

# ENERGY

---

WeChat Official Accounts / 微信公众号: 麦肯息讯报告

*Vol.161,2016*

- oil
- natural gas
- wind
- solar
- biofuels
- ore
- coal
- electricity
- water
- nuclear energy
- new energy



扫一扫 了解更多

Scan For More Information

**Mcanxixun Information and News Service**

# Contents

<b>Oil (石油)</b> .....	<b>3</b>
US fossil fuel subsidies a brake on sustainable transport .....	3
巨额化石燃料补贴阻碍美国发展可持续交通.....	5
Rex Tillerson, the Texas oilman chosen by Trump .....	7
蒂勒森：从 CEO 到国务卿提名人 .....	9
<b>New Energy (新能源)</b> .....	<b>10</b>
Will New Zealand learn from Australia's rooftop solar mistakes? .....	10
新西兰会从澳大利亚的屋顶太阳能错误中吸取经验教训吗? .....	15
<b>Natural Gas (天然气)</b> .....	<b>20</b>
U.S. natural gas production resilient to market changes in 2015, but has fallen in 2016 .....	20
美国天然气生产在 2015 年适应市场变化，但在 2016 年下降.....	22
Floating LNG unit to expand Turkey's annual gas storage capacity by 5.3B cbm .....	24
浮式液化天然气装置使土耳其年度天然气储存容量扩大 53 亿立方米.....	25
Qatar to supply Pakistan 400m ton LNG in 2017 .....	26
卡塔尔计划在 2017 年向巴基斯坦供应 4 亿吨液化天然气.....	26
Turkey to cut gas supply to power plants .....	27
土耳其削减发电厂的天然气供应 .....	27
LNG strategies for the EU and India .....	28
欧盟和印度的液化天然气战略 .....	30
A New World Order Is Emerging In Natural Gas .....	32
天然气行业出现新的世界秩序 .....	33
<b>Minerals (矿产)</b> .....	<b>33</b>
There's another way to solve China's industrial overcapacity.....	34
另辟蹊径削减中国工业产能过剩 .....	36
Chinese steel: those blasted mills .....	37
中国应继续削减钢材产能 .....	38
<b>Clean Energy (清洁能源)</b> .....	<b>38</b>
100% renewable energy system cheapest for South America.....	39
100% 的可再生能源系统对南美洲而言是最便宜的 .....	39
<b>Coal (煤炭)</b> .....	<b>40</b>
India announces plan to step away from coal, casting doubt on approved Queensland Adani mine.....	40
印度宣布退出煤炭计划，影响获批的昆士兰州阿达尼煤矿.....	41
Coal industry set for steep price falls: analysts.....	41
分析者认为煤炭价格将急剧下降 .....	42
A deal to unlock massive Mongolian coal deposits could revive its flagging economy.....	43

## Mcanxixun Information

---

开启大量蒙古煤矿的协议可能会恢复其萎靡的经济.....	44
China to fulfill pledge to eliminate import tax on Australian thermal coal: Canberra.....	45
堪培拉：中国履行承诺，消除澳大利亚动力煤炭的进口税.....	46
Agency: Global coal demand to continue falling .....	46
全球煤炭需求持续下降 .....	47
Argentina's power struggle.....	48
新政府撬动阿根廷能源改革 .....	50
Australia lobbies China-led AIIB to add coal to lending priorities.....	52
澳大利亚游说亚投行将煤炭列入投资重点.....	53
Devastated villages pay the price for ignoring coal's environmental impact .....	54
陕西神木：煤与水的困局 .....	56
<b>Electricity（电力） .....</b>	<b>58</b>
Gas plants, not wind, may have been at fault in South Australia blackout.....	58
南澳大利亚停电由天然气发电厂引发而不是风电场.....	61
Winter residential electricity consumption expected to increase from last winter.....	63
冬季住宅用电量预计比去年冬季高 .....	65
How much storage is needed in solar and wind powered grid?.....	67
太阳能和风能供电网需要多少储能？ .....	70
Aruba Promises 100% Clean Electricity By 2020.....	72
阿鲁巴岛承诺 2020 年 100%清洁电力 .....	73
Wind Energy Is Behind A Historic Shift in US Electricity Production.....	73
风能是美国电力产业历史性转变的后盾.....	76

## Oil (石油)

### **US fossil fuel subsidies a brake on sustainable transport**

Low fuel taxes and subsidies for oil production are deterring investment in sustainable transport, writes Stephen Leahy

On-going subsidies paid to oil and gas companies are costing the US government billions of dollars in potential revenue and making the transition to low carbon alternatives much more difficult, particularly in the transport sector, which generates 26% of US greenhouse gas emissions.

American fossil fuel companies receive at least US\$21 billion (155 yuan billion) a year in subsidies while consumers benefit from some of the lowest fuel taxes in the world.

“If we paid the true cost of gasoline everyone would own an electric vehicle and the US would have a high-speed rail network powered by clean energy,” says Stephen Kretzmann, executive director of Oil Change International, a US-based non-governmental organisation working on energy issues.

#### Fuel tax failure

The cost of fuels like gasoline vary significantly by country. The average price of gasoline in the US on December 5 was US\$0.65 per litre at the pump; Canada \$0.88; UK \$1.45; and China \$0.94. Hong Kong topped the list at \$1.94, according to [globalpetrolprices.com](http://globalpetrolprices.com).

Oil is priced on the global market so price differences are largely the result of national and local taxes. Richer countries tend to tax fuels more than poorer ones. The US, however, is a notable exception to this.

“The US has lower energy taxes than many developing countries from Ethiopia to Turkey,” said Ivetta Gerasimchuk, an energy expert at the International Institute for Sustainable Development (IISD) in Geneva.

This means the US government is foregoing significant tax revenues. In 2015, the US consumed 529 billion litres of gasoline according to the US Energy Information Administration. If that fuel had been taxed at the same rate as Canada, it would have generated an additional US\$121 billion in government revenue. In fact, the IMF estimated that the US under-taxed energy use by US\$699 billion in 2015 alone, said Gerasimchuk.

Fuel taxes help to offset the additional costs of using fuels that are not included in the price and are instead paid for in other ways by the public. These include, for example, health impacts resulting from air pollution and the cost of adapting to changing climate.

Under-taxation also limits the attractiveness of greener transport alternatives and broader progress toward a low carbon economy. Cheap fuel encourages the sale of larger vehicles and encourages people to drive more because running costs are low; it discourages manufacturers from improving fuel economy standards and from producing new energy vehicles such as electric cars.

The low cost of driving is a factor contributing to urban sprawl and a disincentive for investment in mass transit systems, effectively limiting actions that reduce pollution and CO2 emissions, and locking the US into an unsustainable economic model.

The incoming Trump administration is expected to reduce the pressure on automakers to roughly double vehicle fuel efficiency by 2025, a plan agreed under President Obama in 2011. In fact, according to Reuters, the country’s biggest trade group has asked Trump to roll back the targets, which would remove incentives for companies such

## **Mcanxixun Information**

---

as General Motors and Ford to shift consumers away from SUVs toward smaller vehicles and electric vehicles.

The threat of rolling back these targets exposes a clash at the heart of America's future transport strategy. Federal investment in fossil fuel subsidies is at odds with state and industry targets to reduce dangerous vehicle emissions, improve energy efficiency and push the adoption of electric vehicles.

### Needless production subsidies

While consumers benefit from low fuel taxes, oil production and exploration is subsidised by government. Production subsidies reduce the cost of finding and producing oil and can make the difference between whether production and exploration is economically viable or not.

Estimating US oil and gas subsidies is challenging though because subsidies rarely involve direct cash payments to producers. Instead, they take the form of wide ranging tax breaks for energy companies, interest-free loans, free or low cost access to resources like water and land, and governments assuming the legal risks of exploration and development.

The first US subsidies were put in place nearly 100 years ago to help the nascent oil industry meet the energy needs of a growing nation. Some of the first programmes are still in place today.

In 2009, President Obama, along with other leaders of G20 nations, made a commitment to phase out subsidies. Many countries have started doing so but in the US such action has been consistently blocked by Congress, said Kretzmann.

When oil prices are US\$50 a barrel or lower, subsidies can make the difference between whether drilling projects go ahead or not. A forthcoming study of new oil fields in the US finds that state and federal subsidies are a significant factor in increasing oil production when oil prices are low, said Peter Erickson, senior scientist at the Stockholm Environment Institute-US. This support makes it more difficult for the US to reduce CO2 emissions.

At the UN climate talks in Paris last year, nations including the US committed to reduce CO2 emissions and phase out fossil fuels. A report by Oil Change International released in September suggested there is sufficient carbon in the world's working coal mines and oil and gas fields to push global warming beyond 2C if burned. Other reports argue that the significant unworked fossil fuel reserves claimed by companies must remain unburned.

The world doesn't need new sources of fossil fuels, said Peter Wooders of Global Subsidies Initiative (GSI) in Geneva. Continued US subsidies for hydraulic fracking make no sense because it's a mature technology, creates few new jobs, and has major impacts on the environment and local communities. The oil industry is capital intensive but employs relatively few people despite claims by politicians, said Wooders.

### Targeted subsidies

To curb emissions from the US transport sector government must remove US\$21 billion in subsidies for oil production and exploration, increase fuel taxes for consumers, and ensure that subsidies are targeted specifically at sustainable transport options.

"From a climate perspective there's absolutely no choice but to move rapidly to electric vehicles while low-emission mass transit systems are being built," said Wooders.

Targeting subsidies at technologies that can help reduce emissions works. Solar technology offers a good example of how support from governments has helped to massively reduce the cost of solar panels over the past 20 years.

Subsidies for electric vehicles can function in much the same way, helping to reduce costs through technology learning and mass production. Currently, US support from all levels of government averages US\$8,000-8,500 per new vehicle. China's subsidies are closer to \$10,000. An estimated 130,000 new EVs will be sold in the US this year amounting to a US\$1.1 billion subsidy. However, this is just 5% of what the fossil energy sector receives.

Removing fossil fuel subsidies and taxing fuels to disincentivise vehicle use can encourage Americans to adopt more sustainable forms of transportation. German citizens are five times more likely to use public transit, and not

just because their mass transit systems are much better. The biggest reason, according to a study by two US transportation experts, is that they pay higher vehicle fuel and operating costs.

They conclude that governments must put in place transportation policies that restrict vehicle use and make it more expensive. Otherwise, “American public transport is doomed to remain a marginal means of transport, used mainly by those who have no other choice.”

### Prospects for change

Although president-elect Donald Trump has promised a massive investment in US infrastructure, it’s unlikely that this will be targeted at sustainable transport alternatives such as high-speed rail, said Ben Schreiber, climate and energy program director at Friends of the Earth US.

Unlike China and a number of EU countries, the US has no high-speed rail. The fastest train is the Acela Express from Boston to Washington that averages 100 km/hour. High-speed rail in Germany, France, Japan and China are more than twice as fast.

Trump recently nominated former Labor Secretary Elaine Chao to head the Department of Transportation. Chao was “a disaster as Labor Secretary” and did nothing to improve worker safety while undermining the role of unions, said Schreiber.

Although Chao’s priorities are difficult to predict, she is likely to favour deregulation and privatisation, including the sale of public assets and the imposition of tolls on roads and bridges. Such a move could disincentivise vehicle usage. However, Chao’s expected focus on “building new roads and bridges as part of infrastructure spending would be a move in the wrong direction,” said Schreiber.

Perhaps of greater concern is Trump’s denial of climate change and his public support for fossil fuel industries such as coal production that have been hit hard by job losses. This suggests that reducing fossil fuel subsidies and supporting greener transport options will not be a priority for the new administration.

Nonetheless, demand for electric vehicles is expected to remain high. Tesla’s Model S is the world’s best-selling luxury car. The upstart US automaker received deposits of US\$1000 from nearly 400,000 people this year to purchase its new lower-priced Model 3, which has a 250 kilometre range.

More than 80% of Americans dislike the idea that oil companies get billions in taxpayer subsidies, says Kretzmann. However, a number of members of the US Congress depend on contributions from fossil fuel companies for re-election. The American people will have to hold their representatives to account to bring an end to such wasteful subsidies.

The Stockholm Environmental Institute will produce a major study of subsidies to US oil producers in January 2017.

## 巨额化石燃料补贴阻碍美国发展可持续交通

史蒂芬·莱希表示，只有改变超低燃油税和数百亿美元的石油生产补贴，美国的可持续交通发展才有一线生机。

每年，美国政府都要划拨上百亿美元补贴石油和天然气企业，这极大增加了发展低碳替代能源的难度。这个问题在交通运输领域尤其突出，而美国每年温室气体排放总量中有 26% 都来自交通运输行业。

美国化石燃料企业每年至少可以获得 210 亿美元（约合 1550 亿人民币）的补贴，而美国消费者的燃油税也是全球最低的。

国际石油变革组织是一家来自美国的能源非政府组织。该组织执行总监史蒂芬·克雷茨曼表示：“如果让美国人按石油的真实价格生活，那么可能每个美国人都会选择购买电动汽车，而且美国将会拥有一个完全由清洁能源驱动的高速铁路网络。”

### 低燃油税率的代价

各国的燃料（比如汽油）价格不一。据全球汽油价格网显示，12月5日全美平均汽油零售价为0.65美元/升，加拿大为0.88美元/升，英国为1.45美元/升，中国为0.94美元/升，香港价格最高，达到1.94美元/升。

石油的价格取决于国际市场，所以价格差异主要是因为各国税收比率不同。一般情况下，富裕国家燃油税较高，而贫困国家则相对较低，但美国是一个特例。

国际可持续发展研究所（IISD）能源专家伊芙塔·吉尔阿斯米楚克日前在日内瓦表示：“美国的燃油税比埃塞俄比亚、土耳其等许多发展中国家还要低。”

这意味着美国政府放弃了大量的税收收入。据美国能源信息管理局统计，2015年全美汽油消耗量高达5290亿升。如果按照加拿大税率对这些汽油消费进行征税，那么美国财政税收将因此增收1210亿美元。吉尔阿斯米楚克表示，据国际货币基金组织估计，仅2015年一年，美国在能源消费方面损失的税收高达6990亿美元。

燃油税政策有助于抵消负外部性。按照经济学家的说法，所谓“负外部性”就是在燃料使用过程中产生的没有计入价格部分的成本，这类成本最终将由公众通过其他方式进行偿还，比如空气污染带来的健康影响，或者适应气候变化的成本等等。

征税过低还会降低绿色出行和低碳经济转型的吸引力。此外，低廉的燃料价格还会刺激大型汽车的销售，鼓励人们驾车出行，并且打击汽车厂商提高节能标准、生产电动汽车等新能源汽车的积极性。

驾车成本低也是导致城市扩张的一大元凶，甚至会影响到大运力交通运输系统的建设，从而严重拖累美国削减污染物和二氧化碳排放的行动，并最终将美国禁锢在一个不可持续的经济发展模式之中。

2011年奥巴马总统曾出台一项计划，要求在2025年前将美国汽车能效提高一倍。然而随着特朗普政府上台，落实这项计划的压力可能会就此下降。而据路透社报道，全美最大的贸易组织已经要求特朗普（Trump）政府撤销上述计划，取消针对通用、福特等汽车企业的小型汽车及电动车激励政策。

这样做会撕裂美国未来的交通运输战略。联邦政府的化石燃料补贴与各州政府和行业削减有毒汽车尾气排放、提高能效、推广电动汽车的目标背道而驰。如果这一政策冲突得不到解决，美国的未来发展将受到阻碍。

### 持续百年的石油生产补贴

不仅美国消费者可以享受到较低的燃油税，美国的石油生产和勘探厂商也同样能够得到政府补贴。生产补贴降低了石油的勘探和生产成本，从根本上影响了石油生产与勘探的经济可行性。

因为补贴通常不是以现金形式直接支付给生产方，所以想要估算美国石油与天然气补贴总量也并非易事。一般来说，这类补贴主要包括能源企业税收减免和无息贷款，免费或低价使用水源和土地等资源，以及由政府为相关开采和开发提供法律风险担保等等。

近100年前，为了帮助石油行业起步，满足能源发展需求，美国政府第一次推出了能源补贴政策。如今，最初的一些政策仍在实行。

2009年，奥巴马总统携手20国集团（G20）领导人共同承诺逐步淘汰化石能源补贴。克雷茨曼表示，不少国家已经开始行动，而美国方面的行动却仍受到国会的重重阻挠。

当国际原油价格达到每桶50美元或更低水平时，是否继续进行开采就取决于补贴了。斯德哥尔摩环境研究所美国分部资深科学家彼得·艾瑞克森指出，一项即将发布的针对美国几个新油田的研究显示，当石油价格偏低时联邦和州政府的补贴对石油增产至关重要。这样的“支持”使得美国二氧化碳减排难上加难。

去年在巴黎召开的联合国气候大会上，包括美国在内的与会各国都承诺将削减二氧化碳排放并逐步淘汰化石燃料。国际石油变革组织9月发布的一份报告指出，全球现有的煤矿和油气井储量就足以产生推动全球升温超过2摄氏度的碳排放。另有几份报告认为，开采企业已经掌握但尚未开采的化石燃料应当禁止利用。

全球补贴研究中心（GSI）的彼得·伍德斯在日内瓦表示，目前地球已经不再需要新的化石燃料了。美国继续对水力压裂法进行补贴完全没有意义，因为这项技术早已成熟，也不会创造什么新的就业机会，而且还会对当地环境和居民生活造成不利。伍德斯认为，尽管政客们拿出了种种理由企图继续为石油行业谋求支持，但是石油行业就是一个资本密集但就业机会稀少的产业。

让燃料补贴去到正确的地方

为了遏制美国交通运输行业的温室气体排放，美国政府必须削减 210 亿美元的石油生产与勘探补贴，提高消费者燃油税，确保只对某些特定的可持续交通运输项目提供补贴。

伍德斯说：“从气候角度来说，我们除了快速推广电动汽车、建设大运力交通系统之外，别无选择。”

为减排技术提供针对性补贴可以起到很好的效果。以太阳能技术为例，得益于政府的大力支持，过去 20 年太阳能电池板的价格已经实现了大幅下降。

通过推动技术学习和大规模生产，电动汽车补贴同样可以带动整个产业成本的下降。目前，美国各级政府平均为每辆新能源汽车提供 8000 到 8500 美元的补贴，而中国的补贴幅度则将近 1 万美元。据估测，今年全美累计电动汽车销售量将达到 13 万辆，补贴总额高达 11 亿美元。然而即便如此，这样的补贴规模也只相当于化石能源领域补贴的 5%。

撤销化石燃料补贴和增加燃油税率会降低美国人的用车意愿，鼓励更多人选择可持续的交通方式。德国人的公共交通使用率是美国人的 5 倍，原因不仅仅是因为德国拥有更加完备的公共交通系统。美国交通运输领域的 2 位专家指出，关键的原因在于德国的汽车燃油税和使用成本更高。

这 2 位专家认为，美国政府必须尽快落实相关政策，限制汽车使用量，提高用车成本。否则，“美国的公交系统永远都只能是一种非主流的交通方式，只有别无选择的人才会选择公交出行。”

展望未来改变

地球之友美国分部气候与能源项目总监本·施莱伯表示，虽然当选总统唐纳德·特朗普承诺要大力发展美国的基础设施建设，但是高速铁路等可持续交通方式不太可能成为他重点扶植的领域。

与中国和欧盟一些国家不同，美国还没有高速铁路。由阿西乐特快运营的波士顿-华盛顿线路是北美最快的铁路线，平均时速 100 公里/小时。而德国、法国、日本和中国的高速铁路时速都至少是上述速度的两倍多。

特朗普最近提名前美国劳工部长赵小兰为下任交通部长。施莱伯表示，作为劳工部长，赵小兰可谓是一场灾难——她不仅没有提高工人安全感，反而还削弱了工会的作用。

尽管目前外界对赵小兰的工作重心尚不清楚，但是有消息预测她很可能会选择去监管化和私有化政策，比如出售公共财产或增加公路和桥梁收费站等等。这些政策的确可能会降低汽车使用量，但是施莱认为，赵小兰计划中的“将新建道路和桥梁纳入基础设施预算犯了方向性错误。”

特朗普否认气候变化并且公开支持饱受失业影响的煤炭等化石燃料行业才更让人担心。因为这就意味着下届政府不会将削减化石燃料补贴和支持绿色交通作为执政重点。

尽管如此，预计电动汽车的市场需求仍将维持在高位。特斯拉 S 型是目前全球最畅销的豪华汽车车型。今年初，特斯拉公司推出了低价版特斯拉 3 型电动汽车，续航里程 250 公里，目前共有 40 万人预订了该车型，并交纳了 1000 美元的订金。

克赖茨曼说，超过 8 成的美国人对石油公司每年从纳税人手中掠走上百亿美元补贴的状况深表厌恶。然而，很多美国国会议员的连任竞选还指望化石燃料公司出资。所以，要终结这样奢侈浪费的行业补贴，美国人民还得要让这些“代表”负起责任。

斯德哥尔摩环境研究所将于 2017 年 1 月正式发布关于美国石油厂商补贴的专业研究报告。

## Rex Tillerson, the Texas oilman chosen by Trump

In the late 1960s and early 1970s, when his fellow teenagers were going to rock festivals and protesting against

## **Mcanxixun Information**

---

the war in Vietnam, Rex Tillerson spent his summers with the Boy Scouts of America as aquatics director at Camp Strake, about 35 miles north of Houston.

Today he is one of America's most powerful business leaders as chief executive of ExxonMobil, and says he owes it all to scouting. "All of the leadership training I got, I got in the Boy Scouts of America," he told a meeting of the organisation in October.

