡蛎中采集的少量珍珠。在矿业兴起之前，它出名是因为 20 世纪 40 年代末附近的农场工人举行了持续三年的大罢工，那成为澳大利亚原住民争取权益的关键时刻。

这些铁矿距离澳大利亚南部沿海的钢铁工业区路途遥远。不过，20 世纪 60 年代，澳大利亚政府开始允许大规模铁矿石出口，向日本和欧洲的买家开放这个地区。

尽管外国的资金慢慢来到了黑德兰港，但它依然很简陋。1975 年，热带气旋“琼”(Cyclone Joan)将一半黑德兰港夷为平地，州政府用一英尺长的细钢杆在废墟上支起一个预制构件式建筑，替代遭到摧毁的医院。这个医院又使用了近 40 年才遭废弃，如今海边的这幢建筑还空置着。

娱乐方面有 skimpies——也就是年轻女子的脱衣舞表演，她们几乎从不遵守夜晚降临后不得全裸的州法规定，随着夜色渐深，更是不可能遵守。

从黑德兰港往沙漠里驱车数小时，才能到达开采铁矿石的地方。工人们用炸药在露天矿山上炸开巨石，然后用大型推土机把它们铲起来。矿石粉碎后，用比房子还大的机器进行分类，然后用火车或巨型卡车（也就是所谓的公路火车，它能挂三到四个拖车）运到黑德兰港。

前不久，在黑德兰港的犹他点(Utah Point)泊位，一条传送带在印度洋深红色的晚霞中，把铁矿石倒入一艘中国货轮的七个大货舱中。货轮用小型面包车大小的机械吸盘固定。红色碎石流以每秒两吨的速度倾泻而下，发出沉闷的轰隆声。每个货舱都很大，面积相当于一栋宽敞的美国家庭住房，还能留出些空间。

起重机突然转向一边，停止倾泻铁矿石，轰隆着挪到靠近货轮中间位置另一个货舱的上方，继续倾泻。

铁矿石有时也意味着危险。有一次，梅多克罗夫特看见一根绷紧的一英寸粗的钢索突然断裂，把一名男子扫进一堆钢管中。还有一次，他看见一个 50 磅重的钢索滑轮砸到一个工人身上，削掉了他的部分脸和肩膀，并将他击倒在地。

“滑轮把他从地上弹起来，就像篮球那样，”梅多克罗夫特说，“现场流了很多血。”

不过，那时候这里的生活总的来说很平静，生活成本也不高。该市有 8 支业余棒球队，很多工人下班后就会去打棒球。房价也能承受。40 岁的莎伦·拉米雷斯(Sharon Ramirez)还记得，她的父母在 80 年代末曾有机会以 2 万美元买下他们当时租住的平房，但最后决定不买。

“我们没有欣然接受那个价格，”她说，“因为在当时，那还是挺大一笔钱的。”

中国冲击波

黑德兰港的每个人都有关于矿业繁荣对他们造成冲击时刻的故事。

对拉米雷斯来说，那个冲击时刻是她家租住的房子以 100 万美元卖给一个外地投资者的时候。对戴夫·麦高恩(Dave McGowan)来说，是那 8 支棒球队中有 4 支因为工人的轮班从 8 小时变成 12 小时而解散时。对丹尼尔·康纳斯(Daniel Connors)来说，是当地汽车修理厂因为缺少工人而告诉他必须提前 4 个月预订才能给他的汽车换机油时。

当时中国在变化——它也改变了黑德兰港。

中国 30 年的经济改革，再加上 2001 年加入世界贸易组织(World Trade Organization)后贸易壁垒的减少，给中国经济点了一把火。连一些不出名的城市都冒出很多的摩天大楼。该国修了 7.7 万里的高速公路，几乎全是 1997 年之后所建，这比美国的州际高速公路系统还长三分之二——中国的高速公路网就是以美国为样本的。

所有这些建设意味着，中国去年生产和消耗的钢铁几乎是世界上其他国家的总和。

为了给钢铁厂提供原料，中国需要澳大利亚的铁矿石。铁矿石的价格增长了十倍。必和必拓公司(BHP Billiton)、力拓矿业集团(Rio Tinto)和福蒂斯丘金属集团(Fortescue Metals Group)等大公司竞相修建矿场，尽可能地增加港口泊位。

## China mergers shake up steel sector

## Mcanxixun Information

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It was a long road to insolvency for Dongbei Special Steel Group, a state-owned producer in China's northeastern industrial heartlands that first defaulted in March after Yang Hua, the company's chairman, was founded dead after a suspected suicide.

Efforts to save the company through months of negotiations between creditors and the Liaoning government, Dongbei Special's owner, got nowhere

. On Thursday, eight defaults in, the company finally entered bankruptcy proceedings with a restructuring plan expected to be enacted next month.

Dongbei Special's demise was the latest shock in a seismic week for Chinese steel, where the first act of a Beijing-orchestrated plan to forge a more efficient and less indebted industry is under way.

Similar to earlier attempts, Beijing hopes to use a strategy of closures, asset restructuring and mergers to create 10 groups responsible for 60-70 per cent of the country's production by 2025.

"If they can merge with others, they merge," says Li Hongmei, an analyst at S&P Global Platts. "If not, they will ask the banks if they can change debt for equity. If that fails, then they will choose the last resort — that will be bankruptcy."

The sector's problems with overcapacity have global consequences. Last year Chinese steelmakers' failure to cut production to match falling domestic demand led to a glut of Chinese steel flooding global markets, dragging down prices and throwing the global industry into crisis.

International steelmakers are fighting the rise of Chinese exports with a growing number of anti-dumping cases but Beijing says the continued rise in exports merely reflects Chinese steel's competitiveness.

To increase it further, Beijing is pushing top-down consolidation. An arranged marriage between two of China's state-owned steel groups officially started a week ago.

The absorption of Wisco by Baoshan Steel was the first step to come out of continuing discussions between Baosteel Group and Wuhan Iron & Steel Group aimed at creating a steel producer second in output only to ArcelorMittal.

Aside from clearing out "zombies" and creating super groups, Beijing is encouraging local governments to carry out debt restructuring plans to deal with indebted local steel companies, either via debt-for-equity swaps or bond issuance.

Last Sunday a restructuring plan including the issuance of corporate bonds was finalised for Bohai Steel Group, a producer owned by the Tianjin city government with debts of Rmb192bn (\$29bn).

Debt-for-equity deals in steel are part of a broader attempt to deal with corporate debt, says Tomas Gutierrez of Kallanish, a research group. "There is definitely a trend and it's definitely political, because creditors don't agree to these things willingly or easily," he says.

Pushing through the ambitious Chinese steel restructuring plan depends on Beijing's ability to keep in line provincial governments who, worried about unemployment and tax income, often keep local lossmaking producers afloat using subsidies and loans.

President Xi Jinping's rapid centralisation of power through a sweeping anti-corruption campaign has given him greater control over the provinces and their enterprises than his immediate predecessors.

The latest move in Mr Xi's political house-clearing was the expulsion of 45 lawmakers from Liaoning, one of China's most indebted provinces and home to Dongbei Special.

Mr Xi's clout may improve the odds of restructuring, according to analysts, but they warn that deals announced last week may have a limited effect on steel overcapacity.

"The overall impact of recent announcements on oversupply is unlikely to be significant," says Mr Gutierrez.

Restructuring deals tend to save profitable capacity by creating a separate entity with a lower debt burden so it can continue producing.

For Bohai, this means the formation of a subsidiary consisting of the company's premium assets that will hold only Rmb50bn of a total debt pile of Rmb192bn.

For Dongbei Special, it is likely that Fushun Special Steel, a high-end steel pipe manufacturer, will be spun off and continue producing, analysts say.

The drive to preserve and promote high-end, coastal capacity while cutting off low-end, inland capacity is present throughout the restructuring plans, including the headline Bao-Wu merger.

“Coastal capacity is growing, and that's the main trend of the next two years,” says Mr Gutierrez. “Baosteel has a plant in Guangdong, Wisco has one in Guangxi, and they are ramping up to just under 10m tonnes of capacity a year each by the end of 2017. What [international steel producers] really should be asking is what's happening with the extra 50m tonnes of capacity being commissioned on the [Chinese] coast in the next two years.”

## 破产与合并冲击下的中国钢铁业

中国政府正在实施旨在增效减债的钢铁业发展计划，大型钢企的合并及地方钢企的破产重组正冲击着整个钢铁行业。

中国东北工业核心地带的国有钢铁生产商东北特钢集团(Dongbei Special Steel Group)的破产之路十分漫长。3月份，在集团董事长杨华被发现疑似自杀身亡之后，东北特钢出现了首次违约。

债权人与该集团所有者辽宁省政府之间的磋商长达数月。试图借磋商拯救该集团的努力未收到任何效果。近日，至今已9次违约的东北特钢终于确定进入破产程序，重组计划预计会于下个月实施。

对于中国钢铁行业来说，东北特钢的破产是地震般的一周内出现的最新冲击波。在中国钢铁行业，一个由中国政府拟定的计划正迈出第一步。该计划旨在提高钢铁行业的效率、降低其债务。

与早先的尝试类似，中国政府希望到2025年前，通过关停工厂、资产重组与合并策略打造占中国钢铁产量60%到70%的10家集团。

标准普尔全球普氏(S&P Global Platts)分析师李红梅表示：“能合并的就合并。合并不了的会去问银行能不能债转股。如果这也不行，就会选择最后手段——破产。”

中国钢铁业的产能过剩问题对全球都产生了影响。去年，中国钢铁制造商未能削减产量适应不断下滑的国内需求，导致大量中国钢铁涌入全球市场，拉低了钢铁价格，令全球钢铁业陷入危机。

国际钢铁制造商正在以日益增多的反倾销案对抗中国出口的攀升。但中国政府表示，出口的持续攀升只不过反映了中国钢铁的竞争力。

为进一步提升竞争力，中国政府正在推动自上而下的整合。一周前，中国两大国有钢铁集团之间正式启动了一场包办婚姻。

宝钢(Baoshan Steel)对武钢(WISCO)的吸收合并，是在两家集团持续磋商基础上迈出的第一步，旨在打造产量仅次于安赛乐米塔尔(ArcelorMittal)的全球第二大钢铁生产商。

除了清理“僵尸”企业及打造超级企业集团，中国政府还鼓励地方政府通过债转股或发行债券的办法实施债务重组，处理深陷债务的地方钢企。

近日，渤海钢铁集团(Bohai Steel Group)敲定了一份包括发行债券在内的重组计划。该集团由天津市政府所有，背负的债务高达1920亿元人民币（合290亿美元）。

研究集团Kallanish的托马斯·古铁雷斯(Tomas Gutierrez)表示，钢铁行业的债转股交易是处理企业债务更广泛努力的一部分。他说：“毫无疑问存在着这样的趋势，而且这种趋势无疑是政治性的，因为债权人不会愿意、也不会轻易同意这种事情。”

中国钢铁业大胆重组计划的推进，取决于中国政府能否控制各省政府依计划行事。这些省政府由于担

心失业和税收问题，往往会通过补贴和贷款手段维持当地亏损钢铁生产商的经营。

中国国家主席习近平通过一轮全面反腐对权力的迅速集中，令他对各省政府及其企业的控制超过了前任。

他的政治大扫除的最新举措，是将辽宁省 45 名全国人大代表除名。辽宁省是东北特钢的所在地，也是中国负债情况最严重的省份之一。

分析师认为，习近平的影响力也许会加大重组的可能性。不过他们警告称，近期公布的交易对钢铁产能过剩状况的影响也许十分有限。

古铁雷斯表示：“近期公布的消息对供给过剩的总体影响不太可能有多大。”

重组交易往往会另行组建一个债务负担较轻的新实体，以确保其能够继续生产，从而保留具有盈利能力的产能。

对渤海钢铁来说，这意味着组建一家由其优质资产组成的新公司。新公司将仅承接该集团 1920 亿元人民币巨额债务中的 500 亿元人民币。

分析师表示，对于东北特钢，高端钢管制造商抚顺特钢(Fushun Special Steel)可能会被剥离，继续生产。

保留并提升高端沿海产能、削减低端内陆产能的做法，在各种重组规划中随处可见，备受关注的宝钢武钢合并案也是如此。

古铁雷斯表示：“沿海产能正在增长，这是今后两年的主要趋势。宝钢在广东拥有一家炼钢厂，武钢在广西也有一家炼钢厂，它们将在 2017 年年底以前将各自产能提升至略低于每年 1000 万吨的水平。（国际钢铁生产商）真正该问的问题是，今后两年（中国）沿海即将投产的 5000 万吨新增产能进展如何。”

## EU Steel

Europe's steelmakers are urging EU leaders to take a tougher stance on unfair trade to help preserve the industry on the continent at a time when it is under pressure from cheap Chinese imports.

In a letter seen by the FT, top executives from more than 50 companies - including ArcelorMittal, Tata Steel and ThyssenKrupp - have called on member states to bolster the bloc's trade defences.

With China seeking the coveted status as a "market economy" in trade disputes, which opponents warn would give Beijing a "licence to dump", European steelmakers also want Brussels to adopt a position similar to the US by refusing any status that would allow dumping.

They also want Brussels to adopt a position similar to that of the US in regards to China's desire to be treated as a market economy in trade disputes, which opponents from industrial groups warn would give Beijing a "licence to dump".

The intervention comes amid ratcheting trade tensions and a rising tide of protectionism, as a popular backlash in the west against the perceived ills of globalisation grows.

Europe's steel industry was battered by a collapse in prices for the metal last year, triggered by global oversupply and a wave of cheap imports into the bloc.

China in particular is accused of distorting competition by subsidising lossmaking companies and dumping excess material on to international markets at unfairly low prices. Brussels has enacted tariffs against types of steel from a number of countries, but critics say it takes too long to act and is insufficiently robust.

"EU trade defence instruments are very slow to deploy compared to our trade partners," reads the letter, drafted by the lobby body Eurofer ahead of a European leaders' summit in Brussels this week.

"In addition, the effectiveness of the EU anti-dumping instrument is uncertain, producing measures which are significantly below the calculated size of the of the dumping, often not even a tenth of US measures".

Demands outlined in the text include the suspension, in certain cases, of the so-called “lesser duty rule”, under which EU duties are calculated. This would in effect remove a cap on levies.

The European Commission has already proposed a strengthening of the legal tools at its disposal, but there are deep divisions among members states. Britain is among a cabal of countries opposed to the plans, first tabled in 2013, despite heavy job losses in the UK steel industry over the past year.

A Commission spokesperson said: “[W]e need to reinforce our trade defence instruments to be able to face the challenges of globalisation.

“We have an unprecedented number of anti-dumping and anti-subsidy measures in place on steel products and we’re making full use of the available instruments. But these are not enough”.

The EU’s executive arm will try to unblock the legislation’s progress this week at the Brussels summit, at which trade policy will be one of the main topics.