Now he is about to find out whether the lessons he learnt splashing around five decades ago will hold good in the swamps of Washington. Until he was chosen this week by Donald Trump to be his nominee for secretary of state, Mr Tillerson had been heading for a comfortable retirement next year. He could have been spending more time with his second wife Renda and his four children, and on his interests including scouting, the church and golf. Instead, he has walked into a firestorm.

His selection to be the top US diplomat has been denounced across the political spectrum. Environmentalists have been furious that the oil industry is apparently taking the reins in Washington, while hawkish Republicans such as Marco Rubio, the senator for Florida, have raised concerns about Mr Tillerson's ties to Russia's President Vladimir Putin. Meanwhile his strengths, including the experience that comes from leading a \$380bn global company, are largely being ignored. His path to confirmation is looking rocky.

Solidly built, with a slow Texan drawl and a mane of silver hair, Mr Tillerson certainly looks the part for Mr Trump's testosterone-heavy top team. "He knows something about projecting an image in the world of American strength and competence," says Suzanne Maloney of the Brookings Institution, who worked as an adviser to Exxon in the early 2000s.

There was not much in his childhood to suggest he was destined for high office. Born in Wichita Falls in north Texas, he was the son of a mobile baker who took a pay cut to become a professional scout leader. He had his first job at eight, helping his mother mow lawns, and at 16 worked as a janitor at Oklahoma State University, while at the weekends picking cotton and beans. The scouts were responsible for enthusing him about engineering, putting up televisions at a jamboree so the boys could watch the moon landing in 1969.

The other institution that has moulded him is Exxon, where he has worked for 41 years since joining in 1975 immediately after graduating from the University of Texas. In the oil industry Exxon is universally admired for its engineering excellence, but sometimes resented for the arrogance and inflexibility of its managers. As one observer puts it, it is "high IQ but low EQ". Mr Tillerson fitted in well. "He is a product of the Exxon culture, which is extremely process-driven," says the former chief executive of another large oil company.

He has been a solid leader at Exxon, not quite matching the impact of his acclaimed predecessor Lee Raymond. He was slow to grasp the potential of the shale revolution that transformed the US oil and gas industry in the 2000s. One former rival at a large oil company praises him as "very careful, and very thorough, and very conservative".

He is also a tough negotiator. That quality was vital in Russia, after he took responsibility for Exxon's operations there in 1998. He played a key role in driving forward the big Sakhalin 1 oil development off the country's far eastern coast, while the government dragged its feet and tried to apply pressure to secure a better deal. Then, after he had taken over as chief executive in 2006, Exxon was able to fight off competition from US and European rivals to sign a series of potentially lucrative deals in 2011-13 with the state-controlled oil company Rosneft.

Those relationships worry many US politicians. Mr Tillerson was awarded Russia's Order of Friendship in 2013. John McCain, the Republican senator, observed this week that he would never accept an award from Mr Putin.

But some say the concerns are misplaced. "I don't think the 'friendship' with Putin is anything more than a working relationship," says one former chief executive "You have to go where the oil is, even if you don't like it."

On climate change, Mr Tillerson's critics have more of a case. At a conference in London in October, he said: "We share the view that the risks of climate change are real and require serious action." But when he discusses the issue, he does not sound like an enthusiast for action to cut greenhouse gas emissions and rejects the idea that oil

companies must go “beyond” fossil fuels.

While Russia and climate change seem likely to be the key issues for his confirmation, other questions may turn out to be more contentious if Mr Tillerson makes it to the state department. He is a pragmatist, and has not expressed many strong opinions about the world, but unlike Mr Trump he has been a public supporter of free trade. On that issue he may have to fight in the cabinet, or else set his principles aside.

Speaking about the scouts’ duties, Mr Tillerson said: “Whatever direction we take, whether we like it [and] agree with it or not, we have a duty to this country as citizens, to participate in this government.”

It is a fine ideal, and now he is trying to live by it. But the reality of government may turn out to be rather more messy.

## 蒂勒森：从 CEO 到国务卿提名人

被特朗普提名为国务卿的蒂勒森在埃克森美孚是一位稳健型领导者，他善于谈判，这在处理俄罗斯业务时特别有用。

上世纪 60 年代末和 70 年代初，当同龄人都去参加摇滚音乐节并反对越南战争时，十几岁的雷克斯·蒂勒森(Rex Tillerson)却利用暑期，在休斯顿以北约 35 英里的 Strake 营地担任美国童子军(Boy Scouts of America)的游泳指导。

如今，他担任埃克森美孚(ExxonMobil)首席执行官，是美国最有权势的企业领导人之一。他表示，这一切要完全归因于他在童子军得到的锻炼。他在今年 10 月该公司的一次会议上表示：“我的全部领导力培训都是从美国童子军获得的。”

如今，他即将确定大约 50 年前他在水里扑腾时学到的本领是否在华盛顿也能派上用处。在最近被唐纳德·特朗普(Donald Trump)提名为美国国务卿之前，蒂勒森已准备明年退休安度晚年了。他本可以与他的第二任妻子(Renda)和他的 4 个子女度过更多时光，去做自己喜欢做的事情例如童子军活动、教堂活动和高尔夫。然而他却走入了一场风暴。

他被提名为美国最高外交官一事受到了美国政界的普遍谴责。环境保护主义者对于石油行业显然将要在华盛顿当家作主感到愤怒，而共和党鹰派人士，如佛罗里达州参议员马可·鲁比奥(Marco Rubio)对于蒂勒森与俄罗斯总统弗拉基米尔·普京(Vladimir Putin)的关系提出担忧。与此同时，蒂勒森的优点基本上被忽视，比如他领导一家市值 3800 亿美元的全球企业的经验。他的提名被国会确认的道路看似困难重重。

蒂勒森身材魁梧，说话时拖着德克萨斯州人特有的慢吞吞的语调，一头银发，他看上去肯定像是特朗普散发出阳刚之气的最高团队的合适成员。布鲁金斯学会(Brookings Institution)的苏珊妮·马洛尼(Suzanne Maloney)表示：“他懂得如何将美国实力和竞争力的形象投射到全球。”马洛尼曾在本世纪初担任埃克森美孚的顾问。

蒂勒森在少年时期并未显示出他注定会跻身高层的迹象。他生在德克萨斯州北部的威奇托福尔斯(Wichita Falls)，他的父亲是一位流动面包师，后来接受减薪成为一名职业童子军领导人。蒂勒森在 8 岁时得到了第一份工作，帮助他妈妈修剪草坪，16 岁时，他在俄克拉荷马州立大学(Oklahoma State University)当清洁工，周末则摘棉花和豆子。童子军经历让他对工程产生兴趣，1969 年，他曾在童子军大会上摆上电视机，让男孩子们观看阿波罗登月。

另一个塑造蒂勒森性格的组织是埃克森美孚，1975 年从德克萨斯大学(University of Texas)毕业后，他立刻加入埃克森美孚，在那里工作了 41 年。在石油行业，埃克森美孚因其工程卓越而受到普遍赞誉，但有时又因其管理者的傲慢和刻板而受到厌恶。正如一位观察人士所言，该公司属于“高智商低情商”。蒂勒森非常适应这种环境。另一家大型石油公司的前首席执行官表示：“他是埃克森美孚文化的产物，那里极度程序化。”

蒂勒森在埃克森美孚是一位稳健型领导者，在产生的影响上与受人尊敬的前任李·雷蒙德(Lee

Raymond)不在一个水平上。他在意识到页岩革命的潜力方面行动缓慢，这场革命在本世纪头 10 年彻底改变了美国油气行业。某大型石油公司的前竞争对手称赞他“非常谨慎，非常周全，而且非常保守”。

蒂勒森还是一位强硬的谈判对手。在他 1998 年接掌埃克森美孚俄罗斯业务后，这种特质在俄罗斯非常重要。他在推动俄罗斯远东海岸的萨哈林一号(Sakhalin 1)大型石油开发项目上发挥了重要作用，与此同时俄罗斯政府故意拖延，试图施压以寻求更有利的交易。然后，在他于 2006 年担任埃克森美孚首席执行官以后，该公司得以击败美欧竞争对手，在 2011 年至 2013 年与俄罗斯国有控股的俄罗斯石油公司(Rosneft)签订了一系列潜在盈利可观的协议。

这些关系让很多美国政治人士感到担忧。2013 年，蒂勒森被俄罗斯授予“友谊勋章”(Order of Friendship)。共和党参议员约翰·麦凯恩(John McCain)最近表示，他永远不会接受普京颁发的任何奖励。

但一些人表示这些担忧是错位的。“我不认为与普京的‘友谊’具有超越工作关系的任何内涵，”一位前首席执行官表示，“哪里有石油，你就必须到哪里去，即便你不喜欢。”

在气候变化问题上，蒂勒森的批评者们拥有更多的口实。在今年 10 月伦敦的一个会议上，他曾表示：“我们都认为，气候变化的风险是切实的，需要认真的行动。”但在他讨论这个问题时，他听上去不像是一位热衷于减排行动的人，并且拒绝有关石油公司必须“超越”化石燃料的观点。

尽管俄罗斯和气候变化可能会成为蒂勒森的提名得到国会确认的关键问题，但如果他成功出任国务卿，其他问题可能更具争议。他是一位务实主义者，从未就世界问题表达过很多强有力的观点，但与特朗普不同，他一直公开支持自由贸易。在这个问题上，他可能要在特朗普内阁争斗一番，否则他就要放弃自己的原则。

在谈到童子军的责任时，蒂勒森表示：“不管我们走哪个方向，不管我们是否喜欢以及是否认同，作为公民，我们都对这个国家负有责任，要参与到政府中来。”

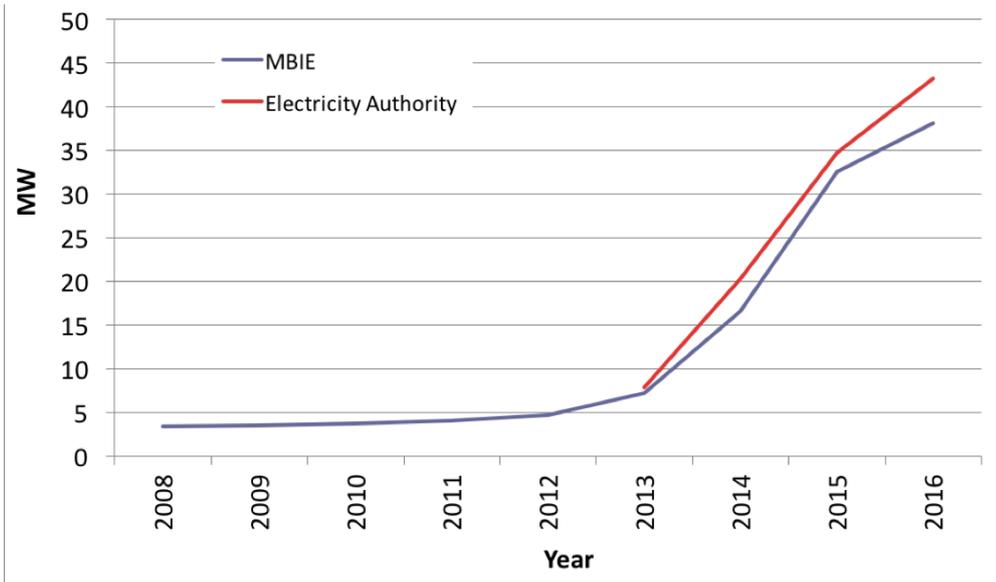
这是一种很好的理想，如今他正试图践行这种理念。但政府的现实可能被证明更加混乱。

## *New Energy* (新能源)

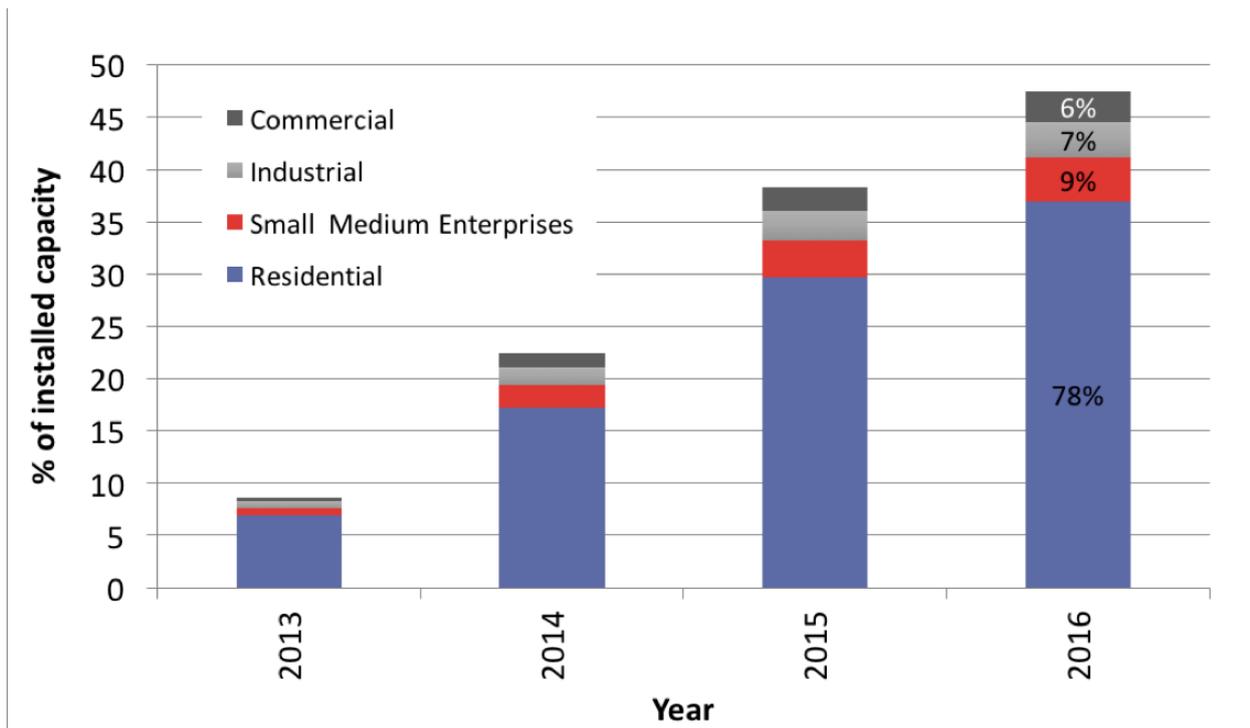
### **Will New Zealand learn from Australia's rooftop solar mistakes?**

What's happening in New Zealand mimics what happened in Australia 5 or so years ago. The question is, will they learn from our mistakes?

PV uptake in New Zealand has increased dramatically since 2013, is now averaging about 1 MW a month, and has reached about 11,000 systems (45 MW). This is shown below using two different data sources, where the MBIE data from 2014 onwards was based on projections.

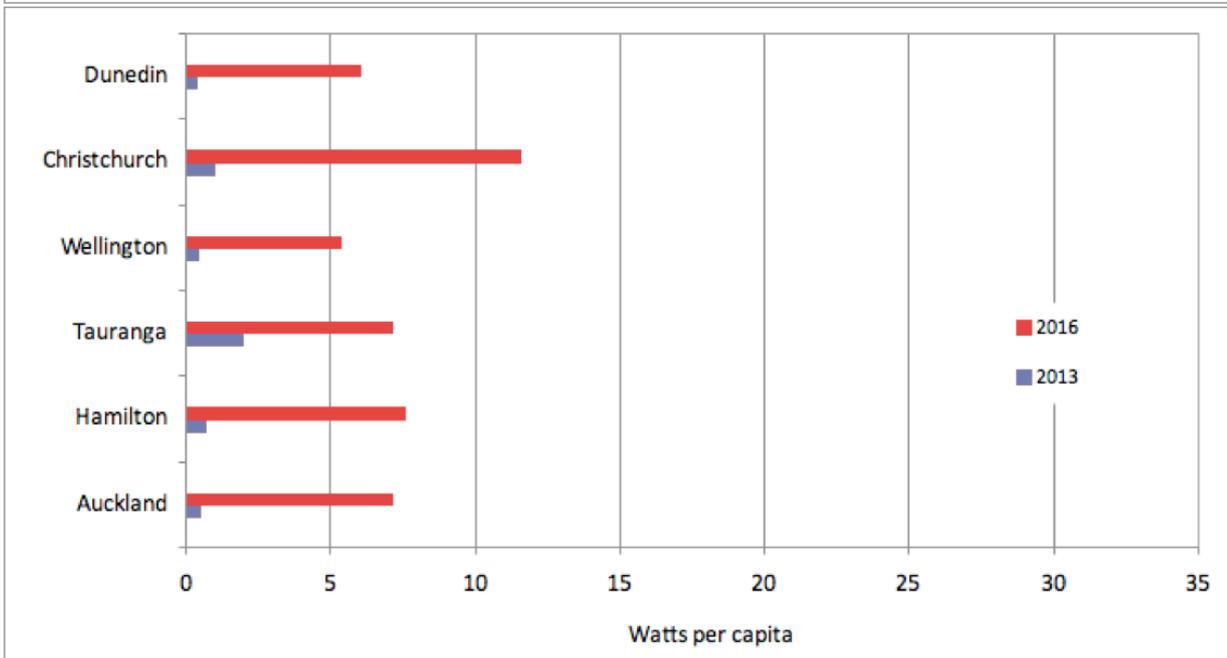
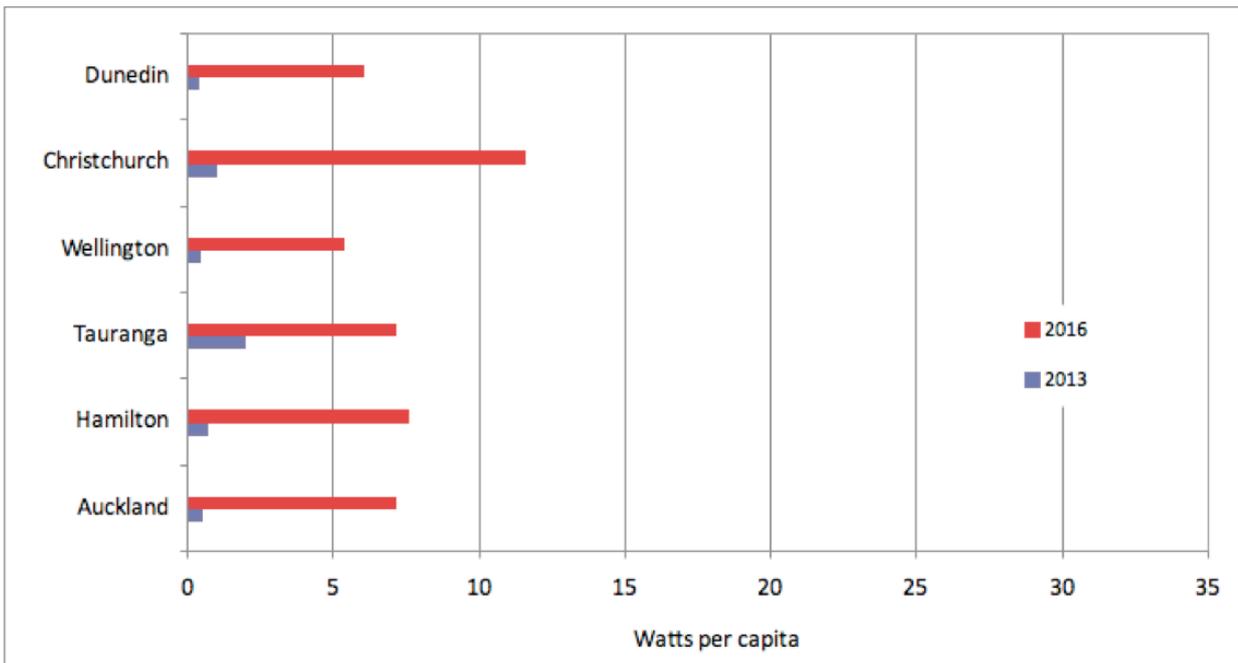


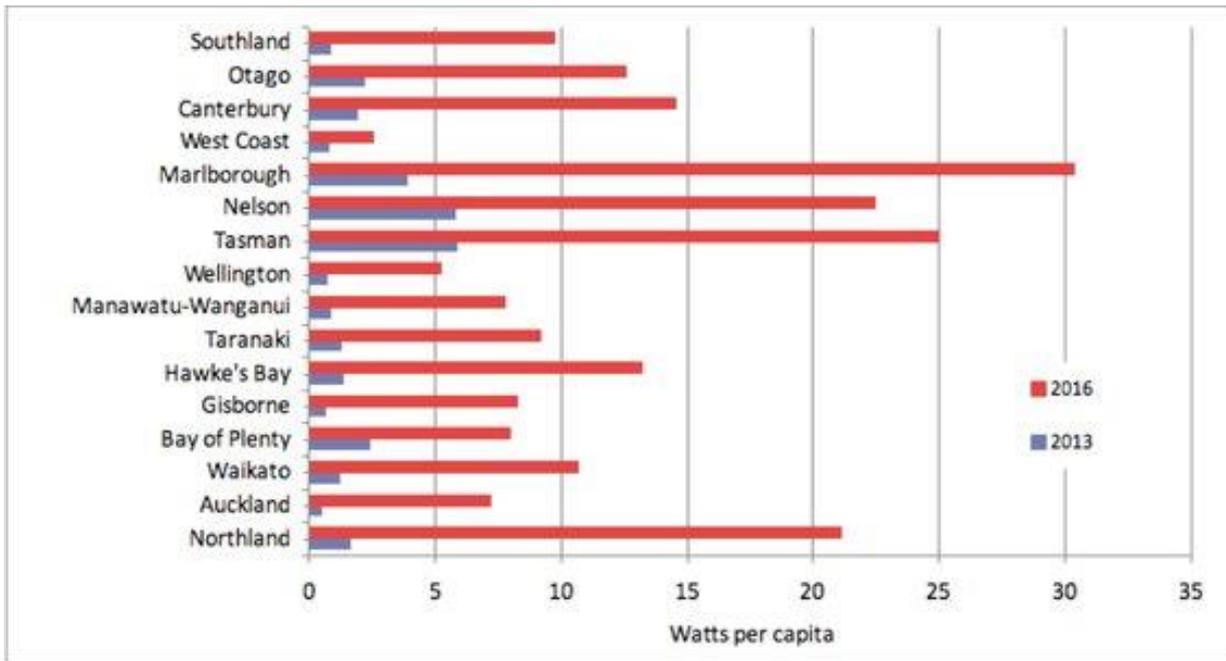
As occurred in the Australian market, uptake has mainly been by households (about 78% of installations), followed by small to medium enterprises at 9%, industrial at 7% and commercial at 6%.