The open letter also touches on the contentious issue of China’s desire to be classified as a market economy, a status that Beijing says it is automatically entitled to obtain at the end of the year under World Trade Organisation rules. Supporters such as the UK say it would boost investment between Europe and China, but detractors believe it would become harder to impose tariffs.

While the debate in Europe has moved on from a simple binary answer to the question, steelmakers want the EU’s anti-dumping regulation to include the bloc’s own criteria for when a country is a market economy, with the burden of proof remaining on exporters into the single market.

The Eurofer letter also calls for a more favourable treatment for the sector under the EU’s emissions trading scheme.

## 欧洲钢铁制造商呼吁强化贸易防御

针对中国所争取的“市场经济”地位，欧洲钢铁制造商呼吁布鲁塞尔拒绝给予可能为倾销开启大门的任何地位。

欧洲钢铁制造商敦促欧盟领导人对不公平贸易采取更强硬立场，以保护遭遇中国廉价钢材压力的欧洲钢铁业。

在英国《金融时报》看到的一封信中，包括安赛乐米塔尔(ArcelorMittal)、塔塔钢铁(Tata Steel)、蒂森克虏伯(ThyssenKrupp)在内的 50 多家公司的高管呼吁欧盟各成员国强化欧盟的贸易防御。

中国正在争取贸易争端中的“市场经济”地位，反对者警告称，这将赋予北京一张“倾销许可证”。欧洲钢铁制造商希望布鲁塞尔也采取类似美国的立场，拒绝给予可能为倾销开启大门的任何地位。

此番呼吁正值贸易关系日趋紧张、保护主义不断升温之际，西方民众抵制全球化在他们眼中的种种弊端。

去年，由全球钢材供应过剩以及大量廉价钢材进入欧盟导致的钢材价格暴跌，使欧洲钢铁业遭受重创。

中国尤其被指责通过补贴亏损的钢厂并以不公平的低价向国际市场倾销过剩钢材而扭曲了竞争。布鲁塞尔已对来自多个国家的多种钢材加征了关税，但批评人士称其行动太迟缓，且不够强硬。

信中称：“相比贸易伙伴，欧盟实施贸易救济措施的速度非常慢。”这封信由游说机构欧洲钢铁联盟(Eurofer)在本周欧盟领导人在布鲁塞尔举行峰会之前起草。

“此外，欧盟反倾销手段的有效性并不确定，所采取措施相对估算的倾销规模明显不足，常常不及美国措施力度的十分之一。”

信中列出的要求包括在某些情况下暂停实施欧盟计算关税使用的所谓“从低征税规则”(lesser duty rule)。此举实际上等于取消关税上限。

欧盟委员会(European Commission)已提出一个强化版法律工具供其使用，但各成员国之间存在深刻分

歧。英国自该计划 2013 年首次提交以来，一直是反对国家之一，尽管过去一年英国钢铁业工作岗位流失严重。

欧盟委员会发言人表示：“我们需要加强我们的贸易防御手段，以便能够面对全球化挑战。”

“我们对钢铁产品采取了数量空前的反倾销和反补贴措施，而且我们充分利用了现有工具，但这些还不够。”

这个欧盟执行机构将于本周在布鲁塞尔峰会上试图开启这一立法进程，贸易政策将是此次峰会主要议题之一。

公开信还谈到中国想获得市场经济地位的争议性问题，北京方面表示根据世界贸易组织(WTO)规则，中国应该在今年底自动获得该资格。英国等支持者表示这将推动欧洲与中国之间的投资，但批评者认为这将加大征收关税的难度。

尽管欧洲的辩论已超越对这个问题的简单二元答案，但钢铁商希望欧盟的反倾销法规包括该区域自己对市场经济国家的认定标准，举证责任仍落在向欧盟单一市场出口的出口商身上。

欧洲钢铁联盟的信还呼吁在欧盟碳排放交易机制下对该行业更加优待。

## *Clean Energy* (清洁能源)

### **Can India walk its climate talk?**

Ratifying the Paris Agreement strengthens India's call for rich nations to move on climate change, but the country needs to start taking stronger action itself

With India submitting its instrument of ratification of the Paris Agreement to the United Nations on October 2, the birth anniversary of Mahatma Gandhi, it is almost certain that the agreement will come into force in a few weeks.

India, the world's third-largest emitter of greenhouse gases (GHG) causing climate change, was followed by the European Union. The world's top two emitters, China and the United States, have already submitted their ratifications. Including India, 63 nations responsible for 52.13% of global GHG emissions have now done so.

The agreement will come into force 30 days after at least 55 nations responsible for at least 55% of global emissions submit their ratifications. The Paris Agreement becomes operational after 2020. The big holdout now is Russia, the world's fourth-largest emitter.

The conditions

India's ratification comes with three strong riders: industrialised countries must take immediate action to reduce their emissions under the second phase of the Kyoto Protocol, which is in force until 2019; industrialised countries must make good their commitment to provide at least US\$100 billion a year to developing nations from 2020 to help move towards a greener economy; and industrialised countries must make green technologies available to developing nations at no cost or low cost. These are contentious issues and will be hotly debated at the next summit of the United Nations Framework Convention on Climate Change (UNFCCC), starting in Marrakech, Morocco, on November 7.

As for industrialised countries reducing their emissions right now, the US not a party to the Kyoto Protocol. Japan, Australia, Canada and other developed countries have walked out of their second phase commitments. The European Union appears to be the only one that will manage to keep its commitments, though many of its members will not do so.

Climate justice

The issue of providing money to developing nations is part of the historical responsibility of industrialised countries, which have emitted over 80% of GHG since the start of the Industrial Age. India has been hammering this point home for decades, but with little result. Climate justice finds only grudging and passing mention in the Paris Agreement. On the question of money, the Green Climate Fund – now the main vehicle for climate finance – has a little over \$10 billion in its kitty and has managed to launch only nine projects so far.

Green technology transfer at no cost or low cost is an issue that most industrialised countries are not even willing to discuss, citing patent laws. In practical terms, this may not matter much for emerging economies; the Confederation of Indian Industry has estimated patent fees comprise less than 5% of project costs in the area of renewable energy. But the issue is of importance to Least Developed Countries, and India wants to continue being seen as their champion in climate negotiations.

Clearly, all the contentious issues in the run-up to 2020 are still on the table. On top of that, the Paris Agreement rests on individual country pledges that are too weak to combat climate change effectively. The agreement says the world should keep global warming to within two degrees Celsius average temperature rise, and strive towards 1.5 degrees. But the country pledges add up to a warming between 2.7 and 3.5 degrees Celsius.

As Sunita Narain, head of the New Delhi-based think tank Centre for Science and Environment (CSE), points out, impacts of climate change are already devastatingly clear with a global temperature rise of around one degree Celsius on average. Evidently, the Paris Agreement needs to be strengthened. Still, it is a start, and has been hailed as a triumph of diplomacy.

### Indian pledges

To meet its commitments under the Paris Agreement, there are three big things that India needs to do, as detailed in its Intended Nationally Determined Contributions, which were submitted to the United Nations Framework Convention on Climate Change (UNFCCC) exactly a year before the country handed over its instrument of ratification. These are: reduce its GHG emissions intensity by 33-35% by 2030; generate at least 40% electricity from non-fossil fuel sources by 2030; and create additional carbon sink of 2.5-3 billion tonnes by planting trees.

The natural increase in efficiency of Indian industry will take care of about half of this emissions intensity reduction, if the trajectory since the late 1990s is maintained. Three independent think tanks and university departments, asked by the Ministry of Environment, Forests and Climate Change to study this pledge, have come to similar conclusions.

Large factories belonging to Indian and multinational corporations are moving towards more energy efficiency – and consequent reduction in emissions intensity – largely because they are aware of possible tightening of regulations. The big gap is in the area of medium, small and micro enterprises (MSME), which together account for around 80% of India's industrial output.

### Lax implementation

Implementation of regulations is lax in the MSME sector, and many entrepreneurs are unable or unwilling to invest in more efficient machinery, though they know about the savings in their own energy bills. There is a case for stronger government intervention here.

Two other big areas are crying out for improvement – electrical appliances in the domestic sector, and more efficient new buildings. The Bureau of Energy Efficiency has done a lot of work in classifying electrical appliances by efficiency, but the uptake by manufacturers and buyers needs a big push; so do the new building codes developed by international and Indian rating agencies. It has been estimated that 70% of the buildings that will stand in India in 2030 are yet to be built – so this is an obvious area for improvement. The work that has progressed very well is expansion of LED lighting – over 165 million LED lights have been distributed under various government schemes.

As for generating at least 40% of its electricity by 2030 without using coal, oil or natural gas, India has the world's most ambitious programme – to generate 100 GW each through solar and wind and more through biogas by 2022. Prime minister Narendra Modi has advanced this deadline to 2020, though official documents continue

## **Mcanxixun Information**

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to refer to the later deadline.

Right now India's solar generation capacity is 8.5 GW and wind 27.6 GW, so there is a need for considerable acceleration. The plan will not work unless state-owned electricity distribution companies change their attitude. Right now, they are reluctant to buy power from renewable energy generation firms. Even when they do so, they are badly in arrears in their bill payments, including the mandatory renewable purchase obligation money.

Of the 100 GW solar plan, 40 GW is supposed to be generated through rooftop installations, and this is another area that is not progressing as well as it should, largely due to bottlenecks at local municipality and distribution company levels.

The big confrontation will come in the area of hydropower. To meet the 40% electricity generation through renewables commitment, the government has counted hydropower among renewable energy sources. But environmentalists and residents are often strongly opposed to large hydropower projects, especially in the Himalayas, where most of the planned projects are located. Many projects are facing huge time and cost overruns.

### **Carbon sink challenges**

Increasing India's carbon sink by 2.5-3 billion tonnes by 2030 is an equally daunting challenge. This can be done only by increasing the number of trees in a country that is overpopulated and where land is a really scarce resource. The country now has a little over 24% of its area under forests, and to meet its pledge will have to increase this to 33%. This does not seem very likely from a government that prides itself on being business-friendly and has been pushing the cutting down of forests for various industrial and infrastructural projects.

The other, and more doable, option is to significantly increase tree cover in degraded forests. But this has to be carried out very carefully to avoid invasive tree species. Afforestation programmes in India have often suffered from this problem.

The one bit of good news is that there is no shortage of money to plant trees, thanks to a regulation that obliges industrialists to pay compensation when they cut trees for their projects.

### **Immediate needs**

From the average Indian's point of view, handling the immediate impacts of climate change is probably more important than meeting international obligations. The biggest impact now is an increase in the uncertainty of water supply – there is either too little or too much. Regulating the extraction of groundwater is an immediate need. But due to political compulsions there is no move towards it.

Another area being immediately impacted is agriculture, with crops unable to withstand higher temperatures, or sudden changes in water supply or both. Indian researchers have been doing commendable work in developing crop varieties that can withstand these stresses better. But their work is not being carried to farms with a fraction of as much urgency as is necessary.

### **Welcome move**

There are formidable challenges ahead. Still, India has taken an important step by ratifying the Paris Agreement. There was a time when observers were unsure whether India would take this step soon, and now there have been a few reports of India giving in to pressure, mainly from the US.

However, Anil Madhav Dave, India's environment minister, denied any pressure. "There were two things on our minds before we reached the decision to ratify," he told journalists a day before the ratification was submitted to the UN. "First, we wanted internal consultations on how this decision would affect our laws. We also wanted to see whether our interests are taken care of when we go forward to implement the Paris deal."

The ratification has received acclaim in India and abroad. UN secretary general Ban Ki-moon, UNFCCC executive secretary Patricia Espinoza, US president Barack Obama, and French president Francois Hollande have all welcomed it.

Most green NGOs in India were also supportive of the move. Sandeep Chachra, executive director of ActionAid India, said, “This year India and its citizens have been on the front line of climate change. This effort to fast-track the entry into force of the Paris Agreement is a clear indication that India both wants and needs urgent action at home, and internationally.”

“India now has a vital role to play in ensuring that its hard-won inclusion of climate justice in the agreement becomes a key outcome and not just an empty phrase. In the next round of UN talks in Morocco this November, it must make sure that the next steps that will be negotiated really do reflect fairness and equitable action for all.”

This point was emphasised by the CSE, whose deputy head Chandra Bhushan said, “Ratification is just the beginning of tough and difficult negotiations ahead. India will have to pay an important role in making Paris Agreement effective and equitable.”

### 印度能够实现其气候承诺吗？

印度向联合国提交了《巴黎协定》的批准案，在要求富裕国家采取行动抵御气候变化的时候腰杆更硬了，但印度自身也必须采取更有力的措施来兑现承诺。

10月2日是圣雄甘地的生日，印度在这一天向联合国提交了《巴黎协定》的批准文件，基本上就是确定将在几周内落实该协定。

印度是世界第三大气候变化温室气体排放国，欧盟已经批准了《巴黎协定》。中美这世界两个最大排放国均已完成批准程序。迄今，包括印度在内的63个国家已批准协定，涵盖了全球52.13%的温室气体排放。

只要55个国家批准且达到世界总排放量55%以上，《巴黎协定》就能在30日之后生效，为2020年后全球应对气候变化行动作出安排。目前主要的“钉子户”就是世界第四大排放国——俄罗斯。

#### 批准条件

印度批准《巴黎协定》有三个强硬条件。一是工业化国家必须立即采取措施实现其在《京都议定书》第二阶段的减排，这一阶段将持续到2019年；二是工业化国家必须切实兑现从2020年起每年向发展中国家提供至少1000亿美元的承诺，帮助它们向更绿色的经济发展；三是工业化国家必须无成本或低成本地向发展中国家提供绿色技术。这些都是争议性的问题，将提交11月7日在摩洛哥马拉喀什举行的联合国气候变化框架公约（UNFCCC）峰会进行讨论。

说到正在减排的工业化国家，美国不是《京都议定书》的成员，日本、澳大利亚、加拿大和其它发达国家已经抛弃了它们的第二阶段承诺，能够恪守承诺的似乎只有欧盟，但其许多成员并不会这么做。

#### 气候正义

向发展中国家提供资金是工业化国家历史责任的一部分，工业化时代以来80%以上的温室气体都是由后者排放的。印度几十年来一直不断强调这一点，但收效甚微。气候正义在《巴黎协定》中只是被勉强地一笔带过。在资金问题上，绿色气候基金目前唯一的气候融资机制，但其口袋里只有100亿美元多一点，迄今成功启动的项目只有9个。

无成本或低成本绿色技术转移则是工业化国家连谈都不愿谈的问题，它们总是拿专利法做挡箭牌。从实践上说，这对新兴经济体并不是什么大问题。据印度工业联合会估计，可再生能源领域的专利费用还不到项目成本的5%。但这个问题对最不发达国家来说就很重要了，印度愿意继续在气候谈判中充当它们的捍卫者。

很清楚，在2020年之前，所有争议问题仍将被摆在桌面上。此外，只靠单个国家的《巴黎协定》过于软弱，无法有效抗击气候变化。协定提出要将平均温度上升控制在2摄氏度以下，同时向1.5摄氏度努力。但目前各国的承诺只能将上升幅度控制在2.7到3.5摄氏度。

正如新德里智库科学与环境中心（CSE）负责人苏妮塔·纳拉因所说，气候变化的影响已经毫无疑问地让全球平均气温上升了1摄氏度。显然，《巴黎协定》必须得到强化巩固。目前还只是开了一个头，却

被鼓吹成了外交胜利。

### 印度承诺

要兑现其在《巴黎协定》下的减排承诺，印度必须做到三件大事。这三件大事被详细列在该国的“国家自主减排贡献”中，在《巴黎协定》批准的整整一年前被提交给联合国气候变化框架公约，它们就是：到 2030 年将温室气体强度降低 33-35%；到 2030 年非化石燃料发电至少占 40%；通过植树额外增加 25 到 30 亿吨碳汇。

如果 90 年代后期以来的趋势能够持续的话，这一排放强度下降一半以上要依靠印度产业效率的自然提升。印度环境、森林与气候变化部印度环境、森林与气候变化部委托三家独立智库和大学院系就这一承诺进行研究，得到了相似的结论。

属于印度和跨国企业的大型工厂的能效在不断提高，排放强度也随之降低，这很大程度上是因为它们都认识到法规将不断收紧。巨大的差距存在于中小微型企业中，而它们占印度工业总产值的 80% 左右。

### 执行不力

中小微型企业的法规执行非常不力，许多企业主无力或不愿投资购买效率更高的机械，尽管他们知道可以节省更多能源成本。这个地方需要更强的政府干预。

另外两个执行亟需改进的大领域是家用电器和新建筑能效。印度能效局在电器能效分级方面已经做了很多工作，但制造商和购买者还需要大力推动。同样，国际和印度评级机构也需要努力制定新的建筑规范。据估计，2030 年印度的房屋有 70% 都要新建，所以这显然是一个亟需改进的领域。目前工作进展十分顺利的是 LED 照明的推广，各种政府建筑已经安装了 1.65 亿个 LED 灯。

至于到 2030 年非化石燃料发电至少占 40%，印度已经制定了世界上最雄心勃勃的计划，即到 2022 年通过太阳能、风能以及更多的生物气发电 1 亿千瓦。莫迪总理将这一期限提前到了 2020 年，但印度官方文件仍沿用原来的 2022 年。

目前印度的太阳能和风能发电量分别为 850 万千瓦和 2760 万千瓦，也就是说要实现目标必须极大加速。但是，如果国有输配电企业不改变态度的话，这个计划就无法推行。现下，这些企业不愿从可再生发电公司购买电力，即便买了，它们也严重拖欠货款，包括政府强制的可再生电力义务购买款项。

在 1 亿千瓦的太阳能发展计划中，4000 万千瓦来自屋顶太阳能装置，这是另一个同样难以推进的领域，很大程度上是因为在地方市政府和输配电公司层面的瓶颈。

水力发电领域也将发生巨大对立。为兑现 40% 电力来自可再生能源的承诺，印度政府将水力发电列为可再生能源。但大型水电项目常常遭到环保活动者和居民的强烈反对，尤其是那些在喜马拉雅山区的，而大多数规划中的水电项目都在该地区。许多项目都面临着严重工期拖延和成本超支。

### 碳汇挑战

让印度的碳汇增加 25 到 30 亿吨是另一个令人却步的挑战。这只能通过增加树木的数量来实现，但印度是一个人口过密的国家，土地资源实在稀缺。目前印度的森林覆盖率是 24%，要兑现上述承诺，这个数字必须增加到 33%。但是，对于以商业友好为傲并一直在为各种工业和基础设施项目砍伐森林的莫迪政府来说，这似乎是一个不可能的任务。

另一个更可行的选择是增加退化森林的树木覆盖。但这么做必须非常小心，避免入侵树种。印度的造林计划常常会遭到这个问题的困扰。

如果说造林计划有那么一点好消息的话，就是它并不缺钱。这要感谢印度的一项法规，即实业家在为了其项目砍树的时候都必须支付补偿费用。

### 迫切需求

在一般的印度人看来，应对迫在眉睫的气候变化影响可能要比承担国际义务更加重要。如今最大的影响就是供水的不确定性——要么多、要么少。对地下水抽取的管理是一个紧迫需求，但由于政治强制，还没有任何行动。

另一个受到迫切影响的领域是农业，作物无法忍耐高温和供水的突然变化，有时还是双重影响。印度

研究者们一直在孜孜不倦地努力，研发可以忍耐上述压力的新作物品种。但他们的工作成果并未被及时转化到农田里来应对迫切需求。

### 应时之举

尽管未来面临巨大挑战，但印度批准《巴黎协定》仍然是迈出了重要的一步。曾经有一段时间，观察家们不确定印度是否会很快批准协定。如今，也有少数报道称印度此举是向压力（主要来自美国）屈服的结果。

但是，印度环境部长戴夫否定了任何压力的说法。在印度向联合国提交批准案的前一天，他对记者说：“我们在作出批准的决定前，脑子里考虑的是两件事情：首先，我们要就这个决策如何影响我们的法律进行内部协商；第二，我们也要看看接下来执行《巴黎协定》时我们的利益是否会受到关照。”

印度批准《巴黎协定》已经得到了国内外的广泛称赞。联合国秘书长潘基文、联合国气候变化框架公约秘书长帕特里夏·埃斯皮诺萨、美国总统奥巴马和法国总统奥朗德均对此表示欢迎。

印度的大多数绿色非政府组织也支持这一行动。印度行动援助的执行主任桑蒂普·恰奇拉说：“今年印度及其公民站在了气候变化的前线。通过快轨程序批准《巴黎协定》是一个明确的指向，说明印度既想要也需要在国内外采取紧急行动。”

“印度如今要发挥至关重要的作用，确保协定中来之不易气候正义变成一项关键成果，而非只是一纸空文。在今年 11 月摩洛哥的下一轮联合国谈判中，印度必须保证接下来将要谈判的措施切实反映对所有人的公平和平等行动。”

科学与环境中心也强调了这一点，其副主任钱德拉·布山说：“批准《巴黎协定》只是未来艰巨谈判的开始。印度必须发挥重要作用，保证《巴黎协定》的有效和公平。”

## Britain's atomic waste legacy

Philip Johnstone asks what we can learn from the UK's failure to develop a viable nuclear reprocessing industry

China has one the most ambitious nuclear programmes in the world. Over the next five years, it plans to build 40 nuclear power plants at a time when most western countries are winding down their nuclear programmes. The strategy involves building commercial reprocessing facilities to store and process hazardous waste, a by-product of nuclear energy.

Recent plans to build a reprocessing plant in Lianyungang, in Jiangsu province, were stalled after thousands of locals took to the streets in opposition to the proposed Sino-French facility, prompted by environmental and health concerns. The delay offers an opportunity to pause and assess the experiences of other nations that have pursued a reprocessing strategy.

The United Kingdom's experience suggests that reprocessing is dangerous, not as green as proponents claim and economically unsound. The history of the UK's longstanding commercial reprocessing activities offers a cautionary tale regarding the pitfalls, which will impact British national policy for decades to come.

### The UK experience

Reprocessing remains, in the words of British scientist Brian Wynne, “the most controversial global aspect, of the most iconically controversial of modern technologies”.

Its controversy lies in the fact that reprocessing can be used for the purposes of nuclear weapons proliferation.

Reprocessing was initially developed in the UK in the 1940s and 50s to make nuclear warheads using recovered plutonium and uranium. Later, it was marketed as a “great hope” with untold economic benefits. Its proponents claimed a new type of nuclear reactor, the Fast Breeder Reactor (FBR) could take spent nuclear fuel and recycle it to produce more power. However an FBR programme never materialised on a commercial scale. Following a series of economic and technical problems, the UK abandoned its fast breeder reactor programme in the 1990s.

## Mcanxixun Information

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### Sellafield and Magnox

Since 1954, the UK has undertaken reprocessing activities at the site now known as Sellafield in Cumbria. The facility currently operates two reprocessing facilities, the soon-to-be-closed “Magnox” plant and the Thermal Oxide Reprocessing Plant (THORP).

Both facilities have been shrouded in controversy: Magnox only achieved around half of its projected output, according to the Nuclear Decommissioning Authority’s (NDA) 2005 projections; while THORP has been closed for around six years of its 22 years in operation. During its lifetime, THORP has consistently failed to meet its throughput targets and in 2005, had a major leak of high level radioactive material.

Undetected for several months, this accident led to the closure of THORP for three years, until 2008, at an estimated cost of £2 million (17.8 million yuan) a day. Sellafield was only fined £500,000 for breach of various licensing conditions.

The Mixed-Oxide (MOX) production plant, which also formed a key part of the rationale of reprocessing -- the facility was designed to utilise the separated plutonium in the production of MOX fuel for use in conventional reactors -- closed in 2011 after 10 years of operation, accumulating a net loss of £2.2 billion. An internal governmental review concluded that the facility was “not fit for purpose”.

When THORP was first debated in the late 1970s, the main justification was that it made commercial sense. Reprocessing, proponents said, turned spent nuclear fuel from a “waste” product into an “asset”, because the separated plutonium could be used in the much-vaunted FBRs. An echo of the arguments you hear in favour of reprocessing today.

But despite repeated claims around FBRs, no fast breeder reactor programme exists and there is no commercial fast reactor operating anywhere in the world.

It is perhaps unsurprising then, that Wynne concluded UK reprocessing represents “one of the UK’s great public technology policy disasters”. Beyond the safety implications highlighted by the leak in 2005, as well as a recent BBC documentary that revealed acute problems with the storage and protection of plutonium and other fissile materials, immense costs and operational set-backs that characterise the history of reprocessing in the UK.

### Doubts over fast breeder reactors

China’s commitment to reprocessing is underpinned by plans to develop FBRs on a commercial scale over the next 20 years. In the 1970s, FBR supporters in the UK claimed they would make a significant contribution to the UK’s electricity generation – a contribution that never materialised. The same could happen in China.

As a consequence of its failed FBR programme, the UK has accumulated the largest stockpile of plutonium in the world, which costs an estimated £80 million a year to store securely and safely. With no solution to this plutonium storage problem, it will most likely have to be secured for decades to come at a cost of hundreds billions of pounds, and potentially great danger to the public and environment. Spent nuclear fuel in China is currently stored at reactor sites in ponds and a centralised storage facility has also been built at the Lanzhou Nuclear Fuel Complex. China is also exploring sites for Deep Geological Disposal. Given the scale of China’s nuclear new build programme, a sizeable, expensive and potentially dangerous plutonium legacy could also present itself in China.

But what if the long-promised potential of fast breeder reactors is realised? In the 1970s, many experts viewed fast breeders as the future; an essential technology, as other finite energy sources were set to decline and the price of uranium set to rise. Today, the development of fast breeders is justified due to their “low carbon” status, with some environmentalists enthusiastically supporting fast breeder technologies – including in China.

Yet it is long understood that pursuing FBRs means creating a “plutonium economy”, which due to the security risks involves high levels of secrecy, armed protection and vetting – as can be seen at Sellafield -- which would have had to have been replicated at various sites across the country if FBR technology had been developed. This throws in to question the degree of transparency that can be achieved -- and the effects this lack of transparency has on how business is carried out. At THORP, there is a series of worrying examples of malpractice: quality

issues, resulting in Japan refusing to use the fuel and BNFL paying £40 million in compensation; an economic report used by politicians to justify THORP that turned out to not actually exist; a major leak remained undetected for nine months; frequent concerns around transportations of plutonium; and the Sellafield facility in 2006 breaching EURATOM's safeguards policy to ensure that fissile materials are not diverted from the peaceful uses for which they have been declared.

Over the years, THORP has been condemned by politicians, business leaders and environmental groups alike, who referred to the management culture around UK reprocessing as having a “disdain for the government and the public”. And this seems to be the experience internationally, not just in the UK.

In the context of the energy transition in China, committing to FBRs is likely to stand in the way of greater transparency and participation in decision making. Whether or not it is worth the risk, the UK government will be dealing with the consequences of reprocessing for decades to come.

## 英国的原子废料遗产

英国核废料再处理行业发展的失败教训可以给我们带来哪些启示？菲利普·约翰斯通报道。

中国有着世界上首屈一指的核工业发展计划。未来五年，在大多数西方国家都在收紧核计划的时候，中国却计划新建 40 座核电站。为了存储和处理危险的核能发电副产品，这一策略中还包括修建若干商业化的核废料再处理设施。

近期，上千名连云港居民出于环境和健康的担忧而上街游行，反对拟在此建设的中法合作再处理厂，项目建设计划也因此被暂时搁置。这使我们得以暂时停下来，评估其他国家追求再处理策略过程中的经验。

英国的经验表明，再处理危险性高，不像支持者所声称的那样绿色环保，在经济上也并不可靠。英国长久以来核废料商业再处理的历史充分揭示了这项活动可能产生的问题，而这些经验也将影响英国接下来几十年中的国家政策。

### 英国经验

在英国科学家布莱恩·韦恩看来，核废料再处理仍然是“最具争议的现代科技中最具全球性争议的方面”。

其争议之处在于，再处理可以用于核武器扩散目的。

再处理最初由英国于 20 世纪四五十年代开发，目的是利用回收的钚和铀制造核弹头。后来，该技术被宣传为具有尚未开发经济效益的“巨大希望”。其支持者声称，快中子增殖反应堆（FBR）这种新型核反应堆可以对乏燃料进行回收再利用，并产生更多能量。然而，FBR 项目从未实现产业化的应用。在项目暴露出一系列经济和技术问题之后，英国政府 20 世纪 90 年代正式放弃了这一项目。

### 塞拉菲尔德与镁诺克斯

1954 年开始，英国在位于坎布里亚的塞拉菲尔德开展再处理活动。该设施目前运行着两座再处理设备，也就是不久即将关闭的“镁诺克斯”以及热氧再处理厂（THORP）。

两座设施都饱受争议：按照英国核能除役署 2005 年测算，镁诺克斯只实现了其预计产能的一半左右；另一方面，THORP 总运行时间只有 22 年，其中关闭的时间大约有六年。在其生命周期中，THORP 一直未能达到其产能目标，并在 2005 年发生过重大的高辐射材料泄漏。

泄漏事件发生几个月后才被发现，并最终导致 THORP 关闭停产至 2008 年，造成每天大约 200 万英镑（约合 1780 万元人民币）的损失。塞拉菲尔德因违反多项授权条件仅被处以 50 万英镑的罚款。