Also as occurred in Australia, a greater proportion of households in regional areas install solar compared to their city counterparts.

# Mcanxixun Information

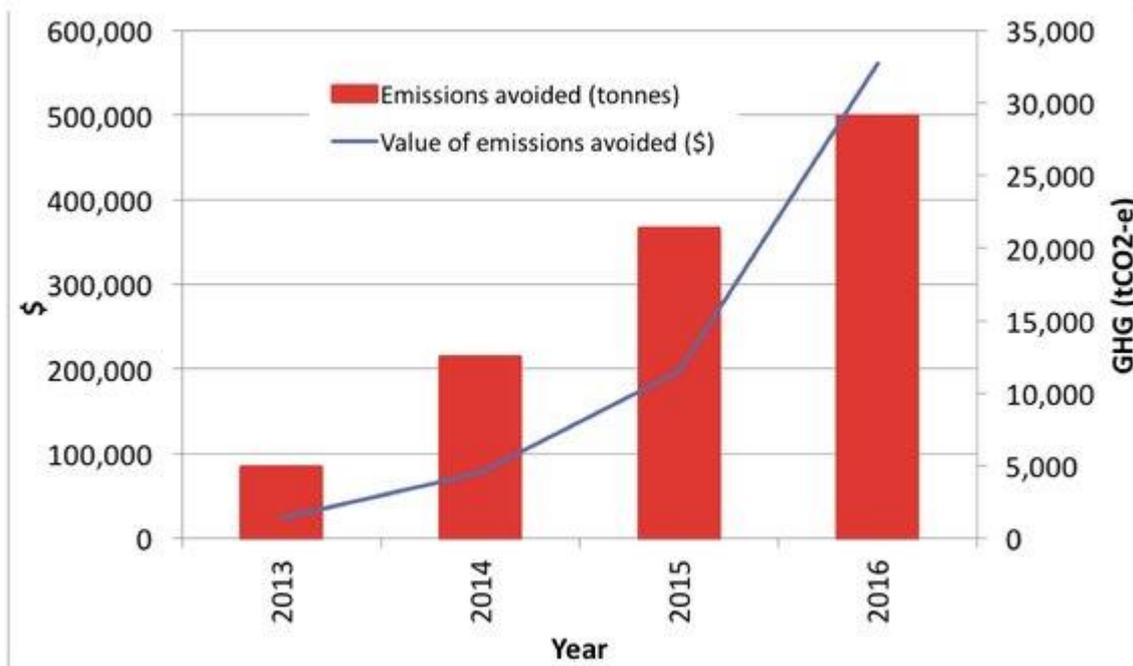




This increased uptake has started a backlash from incumbents, with discussion about the costs solar is imposing, restrictions on uptake, 'solar tariffs', and so on. ITP Renewables was commissioned by a collection of individuals and businesses (coordinated through the Sustainable Energy Association of NZ, SEANZ) to write a report on the impacts of solar PV in NZ.

Although 80% of NZ electricity is from renewables, resulting in an average emissions intensity of 0.14 tCO<sub>2</sub>-e/MWh, the installed PV largely displaces open cycle gas turbines (OCGT), which are the predominant marginal generators (in NZ, wind, geothermal and hydro are considered to be baseload).

The currently installed PV systems are expected to generate about 53 GWh in 2016, and so avoid the production of 29,000 tCO<sub>2</sub>-e with a value of around \$NZD 560,000. This value is based on the current spot price for GHG emissions in the NZ emissions trading scheme, which has been operating without controversy since 2009.



## Mcanxixun Information

Of course, the uptake of solar in NZ has been much slower than in Australia, in part because of the lower insolation but mainly because of the lack of government incentives. The currently installed capacity in NZ is 9.2W per capita, whereas Australia's is 190W per capita.

This all means that NZ is in a unique position, in that solar uptake is starting to take off at a time when batteries are becoming financially viable, and other technologies such as the Power Genius, a NZ invention which enables diversion of loads to soak up PV generation, are coming to market.

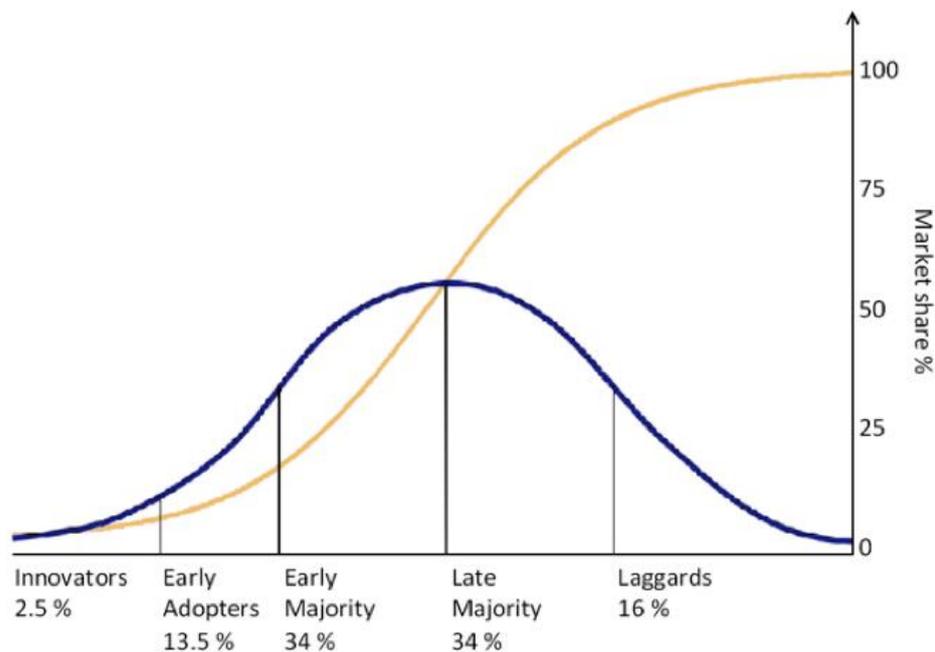
The figure below shows the APVI chart of PV uptake in Australia, with the equivalent installed capacity for NZ, and the installed capacity at the same watts per capita as currently in Australia. Although NZ is unlikely to have the same absolute uptake as Australia, the figure does show there is significant scope for increase.



Of course, as occurred in Australia, the reaction of most of the incumbents has been to try to maintain the status quo (rewind about 5 years in Australia) rather than try to benefit from the new technologies (as many, but not all, incumbents in Australia are focussing on now).

There has even been the usual reports attempting to claim that PV will impose unfair costs on other customers and even increase GHG emissions. Such reports miss the point that the customers who take up PV will likely be the same customers who take up batteries, which can be used to flatten the demand profiles and therefore network costs for all.

Opposition to PV also ignores the widely observed consumer technology adoption curve (below), illustrating the typical trajectory. As it has done in other countries, this trajectory is likely to be followed in NZ for PV, battery storage, energy efficiency and DSM. Uptake is being enhanced by availability of management via mobile apps.



The NZ Ministry of Business, Innovation and Employment recently modelled a number of scenarios, including one termed the ‘Disruptive’ scenario, which has the highest uptake of PV, and concluded that “Solar and battery systems reduce the evening peaks by around 490 MW in 2040 and 800 MW in 2050” – which is about 40% of the rated PV capacity in those years.

The simultaneous uptake of batteries in NZ will also mean that PV continues to offset OCGT electricity (rather than ‘eating down’ into the contribution from existing renewables), and as a result emissions would be reduced by an estimated 8 million tCO<sub>2</sub>-e, worth \$NZD500 million, between 2016 and 2040.

It remains to be seen how quickly the NZ electricity industry and regulators will recognise and benefit from the opportunities that PV, batteries and the host of new energy technologies have to offer.

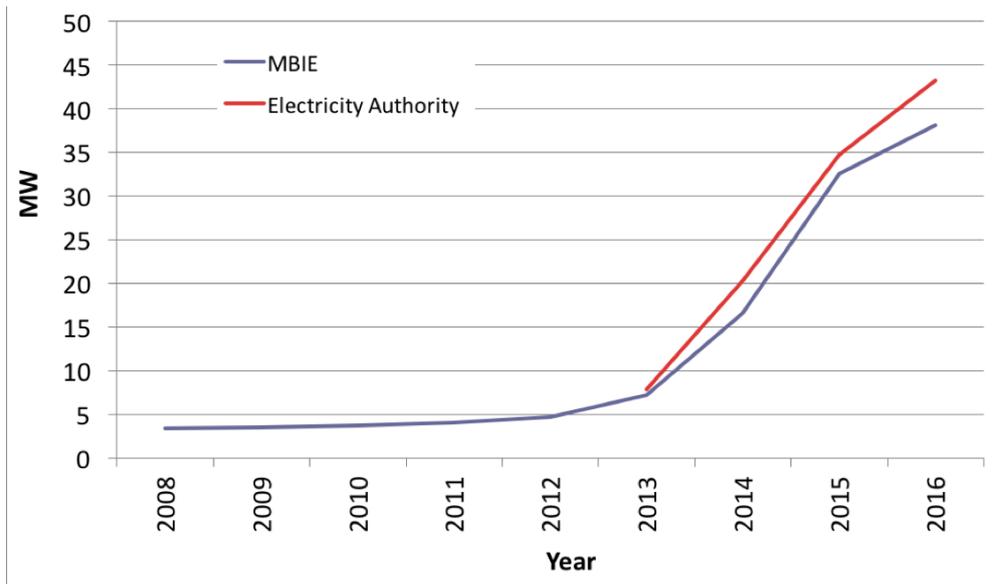
Rather than selectively penalising new technologies, specifically PV, the focus should now be on how to make the most of the coming opportunities driven by increased customer choice, and in enabling the existing electricity industry to transition to the ‘new normal’.

Integrated distributed energy systems present a significant opportunity to provide broad-reaching social benefits. Leasing options and solar PPAs can help overcome the capital cost barrier. Community-owned systems are proving popular for renters or people who have little solar access. Government housing is a prime opportunity for lower income households to reduce their costs, and of course, the interest in PV presents the perfect opportunity to also implement energy efficiency and load management options.

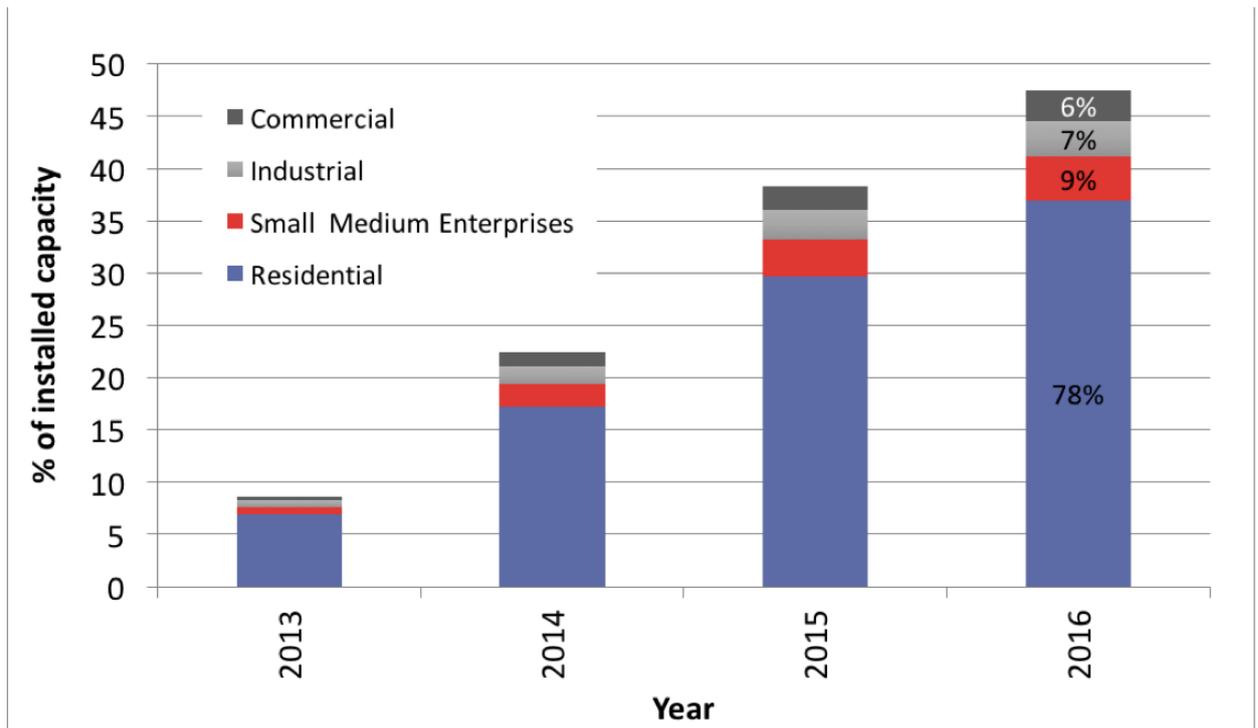
## 新西兰会从澳大利亚的屋顶太阳能错误中吸取经验教训吗？

新西兰所发生的情况重现了澳大利亚大约五年前所出现的情况。问题是，他们是否从错误中吸取了经验教训？

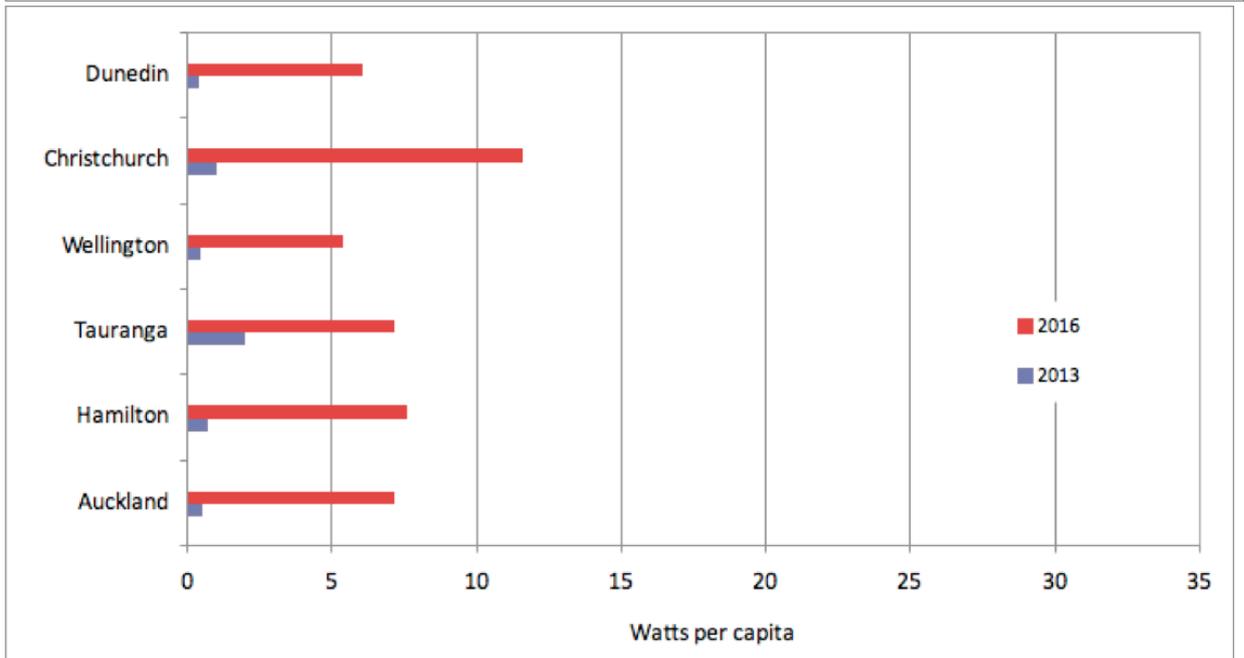
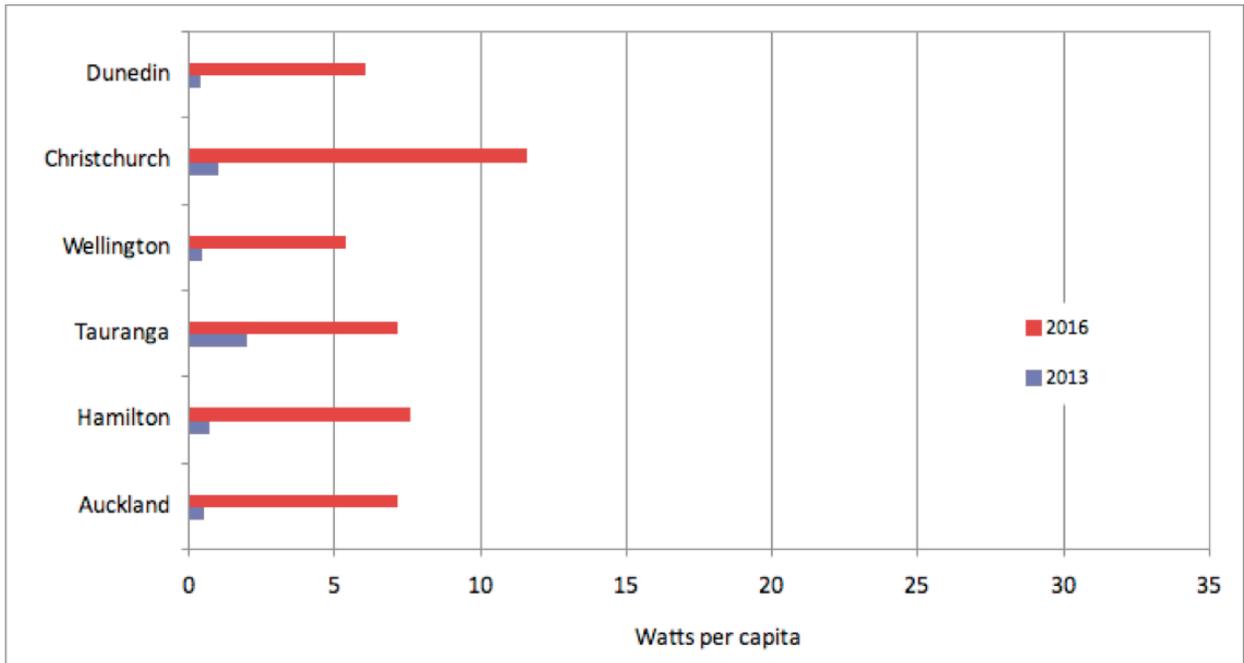
自 2013 年以来，新西兰的光伏吸收率急剧增加，目前平均每月大约有 1 兆瓦，并且已经达到了大约 11000 个系统（45 MW）。这在下文中利用两个不同的数据资源进行了展示，其中 2014 年起的 MBIE 数据是建立在预测的基础之上。