同为再处理项目关键部分的混合氧化物（MOX）核电厂，其初衷旨在将 MOX 燃料生产过程中分离出的钚放在常规反应堆中使用。该电厂运行 10 年后于 2011 年关闭，总计造成了 22 亿英镑的净损失。英国政府内部审查报告认为，该设施“不适于达成其设计初衷”。

当 20 世纪 70 年代末英国社会首次就 THORP 项目展开辩论时，支持者的主要依据就是该项目可以带来经济上的效益。支持者认为，再处理可以将使用过的核燃料从“废料”变成“资产”，因为分离出来的

钚可以用在呼声很高的快增殖反应堆中。这与今天支持再处理的论调有很多相近之处。

不过，虽然有关方面反复强调 FBR 的好处，但现实中并不存在现成的快增殖反应堆项目，世界上也并不存在快增殖反应堆商业化运营的成功先例。

在这种情况下，也难怪韦恩会认为，再处理是“英国一项重大的公共技术政策灾难”。除了 2005 年泄漏事故中凸显的安全影响，以及近期一部 BBC 纪录片揭示的钚和其他核裂变材料在储存和保护方面的严重问题之外，高昂的成本以及运行上的障碍成为了英国再处理发展历史上的显著特征。

对于快增殖反应堆的质疑

中国计划在接下来 20 年中推进快增殖反应堆产业化，凸显出其对于再处理技术的执着。20 世纪 70 年代，英国的 FBR 支持者们宣称，快增殖反应堆会对英国的发电做出显著贡献——这项贡献一直没有兑现。同样的情况可能也会在中国发生。

FBR 项目的失败给英国留下了世界上最大的钚储备，每年安全储存的成本就高达 8000 万英镑。如果没有新的办法解决储备的难题，这些钚会在接下来几十年中带来数千亿英镑的高昂成本，并可能对公共安全和环境带来严重影响。中国的乏燃料目前储存在反应堆的乏燃料池中，兰州核电燃料厂也修建了一个集中存储设施。此外，中国正在研究深层地质处置的选址问题。考虑到中国新建核电项目的规模，中国可能会面临一个规模庞大、成本高昂并且潜在危险性极高的钚遗产。

如果备受期待的快增殖反应堆愿景最终并未实现呢？20 世纪 70 年代，许多专家将快增殖反应堆视作未来；他们认为，在其他有限的能源注定消亡、铀元素价格注定上涨的情况下，快增殖反应堆将是一项必要的技术。如今，快增殖反应堆之所以受到推崇是因为它的“低碳”特点，以至于有些环保人士热情地支持快增殖技术——包括中国也是这样。

但是人们长期以来就已经明白，追求快增殖反应堆意味着创造一个“钚经济”，而鉴于相关的安全风险，就需要像塞拉菲尔德那样，采取高度保密、武装安保以及详细审查等措施以保障其安全。如果快增殖反应堆得到广泛推广，这些保障措施就需要在全国各地的多处设施中复制应用。这让我们对项目的透明度以及这种不透明对于商业运作将产生怎样的影响产生了质疑。THORP 就有一系列此类令人担忧的不当操作先例，如质量问题导致日本拒绝使用燃料并致使英国核燃料有限公司（BNFL）赔偿 4000 万英镑；一份被政客用来为 THORP 项目背书的经济报告最终被证明并不存在；重大核泄漏事故事发后九个月才被发现；人们对于钚元素运输的长期担忧；以及 2006 年塞拉菲尔德设施违反欧洲原子能共同体（EURATOM）关于确保核裂变材料不得用于所宣称的和平用途之外其他目的的安全保障政策。

多年来，THORP 遭到政坛人士、商界领袖和环境团体的一致谴责，他们将英国再处理行业的管理文化称为“政府和公众的耻辱”。而这似乎是国际上共通的经验，而不仅仅是英国的特例。

在中国能源转型的背景下，追求快增殖反应堆可能阻碍透明度的提升和公众参与项目决策。无论项目的风险与收益是否相匹配，英国政府都必须在接下来的数十年中承担再处理项目所带来的后果。

## Paris climate deal to enter into force next month

With the climate treaty set to become international law on November 4, what are commentators from around the world saying?

The Paris Climate Change Agreement will become international law on November 4. To enter into force, the climate treaty required ratification from 55 Parties accounting for at least 55% of global greenhouse gas emissions.

Accounting for more than 58% of global emissions, 74 countries have now ratified the agreement, according to the Climate Analytics ratification tracker. This makes it one of the fastest multilateral agreements ever to enter into force.

“This is a truly historic moment for people everywhere,” said Patricia Espinosa, Executive Secretary of the UN

Framework Convention on Climate Change (UNFCCC), on October 5, adding it was a "powerful confirmation of the importance nations attach to combating climate change and realising the multitude of opportunities inherent in the Paris Agreement."

The deal could prove a "turning point", said US President Barack Obama. "Today is a historic day in the fight to protect our planet for future generations," he said. "This gives us the best possible shot to save the one planet we got. With optimism and faith and hope, we are proving it is possible." Members of the European Parliament, however, expressed regret that nations' commitments, known as Nationally Determined Contributions (NDCs) did not "bring the world even close to the two degree target" and stressed the "urgent and critically important" need for countries to raise their emission reduction commitments.

chinadialogue will be following the story as negotiations continue. In the meantime, here's a brief round-up of opinion from around the world:

Earlier this week at chinadialogue, India Climate Dialogue's Joydeep Gupta pointed out how India's ratification brought the deal close to the finish line, adding that the country's green NGOs supported the move.

Sandeep Chachra, executive director of ActionAid India, said, "This year India and its citizens have been on the front line of climate change. This effort to fast-track the entry into force of the Paris Agreement is a clear indication that India both wants and needs urgent action at home, and internationally."

"India now has a vital role to play in ensuring that its hard-won inclusion of climate justice in the agreement becomes a key outcome and not just an empty phrase. In the next round of UN talks in Morocco this November, it must make sure that the next steps that will be negotiated really do reflect fairness and equitable action for all."

At the Huffington Post, Barbara Finamore pointed to China's crucial role in the agreement.

"China played a key role in getting the Paris Agreement over the finish line. The series of bilateral climate agreements between China and the U.S. – the world's two largest GHG emitters – set the stage for the Paris negotiations, and also contributed to the extraordinary speed with which the agreement will enter into force. In addition, China and the U.S. are working together to push for an ambitious global phase-down of the potent heat-trapping chemicals called hydrofluorocarbons (HFCs) under the Montreal Protocol. China is also playing an active role in negotiations on an agreement to work towards "carbon neutral growth" in aviation emissions post-2020."

The Climate Group noted the importance of progressive businesses in its interview with France's climate envoy Laurence Tubiana.

"Progressive businesses" are crucial in the fight against climate change because they can "give governments the confidence they can go forward, that there are solutions and that a sound investment plan will be well received by the business community," said Laurence Tubiana, the special representative for COP21, Government of France, in an exclusive Climate TV interview.

One of the main architects of the Paris Agreement, Tubiana pointed to the importance of COP22 in Marrakesh, where we must "start the process [...] that a number of countries commit to deliver their mid-century strategies by 2018, together with businesses, together with local authorities."

At the Financial Times, the Inter-American Development Bank's Amal-Lee Amin praised Latin American countries' role in the process and said NDCs can "help rewire development plans to better respond to the demands of citizens and delivering an inclusive growth agenda".

"Yet ratification is only an initial step towards implementation. Fortunately, the region has made progress on designing the policies and institutions to implement the agreement. Peru, Brazil, Mexico and Costa Rica were among the first developing countries to put forward voluntary emission reduction pledges starting in 2008."

In the UK, however, a campaigner from NGO Friends of the Earth expressed concern in The Independent at a lack of focus from the government.

Asad Rehman said: "Britain will ratify the Paris agreement on Climate Change. Great news."

"But that's just the start of the action we need. Which is why Theresa May's cursory mention of climate change in her conference speech is so worrying."

### 《巴黎协定》将于下月正式生效

联合国秘书长潘基文宣布《巴黎协定》将于 11 月 4 日正式生效，面对这一全球性的气候变化应对方案，各界人士有何看法？

《巴黎气候变化协定》将于 11 月 4 日成为具有法律约束力的全球性协议。该协定的生效需要获得 55 个缔约国的批准，且这 55 个国家或地区的温室气体排放量需至少占全球排放总量的 55%。

根据气候分析组织对缔约国履约情况的追踪记录，现在已经有 74 个国家（其温室气体排放量总计超过全球排放总量的 58%）批准了该协定。《巴黎协定》是有史以来生效最快的多边协定之一。

10 月 5 日，《联合国气候变化框架公约》（UNFCCC）秘书处执行秘书帕特里夏·埃斯皮诺萨(Patricia Espinosa)说：“这对于全世界所有人来说都是一个历史性的时刻。”她表示，协定的生效“有力地表明了各国对于对抗气候变化以及《巴黎协定》可能带来的多重机遇的重视。”

美国总统奥巴马表示，《巴黎协定》可能会成为一个“转折点”。“为了下一代，我们一直努力保护我们的星球。对于我们来说，今天是具有历史意义的一天。”他说，“这个协定可能是目前拯救地球最值得一试的方案。凭借着乐观的心态，坚定的信念以及美好的愿望，我们将证明，对抗气候变化是可能的。”然而，欧洲议会的多位成员却遗憾地表示，协定中各国的国家自主贡献（NDCs）“并不足以实现将全球的气温上升幅度控制在 2°C 以内的目标”。他们还强调，有必要使各国意识到进一步提高减排承诺的“紧迫性与重要性。”

中外对话将对谈判的后续进展作跟踪报道。与此同时，我们将各方观点整理成了以下综合报道：

本周三，印度气候对话项目总监乔伊迪普·格普塔在中外对话网站发文表示，印度的批准文件大大促进了《巴黎协定》的生效进程。他还指出印度的许多环保非政府组织（NGO）都支持这一行动。

印度行动援助执行主任桑蒂普·恰奇拉说：“今年印度政府及其公民站在了应对气候变化的前线。印度为促成《巴黎协定》快速生效所付出的努力明确表明，该国希望并迫切需要国内外采取紧急行动。”

“印度现在需要发挥关键作用，以确保《巴黎协定》中来之不易的有关气候正义的内容成为一项关键成果，而非一纸空文。在今年 11 月将于摩洛哥举行的下一轮联合国谈判中，印度必须确保谈判涉及的后续措施体现公平、平等的原则。”

自然资源保护协会高级律师芭芭拉·费娜摩尔在《赫芬顿邮报》上发文说，中国对《巴黎协定》的生效做出了重要贡献。

“中国在《巴黎协定》生效进程的最后环节发挥了关键作用。中美两国（全球温室气体排放量最大的两个国家）签订的一系列双边气候协定为巴黎气候谈判夯实了基础，并推进了《巴黎协定》的快速生效。此外，中美还将在《蒙特利尔议定书》框架下，共同致力于在全球范围内逐渐取缔极大导致温室效应的化学物质氢氟碳化物（HFCs）的使用。目前，中国还在积极参与谈判，以期达成一项实现 2020 年后航空业‘碳中和增长’的协议。”

气候组织在采访法国气候变化谈判大使劳伦斯·图比亚娜时指出进步性企业的重要性。

联合国气候变化框架公约第 21 次缔约方大会法国政府特别代表劳伦斯·图比亚娜在接受气候电视台独家采访时表示，“进步性企业”对应对气候变化至关重要，因为它们能够“使各国政府认识到解决方案的确存在，而考虑周密的投资计划会受到企业界的欢迎，从而对工作的推进充满信心。”

作为促成《巴黎协定》的主要功臣之一，图比亚娜还指出了在马拉喀什召开的联合国气候变化框架公约第 22 次缔约方大会的重要性。在此次大会上，我们必须“着手……（推动）多个国家连同其国内的企业和地方政府在 2018 年之前落实各自的本世纪中期战略。”

美洲开发银行阿迈勒·李·阿敏在《金融时报》上发文，称赞了拉丁美洲国家在促进《巴黎协定》生效过程中所起到的作用。她表示国家自主贡献能够“帮助我们调整各项发展计划，以更好地契合国民需求，并将包容性增长纳入日程。”

“然而，批准只是迈出了落实《巴黎协定》的第一步。幸运的是，拉丁美洲已经在制定落实协定的政策和制度方面取得了进展。秘鲁、巴西、墨西哥，以及哥斯达黎加等国是最早自愿承诺 2008 年就开始减排的发展中国家。”

但是，在英国，非政府组织地球之友的一名活动人士向《独立报》表示，他担心政府会举棋不定。

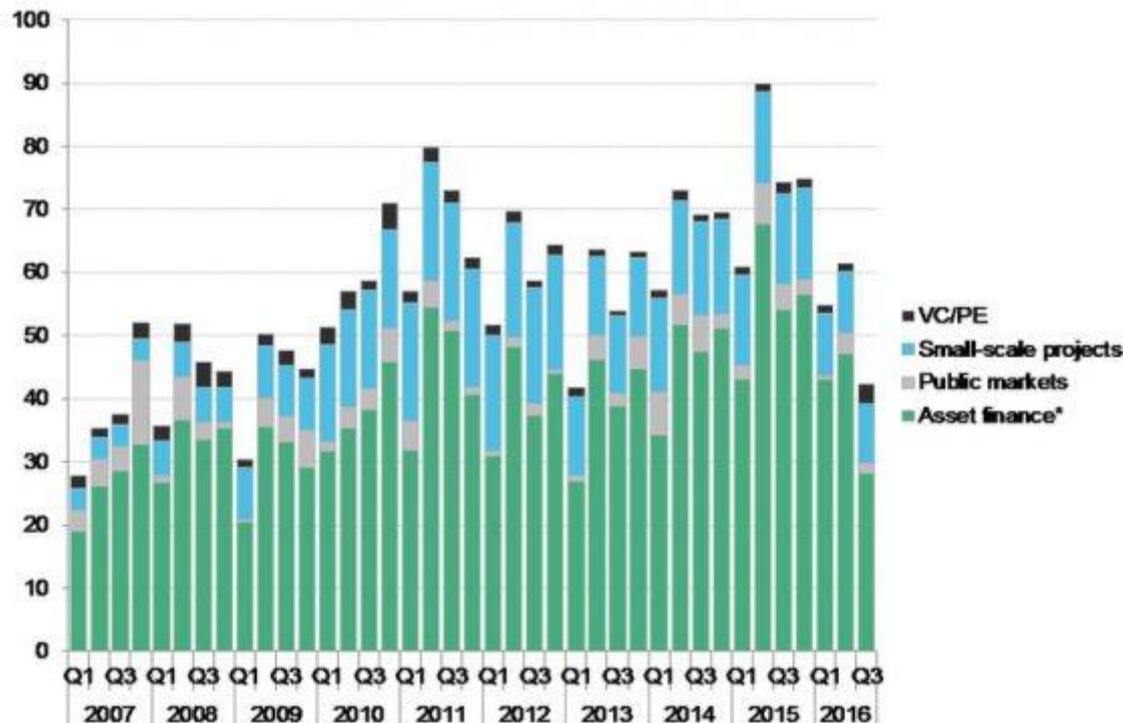
阿萨德·雷曼说：“英国将会通过《巴黎气候变化协定》，这确实是个好消息。”

“但这仅仅是开了个头而已。首相特蕾莎·梅在会议发言中对气候变化只是一笔带过，这令人十分担忧。”

## Global clean energy investment slumps 43% in Q3, year-on-year

With the most comprehensive international agreement to combat climate change set to take effect next month, investment in the global clean energy sector has slumped to “worryingly low” levels, according to the latest data from research group Bloomberg New Energy Finance.

The Q3 BNEF data, published on Monday, shows that a total of \$42.4 billion was invested globally in renewable energy and smart technologies during the period, marking a 31 per cent drop on the spend during Q2 2016, the weakest quarter since 2013, and a spending slump of 43 per cent, year on year.



BNEF said the investment lull was partly seasonal – summer in the northern hemisphere means fewer big deals in Europe’s offshore wind sector – but that this effect had been compounded by a 51 per cent year-on-year fall in clean energy investment in China and a 56 per cent fall in Japan.

Most notably, the research firm said there was a 49 per cent year-on-year plunge in the asset finance of

## Mcanxixun Information

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utility-scale renewables to \$US28.8 billion, mostly due to a 67 per cent drop in large-scale solar investment as policy changes in China and Japan suppressed activity in these segments.

BNEF's chairman of the advisory board, Michael Liebreich, said the Q3 numbers, while “worryingly low”, could also be explained by two converging trends: the record-low cost of solar PV components, and last year's investment rush, which have seemingly triggered this year's “pause for breath.”

“These numbers for Q3 are worryingly low even compared to the subdued trend we saw in Q1 and Q2,” Liebreich said. “A vital point to bear in mind is that there have been sharp reductions in the cost of PV systems, so that much more solar capacity can be added this year than last, per million dollars.

“However, it is also clear that, after last year's record investment levels, some key markets such as China and Japan are pausing for a deep breath,” he said.

“Also, in many countries, electricity demand growth is undershooting government forecasts. My view is that the Q3 figures are somewhere between a ‘flash crash’ blip, and a ‘new normal’.”

China saw one of the largest slumps – a 51% tumble in investment in the space of a year, down to \$14.4 billion in Q3. In Japan's, the \$3.5 billion 2016 Q3 figure was some 56 per cent below 2015's Q3 investments.

Another notable weak point was a 35 per cent drop in small-scale solar PV project investments to \$US9.3 billion.

The largest Q3 deals included \$US1.8 billion for the 396MW Merkur offshore wind farm in the German North Sea and \$US1.2 billion for the UK 299MW Tees biomass project.

On a more positive note, BNEF said there were reasons to believe the final quarter of the year would see increased investment, given the traditional seasonal rush to meet bank lending targets and beat clean energy subsidy deadlines.

The analysts also stressed that Q3's figures could be revised upwards if more transactions came to light.

But BNEF warned that all signs pointed to a 23 per cent year-on-year drop in global investments, making it increasingly likely that 2016 would see far less invested than 2015's record amount of \$348.5 billion.

## 全球清洁能源投资在第三季度同比下降 43%

根据彭博新能源财经研究集团的最新数据显示，随着最全面的对抗气候变化的国际协议预计于下月生效，全球清洁能源部门的投资已经下降至“令人担忧的较低”水平。

根据周一公布的第三季度的 BNEF 数据显示，在此期间全球对于可再生能源和智能技术的投资共计 424 亿美元，标志着 2016 年第二季度的支出下降了 31%，自 2013 年以来最弱的一个季度，并且同比支出下降了 43%。

BNEF 表示，投资迟缓具有部分季节性原因——北半球的夏季意味着欧洲海上风电部门具有较少的大额交易——但是这种影响因中国清洁能源投资同比下降 21% 以及日本下降 56% 而加重。

最值得注意的是，研究公司表示，公用事业规模的可再生能源的资产融资同比下降了 49%，达到了 288 亿美元，主要是由于大规模太阳能投资由于中国和日本抑制这些部门活动的政策变化而下降了 67%。

BNEF 的顾问委员会主席迈克尔·利贝里希表示，第三季度的数据，虽然“令人担忧地低”，但是可能也会通过两个趋同趋势来进行解释：太阳能光伏组件创纪录低的成本以及去年的投资热潮，这似乎引起了今年的“暂停”。

“第三季度的这些数据即使是与我们在第一季度和第二季度所看到的低迷趋势相比也达到了令人担忧的低程度，”利贝里希表示。“要记住的一个重点是光伏系统成本的大幅下降，因此今年每百万美元能够产生比去年更多的太阳能容量。”

“但是显然，在去年的创纪录的投资水平之后，一些主要的市场，例如中国和日本，都将寻求更深层

次地停顿，”他说。

“此外，在许多国家中电力需求的增长超出了政府的预测。我的观点是，第三季度的数据介于‘闪电崩溃’和‘新常态’之间”。

中国出现了最大的暴跌——在一年时间内投资下降了 51%，在第三季度下跌至 144 亿美元。在日本，2016 年 35 亿美元的数据与 2015 年第三季度的投资相比下降了大约 56%。

另一个显著的薄弱点在小型太阳能 PV 项目投资下降了 35%，达到 93 亿美元。

第三季度最大的交易包括德国北海 Merkur 海上风力发电场 396MW 价值 18 亿美元的项目以及 UK 299MW Tees 价值 12 亿美元的项目。

更积极的一面是，BNEF 表示有理由相信，今年第四季度可能会看到投资的增加，因为传统季节性冲击满足了银行贷款目标并且马上就到清洁能源补贴的最后期限了。

分析师还强调称，第三季度的数据可能会得到向上修正，如果出现有更多的交易。

但是 BNEF 警告称，所有的迹象表明全球投资同比下降了 23%，这更加有可能令 2016 年远不及 2015 年 3485 亿美元的创纪录数额。

## Coal (煤炭)

### **China pushes back against US bid to tighten UN coal sanctions on North Korea**

China appears to have pushed back on a US bid to close a UN loophole that allows North Korea to export coal for "livelihood purposes", saying the well-being of North Koreans is a priority in negotiations on possible new UN sanctions on Pyongyang.

Since North Korea's fifth and largest nuclear test four weeks ago, the United States and China, a close ally of North Korea, have been negotiating a new draft Security Council resolution to punish Pyongyang.

"We cannot really affect the well-being and the humanitarian needs of the people and also we need to urge various parties to reduce tensions," Chinese UN Ambassador Liu Jieyi told Reuters on Saturday (Oct 8) of discussions with the United States on "a draft resolution with a wider scope of measures".

In March, the 15-member Security Council imposed tough new sanctions on North Korea following its fourth nuclear test in January.

That resolution bans the 193 UN member states from importing North Korean coal, iron and iron ore unless such transactions are for "livelihood purposes" and would not be generating revenue for Pyongyang's nuclear and missile programmes.

Coal is particularly important to the economic health of North Korea because it is one of its only sources of hard currency and its largest single export item. Coal is also bartered for essentials, including oil, food and machinery.

US Ambassador to the United Nations Samantha Power said on Sunday (Oct 9) that some of the exemptions included in the March resolution - out of concern for the welfare of North Koreans - appeared to have been exploited.

"In the negotiation that we are currently in the midst on in the new resolution, we are hoping to address some of the shortcomings that we have seen," Ms Power told reporters during a visit to Seoul.

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China's imports of coal from neighbouring North Korea reached 1.53 million tonnes in April, down 35 per cent on the previous month when the latest UN sanctions were adopted, but by August imports from North Korea had risen to 2.47 million tonnes.

"Fundamentally, no matter (what) any resolution says, it is going to be up to the member states of the United Nations, and particularly those member states that have dealings with the DPRK (North Korea), to fully enforce the resolution," she said.

China imported US\$1 billion (S\$1.38 billion) worth of North Korean coal in 2015 and US\$73 million of iron ore, according to Chinese customs data.

"We are still looking at the specific things in the draft. It's still in the process of being discussed," Mr Liu said. "We certainly hope that we will achieve a result soon, but it depends on how we work together... towards a common position."

Chinese Foreign Ministry spokesman Geng Shuang told a regular press briefing on Tuesday (Oct 11) that China supported a further response by the Security Council but that it should focus directly on North Korea's nuclear programme.

"We believe that the relevant Security Council response should clearly target North Korea's nuclear activities and be helpful in realising goals of denuclearisation on the Korean peninsula, and in maintaining peace and stability on the peninsula," Mr Geng said.

Beijing fears strengthening sanctions could lead to collapse in North Korea, sending a flood of refugees across the relatively porous border into China, and it also believes the United States and its ally South Korea share responsibility for growing tension in the region.

China has repeatedly expressed anger at the United States and South Korea for their decision to deploy the US Terminal High Altitude Area Defence (THAAD) system in the South to counter missile and nuclear threats from North Korea.

Ms Power told reporters in Seoul on Monday that the United States wanted a UN resolution "that makes a substantive difference and changes the calculus over time of the North Korean leadership."

## 美国试图收紧对朝鲜的煤炭制裁遭中国反对

中国意在打回美国堵住联合国文件漏洞的意图，这个漏洞本可允许朝鲜向外以“谋生目的”出口煤炭。中国认为在协商针对平壤的新联合国制裁时，朝鲜人民的幸福是优先考虑的。

自从四周前朝鲜进行了第五次、也是最大规模的核试验，美国和中国已经在交涉一份安全理事会新决议草案，决定对平壤进行惩罚（中国是朝鲜关系甚好的支持者）。

中国常驻联合国代表刘结一在周六（10月8日）和美国讨论“有更广泛措施的决议草案”时，和路透社说到“我们不能真的去影响人民的幸福和人道主义需求，我们得规劝不同的政党降低紧张气氛。”

在3月，有15名成员的安全理事会对朝鲜强加严厉的新制裁措施，因为朝鲜在1月执意进行第四次核试验。

决议中禁止193位联合国成员国进口朝鲜的煤炭、铁和铁矿石，除非这些交易出于“谋生目的”，并且这些交易不会创造任何资助平壤导弹原子弹项目的盈利。

煤炭对于朝鲜的经济良性有特别重要的意义，因为煤炭是朝鲜获得硬货币的唯一来源，而且是最大的单边出口项目。煤炭也可以交换到其他必需品，包括石油、食物和机器。

美国常驻联合国代表萨曼莎·鲍尔在周日（10月9日）说，出于对朝鲜人民的福利考虑，三月决议中部分豁免条例似乎已发挥作用。

鲍尔女士访问首尔时告诉记者：“在协商中我们目前对新的决议处中立位置，我们希望能解决一些我

们所见的问题。”

中国自邻国朝鲜的煤炭进口在4月达到153万公吨，在最新联合国制裁实施下，在前一个月进口量降35%，但到8月自朝鲜进口煤炭量升至247万公吨。

“从根本上说，不管任何决议谈论什么，全面落实决议取决于联合国成员国，特别是与朝鲜民主主义人民共和国（朝鲜）有贸易往来的成员国。”鲍尔提到。

根据中国海关数据，在2015年中国从朝鲜进口了价值10亿美元（折合为13.8亿新加坡元）的煤炭和7300万美元的铁矿石。

刘结一先生说“我们还在查看草案中的具体事项，仍然在讨论过程中。我们当然期待很快将得到一个据俄国，但这取决于我们如何合作达到共识。”

中国外交部发言人耿爽在周二（10月11日）例行记者会上提到，中国支持安理会做出进一步的反应，但主要针对朝鲜的核项目。

耿先生说：“我们相信安理会有关反应应明确针对朝鲜核活动，应有助于实现朝鲜半岛无核化的目标，并且维持半岛和平与稳定。”

北京方面害怕不断强化的制裁会引起朝鲜的恐慌，透过相对松散的边境线向中国输送大批难民，北京认为升级朝鲜地区紧张局势归咎于美国和其同盟国韩国。

美国和韩国决定在韩国境内部署美国的末端高空区域防御系统（“萨德”），来应对朝鲜导弹和原子弹威胁。对此部署，中国反复表达了自己的愤怒。

鲍尔女士周一在首尔告诉记者，美国希望有一份联合国决议，能起实质性作用，改变长时间来朝鲜主导局面的顽疾。

## **Coal Mining Update Indonesia: Production Down, Consumption Up**

While many analysts have spoken or written about the demise of coal as a key source for energy generation, rebounding coal prices in 2016 have taken markets by surprise. Thermal coal (both physical and futures) prices soared between 50 and 80 percent since the start of the year. This rally might continue into the first quarter of 2017.

### **What Causes the Coal Price Rally?**

To answer this question we have to look at the supply and demand mechanism. Supplies in key coal producing countries have declined. Indonesia is one of these key countries. According to the BP Statistical Review of World Energy 2016, Indonesia's coal production fell 14.4 percent (y/y) to 241.1 Mtoe (million tons of oil equivalent) in 2015 from 281.7 Mtoe in the preceding year. This was the first time that BP saw Indonesia's coal output declining on a year-on-year basis. This decline is attributed to a fall in global coal demand in preceding years, particularly in China, that caused financial troubles for local miners that therefore reduced - or completely shut down - their operations in 2015 and 2016.

Meanwhile, Indonesia's coal consumption rose 15 percent (y/y) to 80.3 Mtoe in 2015, from 69.8 Mtoe in the preceding year (Indonesia is now the world's 8th largest coal consumer). Rising consumption is fueled by the government's ambitious program to expand the nation's power capacity to 35,000 MW by 2019. The majority of new power plants are coal-fired, a logical option given that Indonesia has abundant coal supplies and prices are still low. Coal already is the biggest source for power generation. According to BP coal contributes 41.4 percent to Indonesia's total energy consumption, followed by oil (37.6 percent of the total).

Not only in Indonesia but also in Europe and Asia coal demand is growing. The recent price rally is specifically attributed to rising demand from China, the world's largest energy consumer. Although China's coal demand had

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fallen in recent years, there has been a surge of coal imports into China in recent months as local authorities capped domestic coal mining output (to comply with the Paris Climate Agreement) and therefore turned to imports again.

Besides authorities' encouragement to curtail coal production (a strategy to boost global coal prices and safeguard future supplies), coal production in Indonesia and Australia have also declined this year due to a prolonged wet season in the key coal producing regions.