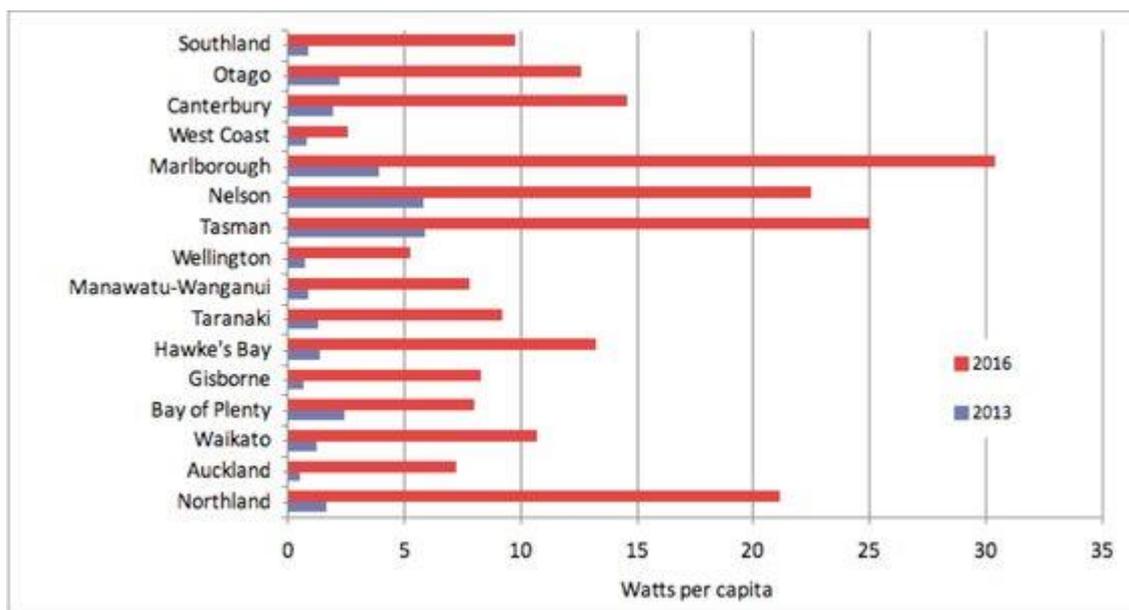


与澳大利亚市场中发生的一样，吸收率主要是家庭（大约 78% 的安装率）构成，接下来是占 19% 的中小型企业，工业达到 7%，商业达到 6%。



同样也如澳大利亚所发生的一样，与城市居民相比，该地区很大一部分家庭都安装了太阳能。

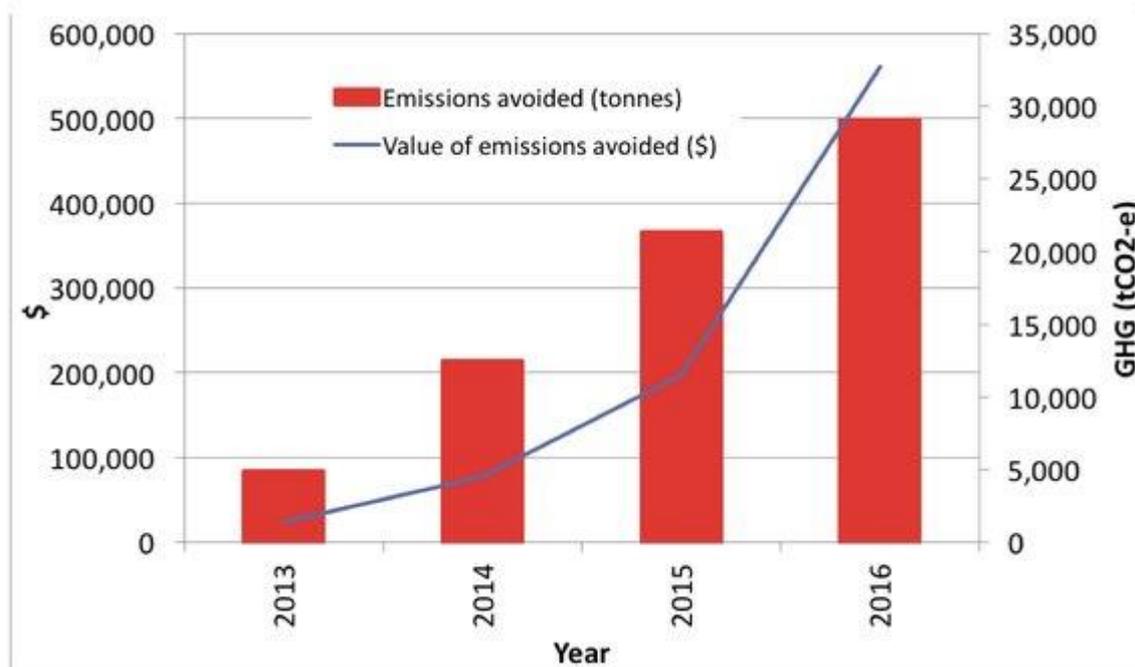




增加的吸收率已经在现有设施中开始出现反激烈反应，其中关于太阳能所产生的成本、吸收的限制、‘太阳能关税’等等问题进行了讨论。ITP 可再生能源受到个人和企业的联合会（通过新西兰可持续能源协会 SEANZ 协调构成）的委托，编写关于新西兰太阳能光伏影响的报告。

虽然新西兰 80% 的电力来自于可再生能源，产生平均排放强度达 0.14 tCO<sub>2</sub>-e/MWh，但是安装的 PV 在很大程度上取代了开式循环燃气轮机（OCGT），OCGT 是主要的边际机组（在新西兰，风能、地热能和水电被认为是基荷）。

目前安装的 PV 系统预计在 2016 年产生 56 GWh，并且因此避免了 29000 tCO<sub>2</sub>-e 的产生，其价值大约为 56000 新西兰元。这个值是根据新西兰排放量交易方案的 GHG 排放量目前现货价格产生的，该方案自 2009 年以来一直进行着无争议运营。



当然，新西兰的太阳能吸收率比澳大利亚慢得多，部分原因在于较低的日照，但是主要原因是缺乏政府的支持。目前新西兰安装的产能为人均 9.2 W，而澳大利亚达到了人均 190W。

这都意味着，新西兰处于独特的位置上，其中太阳能的吸收率在电池变得在经济上可行并且其他技术上市时，例如一项新西兰发明令负荷向吸收光伏发电转移的 Power Genius，开始增长。

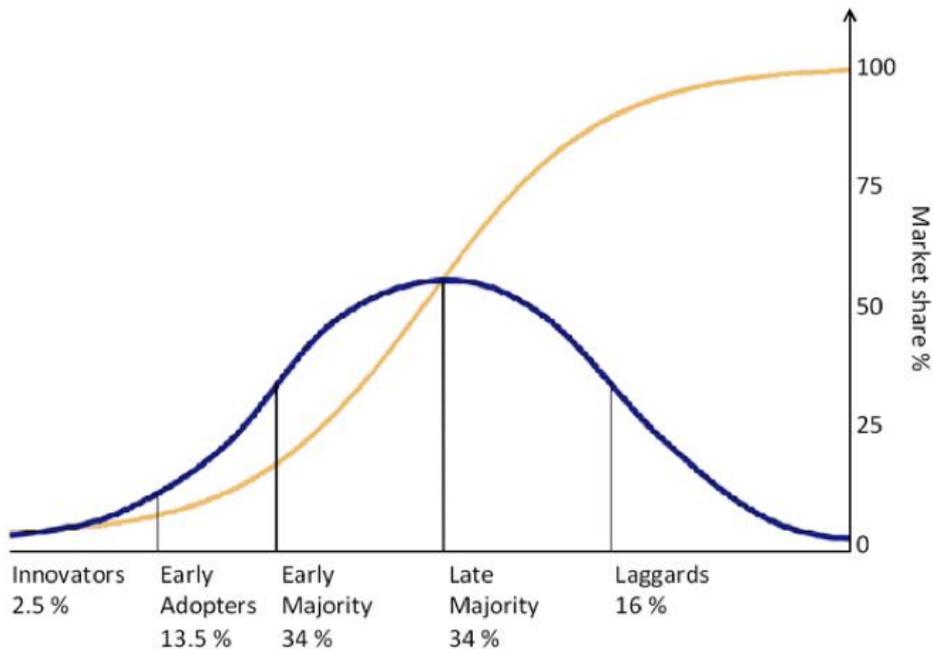
下图展示了澳大利亚 PV 吸收率的 APVI 表，其中新西兰具有同等的装机容量，并且装机容量的人均瓦特数与目前的澳大利亚相同。虽然新西兰不太可能具有与澳大利亚相同的绝对吸收率，但是该图确实展示出明显地增长。



当然，与澳大利亚发生的情况一样，大部分在职者的反应一直都是试图维持现状（大约重现了澳大利亚五年前的状况），而不是试图从新的技术中获益（像许多澳大利亚在职者目前专注的一样，并不是所有人都这样）。

甚至时常有报道试图表明，PV 将给其他消费者带来不公平的费用，甚至会增加 GHG 的排放量。这样的报道遗漏了一点，即采用 PV 的客户有可能同样采用了电池，他们有可能利用电池来平衡需求曲线，以及所有的网络成本。

对于 PV 的反对意见也忽略了广泛观察到的消费者技术采用曲线（见下文），展示了典型的轨迹。就像在其他国家做的一样，新西兰的 PV、电池、能源效率和 DSM 很有可能会遵循该轨迹。吸收率通过移动应用程序受到管理可用性的增强。



新西兰商务、创新和就业部最近模拟了多个场景，包括一个称为“破坏性”的场景，其具有最高的 PV 吸收率，并且总结称，“太阳能和电池系统在 2040 年将降低大约 490MW 的晚高峰，并且在 2050 年降低大约 800MW”——大约是这些年额定 PV 容量的 40%。

同时新西兰的吸收率也将意味着 PV 将继续抵消 OCGT 电力（而不是“消耗”现有可再生能源的贡献），并且因此排放量在 2016 至 2040 年间可能会减少大约 800 万 tCO<sub>2</sub>-e，价值 5 亿新西兰元。

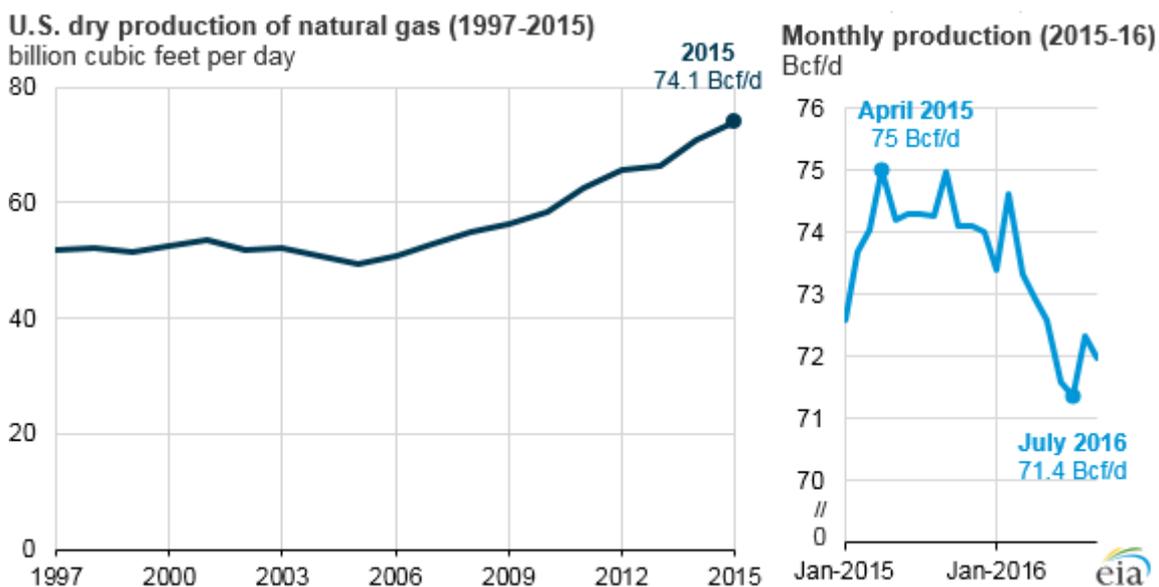
仍然可看到新西兰电力行业和监管机构将以多快的速度承认并从 PV、电池和新能源技术的主体必须提供的机遇中受益。

不同于选择性的惩罚新技术，特别是 PV，目前的重点应该关注于如何通过增加的客户选择来推动大部分即将出现的机遇，并且令现有的电力行业过渡到“新的正常”状况下。

综合分布式能源系统提供了一个重要的机会，提供广泛的社会效益。租赁选项和太阳能应用程序有助于克服资本成本障碍。社区所有的系统将受到没有太阳能系统的租房者或人们的欢迎。政府住房是低收入家庭降低他们的成本的一个主要的机会，并且当然，PV 的利益呈现了完美的机会，用于实施能源效率和载荷管理选项。

## Natural Gas (天然气)

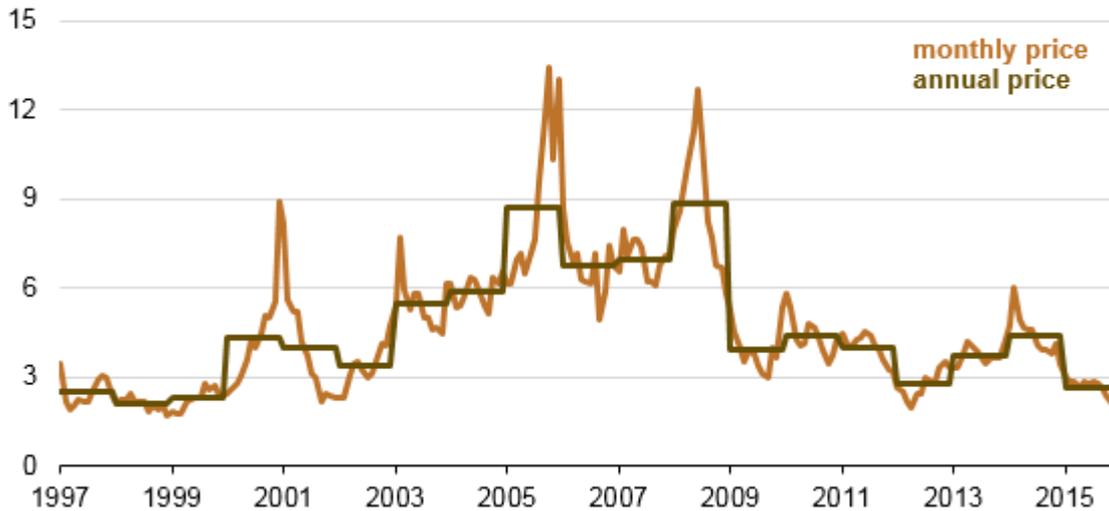
### U.S. natural gas production resilient to market changes in 2015, but has fallen in 2016



Source: U.S. Energy Information Administration, Natural Gas Annual

U.S. dry natural gas production continued to increase in 2015, reaching 74.1 billion cubic feet per day (Bcf/d). This record-high level was a 4.5% (3.2 Bcf/d) increase over 2014, according to EIA's Natural Gas Annual, which provides final production data for 2015. The increase in 2015 production levels marked the tenth straight annual increase, with the most recent increase occurring despite natural gas prices at the Louisiana Henry Hub declining more than 40% from an average of \$4.55 per million British thermal unit (MMBtu) in 2014 to \$2.62/MMBtu in 2015.

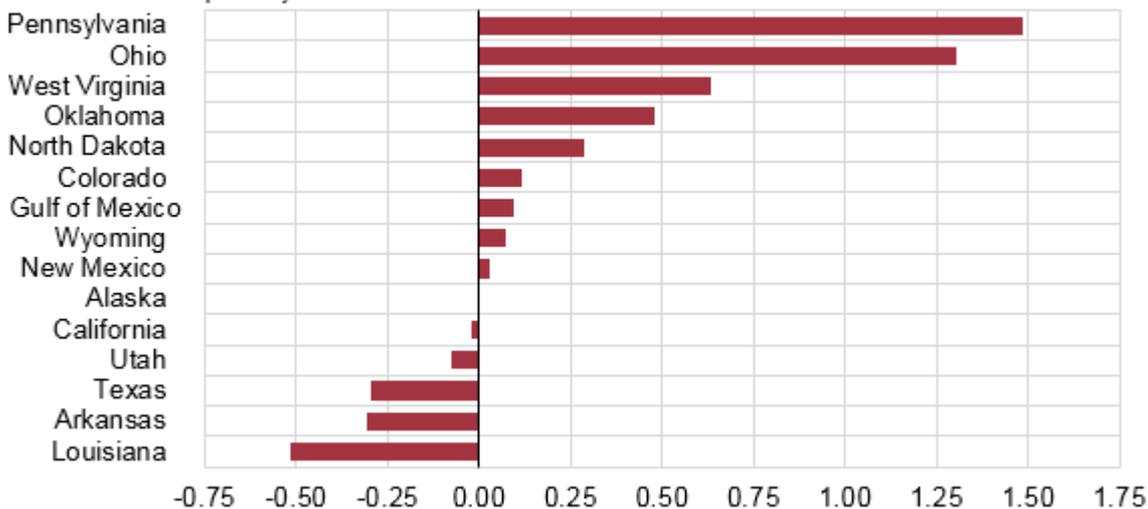
Natural gas price at Henry Hub  
\$/MMBtu



Source: U.S. Energy Information Administration

Production gains were highest in Pennsylvania, Ohio, and West Virginia, due in large part to production from the Marcellus and Utica/Point Pleasant shales. These three states accounted for most of the total increase in 2015. Although annual production in 2015 grew, monthly U.S. natural gas production has since declined in 2016, falling to 71.4 Bcf/d in July 2016 after reaching a peak of 75 Bcf/d in April 2015.

Change in dry natural gas production by state or area (2015 versus 2014)  
billion cubic feet per day



Source: U.S. Energy Information Administration, Natural Gas Annual

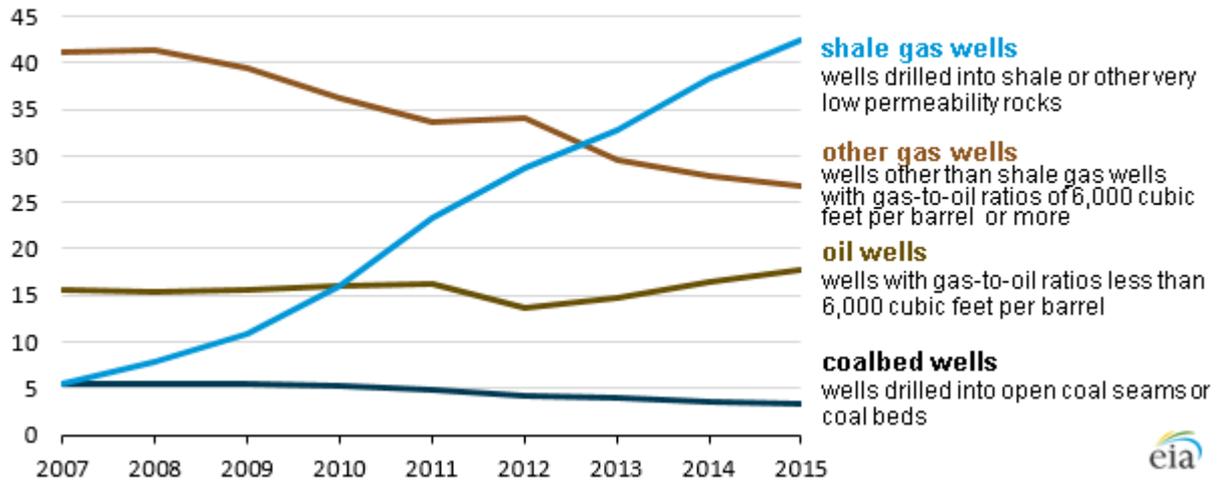
Texas remains the largest natural gas producing state, producing 19.4 Bcf/d in 2015. For the third consecutive year, Pennsylvania saw the largest total gain in annual production, increasing to 13 Bcf/d in 2015, up 11.4% from 11.6 Bcf/d in 2014. Ohio saw the largest percentage increase in natural gas production, increasing 49.9%, from 1.3 Bcf/d in 2014 to 2.6 Bcf/d in 2015. Louisiana production declined by the largest amount, falling to 4.8 Bcf/d in 2015, a decrease of 0.5 Bcf/d, or 10.8%, compared to 2014.

Shale gas wells continue to be the largest source of total natural gas production. According to the Natural Gas Annual, gross withdrawals from shale gas wells—which, unlike dry natural gas production, include all compounds extracted at the wellhead—increased from 38.3 Bcf/d in 2014 to 42.4 Bcf/d in 2015, representing 47%

of total natural gas production. This increase in production occurred despite declines in natural gas prices.

**U.S. natural gas gross withdrawals by well type (2007-15)**

billion cubic feet per day

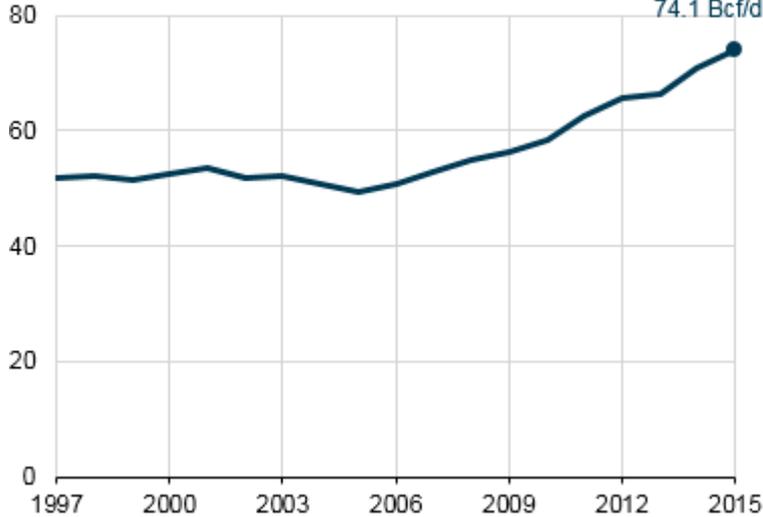


Source: U.S. Energy Information Administration, Natural Gas Annual

美国天然气生产在 2015 年适应市场变化，但在 2016 年下降

**U.S. dry production of natural gas (1997-2015)**

billion cubic feet per day



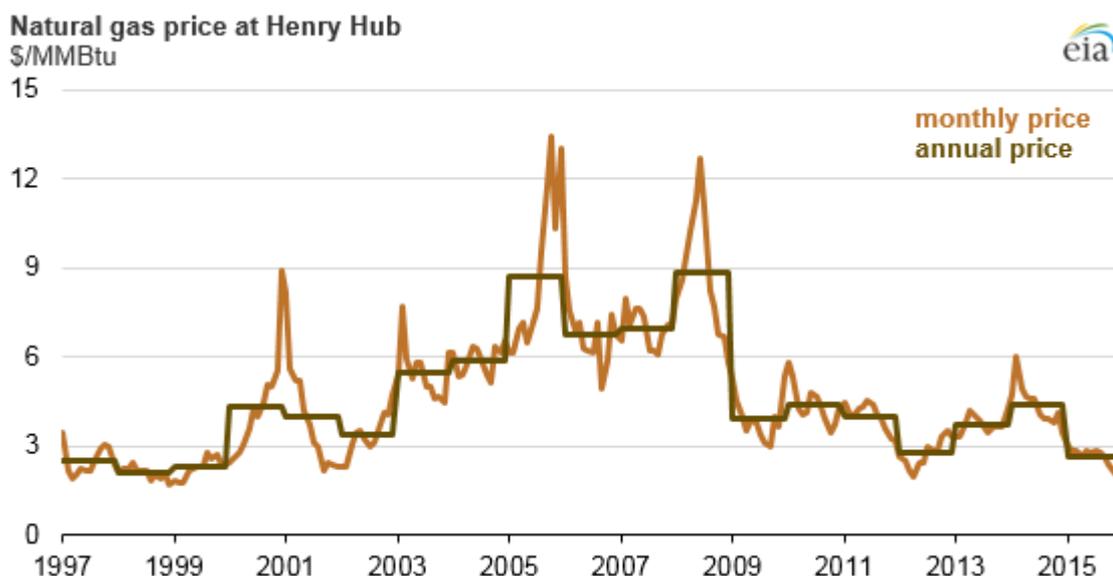
**Monthly production (2015-16)**

Bcf/d



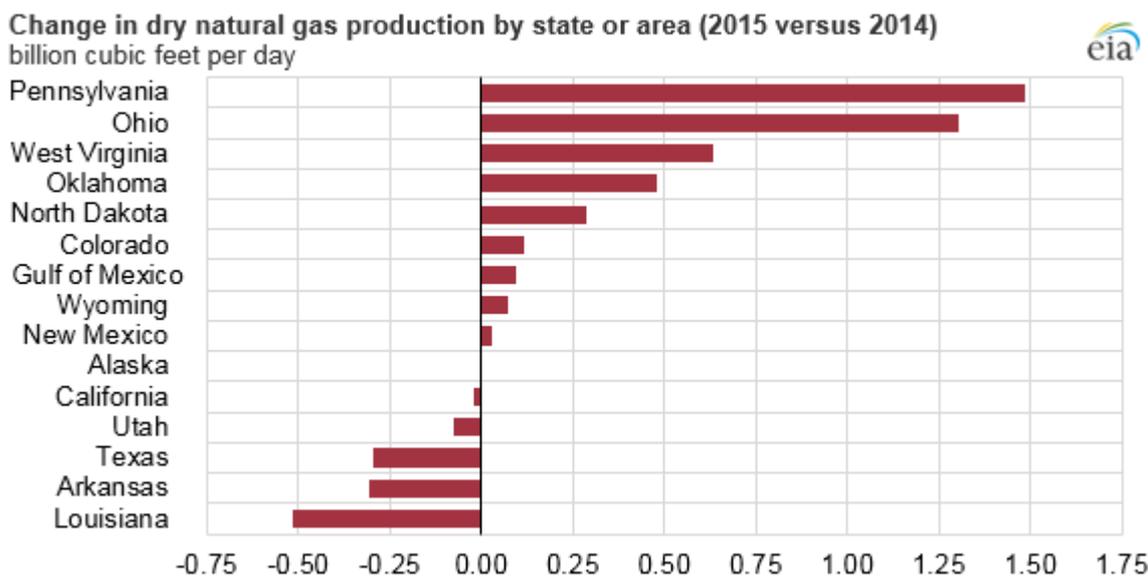
资料来源：美国能源信息署，天然气年报

美国干燥天然气产量在 2015 年继续增加，达到 741 亿立方英尺/天 (74.1Bcf/d)。根据 EIA 的天然气年报，这一创纪录的高位比 2014 年增长了 4.5% (3.2Bcf/d)，该年度提供了 2015 年的最终产量数据。2015 年生产水平的增长标志着连续第十年的年增长，尽管路易斯安那州亨利枢纽的天然气价格从 2014 年的平均每百万英热单位 (MMBtu) 4.55 美元下降超过 40%，到 2015 年为 2.62 美元/MMBtu，但是最近出现增长。



资料来源：美国能源信息管理局

在宾夕法尼亚州、俄亥俄州和西弗吉尼亚州，生产效益最高，主要是由于 Marcellus 和 Utica / Point Pleasant 页岩的生产。这三个州占 2015 年总增量的大部分。尽管 2015 年年产量增长，但美国天然气产量自 2016 年以来每月下降，2016 年 7 月达到 71.4Bcf/d，在 2015 年 4 月达到峰值 75Bcf/d 之后。



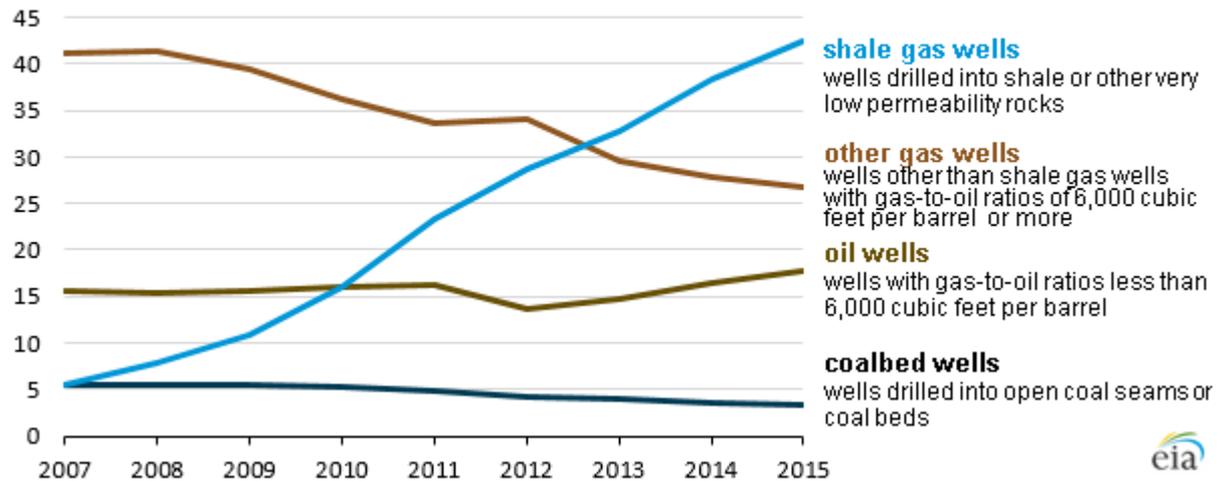
资料来源：美国能源信息署，天然气年报

德克萨斯州是最大的天然气生产国，2015 年产量为 194 亿立方英尺/天。连续第三年，宾夕法尼亚州的年产量增长最大，增长到 130 亿立方英尺/天，2015 年增长 11.4%，从 116 亿立方英尺/天。俄亥俄州天然气产量增长最大，增长 49.9%，从 2014 年的 1.3Bcf/d 增加到 2015 年的 2.6Bcf/d。路易斯安那州生产量下降最大，2015 年下降至 4.8Bcf/d，与 2014 年相比减少 0.5 Bcf/d 或 10.8%。

页岩气井仍然是天然气总产量的最大来源。根据天然气年报，与干天然气生产不同，包括在井口提取的所有化合物的页岩气井的总提取量 - 从 2014 年的 38.3Bcf/d 增加到 2015 年的 42.4Bcf/d，占总天然气生产的 47%。尽管天然气价格下降，但产量增加。

U.S. natural gas gross withdrawals by well type (2007-15)

billion cubic feet per day



资料来源：美国能源信息署，天然气年报

## Floating LNG unit to expand Turkey's annual gas storage capacity by 5.3B cbm

Expected to contribute more than 5 billion cubic meters (CBM) of natural gas to Turkey's annual gas supply, the GDF Suez Neptune plant, Turkey's first Floating liquefied natural gas (LNG) Storage Regasification Unit (FRSU), has started conducting test studies in İzmir's Aliaga district. In a period of only six months unit will be able to transfer the capacity, which is usually activated in four years, to Turkey's national gas supply. This is possible since it operates from the water.

The LNG regasification project, conducted by Etki Liman İşletmeleri Doğal Gaz İthalat ve Ticaret AŞ (Etki Port Operations Natural Gas Import and Trade Inc.) and founded by Kolin Group and 50 percent owned by Kalyon Group, has reached its final stage. According to information received from the senior executives of Etki Liman İşletmeleri AŞ by the Anadolu Agency, the floating LNG Storage and Regasification Unit GDF Suez Neptune, which can provide a prompt solution to Turkey's energy supply crisis, is anchored at the private pier built on the coast alongside Çakmaklı Street in İzmir's Aliaga district.

The Norwegian-flagged 2009-built, 283-meter-long, 43-meter-wide floating unit will be able to transfer LNG from different vessels to the national system in addition to the gas supply at -163 degrees Celsius it contains. A storage capacity of 5.3B CBM Included among the entry terminals of the natural gas imported by Turkey, the floating vessel will have a storage capacity of 145,000 CBM of liquid natural gas and can supply over 5.3 billion CBM of gas annually to the national system.

With a capacity of more than 10 percent of Turkey's annual demand of about 40 billion CBM of gas, the unit is continuing its test studies in the process of converting liquefied gas into natural gas. If the unit completes the testing process, it is expected to start providing natural gas to the system by the end of next week.

It has been reported that the demand for floating terminals has rapidly increased in the world due to the advantages of fast mobilization, resource diversity, and supply security, and GDF Suez Neptune was one of about 20 floating units in the world. It was also noted that the vessel's capacity, which would be activated in four years if it were a fixed facility, can be transferred to the national system within only a total of six months thanks to the floating unit. Operated by a long-term leasing method, the power plant was established in Aliaga due to its high natural gas supply, but it can be taken to different regions of Turkey in the case of new pier investments.

With the floating terminal in Aliğa, the daily capacity of Silivri's underground gas storage plant is expected to increase to 25 million CBM, and EgeGaz's LNG plant in Aliğa to 24 million CBM, thus increasing Turkey's daily supply capacity of natural gas from 191 million to a total of 224 million CBM.

Starting operation on Dec. 23

The floating LNG terminal project, which was brought to fruition by Energy and Natural Resources Minister Berat Albayrak to ensure supply security and resource diversity in the natural gas area in Turkey in the short-term, will be put into active use at a ceremony that President Recep Tayyip Erdoğan and Prime Minister Binali Yıldırım will attend in Aliğa on Dec. 23.

FSRU in Marmara on the agenda

A floating natural gas terminal with an annual capacity of 6 billion CBM is planned to be established in Marmara. It was previously reported in the Dünya daily that Maks Energy has applied to the Energy Market Regulatory Authority (EMRA) in order to obtain a license to operate a FSRU that will be located in the Gulf of İzmit in the Altınova district. The fact that the unit will be located in Marmara region, which consumes 30 percent of Turkey's gas supply, is important. The environmental impact assessment study for this location has already been obtained, as it was previously considered for the construction of a shipyard, but it was later decided that it should host a floating liquefied natural gas (LNG) terminal. The LNG supplied by tankers will be regasified and supplied to the gas distribution network of state-owned company Petroleum Pipeline Corporation (BOTAŞ). The capacity of this floating terminal would be 6 billion CBM of gas per year, of which some 4 billion would be used by BOTAŞ and the rest by various private companies. The project is expected to cost between \$550-600 million.

## 浮式液化天然气装置使土耳其年度天然气储存容量扩大 53 亿立方米

土耳其第一个浮式液化天然气 (LNG) 储存再气化装置 (FSRU), GDF Suez Neptune 工厂已经开始在伊兹密尔的 Aliğa 区进行试验研究, 预计将给土耳其的年度天然气供应提供超过 50 亿立方米的天然气。在仅仅六个月的时间内, 装置将能够转移通常在四年内才能激活的容量到土耳其的国家天然气供应中。因为它凭借水资源来运作, 因此这是可能的。

这项 LNG 再气化项目由 Etki Liman İşletmeleri Doğal Gaz İthalat ve Ticaret AŞ (Etki 港口运营天然气进口和贸易公司) 进行, 由科林集团创立, 并且 Kalyon 拥有 50% 股份, 已经到了其最后阶段。根据阿纳多卢通讯社从 Etki Liman İşletmeleri AŞ 高管那里收到的消息, 可以给土耳其的能源供应危机提供及时解决的浮式 LNG 储备和再气化装置 GDF Suez Neptune 工厂固定在建立在靠着伊兹密尔的 Aliğa 区 Çakmaklı 街的海岸线上的私人码头上。

浮式装置是挪威于 2009 年建造的, 283 米长, 43 米宽, 可以将 LNG 从不同的船只中转移到国家系统中, 此外, 还在 -163 摄氏度进行供应。储存容量达 53 亿立方米。浮式船只包含在土耳其进口的天然气进入港口, 将会有 145000 立方米液态天然气的储存容量, 并且可每年向国家系统提供 53 亿立方米的天然气。

该装置有着土耳其大约 400 亿立方米的年度天然气需求容量的百分之十几, 正在将液态天然气转化为天然气的过程中继续其测试研究。如果该装置完成了测试过程, 有望在下周末开始向系统提供天然气。

据报道, 由于快速移动, 资源多样性, 以及供应安全等有利条件, 全世界对浮式终端的需求快速增长, 并且 GDF Suez Neptune 是世界上拥有大约 20 个装置的国家之一。有人还指出, 船只的容量, 如果这是一个固定设施, 将在四年内激活, 原因是浮式装置可以在仅仅六个月的时间内转移到国家系统中。发电厂通过长期的租赁方法运营, 由于其高的天然气供应而建立在 Aliğa, 但是在新的码头投资的情况下, 它可以被带到土耳其的任何地方。

由于 Aliğa 的浮式终端, 锡利夫里的地下天然气储备工厂的日产能预计会增加到 2500 万立方米, 在 Aliğa 的 EgeGaz LNG 工厂将增加到 2400 万立方米, 这样会将土耳其的天然气日供应能力从 1 亿 9100 万

立方米增加到 2 亿 2400 万立方米。

12 月 23 日开始运营

通过能源和自然资源部长 Berat Albayrak 带来成效，以在短期内保证土耳其天然气地区的供应安全和资源多样性的浮式 LNG 终端项目，将会在一场总统 Recep Tayyip Erdoğan 和首相 Binali Yıldırım 都会参加的于 12 月 23 日在 Aliğa 举行的典礼上投入使用。

提上日程的在马尔马拉的浮式储存气化装置

有着年度容量为 60 亿立方米的浮式天然气终端，计划建在 Marmara。Dünya 日报先前报道，马克斯能源公司 (Maks Energy) 已经应用于能源市场监督管理局 (EMRA)，以期得到运营将会坐落于阿尔特诺瓦区伊兹米特湾的 FSRU 的许可证。该装置将会坐落于消耗土耳其天然气供应 30% 的马尔马拉区这个事实非常重要。这个位置的环境影响评估已经得到了，因为这个地区之前被考虑修建一个造船厂，但是之后决定这里应该作为一个浮式液化天然气 (LNG) 终端。由邮轮提供的 LNG 将会被再气化，然后供应给国有企业石油管道公司 (BOTAŞ) 的天然气分销网络。这个浮式终端的容量将会是每年 60 亿立方米的天然气，其中 40 亿立方米将由 BOTAŞ 使用，余下的由各个民营企业使用。这个项目计划会花费 5 亿 5000 万到 6 亿美元。

## Qatar to supply Pakistan 400m ton LNG in 2017

Saqar Bin Mubarak Al Mansuri, Ambassador of Qatar in Islamabad, has disclosed that his country would provide 400 million ton LNG to Pakistan in the year 2017. In 2016, Qatar provided 300 million ton LNG to Pakistan that played an important role in eliminating gas crisis in the country.

Talking to this reporter at his office on Tuesday, Al Mansuri said an important Pakistan-Qatar joint ministerial commission meeting will be held on December 22 where a high level delegation from Qatar led by Muhammad Bin Saleh Alsada, Minister of Energy and Industry of Qatar, will participate.

The ambassador said Qatar companies would recruit skilled and non-skilled labour including engineers, doctors, technicians, bankers and service sector persons from Pakistan. He said a number of investors from Qatar will also be included in the joint ministerial commission meeting to assess investment opportunities in the fields of energy, higher education, agriculture, health and trade in Pakistan. He said bilateral trade between Qatar and Pakistan stood at \$600 million and both the countries were striving to increase it. The Qatar envoy said to commemorate the National Day of Qatar they were preparing to host a reception on December 16 for the Pakistani nation and government officials.

## 卡塔尔计划在 2017 年向巴基斯坦供应 4 亿吨液化天然气

卡塔尔驻伊斯兰堡大使 Saqar Bin Mubarak Al Mansuri 透露，卡塔尔将会在 2017 年向巴基斯坦提供 4 亿吨液化天然气。2016 年，卡塔尔向巴基斯坦提供了 3 亿吨液化天然气，这对该国消除天然危机起了重要作用。

于星期三在他的办公室告知记者，Al Mansuri 说一场重要的巴基斯坦卡塔尔部长级联合委员会将于 12 月 22 日举行，由卡塔尔能源工业部长 Muhammad Bin Saleh Alsada 为首的高级别代表团将会参加这次会议。

大使说，卡塔尔的公司将会从巴基斯坦招聘熟练和非熟练劳动力，包括工程师、医生、技术人员、银行家以及服务部门人员。他说来自卡塔尔的一些投资者也同样会参加这次联合部长级委员会，以评估在巴基斯坦的能源、高等教育、农业、保健以及贸易领域的投资机会。他说卡塔尔和巴基斯坦之间的双边贸易额为 6 亿美元，两国都在努力增加这个值。卡塔尔特使说为了庆祝卡塔尔国庆，他们准备在 12 月 16 日为巴基斯坦国家和政府官员举行接待会。

## Turkey to cut gas supply to power plants

Turkish natural gas system operator Botas has instructed state-run gas-fired power plants to reduce their contractual gas use to just 10pc from 08:00 local time (05:00 GMT) tomorrow.

Residential demand remains high, because of a cold snap. The move has supported Epias day-ahead power prices, which reached 380 lira/MWh (€104/MWh) today, their highest since February 2012, when gas supplies dropped amid technical problems.

Prices for delivery at 17:00 tomorrow settled at TL1,169.55/MWh.

Average temperatures in Istanbul are forecast at 6.1°C for tomorrow — down by 1.7°C compared with the seasonal norm — and are expected to remain 0.9-2.9°C below average in the remainder of this month.

Utilities were instructed yesterday to limit their contractual gas use to 25pc, from 08:00 local time today. All have halved their consumption since 14 December, and state-owned Euas and Tetas since late November.

Russian flows through Western Line pipeline's Malkoclar entry point, on the border with Bulgaria, stood at 42.7mn m<sup>3</sup> yesterday, down by 3.3mn m<sup>3</sup> on the day, but above contractual quantities of around 40.5mn-41mn m<sup>3</sup>/d.

The 129,767m<sup>3</sup> Bachir Chihani is likely to deliver an Algerian LNG cargo to the 6mn t/yr Marmara Ereglisi terminal tomorrow, while the 177,000m<sup>3</sup> LNG Lagos 2 is scheduled to unload at the 4.4mn t/yr Aliaga facility on 24 December.

And Turkey's first LNG floating storage and regasification unit is expected to deliver up to 6mn-7mn m<sup>3</sup>/d to the system by the end of this week. The combined supply could help relieve the grid of its present limitations.

The 145,700m<sup>3</sup> LNG Benue is expected to dock at Aliaga on 27 December, followed by the 140,000m<sup>3</sup> Arctic Discoverer five days later and the 155,00m<sup>3</sup> GDF Suez Point Fortin on 3 January.

## 土耳其削减发电厂的天然气供应

土耳其天然气系统运营商 Botas 已指示国营燃气电厂在当地时间明日 8 点（格林威治时间 5 点）减少天然气使用至 10pc。

由于寒流，住宅需求居高不下。此举支持 Epias 的日前电价，今天电价达到每兆瓦时 380 里拉（每兆瓦时 104 欧元），是 2012 年二月由于技术问题天然气供应下降以来最高。

明天的价格定于明天 17 点，每兆瓦时 1,169.55 TL。

伊斯坦布尔明天平均温度预计是 6.1°C——与季节性规范相比，下降了 1.7°C——预计在本月剩下的这几天，都比平均温度低 0.9-2.9°C。

公用事业昨天指示，从今天当地时间八点起限制合同天然气使用至 25pc。12 月 14 日以来所有消费减少了一半，包括国有欧盟配额和土耳其买家。

俄罗斯流经西部管道的 Malkoclar 入口点，与保加利亚接壤，昨天处于 42.7mn m<sup>3</sup>，下降了 3.3mm<sup>3</sup>，但超过大约 40.5mn-41mn m<sup>3</sup>/天的合同量。

129,767m<sup>3</sup> 的 Bachir Chihani 明天可能会提供一个阿尔及利亚 LNG 货物每年 6mn 吨的 Marmara Ereglisi 终端，而 12 月 24 日，177,000m<sup>3</sup> 的 LNG Lagos 2 会在每年 4.4mn 吨的 Aliaga 工厂卸载。

土耳其的第一个 LNG 浮式储能和再气化装置，预计将在本周末前给系统提供高达 6mn-7mn m<sup>3</sup>/天的量。合并后的供应有助于缓解电网目前的局限性。

145,700m<sup>3</sup> 的液化天然气 Benue 预计在 12 月 27 日停靠在 Aliaga，其次是五天后 140,000m<sup>3</sup> 的 Arctic Discoverer 和 1 月 3 日 155,00m<sup>3</sup> 的 GDF Suez Point Fortin。

### **LNG strategies for the EU and India**

India's gas consumption is lower than the EU's, but it too, like the EU, relies heavily on imports. With LNG likely to remain a key part of India's gas supplies in the future, and given recent changes in the global market, what is the future potential of LNG imports for the EU and India? What are the best energy policies for the two regions?

The following article was part of The Gateway of India Dialogue 2016 compendium 'Where Geopolitics meets Business'. This piece has been published separately.

The Gateway of India Geoeconomic Dialogue will happen on 13-14 February 2017.

India and the European Union (EU) share a common fate in terms of fossil fuels: both are poor in proved indigenous reserves and need substantial amounts of imports to fill the gap between domestic production and consumption.

This is also true for natural gas. Given recent changes in the global market for liquefied natural gas (LNG)—including flexibility of trade and falling prices—what is the potential of LNG imports in the future for the EU and India? What are the LNG strategies that the two regions can consider?