Indonesian Government's Benchmark Thermal Coal Price (HBA):

Month	2012	2013	2014	2015	2016
January	109.29	87.55	81.90	63.84	53.20
February	111.58	88.35	80.44	62.92	50.92
March	112.87	90.09	77.01	67.76	51.62
April	105.61	88.56	74.81	64.48	52.32
May	102.12	85.33	73.60	61.08	51.20
June	96.65	84.87	73.64	59.59	51.87
July	87.56	81.69	72.45	59.16	53.00
August	84.65	76.70	70.29	59.14	58.37
September	86.21	76.89	69.69	58.21	63.93
October	86.04	76.61	67.26	57.39	
November	81.44	78.13	65.70	54.43	
December	81.75	80.31	69.23	53.51	

in USD/ton

Source: Ministry of Energy and Mineral Resources

Indonesian Production, Export, Consumption & Price of Coal:

	2007	2008	2009	2010	2011	2012	2013	2014	2015
<b>Production</b> (in million tons)	217	240	254	275	353	412	474	458	461
<b>Export</b> (in million tons)	163	191	198	210	287	345	402	382	366
<b>Domestic</b> (in million tons)	61	49	56	65	66	67	72	76	87
<b>Price (HBA)</b> (in USD/ton)	n.a	n.a	70.7	91.7	118.4	95.5	82.9	72.6	60.1

Sources: Indonesian Coal Mining Association (APBI) & Ministry of Energy and Mineral Resources

However, coal remains the second-most attractive fuel (after crude oil), worldwide, for power generation. Especially in emerging markets authorities are developing coal-fired power plants, including Indonesia, to boost the countries' electrification ratios to serve the burgeoning middle classes. The cheap price of coal has made it attractive to use this dirty fuel and thus boosts coal demand.

Although there is a global push for cleaner energies and a reduction to greenhouse gas emissions - which has made funds and investors ditch coal assets - coal will remain a key commodity in the next decades, particularly as the development of clean energies, including geothermal energy and coalbed methane (CBM), go rather slow. Such slow development undermines nations agreement - in Paris last year - to curb fossil fuel usage by unprecedented rates of decarbonization.

Investors who are interested to invest in shares of listed Indonesian coal miners are advised to monitor companies' ability to extend coal contracts and miners' ability to diversify their business (for example into power generation). For example, coal miner Adaro Energy's shares have surged 168 percent so far this year supported by the company's expansion into the power generation sector.

## 印尼采煤：产量下降，消费提高

当很多分析师谈到或写到煤炭衰落是能源更迭的主因时，2016年煤炭价格反弹吓坏了各个市场。热能煤实物和期货价格自今年年初起，上升了50%到80%。这次好转局势可能会持续到2017年第一季度。

什么引起了煤炭价格好转？

我们得看供给原理来回答这个问题。主要煤炭生产国家的供给减少。印度尼西亚是主要供给国之一。根据2016《BP世界能源统计报告》显示，印度尼西亚煤炭产量下跌14.4%，从2014年28170万吨油当量跌至2015年24110万吨油当量。BP第一次观察到印度尼西亚煤炭产量同比下滑。此次下滑归因于前些年全球煤炭需求下跌，特别是来自中国的需求，当地煤矿业主因此遭受财政危机，在2015年和2016年缩减规模或彻底停业。

与此同时，印度尼西亚的煤炭消费量提高了15%，从2014年6980万吨油当量升至2015年8030万吨油当量（印度尼西亚目前是世界第8大煤炭消费国）。不断上升的消费作为燃料用于政府雄心勃勃的项目，政府打算到2019年将国家发电功率扩大到35000兆瓦（MW）。印度尼西亚有丰富的煤炭供给，煤炭价格持续低位，新发电厂大部分都燃烧煤炭。煤炭已经是发电的最大来源。根据BP，煤炭为印度尼西亚总能源消费贡献了41.4%，石油消费紧跟其后（占总体的37.6%）。

不仅在印度尼西亚，欧洲和亚洲的煤炭需求也在上升。近期价格好转明确归功于来自中国的上升需求，

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中国是世界上最大的能源消费国。虽然中国的煤炭需求在近几年有所下滑，近几月仍有一波进口煤炭涌入中国，因为当地政府限制国内煤炭采矿业的产值（为遵从《巴黎气候协定》），因此煤炭又转为进口商品。

除了政府鼓励削减煤炭生产（这是提高全球煤炭价格和保护未来供给的策略），今年印度尼西亚和澳大利亚煤炭生产下滑还因为主要煤炭生产地区持续潮湿的气候。

印度尼西亚政府热能煤基准价格（简称 HBA）：

Month	2012	2013	2014	2015	2016
January	109.29	87.55	81.90	63.84	53.20
February	111.58	88.35	80.44	62.92	50.92
March	112.87	90.09	77.01	67.76	51.62
April	105.61	88.56	74.81	64.48	52.32
May	102.12	85.33	73.60	61.08	51.20
June	96.65	84.87	73.64	59.59	51.87
July	87.56	81.69	72.45	59.16	53.00
August	84.65	76.70	70.29	59.14	58.37
September	86.21	76.89	69.69	58.21	63.93
October	86.04	76.61	67.26	57.39	
November	81.44	78.13	65.70	54.43	
December	81.75	80.31	69.23	53.51	

in USD/ton

Source: Ministry of Energy and Mineral Resources

印度尼西亚煤炭生产，出口，消费和价格：

	2007	2008	2009	2010	2011	2012	2013	2014	2015
<b>Production</b> (in million tons)	217	240	254	275	353	412	474	458	461
<b>Export</b> (in million tons)	163	191	198	210	287	345	402	382	366
<b>Domestic</b> (in million tons)	61	49	56	65	66	67	72	76	87
<b>Price (HBA)</b> (in USD/ton)	n.a	n.a	70.7	91.7	118.4	95.5	82.9	72.6	60.1

Sources: Indonesian Coal Mining Association (APBI) & Ministry of Energy and Mineral Resources

然而，煤炭在全球范围内仍是发电燃料中第二有吸引力的燃料（在原油之后）。特别是在新兴市场，包括印度尼西亚在内，政府正发展燃煤发电厂，来提高国家电气化率服务迅速增加的中产阶级。煤炭的低价吸引消费国使用这种不清洁燃料，因此提高了煤炭需求。

虽然全球在推动更清洁能源并减少温室气体排放量（这会使基金机构和投资者抛弃煤炭资产），在接下来的十几年里煤炭依旧是主要上平，特别是因为清洁能源发展得特别慢，其中包括地热能和煤层气（CBM）。如此慢速度发展损害了国家协议（比如在巴黎签订），该国家协议本意是以高速脱碳率抑制化石燃料使用。

投资者若感兴趣投资一部分所列出的印度尼西亚煤矿主，建议监督公司出煤炭合同的能力和煤矿主进入新商业领域的的能力（比如进入发电业）。比如说，煤矿主阿达拉能源公司股份到今年目前为止，激升了168%，因为该公司将业务扩展到发电领域。

## **The coal industry is dying — no matter what the president does**

Both major-party candidates have made a point to mention coal in their stump speeches as they travel the country. The Republican candidate, Donald Trump, has gone so far as to say he'll bring back coal jobs with less regulation and better trade deals. Hillary Clinton, on the other hand, wants to continue a transition from coal to cleaner forms of energy like wind and solar. They couldn't be more different in the policies they would put in place.

But coal isn't as easy to understand as a few lines from a stump speech. It's an energy source with structural challenges that may go against other forms of U.S. energy, and it's important to frame the discussion going on in politics with the reality in energy. It's nice to talk about bringing back U.S. energy, particularly in hard-hit regions known for coal mining. But is that really possible?

### What really killed the coal industry

It's a hard truth, but the biggest reason the coal industry is in trouble in the U.S. is the growth of U.S. natural gas production. That's right, U.S. natural gas production is killing U.S. coal production.

Natural gas is so abundant and so cheap that utilities aren't even thinking about building coal plants. In fact, coal plants are being shut down left and right because the average U.S. coal plant is more than 40 years old. Since electricity generation accounts for the vast majority of coal consumption, the rise of natural gas can directly be blamed for the decline of coal.

The challenges facing coal producers like Cloud Peak Energy, CNX Coal Resources and Westmoreland Coal aren't going away anytime soon either. Coal-fired power plants have been shut down across the country, including 18 GW, or 4.6 percent of the country's coal-powered electricity capacity, shut down in 2015 alone. And the power plants can't be turned on because the president says so. Ramping up coal consumption would require the U.S. to accept a big increase in harmful emissions and higher electricity costs because of the cost to bring decades-old coal power plants up to date.

Plus, a rise in coal consumption would be directly offset by a decline in natural gas consumption. And that would mean thousands of natural gas workers would find themselves out of jobs. Trading natural gas jobs for coal jobs seems like a poor trade, meaning the U.S. isn't going to drive a coal recovery without major sacrifices elsewhere in the economy.

### China can save U.S. coal?

The working thesis among coal companies just a few years ago was that the booming economies of China and India would have a growing demand for U.S. coal, keeping the industry afloat even if U.S. demand declined.

## Mcanxixun Information

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That thesis of rising exports worked until 2012. But in the past four years exports of U.S. coal have dropped 65 percent.

China and India have chosen to produce their own coal rather than import it from the U.S. and are actually starting to slow coal consumption altogether. Poor air quality in China and low-cost renewable energy has caused a shift in energy from coal to cleaner sources, and that's contributed to a decline in U.S. coal export.

No matter the reason countries are slowing imports of U.S. coal, they simply don't want the coal we have to offer. And that's going to keep a cap on any potential recovery in the industry.

The reality is that saving the coal industry would require a massive increase in domestic or international demand—or more likely both. But there's nothing to indicate either will happen, no matter what the president does.

U.S. coal demand has suffered because of an explosion in natural gas production and there's no gain, political or economic, to ending that trend. Internationally, India and China are needed to increase coal exports and neither country has shown interest in being dependent on U.S. coal.

It's nearly impossible to see how Donald Trump, or anyone else, could save the U.S. coal industry. That's the hard truth of this former powerhouse energy source.

### 美煤炭产业衰败中

两大党候选人在他们出行全国各地发表政治演说中都提到煤炭并发表政见。共和党候选人，唐纳德·川普已经提到他将用较少的规则、更多的贸易合同恢复煤矿工作。另一边，希拉里·克林顿想要继续从煤炭到清洁能源（比如风能、太阳能等）的转变。他们在能落实到位的政策上并无太大不同。

但煤炭并不能依照政治演讲的几段文字去轻易解读。煤炭资源的结构性改革可能会不利于美国其他能源形势，厘清政治中正进行的有关能源现状的讨论非常重要。讨论振兴美国能源令人欣喜，特别在以煤矿闻名并受重创的地区。但这真的可能么？

什么在扼杀煤炭产业

这是个沉重的事实，但在美国煤炭产业陷入困境的最大原因是美国天然气生产增长率。不可否认，美国天然气生产在扼杀美国煤炭生产。

天然气非常丰富而且价钱便宜，以至公共事业根本不会考虑建设燃煤工厂。事实上，燃煤工厂正接连停工因为美国燃煤工厂平均寿命超过 40 年。由于发电占耗煤量的绝大部分，煤炭下行能直接归咎于天然气的上行。

云峰能源、CNX 煤炭能源、威斯特摩兰煤炭等煤炭生产者面临的挑战不会很快消失。燃煤发电厂已经在全国范围内停工，仅在 2015 年 180 亿瓦特或说全国煤炭发电量的 4.6% 已经停工。根据总统授意这些停工工厂不能再开业。提高耗煤量需要美国承受有害排放物的大量增加和更高的电力成本，这是将几十年燃煤电厂改为现代化的代价。

此外，耗煤量的上升直接导致天然气消费量的下降。这意味着成千上万的天然气员工将面临失业。天然气工作换成煤矿工作似乎不是一个好交易，这交易意味着美国会以经济其他领域的严重牺牲唤起煤炭业复苏。

中国在拯救美国煤炭？

前几年煤炭公司中奏效的方法是，中国和印度经济增长带来对美国煤炭的需求增长，即使在美国内需下跌的情况下也能使产业维持下去。

出口上行的办法只坚持到 2012 年。在过去四年中美国煤炭出口已经下跌了 65%。

中国和印度已改为生产本国煤炭，不从美国进口煤炭。并且实际上正一起开始减缓耗煤量。中国的低空气质量和低价可再生能源使得能源使用从煤炭转向更清洁能源，这恰恰导致了美国煤炭出口的下跌。

无论各国减缓美国煤炭进口出于何种原因，他们只是不想要我们所能提供的煤炭。这将会给煤炭产业任何潜在的复苏设限。

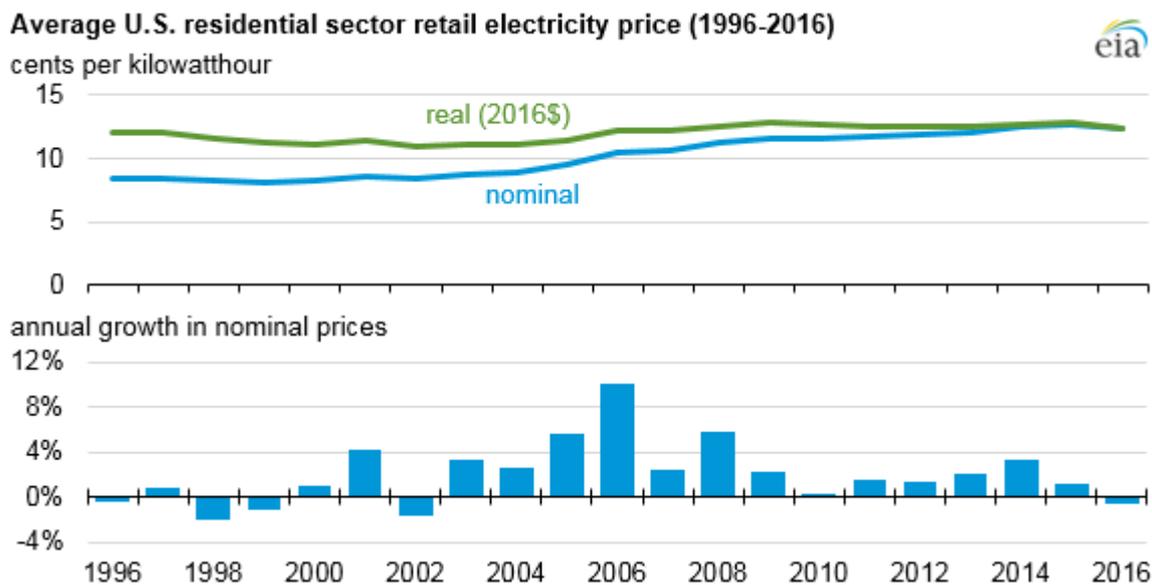
事实是，若要拯救煤炭产业，需要国内或国际需求（或两者兼有）有大量的提升。但无论总统做什么，没有什么迹象表明需求上涨会发生。

美国煤炭需求受创是由于天然气生产的激增，并且阻止这个发展趋势没有任何政治或经济回报。在国际上，需要印度和中国增加煤炭出口，并且两国都没有对表现出美国煤炭的依赖迹象。