In the EU, the gap between domestic production in 2014 was around 255 billion cubic meters (bcm). [1] It is mainly covered by imports of piped gas, roughly two-thirds of which come from Russia and Norway. In recent years, LNG accounted for 10% of total gas imports, [2] far below the EU's 2015 total regasification capacity of 195 billion cubic meters per year (bcma). [3]. Although the EU's demand for gas peaked in 2010 and has decreased since, the need for additional imports is likely to rise in the future due to more rapidly decreasing domestic production.

LNG could play an important role, not only in filling the supply gap, but also in reducing the dependence on imports from Russia.

India's gas consumption, at 50.6 bcm, is much lower than the EU's, but with production only at 31.7 bcm, [4] it too relies to a large extent on imports. For natural gas, the supply gap in 2014 amounted to around 19 bcm. [5] In the absence of import pipelines, India exclusively relied on LNG imports to its four existing terminals with a total capacity of around 35 bcma. [6]

Although India's gas demand peaked in 2011, it is still projected to more than double until 2030 due to population and economic growth, and poverty reduction. [7] Without the development of substantial domestic gas fields, this means that the supply gap will increase in the future, raising the question where the gas for India will come from. Given the political difficulties associated with building import pipelines in the region to access Caspian or Iranian gas (through Afghanistan or Pakistan), LNG is likely to remain a key pillar of India's gas supplies in the future.

The new EU LNG strategy

The EU's energy policy is based on three pillars: security, competitiveness, and sustainability. Against this background, the European Commission proposed a strategy for LNG and gas storage in February 2016. [8] In terms of security, the strategy aims to diversify import sources and routes, with a particular focus on Eastern Europe. Given that some 95% of existing EU LNG import capacity is in Western Europe, the EU needs to explicitly aim at improving access to LNG particularly in Eastern European countries currently dependent on only one import source.

In terms of competitiveness, the strategy proposes a three-pronged approach. First, it focuses on infrastructure, which is not only needed to complete the EU's internal gas market but also to improve access to international LNG markets either directly or through other member states. Within this context, the Commission also highlights the role of gas storage in optimising gas infrastructure use and in balancing the system. Second, it urges the completion of the internal gas market in order to send the right price signals for both LNG imports and for required infrastructure investments. And third, the strategy calls for closer cooperation with international partners,

both suppliers and major consumers of LNG (including India), in order to remove obstacles in the trading of LNG and to advance towards free, liquid, and transparent global LNG markets.

Regarding sustainability, the EU LNG strategy highlights the potential of LNG in transport, in particular as a means to decarbonise shipping and heavy duty vehicles (such as trucks). It also points to the possibility of using small-scale LNG to replace more polluting fossil fuels in the heat and power sectors, for example in remote or off-grid locations.

Elements of a successful LNG strategy [9]

Current global market dynamics could support further diversification towards LNG. Increasing the flexibility of LNG trade, decreasing LNG prices and LNG charter rates, and a reduction in Asia-Pacific import prices could all reinforce the economic viability of a LNG strategy. This is true for the EU as well as for India, and these trends are expected to continue as more LNG enters the market, mainly from new suppliers such as Australia and the U.S.

However, in order to be effective and to avoid mismatches between investments and market reality, a LNG strategy should be part of a broader natural gas and energy strategy. This latter strategy should not only consider issues related to the security of gas supplies, but also take into account potential future developments of gas demand—also within the context of Paris Agreement on climate change. A LNG strategy should thus seek to define a space for LNG in the overall demand equation, taking into account the whole energy system and interactions between different energy sectors (for example, between gas and power markets, and gas and the transport sector). This will help avoid inefficient investments, as was the case in Europe in the recent past driving down utilisation rates of EU LNG terminals to 19% in 2015. [10]

As important, the key to a successful LNG strategy is to develop sufficient infrastructure. Low utilisation rates of EU LNG terminals can be explained by decreasing gas demand, but partly also by the fact that there are not enough interconnections between EU countries (for example, between Spain and France). In order to fully exploit the benefits of LNG, a system of interconnectivity requires three essentials: (i) additional infrastructure, either in the form of interconnectors or additional LNG terminals; (ii) a clear regulatory framework avoiding contractual congestion at the interconnection points; and (iii) properly functioning gas hubs to facilitate trade.

In addition, any type of infrastructure to be built should be based on a cost-benefit analysis, taking into account possible lower cost alternatives. For example, LNG Floating Storage and Regasification Units (FSRU) may turn out to be more cost-effective than large LNG terminals or new pipelines. They can add flexibility to the system and can be used for trading if utilisation rates are too low.

Finally, the element of international cooperation between the EU and India should be strengthened with the aim to promote transparent and liquid LNG markets around the world. The European Commission [11] particularly highlights the need to ensure that market participants are not prevented from establishing commercial relationships (for example, by territorial restrictions) and that there are no limitations to the free trade of LNG—both under normal market conditions and in the event of an external shock.

Arno Behrens is Head of Energy and Research Fellow, Centre for European Policy Studies (CEPS), Brussels.

The Gateway of India Dialogue was co-hosted by Gateway House and the Ministry of External Affairs on 13-14 of June 2016. The 2017 conference, The Gateway of India Geoeconomic Dialogue will be held on 13-14 of February 2017.

This feature was exclusively written for Gateway House: Indian Council on Global Relations. You can read more exclusive features here.

For interview requests with the author, or for permission to republish, please contact outreach@gatewayhouse.in or 022 22023371.

© Copyright 2016 Gateway House: Indian Council on Global Relations. All rights reserved. Any unauthorized copying or reproduction is strictly prohibited.

### References

- [1] BP, BP Statistical Review of World Energy, June 2015, <<https://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2015/bp-statistical-review-of-world-energy-2015-full-report.pdf>>
- [2] European Commission, Liquefied Natural Gas and gas storage will boost EU's energy security, European Commission: Fact Sheet, 16 February 2016, <[http://europa.eu/rapid/press-release\\_MEMO-16-310\\_en.htm](http://europa.eu/rapid/press-release_MEMO-16-310_en.htm)>
- [3] European Commission, Commission Staff Working Document accompanying the Communication on an EU strategy for liquefied natural gas and gas storage, SWD(2016) 23 final, 16 February 2016, <[https://ec.europa.eu/energy/sites/ener/files/documents/1\\_EN\\_autre\\_document\\_travail\\_service\\_part1\\_v3.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/1_EN_autre_document_travail_service_part1_v3.pdf)>
- [4] BP, BP Statistical Review of World Energy, June 2015, <<https://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2015/bp-statistical-review-of-world-energy-2015-full-report.pdf>>
- [5] Ibid.
- [6] EY, Gas market in India – Overview and future outlook, 2016, <[http://www.ey.com/Publication/vwLUAssets/EY-gas-market-in-india/\\$FILE/EY-gas-market-in-india.pdf](http://www.ey.com/Publication/vwLUAssets/EY-gas-market-in-india/$FILE/EY-gas-market-in-india.pdf)>
- [7] IEA, World Energy Outlook 2015, OECD/IEA, 2015, <<http://www.worldenergyoutlook.org/weo2015/>>
- [8] European Commission, Communication on an EU strategy for liquefied natural gas and gas storage, COM (2016) 49 final, 16 February 2016, <[https://ec.europa.eu/energy/sites/ener/files/documents/1\\_EN\\_ACT\\_part1\\_v10-1.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/1_EN_ACT_part1_v10-1.pdf)>
- [9] Molnar, Gergely, Arno Behrens, Christian Egenhofer, Fabio Genoese, Europe's LNG Strategy in the Wider EU Gas Market, CEPS Policy Brief No. 33, October 2015, <[https://www.ceps.eu/system/files/PB333\\_Europe%20LNG%20Strategy\\_0.pdf](https://www.ceps.eu/system/files/PB333_Europe%20LNG%20Strategy_0.pdf)>
- [10] European Commission, Commission Staff Working Document accompanying the Communication on an EU strategy for liquefied natural gas and gas storage, SWD (2016) 23 final, 16 February 2016, <[https://ec.europa.eu/energy/sites/ener/files/documents/1\\_EN\\_autre\\_document\\_travail\\_service\\_part1\\_v3.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/1_EN_autre_document_travail_service_part1_v3.pdf)>
- [11] European Commission, Communication on an EU strategy for liquefied natural gas and gas storage, COM(2016) 49 final, 16 February 2016, <[https://ec.europa.eu/energy/sites/ener/files/documents/1\\_EN\\_ACT\\_part1\\_v10-1.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/1_EN_ACT_part1_v10-1.pdf)>

## 欧盟和印度的液化天然气战略

印度的天然气消费量低于欧盟，但是它也像欧盟一样，严重依赖于进口。液化天然气未来可能会继续成为印度天然气供应的重要组成部分，考虑到近期全球市场的变化，欧盟和印度进口液化天然气的未来是什么？对这两个国家来说，最优的能源政策是什么？

下面这篇文章是印度对话 2016 纲要‘地缘政治遇到商业’的一部分。这条也被单独出版。

2017 年 2 月 13-14 日，将举行印度经济对话。

印度和欧盟（EU）在化石燃料方面有着共同的命运：探明的固有储量很少，需要大量进口来填补国内生产和消费的差距。

这也是真实的天然气。考虑到液化天然气（LNG）全球市场最近的变化——包括贸易的灵活性以及价格下降——未来欧盟和印度液化天然气进口的潜力是什么？这两个国家可以考虑什么样的 LNG 战略？

在欧盟，2014 年国内生产的差距约是 2550 亿立方米。【1】主要由管道进口燃气，其中三分之二来自俄罗斯和挪威。近年来，液化天然气占天然气总进口量的 10%。【2】远低于欧盟 2015 年每年 1950 亿立方

米的总再气化能力。**【3】** 尽管欧盟对天然气的需求在 2010 年达到高峰，此后有所下降，但由于国内生产的迅速下降，未来对进口的需求可能会上升。

液化天然气可以发挥重要作用，不仅填补了供应缺口，还减少了从俄罗斯进口的依赖。

印度的天然气消费是 506 亿立方米，比欧盟的低很多，但是每年的生产量仅仅 31.7 bcm。**【4】** 在很大程度上也依赖于进口。天然气 2014 年的供应缺口达 190 亿立方米。**【5】** 在进口管道的情况下，印度完全依赖于 LNG 进口，四个终端的容量大约是 350 亿立方米**【6】**

尽管印度的天然气需求在 2011 年达到顶峰，但由于人口和经济的增长、贫穷的减少，印度的产量预计将增长一倍直到 2030 年。**【7】** 没有国内天然气田的大量开发，这意味着未来的供应缺口将增加，这引出了印度天然气将何去何从的问题。考虑到该地区与建设连接里海或伊朗的进口管道相关的不同政治难题，（需经过阿富汗和巴基斯坦），LNG 可能会继续成为印度未来天然气供应的一个重要支柱。

#### 欧盟新的 LNG 战略

欧盟的能源政策基于三大支柱：安全、竞争力和可持续性。在此背景下，欧盟委员会在 2016 年 2 月提出了 LNG 和天然气储存的战略。**【8】** 安全方面，该战略的目的是使进口来源和路线多元化，尤其侧重于东欧。鉴于欧盟现有的 95% 进口 LNG 能力在西欧，欧盟需要明确目标，提高 LNG 的准入，尤其是目前只依赖于这一进口来源的东欧国家。

竞争力方面，该战略提出一个三管齐下的办法。首先，重点在基础设施，这不仅需要完成欧盟内部的天然气市场，还要提高其他成员国直接或见解进入国际 LNG 市场的能力。在这一背景下，证监会还强调了储气库优化天然气基础设施使用的作用和平衡系统。第二，它敦促内部天然气市场的完成，为进口 LNG 和所有基础设施建设发出正确的价格信号。第三，该战略要求加强与国际合作伙伴的合作，不仅是供应商还是 LNG 主要的消费者（包括印度），为了消除 LNG 交易的障碍，向自由、明亮、透明的全球 LNG 市场前进。

至于可持续发展，欧盟的 LNG 战略突出其他运输的潜力，尤其是作为低碳运输和重型车辆的方法（如卡车）。它还指出，使用小规模 LNG 代替热量和电力方面的更具污染性的化石燃料，比如在偏远离网的地区。

#### 液化天然气战略成功的要素**【9】**

目前，全球市场动态可能支持 LNG 进一步多样化。增加 LNG 贸易的灵活性，降低 LNG 价格和租船费率，减少亚太进口价格，这些都可以加强 LNG 战略的经济可行性。这对欧盟和印度来说都是如此，这些趋势将继续下去，因为更多的 LNG 进入市场，主要来自澳大利亚和美国等新的供应商。

然而，为了有效并避免投资和市场现实之间的不匹配，LNG 战略应该是更广泛的天然气和能源战略的一部分。后一个战略不仅要考虑与天然气供应安全相关的问题，还要考虑到未来潜在需求的发展——在巴黎气候变化协议的背景下。因此，LNG 战略应该在整体需求方程下寻求定义 LNG 的空间，考虑到整个能源系统和不同能源部门之间的相互作用（比如，天然气和电力市场、天然气和运输部。）这将有助于避免低效率的投资，就像欧洲最近的情况一样，欧盟 LNG 码头的使用率再在 2015 年下降 19%。**【10】**

同样重要的是，LNG 战略成功的关键是发展足够的基础设施。欧盟 LNG 码头的低使用率可以通过减少天然气需求来解释，但部分是由于欧盟国家之间没有充分联系（例如西班牙和法国之间）。为了充分利用 LNG 的好处，系统之间互联互通需要三个要素：（1）额外的基础设施，无论是互联网形式还是 LNG 接收终端的形式。（2）一个清晰的监管框架避免在互联网点拥堵。（3）正常运作的天然气枢纽来促进贸易。

此外，任何类型的基础设施将建立在成本效益分析的基础上，考虑到可能的成本较低的替代品。例如浮式液化天然气储存和再气化装置（FSRU）可能会比大型 LNG 中断或新管道更划算。他们可以增加系统的灵活性，如果利用率太低，可用于交易。

最后，欧盟和印度之间国际合作的要素应该加强，以促进世界各地透明的 LNG 全球市场。欧盟委员会**【11】** 特别强调需要确保市场参与者不被建设中商业关系所阻止（如地域限制），对 LNG 的自由贸易没有限制——在正常的市场条件和外部市场的冲击下。

## Mcanxixun Information

---

Arno Behrens 是能源研究人员和布鲁塞尔欧洲政策研究中心（CEPS）的领导。

印度对话由众议院以及外交部在 2016 年 6 月 13-14 日联合举办。2017 年的印度对话会议在 2017 年 2 月 13-14 日举行。

参考文献：

[1] BP, BP Statistical Review of World Energy, June 2015, <<https://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2015/bp-statistical-review-of-world-energy-2015-full-report.pdf>>

[2] European Commission, Liquefied Natural Gas and gas storage will boost EU's energy security, European Commission: Fact Sheet, 16 February 2016, <[http://europa.eu/rapid/press-release\\_MEMO-16-310\\_en.htm](http://europa.eu/rapid/press-release_MEMO-16-310_en.htm)>

[3] European Commission, Commission Staff Working Document accompanying the Communication on an EU strategy for liquefied natural gas and gas storage, SWD(2016) 23 final, 16 February 2016, <[https://ec.europa.eu/energy/sites/ener/files/documents/1\\_EN\\_autre\\_document\\_travail\\_service\\_part1\\_v3.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/1_EN_autre_document_travail_service_part1_v3.pdf)>

[4] BP, BP Statistical Review of World Energy, June 2015, <<https://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2015/bp-statistical-review-of-world-energy-2015-full-report.pdf>>

[5] Ibid.

[6] EY, Gas market in India – Overview and future outlook, 2016, <[http://www.ey.com/Publication/vwLUAssets/EY-gas-market-in-india/\\$FILE/EY-gas-market-in-india.pdf](http://www.ey.com/Publication/vwLUAssets/EY-gas-market-in-india/$FILE/EY-gas-market-in-india.pdf)>

[7] IEA, World Energy Outlook 2015, OECD/IEA, 2015, <<http://www.worldenergyoutlook.org/weo2015/>>

[8] European Commission, Communication on an EU strategy for liquefied natural gas and gas storage, COM (2016) 49 final, 16 February 2016, <[https://ec.europa.eu/energy/sites/ener/files/documents/1\\_EN\\_ACT\\_part1\\_v10-1.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/1_EN_ACT_part1_v10-1.pdf)>

[9] Molnar, Gergely, Arno Behrens, Christian Egenhofer, Fabio Genoese, Europe's LNG Strategy in the Wider EU Gas Market, CEPS Policy Brief No. 33, October 2015, <[https://www.ceps.eu/system/files/PB333\\_Europe%20LNG%20Strategy\\_0.pdf](https://www.ceps.eu/system/files/PB333_Europe%20LNG%20Strategy_0.pdf)>

[10] European Commission, Commission Staff Working Document accompanying the Communication on an EU strategy for liquefied natural gas and gas storage, SWD (2016) 23 final, 16 February 2016, <[https://ec.europa.eu/energy/sites/ener/files/documents/1\\_EN\\_autre\\_document\\_travail\\_service\\_part1\\_v3.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/1_EN_autre_document_travail_service_part1_v3.pdf)>

[11] European Commission, Communication on an EU strategy for liquefied natural gas and gas storage, COM(2016) 49 final, 16 February 2016. <[https://ec.europa.eu/energy/sites/ener/files/documents/1\\_EN\\_ACT\\_part1\\_v10-1.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/1_EN_ACT_part1_v10-1.pdf)>

## A New World Order Is Emerging In Natural Gas

Brazil's Petrobras and partners produced their billionth barrel of oil from presalt fields this month. Underlining one of the biggest shifts to happen this decade in global crude output.

And news yesterday suggests we may be about to see another mega-shift in energy. In the worldwide natural gas business.

That was a deal struck by petro-major BP. Which is spending nearly a billion dollars to get into projects in an unexpected part of the world: western Africa.

BP said it has reached an agreement to buy stakes in development projects in Senegal and Mauritania. Which the major is acquiring from junior developer Kosmos Energy, in exchange for \$162 million cash — and subsequent payment of \$754 million in appraisal and development expenses.

That's a big outlay for BP. But the prize on the western African licenses is commensurate — with Kosmos' recently-discovered Tortue field in Mauritania holding a currently-estimated 15 trillion cubic feet of natural gas.

In fact, BP said it believes the complete acreage acquired under this deal could hold up to 50 trillion cubic feet. And those big numbers have the major eyeing the region as the world's newest center for natural gas development.

BP's chief executive officer Bob Dudley summed up these ambitions succinctly. Saying the company is looking to "create a new LNG hub in Africa." One which he noted will be supported by low production costs and "advantaged access" to global gas markets. Related: Rosneft To Ramp Up Global Expansion Under Trump

Indeed, as the map below shows, Mauritania is well-located for shipping LNG to key markets in South America and Europe. Markets that are distant from much of the Asia-focused LNG production building taking place in countries like Papua New Guinea and Australia.

BP may thus be pioneering a "new world order" for natural gas. Zeroing in on new markets at a time when much of the focus has shifted to Asia.

That could be very good news for the West Africa energy complex. Helping to spur infrastructure development and investor confidence here. Watch for results from BP's development drilling planned for 2017, and for further news on timing of development plans in this critical area.

Here's to seeing the future.

## 天然气行业出现新的世界秩序

巴西石油公司和合作伙伴，在本月从油田中生产了他们的第十亿桶石油。这是这十年全球原油产量的一个最大的变化。

昨天的消息表明，我们可能会看到世界范围内天然气能源的另一巨大转变。

这是一个主要由英国石油公司指定的协议。花费了将近十亿美元进入意想不到的地方——非洲西部的计划。

英国石油公司表示，已经达成购买塞内加尔和毛里塔尼亚开发项目股份的协议。这主要是从初级开发者 Kosmos Energy 得到，以换取 1 亿 6200 万美元的现金——以及后续评估和开发 7 亿 5400 万美元的费用。

这是英国石油公司的一大支出。但是非洲西部许可证的奖励是相称的——与最近在毛塔尼亚发现的 Tortue 油田，举办目前估计 15 万亿立方英尺的天然气。

事实上，英国石油公司表示，他相信根据这笔交易，获得全部土地面积会高达 50 万亿立方英尺。这些庞大的数字主要着眼于该地区最新的天然气开放中心。

BP 的首席执行官 Bob Dudley 简洁地总结了这些野心。他说，该公司正在寻求“在非洲建立一个 LNG 枢纽。”他指出，廉价的生产成本以及进入全球天然气市场得天独厚的条件支撑着他们。相关报道：俄罗斯石油公司在特朗普的压力下加大全球扩张。

因此，正如下图所示，毛里塔尼亚很好地将液化天然气运输到南美和欧洲的主要市场。与很多亚洲液化天然气生产大楼距离很远的市场正在代替巴布亚新几内亚和澳大利亚这样的国家。

BP 可能正在为天然气开创“新世界秩序”。着眼于新市场的时候，大部分的重点已经转移到亚洲。

这可能对非洲西部混合能源是个好消息。有助于刺激基础设施发展以及投资者的信心。注意 BP2017 年开始钻井项目的结果，以及在这个关键领域发展计划的进一步消息。

期待即将到来的未来吧。

## Minerals (矿产)

# There's another way to solve China's industrial overcapacity

Reducing excess supply in cement is easier than for coal and steel but cooperation among firms will be crucial, writes Tan Hao

A top priority for China's government in 2016 has been to reduce excess industrial capacity, a problem that is particularly evident in many energy intensive and polluting industries.

Six of those industries - including steelmaking, nonferrous metals, building materials, petrochemicals, chemicals, and electric power generation - accounted for 77% of total energy consumption of the entire Chinese industrial sector in 2010.