无需去留意唐纳德·川普或其他任何人如何拯救美国煤炭产业，这几乎是办不到的。这就是前发电站能源的严峻现实。

## Electricity (电力)

### U.S. residential electricity prices decline for the first time in many years



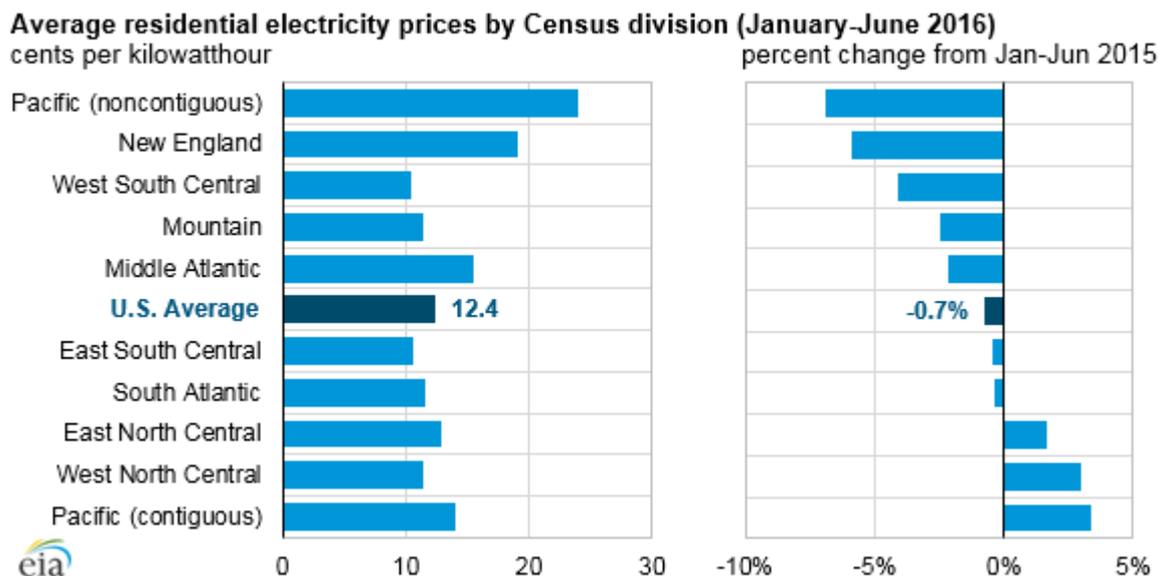
Source: U.S. Energy Information Administration, Monthly Energy Review, August 2016

Note: Prices for 2015 and January-June 2016 are preliminary data. Growth rate for 2016 year-to-date compares January-June 2016 with January-June 2015.

Republished Friday, October 7, 2:30 p.m. to correct an error in the text. Low prices in New England so far this year should be partly attributed to last winter's mild weather.

During the first six months of 2016, residential customers paid on average 12.4 cents per kilowatthour (kWh), or 0.7% lower than the same period last year. If this trend continues for the rest of 2016, annual average residential electricity prices would decline for the first time since 2002. Over the past five years, nominal residential prices have increased an average of 1.9% annually, about the same rate as overall inflation.

## Mcanxixun Information



Source: U.S. Energy Information Administration, Electric Power Monthly, August 2016

Note: Pacific (contiguous) includes California, Oregon, and Washington. Pacific (noncontiguous) includes Hawaii and Alaska.

Residential customers in most areas of the country are seeing lower retail electricity prices this year compared with the same time last year. Declining costs of fuel, especially natural gas, have been a key driver of recent reductions in retail electricity prices. Over the first six months of 2016, the weighted average cost of natural gas delivered to electricity generators was \$2.58 per million Btu, 28% lower than in the first half of 2015.

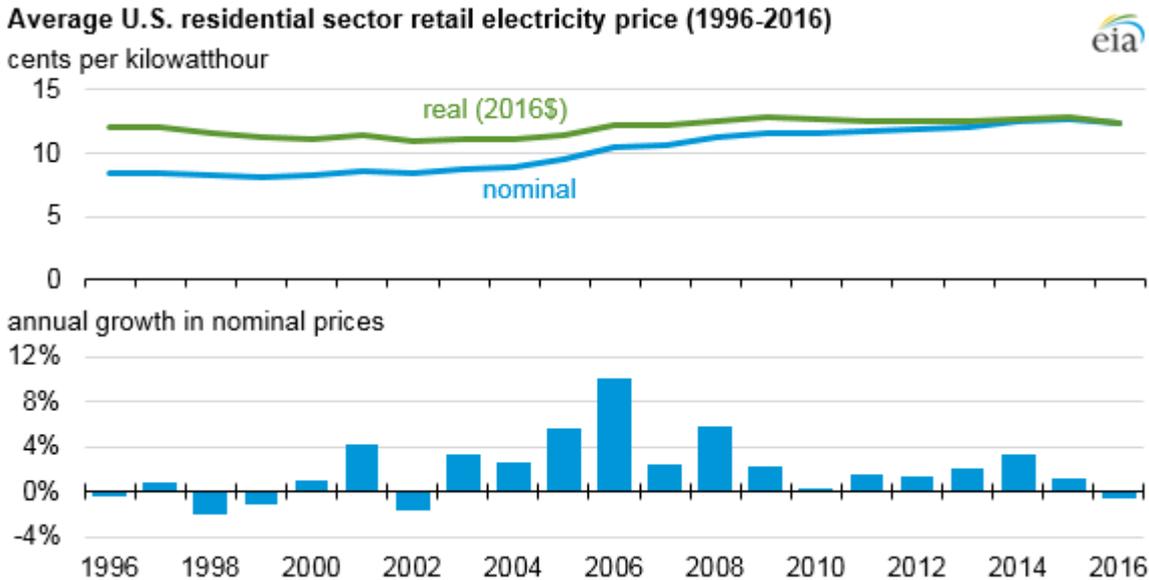
Residential electricity prices in the New England region have fallen by 6% during the first half of 2016 and now average 19.2 cents/kWh. New England electricity prices rose substantially between 2013 and 2014 as a result of a sharp rise in wholesale power prices. Mild weather last winter, which allowed power generators to tap into the region's available supply of low-priced natural gas, contributed to declining electricity rates in New England this year.

Natural gas prices have been increasing in recent months, and EIA's latest Short-Term Energy Outlook projects the average delivered cost of natural gas in the last six months of 2016 will be 27% higher than the average cost in the first six months of the year. Because natural gas prices are expected to continue increasing in 2017, EIA also expects average U.S. residential electricity prices to increase 3% in 2017.

Not all recent declines in electricity prices can be attributed to developments in natural gas markets. Hawaii consistently has the highest electricity prices in the United States, averaging 24 cents/kWh so far in 2016. Many of the utility-scale generating units in Hawaii are fueled by petroleum, and the falling cost of crude oil has contributed to a 12% decline in retail electricity prices so far in 2016. Hawaii's electricity system has been shifting toward increased adoption of rooftop solar, with the ultimate goal of providing 100% of its electricity from renewable sources by 2045.

Despite the decline in national average residential electricity prices in the first half of 2016, prices are rising in some states and regions. On average, residents of the contiguous Pacific Coast states (California, Oregon, and Washington) so far in 2016 are paying 3% higher prices than in the first six months of 2015. The regulated electric utilities in these states sought permission to increase rates to cover costs of maintaining and upgrading the region's power transmission grid and its network of natural gas pipelines. Midwest residential customers have also experienced increasing electricity prices, with year-to-date rates increasing by 2% and 3% in the East North Central and West North Central regions, respectively.

## 美国住宅电价多年来首次下降

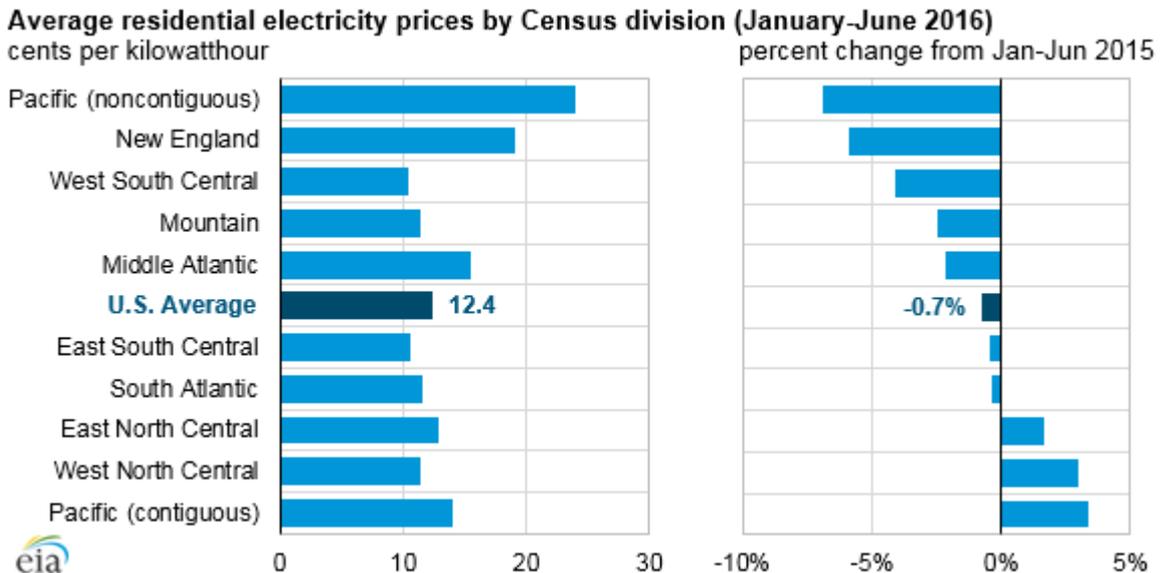


资料来源：美国能源信息管理局，月度能源评论，2016年8月

注：2015年和2016年1月的价格是初始数据。2016年年初至今的增长将2016年1月至6月与2015年1月至6月进行了比较。

在2016年10月7日下午2:30进行了重新发布，更正正文中的错误。到目前为止，新英格兰今年的低价格主要归咎于去年冬天的温和天气。

在2016年上半年，住宅客户平均每千瓦时(kWh)支付了12.4美分，或者与去年同期相比下降了0.7%。如果这种趋势在2016年下半年持续下去，年平均住宅电价将出现自2002年以来的第一次降低。在过去的五年内，名义上住宅价格每年平均增长1.9%，与整体通货膨胀率的增长率相同。



资料来源：美国能源信息管理局，月度能源评论，2016年8月

注：太平洋（连续）包括加利福尼亚州、俄勒冈州和华盛顿州。太平洋（不连续）包括夏威夷和阿拉斯加。

该国大部分地区的住宅客户都将看到今年的电价与去年同期相比有所下降。燃料，特别是天然气成本的下降一直都是最近零售价下降的主要驱动因素。在2016年上半年，输送到发电机的天然气的加权平

均成本达每百万 Btu 2.58 美元，比 2015 年上半年减少了 28%。

新英格兰地区的住院电价在 2016 年上半年已经下降了 6%，目前平均为 19.2 美元/kWh。新英格兰电力价格在 2013 至 2014 年间由于批发电价的急剧上升而大幅上涨。去年冬天，令发电机充分利用该地区的可用低价天然气的温和天气造就了新英格兰今年的电力下降率。

所几个月天然气的价格一直在上涨，并且 EIA 最新的短期能源展望项目预计，2016 年下半年天然气的平均交付成本比本年上半年的天然气成本高出 27%。由于天然气的价格预计在 2017 年将继续增长，EIA 还预计 2017 年美国平均住宅电价将增长 3%。

并非所有最近电价的下降都能够归因于天然气市场的发展。夏威夷一直在美国都具有最高的电价，在 2016 年到目前为止电价达到平均 24 美分/kWh。夏威夷的许多公用事业规模的发电机组都是由石油供给燃料的，而原油成本的下降已经导致 2016 年到目前为止零售电价下降了 12%。夏威夷的电力系统已经转向了太阳能屋顶越来越多地采用，其最终目标是到 2045 年用可再生能源提供其 100% 的电力。

尽管 2016 年上半年全国平均住宅电价有所下降，但是价格是一些州和地区仍然在持续上涨。平均而言，到目前为止，2016 年太平洋沿岸邻近州（加利福尼亚州、俄勒冈州和华盛顿州）的居民将支付比 2015 年上半年高出 3% 的价格。这些州的监管电力机构寻求许可，增加费率以支付维护和升级该地区的输电网络及其天然气管道网络的费用。中西部住宅客户也经历了电价的上涨，到目前为止费率在东北中部和西北中部地区分别增长了 2% 和 3%。

## **How gas generators cashed in and exploited hot water load**

It's a sign of lazy journalism and it is rampant. Almost all mainstream media – Fairfax, the ABC and of course the Murdoch empire – routinely blame South Australia's high electricity prices on renewable energy. They hardly ever question the role of the gas generators. They should.

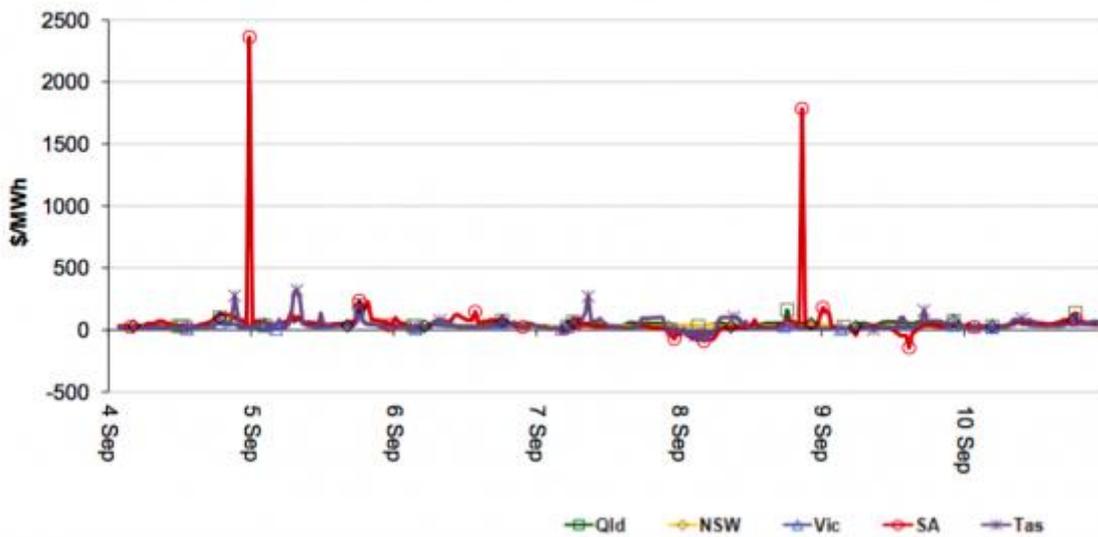
South Australia has long had the highest electricity prices in Australia – even before its investment in wind and solar – because it is at the end of the grid and it has always had a heavy reliance on gas generation, and “peaky” usage.