But today the oversupply of products, such as steel and coal, has been blamed for falling profits in Chinese industry, and led to accusations by China's trading partners that the country is causing "distortions in global markets".

That said, the plan to cut excess capacity appears to be working. Government data indicates that the steel, iron and coal mining industries have reportedly achieved their 2016 targets ahead of schedule. These were to cut 45 million tonnes of crude steel production and 250 million tonnes of coal, respectively. For comparison, China produced about 800 million tonnes of crude steel and 3.7 billion tonnes of coal in 2015.

But for the cement industry progress has been slower. In fact, cement production is up compared to last year, which suggests that the industry is failing to address overcapacity compared with the gains elsewhere.

But looking beyond the recent data towards the medium and long term prospects for reducing oversupply suggests that China's steel and coal industries may face greater challenges ahead, while the signs for cement are more promising. This is because of cement's unique product and market characteristics.

### Flawed methods

So why will it be hard to tackle excess capacity in China's steel and coal industries?

Firstly, reductions made so far in these industries may not be as impressive as they appear. The Chinese business paper, Caixin, recently reported that many steelmaking factories that were targeted as part of the government's capacity reduction plan in 2016 had, in fact, been "idle" for years. This will make reductions in 2017 and beyond much harder as the low-hanging fruit has been picked. Furthermore, closure of coal and steel plants has been supported by significant funding from central government, partly through a 100 billion yuan (US\$14.5 billion) special fund, inaccessible to other industries such as cement.

But perhaps more importantly, the two approaches to cutting excess capacity in the coal and steel industries have some important limitations.

The first approach consists of administrative measures that critics say are arbitrary and unsustainable. For example, the Chinese government issued a policy early this year requiring coal mines to operate less than 275 days per year, effectively reduced coal mining capacity by 16%. Unfortunately, the government had to relax the limit in November due to a shortage of coal.

In the steel industry, small steelworks that produce poor quality products have escaped scrutiny because they are not covered by an official list of registered steelworks.

The second approach to reducing capacity relies on intensifying market competition. In theory, firms that operate least efficiently and have the highest costs would be out-competed and forced to close. But in practice this requires the enforcement of laws and regulations with respect to environmental protection, product quality, safety

and so on. Although China is improving in these respects, prices of many products do not yet fully reflect the true costs of production. In some cases, production comes at a cost to the public, and also to those companies that are more socially and environmentally responsible, thereby denying a level playing field.

In addition, the nature of competition between companies in the same industry, in which each firm acts in its own interests, can lead to adverse market outcomes. In the face of uncertain market prospects, firms may be unwilling to exit from the market first and give others the advantage. The result is deadlock among competing firms.

Economic models suggest that it may well be large firms that cut production capacity first in a declining industry because they bear higher costs in maintaining market share than small firms. Given that large firms tend to employ more advanced technology, this scenario may lead to a reduction in technological competence at the industry level. Managerial and behavioural factors are also important. Managers may be reluctant to reduce capacity or close entirely because of career concerns, even when the company is uncompetitive and divestment may be in the best interest of investors.

### A role for cartels

One solution to these problems would be to encourage cooperation among firms to jointly reduce capacity. While cartels are often viewed as undermining market competition, they can prove useful under some circumstances.

China's Anti-Monopoly Law allows for an agreement among business operators under certain circumstances, including for the purpose of "mitigating serious decrease in sales volume or obviously excessive production during economic recessions"; as well as for "achieving public interests such as conserving energy, protecting the environment and relieving the victims of a disaster". The coal, steel and cement industries clearly meet these conditions.

But getting firms to voluntarily cooperate to cut capacity is another matter. In the coal and steel industries this would pose a significant challenge because there are a large number of independent businesses that are scattered diffusely among a large number of regions. There is an added risk that some firms would act as "free-riders" and look to take advantage of voluntary capacity closures by others firms.

### The cement industry is different

Yet there is hope that such problems could be overcome in the cement industry because its market is highly regional. Cement is mostly sourced and sold locally because a large proportion of the price results from transportation and distribution costs. In a given regional market the number of competitors is limited, making an agreement among parties to reduce capacity more likely.

There are already encouraging signs that the cement industry can facilitate capacity closures. Cement manufacturers in Shandong province, for example, have been working together to coordinate production. With support from the China Cement Association, major cement producers have also been working towards establishing a joint investment enterprise that will help to rationalise cement production capacity in the province. Under the plan, participating firms make closures in a voluntary and cooperative manner.

The China Cement Association has also made policy recommendations to the Ministry of Industry and Information Technology (MIIT) to establish a fund to compensate firms willing to close production lines and to help businesses across the country transition into other activities. Cement companies would contribute to the fund according to their level of production.

### Lessons from history

The Chinese cement industry could also learn from the experience of the UK steel castings industry in the 1980s, which successfully reduced capacity.

Like other industries in the 1970s and '80s, it experienced severe excess capacity and undertook a restructuring process. Firms established a fund based on contributions from the companies and government to compensate firms that voluntarily reduced capacity. Every player in the industry could choose either to contribute to the fund and

stay, or take compensation and leave.

Unlike the plans currently under consideration in the Chinese cement industry, the initiative was designed and implemented by an investment bank, Lazard. By using a third party the arrangement avoided conflicts of interest, and the involvement of a financial institute helped to facilitate the process and ease access to financial support.

As documented by professor Charles Baden-Fuller of Cass Business School the implementation of the programme was not without difficulties because many firms were unwilling to close capacity owing to economic and managerial concerns. The programme was successful though. About 36,700 tonnes of casting capacity was closed, accounting for 14% of the industry's total capacity in 1975.

The lessons from industrial restructuring in the West and from current efforts to reduce overcapacity in China suggest that administrative measures and market competition are not the only ways to address the problem.

For energy intensive and heavily polluting industries such as cement, cooperation among firms and voluntary agreements for joint capacity closures should be encouraged. The government and industry associations should work closely with firms and provide support to achieve these goals.

## 另辟蹊径削减中国工业产能过剩

水泥企业结成同业联盟，协调合作共同解决产能过剩的路径值得推广到其他重工业，谭浩写到。

中国政府 2016 年的工作重点之一是减少钢铁、煤炭、水泥等高污染行业的过剩产能。

此举针对六大重点能源密集型行业：钢铁、有色金属、建材、石化、化工以及电力，其中大多数近年来遭遇了严重的产能过剩问题。2010 年这六个行业占中国工业总能耗的 77%。

这些行业的产能过剩被认为是中国工业利润下降的原因，贸易伙伴还因此指责中国造成了“全球市场的扭曲”。

政府的方案似乎起到了作用。官方数据显示，钢铁以及煤炭开采行业都已提前实现了 2016 年的去产能目标，压减粗钢产量 4500 万吨，退出煤炭产能 2.5 亿吨，而中国 2015 年共生产了大约 8 亿吨粗钢和 37 亿吨煤炭。

但水泥产业的去产能步伐更为缓慢。事实上，今年水泥产量不降反增。因此有人认为，相比其他行业取得的进展，水泥行业并没有解决产能过剩问题。

然而，如果我们将目光从近期数据转移到这些产业未来几年去产能的前景上，就会发现中国的钢铁和煤炭行业未来将面临更大的挑战，而水泥行业却显示出积极迹象。这是因为水泥是一种特殊的产品，具有独特的市场特性。

当前去产能路径将碰瓶颈

那么，中国钢铁和煤炭行业去产能接下来会遇到什么困难？

首先，这些行业目前取得的去产能成果实际上并没有看起来的那么成功。据财新网近期报道，被列入中国政府 2016 年去产能目标中的许多钢铁厂实际上长期处于“闲置或停产”状态。这些本就无效的产能去掉后，2017 年以及之后的去产能工作难度会更大。另外，关停煤炭和钢铁厂的动作为中央政府大量的资金支持，包括总额 1000 亿元的（约合 145 亿美元）专项基金。水泥等其他行业则没有这样的支持。

但也许更重要的是，煤炭和钢铁行业采取的两种削减过剩产能的方式都存在重大局限。

第一种方式属于行政手段，一些批评意见认为这种方式过于武断和不可持续。例如，中国政府今年发布的一项政策要求煤矿全年运营时间不得超过 275 天。这实际上将煤炭开采生产能力降低了 16%。但不幸的是，今年 11 月，由于煤炭供应短缺，政府又不得不放松限产的要求。

至于钢铁行业，一些专家认为很多采用低级技术、生产低质量产品的小型钢铁厂应该首先被关停。但是，这些小厂由于根本没有注册而未被列入去产能企业官方名录，从而逃脱了监督。

第二种削减产能的方式则是依靠市场竞争。但这种方式也存在问题。理论上，经营效率最低、成本最

高的企业会因为竞争失败而被迫关停，但在实践中，这需要环保、产品质量、安全等方面的法律法规能够得到有效落实。

虽然中国在不断完善执法工作，但很多产品的价格仍然不能充分反映真实的生产成本。也就是说，一些企业的生产行为是以牺牲公众以及对社会和环境负责的企业的利益为代价的。

另外，企业从各自利益出发而开展的同业竞争也会导致负面的市场结果。面对不确定的市场前景，很多企业可能会不愿意从市场中退出而让其他企业获利，从而导致竞争企业之间相持不下。

经济模型显示，处于衰退期的行业中，往往是大型企业率先削减生产能力，因为他们维持市场份额的成本比小型企业更高。考虑到大型企业往往会采取更先进的技术，这样就可能导致整个行业技术水平下降。

管理和行为因素也值得考虑。管理人员可能会出于个人职业生涯的考虑而不愿削减产能或者彻底关停企业，即便企业本身已经缺乏竞争力，而撤资或许对于投资者最为有利。

### 同业联盟的去产能功效

我们认为，上述问题的一个解决办法就是鼓励企业间合作，共同削减产能。虽然人们常认为卡特尔（同业联盟）损害市场竞争，但在某些情况下卡特尔却可以发挥作用。

中国的《反垄断法》允许企业经营者之间在特定情况下一致行动，包括“因经济不景气，为缓解销售量严重下降或者生产明显过剩”，以及“为实现节约能源、保护环境、救灾救助等社会公共利益”等。煤炭、钢铁和水泥行业显然满足这些条件。

但推动这些企业自愿合作、共同削减产能则是另外一类问题。在煤炭和钢铁行业，这面临十分严峻的挑战。一方面，这两个行业中有大量分散在各地的独立企业；另一方面，某些企业希望“搭便车”，趁其他企业自愿削减产能而获利。

### 水泥业独辟蹊径

但此类问题有望在高度区域化的水泥行业中得到解决。水泥主要是本地生产、本地销售，因为运输和分销成本在水泥价格中占很大比重。同一区域市场中竞争者的数量有限，因而更有可能在各方之间达成去产能协议。

已经有一些令人鼓舞的迹象表明，水泥行业可以用这种方法有效推进去产能。例如，山东省的水泥生产企业已经合作起来协调生产。在中国水泥协会的支持下，主要水泥生产商已经共同建立合资企业，推动省内水泥产能合理化。参与这一计划的企业均需自愿配合减产。

中国水泥协会也向工业和信息化部（MIIT）提出政策建议，认为应该建立专项基金，补偿自愿关停生产线的企业并帮助全国的水泥企业转产。水泥企业将根据各自的产量向基金注资。

### 历史经验

中国水泥行业还可以借鉴上世纪 80 年代英国钢铁铸造行业成功削减产能的经验。

如同上世纪七八十年代的其他行业一样，英国钢铁铸造行业也经历了产能严重过剩和结构调整。企业和政府共同出资建立基金，补偿自愿减产的企业。行业中每个企业均可选择是继续生产但向基金注资，还是推出但获得补偿。

与中国水泥行业正在考虑的方案不同，上述方案是由拉扎德投资银行设计和实施的。第三方的介入可以避免利益冲突，而金融机构的参与则有助于项目的执行，并降低了获得资金的难度。

正如策略学者查尔斯·巴登-富勒（Charles Baden-Fuller）记述的那样，这一项目的执行也并非一帆风顺，因为很多企业出于经济和管理方面的考虑并不愿意削减产能。不过项目最终还是取得了成功。1975 年，英国总计关停了 36700 吨铸造产能，占该行业总产能的 14%。

西方行业结构调整以及当前中国去产能的经验表明，行政手段和市场竞争并非解决问题的唯一方式。

对于水泥这样能源密集并且高污染的行业，应鼓励企业间通过合作以及协议的形式自愿去产能。政府和行业协会应该与企业密切合作，为实现这样的目标提供支持。

## Chinese steel: those blasted mills

A year ago you could not give steel mills away. Well, almost. Consider Tata Steel, the Indian owner of a number of then loss-making steel plants in the UK. It decided it wanted out at any price. One reason: the world's largest producer, China, was increasing steel exports, depressing prices. Fast forward to this year and steel has moved to portfolio managers' buy lists.

Whereas China took the blame before, it gets credit for a steel price boom. Its steelmakers cut output, though only by necessity. Chinese mills in the fourth quarter of last year lost money on every tonne of commodity steel produced. Hot rolled coil lost the average plant Rmb200 (\$29) a tonne. Mills stopped making steel. Roughly twice as much blast furnace capacity (150m tonnes) underwent maintenance during the first quarter of 2016 compared with 2015, notes Credit Suisse, thereby reducing supply.

Meanwhile, demand had improved. During late 2015, Beijing opened its wallet for new, steel-hungry infrastructure projects to boost the flagging economy. In renminbi terms this spending had dipped year on year in the first half of 2015, according to CEIC data. By the beginning of 2016 a surge in infrastructure spend had begun, up as much as 40 per cent from the previous year. More demand with reduced capacity lifted local prices; exports slowed. Dull metal suddenly shone, as profit per tonne jumped to Rmb1,000. Chinese steelmaker Maanshan's shares are up by roughly half this year. In Europe, shares in Amsterdam-listed producer ArcelorMittal have doubled.

Supply will make the big difference in 2017, less so demand. As public spending slows, private construction — from housing — is not likely to take up the slack. Beijing wants to cool an overheated housing market. The World Steel Association forecasts Chinese demand will fall 2 per cent. For China's gift on steel to keep giving, Beijing needs to ensure that steel capacity keeps falling in the new year as well.

### 中国应继续削减钢材产能

2017年，提振价格将要靠供应、而非需求。要维持中国提振起来的钢价，中国政府还需确保在新的一年里继续削减钢材产能。

一年前，你想脱手钢厂都无人接盘。或者说，几乎是这样吧。彼时在英国拥有多家亏损钢厂的塔塔钢铁(Tata Steel)例外。当时，塔塔钢铁决定不惜任何代价让自己抽身。原因之一是：当时世界上最大钢材生产国中国在增加钢材出口，压低钢材价格。把时间快进到今年，钢材已进入投资组合经理的购买清单。

虽然之前钢价走低被怪到中国头上，但此轮钢价上涨中国却是功臣。中国钢铁企业削减了产能——虽然只是迫不得已。去年第四季度，中国钢厂每生产一吨钢材都要赔钱。热轧卷板平均每吨让钢厂亏损200元人民币（合29美元）。许多钢厂停止产钢。瑞信(Credit Suisse)指出，2016年第一季度，处于停产维护状态的高炉产能（1.5亿吨）约为2015年的两倍，因而导致供应减少。

与此同时，需求出现了改善。2015年底，中国政府开始向需要钢材的新基建项目放开资金，以提振增速下滑的经济。司尔亚司(CEIC)的数据显示，以人民币计算，2015年上半年的基建投入同比出现了下滑。到2016年初，基建投入已开始激增，较上年增加高达40%。产能减少、需求增加，导致本地价格上涨；出口放缓。麻雀突然变凤凰，每吨钢材的利润飙升至1000元人民币。中国钢铁制造商马鞍山钢铁(Maanshan Iron and Steel)的股价今年涨了约50%。在欧洲，阿姆斯特丹上市的钢铁制造商安赛乐米塔尔(ArcelorMittal)的股价已经翻倍。

2017年，提振价格将要靠供应、而非需求。随着公共支出放缓，私营部门的房地产建设不大可能填补这一空缺。中国政府希望给过热的房地产市场降温。世界钢铁协会(World Steel Association)预测，中国的钢材需求将下降2%。要维持中国提振起来的钢材价格，中国政府还需确保在新的一年里继续削减钢材产能。

## Clean Energy (清洁能源)

## 100% renewable energy system cheapest for South America

Transitioning to a fully renewable energy system, with over 50% coming from solar PV, would be the cheapest option for South America and it is possible in the next 15 years, according to research conducted by the Lappeenranta University of Technology.

As an ever-present accomplice to South America's dramatic scenery, heavy sunlight could also be the dominant source of energy for the region by 2030, according to a new study from Finnish Lappeenranta University of Technology (LUT) and VTT Technical Research Centre of Finland. But this is not the only clean energy source that the region should adopt, as the study finds that a 100% renewable energy system, including numerous renewable technologies, would be the cheapest energy system option for the region, due to its rich solar, wind and hydro resources.

LUT and VTT Technical Research Centre of Finland have undertaken a number of similar studies, funded by the Finnish Funding Agency for Innovation as part of the Neo-Carbon Energy research initiative, but found that South America has a number of advantages for renewable energy adoption.

The study found that these competitive advantages over other parts of the world mean that developing a 100% renewable energy system is not only the cheapest option, but that it is also achievable by 2030. The advantages come in the form of solar, wind, and hydro resources, which means that only few energy storages would be needed in a renewable energy system, while hydro dams could even be used as virtual batteries for solar and wind electricity storage.

“South America has a unique renewable energy resource base since one of the best wind sites globally is Patagonia, the best solar energy sites are in the Atacama Desert, hydro power is already used in large amounts and the sustainable biomass potential is significant,” commented professor Christian Breyer, from LUT. “For these reasons, South America is one of the most favorable regions globally to shift to a 100% renewable energy system.”

The study looked at the costs for electricity in a 100% renewable energy system in South America, and found that it would range between EUR 47 to 62 per MWh, while other options, including new nuclear and carbon capture and storage, would cost between 75-150% higher for the electricity.

Interestingly, the renewable energy source that would come out on top in this forecasted system is solar PV, by quite some way. In fact, the study forecasted that solar PV would make up 415 GW of the 688 GW required for a 100% renewable system, which is approximately 60%, and significantly higher than hydro dams that would make up 144GW, and wind that would account for 69 GW.

### 100%的可再生能源系统对南美洲而言是最便宜的

据拉普兰塔理工大学进行的研究显示，过渡到一个完全可再生能源系统，其中 50% 以上的电力来自于太阳能 PV，对于南美洲而言可能是最廉价的选项，并且有可能在未来 15 年内发生。

据芬兰拉彭兰塔理工大学（LUT）和芬兰 VTT 技术研究中心进行的一项新的研究表明，作为南美洲秀丽景色的常客，强光照可能也将在 2030 年成为该地区主要的能源来源。但是这并不是该地区应该采用的唯一的清洁能源，因为该研究发现的，100% 的可再生能源系统，包括无数可再生能源技术，可能会该地区最廉价的能源系统选项，因为其具有丰富的太阳能、风能和水力资源。

LUT 和芬兰 VTT 技术研究中心已经进行了一些类似的研究，这些研究受到了芬兰创新资助局的赞助，作为新碳能源研究计划的一部分，但是该研究发现，南美洲在可再生能源采用方面具有许多优势。

该研究发现，这些竞争优势与世界其他地区相比意味着开发 100%的可再生能源系统不仅是一个最廉价的选项，而且有可能在 2030 年实现。该优势来自于太阳能、风能和水力资源，这意味着在可再生能源系统中只需要少量的能源储备，同时水坝甚至可以用作太阳和风能电力储备的虚拟电池。

“南美洲拥有一个独特的可再生能源资源基地，因为全球最好的风电场之一是巴塔哥尼亚，最好的太阳能站点位于阿塔卡马沙漠，水电已经得到了大量使用，并且可持续的生物质能源潜力非常巨大，” LUT 的 Christian Breyer 教授评论称。“出于这些原因，南美洲是全球转变为 100%可再生能源系统的最有利的地区之一。”

该研究考察了南美洲 100%可再生能源系统中电力的成本，并且发现该数额有可能在 47-62 欧元每 MWh，而其他的选项，包括新核电和碳捕获及储备，可能电力成本要高出 75-150%。

有趣的是，在这个预测系统中可能问顶的可再生能源是太阳能 PV，在某种程度上。事实上，该研究预测，太阳能 PV 可能构成了 100%可再生能源系统所需的 688GW 的电力中的 415GW，这大约为 60%，并且显著高于构成 144GW 的水力电站，而风能可能占据了 69GW。

## Coal (煤炭)

### **India announces plan to step away from coal, casting doubt on approved Queensland Adani mine**

India has released a new power plan promoting a dramatic increase in renewable energy and raising doubts about the Indian-owned Adani Group's massive coal mine in Queensland.

India's Energy Minister Piyush Goyal alluded to a renewables pivot when he spoke to Four Corners last year.

"I hope in the years to come we can see an explosion of renewable energy on the back of cheaper storage," Mr Goyal said.

Tim Buckley from the Institute for Energy Economics and Financial Analytics told AM the development was bad news for the Australian coal industry.

"They [India] say that they have 50 gigawatts of coal-fired power plants under construction already, so it's far better to complete those than write them off as stranded assets," he said.

"But no new coal-fired plants in India in the next decade."

Mr Buckley said the plan had left the Adani proposal "totally stranded".

"It is a white elephant, and it is six years past its use by date," he said.

However, Adani rejects Mr Buckley's argument, saying it needs to coal for itself.

"What happens to the market has no implication for Adani because we are supplying our own power stations with our own coal," an Adani spokesman told the ABC.

Plans to fund billion-dollar railway to mine

Despite these doubts, the Australian Government plans to give a \$1 billion subsidised loan to Adani to build a railway to the planned mine.