The sort of price spikes witnessed on July 7 used to be commonplace before the arrival of wind and solar, which makes it deeply ironic that the July price surge was blamed on renewables, or the lack of them.

But events since then provide another illustration on how gas generators are able to exploit the market, and are clearly events when the blame cannot be shifted on renewables.

According to the Australian Energy Regulator, a price spike to \$14,000/MWh occurred just after 11.35pm on Monday, September 5, when demand jumped 212MW as the grid operator switched on all the electric hot water systems under its controlled load operations.

Figure 1: Spot price by region (\$/MWh)



This demand is not a secret nor a surprise. It happens every night. Powering hot water systems was shifted to the late evening time slot years ago because the coal fired generators and other “baseload” generators did not want to be switched off, but there was nothing much else for them to power while everyone slept.

On September 5, the market was cruising along normally. Then a funny thing happened. There was slightly less wind capacity coming through than thought four hours earlier, but instead of pushing up prices by a little bit, or maybe even doubling them, the price surged from \$33/MWh to \$14,000MWh.

**Monday, 5 September**

Table 3: Price, Demand and Availability

Time	Price (\$/MWh)			Demand (MW)			Availability (MW)		
	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast
Midnight	2361.27	50.96	43.80	1656	1609	1562	1875	1863	1880

Apparently, that was because “low priced” gas generation was “not available”, although this table above suggests there was plenty of available capacity. And guess what happened when the price jumped to \$14,000/MWh?

Suddenly, within five minutes all the “unavailable” gas generation suddenly became “available”, because the operators knew they were guaranteed a minimum \$2,300/MWh for switching on in that 30 minute period.

In the rush to grab that money, there was a stampede of offers from generators that had been “unavailable” just 5 minutes earlier and the price fell immediately to \$44/MWh.

A similar event occurred three days later when the price jumped from \$60/MWh to \$14,000/MWh, again in that second five minute time slot, before falling to negative territory as the gas generators fought for an allocation knowing they were guaranteed a windfall if they could win a slot.

Of course, this sort of caper carries on most days. The Melbourne Energy Institute recently produced a report showing the number of times capacity was “unavailable” at the start of a 30 minute period, and then suddenly became available 5 minutes later after the price had surged in one 30 minute interval.

## Mcanxixun Information

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A variation of this bidding strategy occurred in the July 7 surge blamed on renewable energy, or the lack of it. Gas capacity was “unavailable” at the start of the 30 minute session at prices less than \$14,000. And once that price was established, they all rushed in for their share of the spoils.

This didn’t happen just once but repeatedly through the day, as if on a continuous loop. Everyone rushes in, but then suddenly capacity is scarce again! Repeat. And somehow the blame for the state’s high costs goes to renewables.

The Australian Competition and Consumer Commission reckons this is fair play, just a market operating as it should. Its boss Rod Sims, says the gas generators have every right to exploit the market in this way.

But the Australian Energy Market Operator and the Australian Energy Regulator concede that this practice distorts the price, and that is why they are supporting a rule change proposed by big energy users, such as aluminium smelter Sun , who are sick of getting screwed by the gas generators.

This rule change is simple. Instead of having financial settlement every 30 minutes, which allows one 5 minute bidding rush to raise the prices for the whole period, it proposes to have the settlement every 5 minutes.

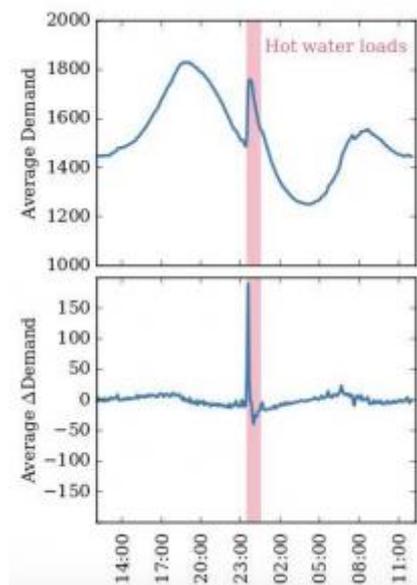
This, the proponents say, and the regulator and market operator agree, will reduce the cost, and encourage new market entrants such as battery storage, which can respond in milli-seconds, much quicker than the 40-year-old gas generators that currently dominate the market.

Of course, the gas generators, owned by AGL, Origin Energy, Engie and others, are furious anyone is suggesting such a thing. They say it will increase costs and is too hard (AEMO says that is rubbish), and will force the exit of gas generators – revealing once again their penchant for holding the market to ransom.

The AEMC was on the verge of knocking the rule change on the head, as it has done to most progressive rule change suggestions in recent years. But under pressure, it has decided to look at it in more detail, and a decision will be made around the middle of next year. It couldn’t come soon enough for Australian energy consumers.

The point of this story is to point out, yet again, that the market rules and practices in Australia are designed to favour the incumbents, who have exploited their market power to such an extent that it is all but impossible for consumers to access electricity in Australia at less than \$300/MWh, in many cases less than \$400/MWh

That is more than 10 times the price of our “cheap coal”, but the generators, networks and retailers, with a mixture of over-investment, super high margins and market manipulation, have been allowed to screw the consumer, and pass the blame elsewhere. It shocks me that the mainstream media lets this by. Maybe it’s the party pies in the corporate boxes.



P.S. Why on earth has the South Australian network operator not already moved the big lump of hot water load from 11.30pm and scattered the load through the day, particularly to fill in the “solar sponge” created by all that solar PV on the rooftops of homes and businesses and being exported back to the grid.

As this graph shows, the hot water loads are a constant and could easily be spread through the evening. The second graph shows the changes in demand. It seems outrageous that the gas generators should be allowed to exploit this, to varying degrees, day in and day out.

The Queensland network operator has already shifted some solar hot water to the middle of the day to act as a “solar sponge.” SAPN has said it was considering doing the same, but presumably has not yet acted because it is “hard”, and requires some smart software to do it properly. Yet another argument for having a “smart grid” rather than the dumb, gold-plated monolith we currently have to deal with.

## 天然气发电机如何利用以及从热水负荷中获利

这是懒惰的新闻作者的一个标志，并且非常猖獗。几乎所有的主流媒体——费尔法克斯、ABC、当然还有默多克帝国——通常会责备南澳大利亚在可再生能源上收取的较高电价。他们几乎没有质疑过天然气发电机的作用。他们应该要的。

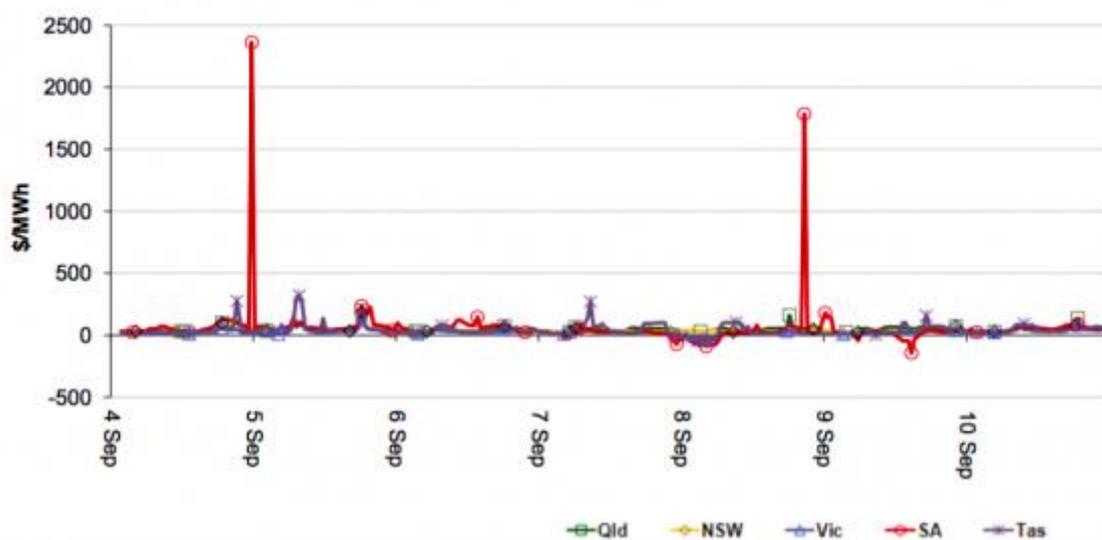
南澳大利亚长期以来一直具有澳大利亚的最高电价——即使是在其投资风力和太阳能之前——因为它位于电网的末端，并且总是严重依赖于天然气发电机，以及“高峰”利用。

在7月7日看到的这种价格峰值在风力和太阳能出现之前是比较常见的，这使得将本月价格的暴涨归咎于可再生能源或缺乏可再生能源变得非常具有讽刺意味。

但是自那之后的事件提供了另一个有关天然气发电机如何利用该市场的例子，并且显然是在责备无法转嫁到可再生能源时会发生的事件。

根据澳大利亚能源监管机构表示，仅仅在9月5日的周上下午 11:35 之后，价格就突然上涨至 14000 美元/兆瓦时，当时由于电网运营商在其受控的负载运行下接通了所有的电热水系统，需求量突然增加至 212MW。

Figure 1: Spot price by region (\$/MWh)



这种需求并不是秘密，也不是惊喜。这在每天晚上都会发生。热水系统的供电在几年前转移到深夜，因为燃煤发电机和其他“基荷”发电机并不希望关闭，但是在人们都睡觉时并没有什么可供它们来提供电力。

9月5日，市场正常巡航。然后发生了一个有趣的事情。风力发电量出现略微降低的情况比预期的早了四个小时，但是这并没有推动价格上涨一点点，或是甚至翻了一倍，该价格从33美元/MWh激增至14000美元MWh。

**Monday, 5 September**

**Table 3: Price, Demand and Availability**

Time	Price (\$/MWh)			Demand (MW)			Availability (MW)		
	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast
Midnight	2361.27	50.96	43.80	1656	1609	1562	1875	1863	1880

显然，这是因为“低价”气体的产生并“不可用”，虽然上表表明有大量的可用容量。但是猜猜在价格上涨到14000美元/MWh时会发生些什么？

突然，在五分钟内，所有“不可用”的气体生产突然成为了“可用”，因为运营商知道他们在这三十分钟的时期内能够确保接通会产生最低2300美元/MWh的费用。

在抢钱的这个突袭过程中，发电机会匆忙提供了一些在五分钟前还“不可用”的容量，并且价格立即下降至44美元/MWh。

在价格从60美元/MWh增长至14000美元/MWh的三天后发生了一个类似事件，再一次在第二个五分钟的时间段内，在天然气发电机争取到一个装置为他们能够赢得一个时间段时确保在发生意外时能够进行处理而因此下降到负区域之前。

当然，这种跳跃发生在大多数日子中。墨尔本能源研究所最近产生了一份报告，容量“不可用”在开始的时间达30分钟，并且之后突然在30分钟间隔期间价格飙升的五分钟之后变为可用。

这种出价策略的变化发生在7月7日归咎于可再生能源或其缺乏的原因的浪潮中。气体容量在30分钟时间段开始时价格不足14000美元时“不可用”。一旦这个价格建立，他们都会冲进来分享他们的战利品。

这不只发生一次，而在一天时间内反复发生，就好像是一个连续的循环。每个人都涌入，但是之后突然容量再次稀少！重复。但是不知何故，该国的高成本归咎于可再生能源。

澳大利亚竞争和消费者委员会认为这是一场公平的竞争，只是一个市场正常运作而已。其老板罗德·西姆斯称天然气发电机完全有权以这种方式利用该市场。

但是澳大利亚能源市场运营商和澳大利亚能源监管机构承认，这种做法扭曲了价格，并且这正是他们支持大型能源用户提供的规则改变的原因，这些大型能源用户包括铝冶炼厂太阳，它们不喜欢受到天然气发电机的不公平待遇。

这项规则改变非常简单。不同于每三十分钟进行一次财务结算，这种方式会产生一个五分钟的出价潮导致整个期间的价格上涨，不同规则提议每五分钟进行一次结算。

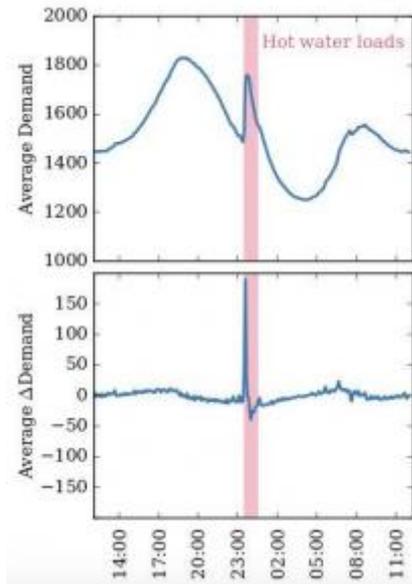
支持者表示，这点和监管机构及市场运营商的同意将降低成本，并且鼓励新的市场进入者，例如电池储备，能够在几毫秒时间内进行响应，比四十年的目前主导该市场的天然气发电机更快。

当然，由AGL、Origin能源、Engie和其他公司所拥有的天然气发电机惹恼了任何提出这样的变化的人。他们称，这将增加成本并且太困难（AEMO表示这是一个垃圾），并且将迫使天然气发电机的退出一一再次揭示了他们令该市场赎回的倾向。

AEMC接近于给规则改变当头一棒，正如它对近年来先进的规则改变建议所做的一样。但是在压力之下，它决定更详细地研究规则改变，并且将在明年中旬作出一项决策。这对于澳大利亚能源消费者而言还不够快。

这个故事的重点是再一次指出，澳大利亚市场的规则和实践专用有利于在位者，在位者利用他们的市场力量，从而澳大利亚的消费者均未以低于 300 美元/MWh 的价格获得电力，在许多情况下低于 400 美元/MWh。

这比我们“廉价的煤炭”所提供的价格增长了十倍，但是发电机、网络和零售商，通过过度投资、超高利润和市场操纵的混合，一直都允许压榨消费者，并且将责难转嫁到其他地方。主流媒体令此事发生让我备感震撼。也许这正是该企业盒子中的派对美食。



附：地球上南澳大利亚网络运营商还没有将大量热水负载从下午 11:30 移开并且在一整天分散该负荷的原因，特别是填补由家庭、企业的屋顶太阳能光伏以及输出到电网的太阳能光伏所创造的“太阳能海绵”。

如图所示，热水负荷是一个常数，并且可能轻易地在夜晚分散开来。第二个图显示了需求的变化。似乎令人不安的是，天然气发电机应该获准利用这一点来改变日复一日的程度。

昆士兰网络运营商已经将一些太阳能热水转变为在中午作为“太阳能海绵”。SAPN 已经表明，其将考虑进行相同的事情，但是可能还没有采取行动，因为“很难”，并且需要一些智能软件来正确地进行。然而，还有一论点是拥有“智能电网”而不是我们目前必须处理的愚钝、镀金的巨石。