When the then Minister for Resources Josh Frydenberg approved the Adani mine in north Queensland 14 months

ago, he argued it had to go ahead because India desperately needed it for energy.

"I think there is a strong moral case here, it will help lift hundreds and millions of people out of energy poverty, not just in India but right across the world," Mr Frydenberg said.

Mr Buckley said the International Energy Agency (IEA) had forecast that hundreds of gigawatts of new coal-fired power plants would be built in India in the next few decades.

"The Indian Energy Ministry is saying that is absolutely wrong," he said.

"He instead articulates a plan that involves building 215 gigawatts of renewable energy, building another 20 gigawatts of hydro, building five gigawatts of nuclear, building a bit more gas, and dramatically elevating the importance of energy efficiency and grid efficiency in order to diversify India rapidly away from coal."

## 印度宣布退出煤炭计划，影响获批的昆士兰州阿达尼煤矿

印度发布了一项新的电力计划，促进可再生能源的大幅增长，并对印度拥有的阿达尼集团在昆士兰州的大型煤矿提出质疑。

印度能源部长 Piyush Goyal 在去年与 Four Corners 谈话时提到可再生能源。

“我希望在未来的岁月里，我们可以看到可再生能源在更便宜的储能上爆发。”戈亚尔说。

来自能源经济与金融分析研究所的 Tim Buckley 告诉 AM 这个发展对于澳大利亚煤炭行业来说是个坏消息。

“他们[印度]说，他们有 50 吉瓦的燃煤发电厂在建，因此完成它们远好于把它们作为搁浅的资产。”

“但在未来十年，印度没有新的燃煤电厂。”

Buckley 先生说，该计划已经使阿达尼提案“完全搁浅”。

“这是一件费力不讨好的事情，离它的使用日期已经过去六年。”他说。

然而，Adani 拒绝 Buckley 的论点，说它本身需要燃煤。

Adani 发言人告诉 ABC 说，“市场发生的变化对 Adani 没有影响，因为我们正在向我们自己的发电站提供我们自己的煤炭。”

计划资助数十亿美元修建采矿区铁路

尽管有这些疑问，澳大利亚政府计划向 Adani 提供 10 亿美元的补贴贷款，以便为计划中的矿山建造一条铁路。

当时资源部长 Josh Frydenberg 在 14 个月前批准了位于昆士兰北部的阿达尼煤矿时，他认为石油需要继续开发，因为印度迫切需要能源。

“我认为这里有一个强大的道德情况，它将帮助数以百万计的人摆脱能源贫困，不仅在印度，而且在世界各地。”Frydenberg 说。

Buckley 说，国际能源机构（IEA）预测，在未来几十年内将在印度建造数百吉瓦的新燃煤发电厂。

“印度能源部说这是绝对错了。”他说。

“他阐述了一个计划，涉及建设 215 吉瓦的可再生能源，建造另一个 20 吉瓦的水电，建设 5 吉瓦的核能，更多的天然气，大大提高能源效率和电网效率的重要性，以使印度能源多样化，迅速远离煤。”

## Coal industry set for steep price falls: analysts

The sudden surge in coal prices in 2016 is set to be followed by a similarly steep fall in 2017 as Chinese efforts to boost the profitability of its mines threaten to backfire, industry experts have warned.

This year Beijing decreed that coalmines could operate only 276 days a year, rather than 330, and the result was a

spectacular rebound in prices, especially for coal used in steelmaking, as the world's biggest consumer turned to overseas markets.

Prices had been falling for years after tougher environmental regulation, trouble in the steel industry and an excess of supply drove Peabody Energy, the world's largest private coalminer, into Chapter 11 bankruptcy protection.

The Chinese policy shift was supposed to tackle the problem of oversupply and to raise the profitability of state coalmines. However, the problem with the policy, analysts say, is that it threw a lifeline to some of the smaller, marginal coal producers that otherwise would have closed. Many of these higher-cost mines produce the lower-quality coal that China has been trying to phase out as it struggles to reduce air pollution.

According to Rosealea Yao, a Beijing-based analyst at Gavekal Dragonomics, a consultancy, the larger, low-cost producers have borne the brunt of the output cut, which means that the policy is primed to go wrong.

“The surge in prices was much larger and faster than almost anyone expected, so much so that the government has now reversed course and is trying to push prices back down”, she said. “But there is little sign that officials have learnt any lessons from the policy-induced price spike, which means there is a real risk that their actions will cause prices to overshoot on the downside in coming months.”

The National Development and Reform Commission held a series of meetings to persuade coalmines to increase output, thus taking the sting out of a price rise that it has said is unsustainable. Chinese coalmines shed nearly half a million jobs in the year to September.

Benjamin Sporton, chief executive of the World Coal Association, said that a byproduct of the Chinese policy had been a shift towards cleaner coal.

“Higher-quality coal, available on the seaborne market, will generally burn more efficiently and have fewer impurities,” he said.

China, which burns half of the world's coal, is taking steps to improve its air quality. The efficiency of its coal-fired power stations has overtaken those of the United States. Imports of “dirty” Indonesian coal plunged by a third last year.

In a report on the five-year outlook for coal markets last week, the International Energy Agency, the forecaster for the OECD nations, hinted that the volatility in the market caused by Chinese policy was not receding.

“Changes arrive very quickly in China: only a few months after the new policy was introduced, the government softened it to cool down coal markets,” it said.

## 分析者认为煤炭价格将急剧下降

行业专家警告称，和 2016 年煤炭价格突然激增一样，2017 年煤价将急剧下降，原因是中国提高煤矿利润率的努力有可能引起反弹。

今年北京规定，煤矿每年只能运行 276 天，而不是 330 天，结果是价格出现了惊人的反弹，特别是炼钢生产的煤炭，因为世界上最大的消费者转向海外市场。

随着环境监管日益严格，钢铁行业陷入困境，供应过剩，世界上最大的私营煤矿企业 Peabody Energy 进入第 11 章破产保护，价格一直在下降。

中国的政策转变应该解决供大于求的问题，提高国有煤矿的盈利能力。然而，分析人士表示，政策的问题是，它为一些规模较小的边缘煤炭生产商提供了生命线，否则这些煤炭生产商将关闭。许多这些成本较高的煤矿生产低质量的煤炭，中国一直试图逐步淘汰，因为中国在努力减少空气污染。

据咨询公司 Gavekal Dragonomics 的北京分析师 Rosealea Yao 说，规模较大、成本较低的生产商在产量下降中首当其冲，这意味着该政策将会出现问题。

她说：“价格的上涨比几乎任何人都期望的要大得多、速度快，所以政府现在扭转了方向，并试图推

低价格。但是，很少有迹象显示官员从政策引发的价格飙升中获得了任何教训，这意味着他们的行为会导致价格在未来几个月下跌。”

国家发展和改革委员会举行了一系列会议，说服煤矿增加产量，从而使其濒临价格上涨，据说是不可持续的。中国煤矿在今年9月份已经减少了将近50万个就业岗位。

世界煤炭协会首席执行官 Benjamin Sporton 说，中国政策的一个副产品是转向更清洁的煤炭。

他说：“海运市场提供的优质煤通常燃烧效率更高，杂质更少。”

中国燃烧了世界上半的煤炭，正在采取措施改善空气质量。其燃煤发电站的效率已超过美国的效率。进口的“脏”印尼煤炭从去年第三下跌。

在上周关于煤炭市场五年展望的报告中，经合组织国家的预测机构国际能源机构暗示，中国政策导致的市场波动不会减退。

在上周关于煤炭市场五年展望的报告中，经合组织国家的预测机构国际能源机构暗示，中国政策导致的市场波动不会减退。

## **A deal to unlock massive Mongolian coal deposits could revive its flagging economy**

Former frontier market darling Mongolia has had a tough time in a world of low commodity prices, with its government struggling to make ends meet , but a spike in global coal prices could see the country stage a comeback.

The mineral-rich country had seen double-digit economic growth as high as 17.3 percent in 2011 at the height of the mining industry boom. Subsequent declines in global commodity prices eroded those gains, with ratings agency Moody's predicting 2016 growth to be flat and only a 1 percent uptick in 2017.

But following reforms in China this year to rein in overproduction, and growing demand in Asia Pacific, coal prices soared. In November, Reuters reported premium coking coal prices in Australia had jumped to \$289.30 a metric ton, up from about \$85 at the beginning of June. Coking coal is a key component in steel production.

The recovery in prices has spurred Mongolia's hopes for a complex restructuring of the Tavan Tolgoi coal mine in the South Gobi desert, a move that would settle outstanding debt to Chinese aluminum producer Chalco Group. An end to the Tavan Tolgoi upset would make it easier to invite new investors such as Chinese state-owned firm Shenhua Group (Shanghai Stock Exchange: 1088-SZ) to help ramp up production and shipments to key market China at better prices.

"Nothing has changed on the Mongolian side of the border, in terms of quality of the coal, the availability (and) the low production costs," Layton Croft, an independent director at Mongolian real estate business Asia Pacific Investment Partners, told CNBC.

"In some cases, the ability to add value by washing the coal and, of course, the short transpiration distances are competitive advantages for Mongolian producers."

The development of Tavan Tolgoi, which contains 7.4 billion ton of coking and thermal coal deposits and is largely untapped, hit a series of political and economic roadblocks over the past few years, but the July election of the Mongolian People's Party is expected to ease the way forward .

To be sure, global coal demand is expected to remain sluggish , according to an International Energy Agency forecast released this month, noting while China aims to curb production it also is looking at to further develop other power sources.

Mongolia's government on Friday held an initial meeting with a private consortium, led by Shenhua, which is in

## Mcanxixun Information

---

talks to take over development of the Tavan Tolgoi mine from the Mongolian state-owned company Erdenes Tavan Tolgoi JSC (ETT).

ETT owns six mining licenses, including one in the Tsankhi section of the Tavan Tolgoi mine that has coking coal deposits, but the company has been saddled with outstanding debt to Chalco. In 2011, the company borrowed \$350 million from Chalco and agreed to repay the debt in the form of coal deliveries, according to Reuters. Because ETT is the largest miner in the country, this deal has meant much of Mongolia's coal exports have been unable to benefit from a resurgence in coal prices.

Under the agreement with Chalco, Mongolia was selling coal at \$33 a metric ton, significantly lower than international average selling prices, according to Nick Cousyn, chief operating officer BDBSec Joint Stock Company, a Mongolian brokerage,

With ETT representing a majority of Mongolia's current coal production, private companies have to contend with these low coal prices. "They are effectively being crowded out by the government," Cousyn told CNBC by phone.

He said Mongolia was missing out \$70 a metric ton, or about \$2 billion, in potential revenue if it produced about 30 million tonnes of coal on the assumption coking coal sold for \$100 a metric ton on average. For Mongolia's \$12 billion economy, that is a significant amount.

A representative from ETT told CNBC by email the key focus of the negotiations between the Mongolian government and the Shenhua-led consortium was to come up with a holistic approach to fix current underlying issues.

"For ETT, it means to fix its heavily discounted unwashed coal export and to regain commercial freedom through the economics of washing the coal and mining at both East and West Tsankhi," the spokeswoman said. She added that ETT expected to pay off its remaining \$96 million debt to Chalco by the end of fiscal 2016.

## 开启大量蒙古煤矿的协议可能会恢复其萎靡的经济

之前未开垦区域市场的宠儿蒙古在世界低商品价格时期经历了一段艰难的日子，其政府努力令收支相抵，但是全球煤炭价格的飙升可能会令该国重新走出困境。

2011年，矿产资源丰富的国家在采矿业繁荣时期达到了经济两位数的增长率，高达17.3%。随后全球商品价格的下跌削弱了这些收益，其中评级机构Moody 2016年的增长预测趋于平衡，并且在2017年仅增长1%。

但是随着中国今年进行改革以控制过度生产，并且亚太地区不断增长的需求，煤炭的价格再次飙升。11月，路透社报道称，澳大利亚的焦煤价格从六月初的85美元左右上涨至289.30美元每公吨。炼焦煤是钢铁生产的重要组成部分。

价格的回升已经促进了蒙古在南戈壁沙漠对塔万陶勒盖煤矿进行复杂重组的希望，这一举措有可能会偿还对于中国铝业生产商Chalco集团的未偿债务。结束Tavan Tolgoi的困境可能会令其更要轻易地招募到新的投资者，例如中国国有企业神华集团（上海证券交易所：1088-SZ），用于帮助加强产量以及以更好的价格到达主要的中国市场的货运量。

“在煤炭的质量、可用性以及较低的生产成本方面，蒙古国边境并没有发生任何的变化，”蒙古房地产企业亚太区投资合作伙伴的独立董事Layton Croft对CNBC表示。

“在某些情况下，通过洗煤增加价值的的能力，当然，较短的蒸腾距离是蒙古生产商的竞争优势。”

Tavan Tolgoi的发展，包含74亿吨的焦煤和动力煤矿床并且在很大程度上都尚未开发，在过去几年内遭遇了一系列政府和经济障碍，但是七月蒙古人民党的选举预计会缓解前进的方向。

根据国际能源署本月发布的预计显示，可以肯定的是，全球煤炭需求预计将持续低迷，并且其指出，虽然中国旨在遏制生产，但是它还将寻求其他电力资源的进一步发展。

蒙古政府于周五与一个由神化领导的私人财团举行了一个初步会谈，主要谈论了从蒙古国有公司

Erdenes Tavan Tolgoi JSC (ETT) 手上接管 Tavan Tolgoi 矿场的发展。

ETT 拥有六个采矿许可证，包括 Tavan Tolgoi 在 Tsankhi 的一个部门，其具有采矿许可证，但是该公司对于 Chalco 一直具有未偿还的债务。据路透社报道，在 2011 年，该公司向 Chalco 借贷了 3.5 亿美元，以煤炭交付的形式偿还债务。由于 ETT 是该国最大的矿场公司，这次交易意味着蒙古大部分的煤炭出口一直都无法从煤炭价格的复苏中受益。

根据与 Chalco 签订的协议，蒙古将以 33 美元每公吨的价格出售煤炭，显著低于国际平均销售价格，据蒙古经济公司 BDBSec 股份公司的首席运营官 Nick Cousyn 指出。

由于 ETT 提供了蒙古目前大部分的煤炭产量，因此私人企业必须应对这些较低的煤炭价格。“他们实际上是被政府挤满了，” Cousyn 通过电话告诉 CNBC。

他表示，假设炼焦煤平均以 100 美元每公吨的价格出售，那么如果蒙古生产大约 3000 万吨的煤炭，其潜在收入将会损失 70 美元每公吨，或者大约有 20 亿美元。对于蒙古 120 亿美元的经济，这是一个很大的数额。

ETT 通过电子邮件发给 CNBC 的一份信件展示，蒙古政府与神华领导的财团之间商谈的主要重点在于提出一个整体方案来解决当前的根本问题。

“对于 ETT，这意味着修复其大量打折的未清洗的煤炭出口量，并且通过在 Tsankhi 东部和西部清洗煤炭和采矿来重新获得商业自由，” 发言人表示。她补充称，ETT 预计将在 2016 财年年度偿还 Chalco 剩余的 9600 万美元。

## **China to fulfill pledge to eliminate import tax on Australian thermal coal: Canberra**

Australian thermal coal cargoes arriving at China's ports on January 1, 2017, and thereafter will be clear of the Asian country's 2% import tax, currently equivalent to \$1.50/mt, and levied on the delivered CFR South China price of shipments, said the Australian government Thursday.

Beijing introduced a 6% tax on all thermal coal imports with little advance warning in October 2014, and went on to lower its rate on Australian-origin thermal coal to 4% in December 2015, and then to 2% effective January 1, 2016.

"Under China-Australia Free Trade Agreement (ChAFTA) commitments, this tariff is scheduled to be fully eliminated (cut to 0%) for Australian-origin thermal coal on January 1, 2017," said a spokeswoman for the Australian government's department of foreign affairs and trade in an emailed response to S&P Global Platts' questions.

"Prior to the China-Australia Free Trade Agreement coming into force, China's general import tariff for [thermal coal] was 6%. Under ChAFTA commitments, this rate has already been reduced twice for Australian-origin thermal coal, to now sit at 2%," said the department of foreign affairs and trade.

Chinese buyers successfully resisted paying the import tax, and pushed its deadweight cost on to the seaborne market where it weighed on prices of Australian thermal coal, ultimately being largely absorbed by Australian shippers as an additional cost.

Market participants will be watching to see how prices in the Chinese seaborne market react to the lifting of the import tax, and whether CFR South China prices rise by an equivalent amount, about \$1.50/mt.

In Asia trade Wednesday, Platts assessed the CFR South China price of 5,500 kcal/kg NAR Australian thermal coal for delivery to China in January at \$75.30/mt, down 30 cents from Tuesday.

January-loading Capesize cargoes of Australian 5,500 kcal/kg NAR thermal coal were heard bid by Chinese

buyers in Wednesday's Asia trade at \$66/mt FOB Newcastle to offer prices at \$67.50-\$68/mt, according to Platts data.

On its Free Trade Agreement website, Australia's department of foreign affairs and trade said China's total imports of bituminous thermal coal and related products was worth \$7.8 billion in 2015, down 48.5% from \$15.2 billion in 2014.

Australia's share of this market last year was 65.7%, with Australian thermal coal shipments to China worth \$5 billion in 2015, down 40.5% from an import value of \$8.6 billion in 2014, said the department.

Although China will be lifting its import tax on Australian thermal coal shipments early in the new year, Beijing is maintaining its 6% tax on imports of thermal coal from Colombia, Russia and South Africa.

Indonesian thermal coal shipments to China are exempt from any import tax under a bilateral free trade agreement.

### 堪培拉：中国履行承诺，消除澳大利亚动力煤炭的进口税

澳大利亚政府于周四表示，澳大利亚动力煤炭货物于 2017 年 1 月 1 日抵达中国港口，并且此后将消除亚洲国家 2% 的进口税，目前相当于 1.5 美元/吨，并且以中国南方 CFR 货运价格交付。

北京于 2014 年 10 月在几乎没有提前警告的前提下对动力煤炭进口征收 6% 的税收，并且于 2015 年 12 月将其对澳大利亚动力煤的税率降低至 4%，然后在 2016 年 1 月降至 2%。

“根据中澳自由贸易协定（ChAFTA）的承诺，这一关税预计将在 2017 年 1 月 1 日有关澳大利亚热煤完全消除（削减至 0%），”澳大利亚政府外国事务和贸易部的发言人在回应 S&P 全球普拉茨问题的邮件中表示。

“在中澳自由贸易协定生效之前，中国对（动力煤）征收的一般进口关税为 6%。根据 ChAFTA 的承诺，该税率已经为澳大利亚动力煤减少了两次，目前达到了 2%。”外交事务和贸易部表示。

中国买家成功地拒绝支付进口税，并且将其载重成本推加到海运市场，在该市场中其加重了澳大利亚动力煤的价格，最终大部分被澳大利亚货运人作为额外费用给吸收了。

市场参与者将观察中国海运市场的价格将如何变动以回应进口税的撤消，以及 CFR 中国南方的价格是否会以同等金额上涨，大约为 1.50 美元/吨。

在周三的亚洲贸易中，普氏评估了 5500kcal/kg NAR 澳大利亚动力煤 CFR 中国南方价格在 1 月运送至中国的价格为 75.30 美元/吨，与周二相比下降了 30 美分。

据普氏数据显示，1 月加载的澳大利亚 5500kcal/kg NAR 动力煤的 Capesize 货物据了解在周三的亚洲交易中由中国购买商以 66 美元/吨的 FOB Newcastle 价格中标，提供价格为 67.50-68 美元/吨。

在其自由贸易协定网站上，澳大利亚外交事务和贸易部表示，中国沥青动力及相关产品的总进口额在 2015 年价值 78 亿美元，与 2014 年的 152 亿美元相比下降了 48.5%。

该部门表示，澳大利亚去年该市场份额为 65.7%，其中澳大利亚运送至中国的动力煤在 2015 年价值 50 亿美元，与 2014 年 86 亿美元的进口值相比下降了 40.5%。

虽然中国将于明年初取消其澳大利亚动力煤征收的进口税，北京将维持其对哥伦比亚、俄罗斯和南非的动力煤征收的 6% 的进口税。

运送至中国的印尼动力煤试图通过双边自由贸易协定免征任何进口税。

### Agency: Global coal demand to continue falling

Murray Energy Corp. officials confirm the Powhatan No. 6 Mine is closed, which leaves several hundred miners

with an uncertain future at the same time the International Energy Agency predicts global demand for coal will stall for the next five years.

According a Worker Adjustment and Retraining Notification Act notice, the southern Belmont County mine employed as many as 492 workers this year. Murray officials announced the planned closure in May, citing the facility reaching the end of its “productive life” because there are no longer any minerals to extract in an economical manner.

“Yes. Closed,” said Murray Energy spokesman Gary Broadbent by email regarding the Powhatan mine Tuesday. He did not comment further.

Murray operates both union and non-union mines. Hourly workers at the Marshall County Mine, the Ohio County Mine and Powhatan No. 6 have United Mine Workers of America representation.

“It’s never a good day when a mine closes,” UMWA spokesman Phil Smith said Tuesday. “However, we are pleased that we were able to get jobs for members at other Murray Energy union mines in the area.”

Mine Safety and Health Administration data show the Powhatan mine yielded 2.72 million tons of coal this year, which is down from 4.76 million tons last year. In 2015, employees worked 1.15 million hours at the mine, but this number dropped to 495,939 hours this year.

Coal industry leaders are optimistic about the future of the business in light of Republican Donald Trump’s election as president. However, the International Energy Agency predicts coal’s share of the global electricity generation portfolio will fall to 36 percent by 2021, down from its current 41 percent.

The IEA is an autonomous organization that works to provide energy data for 29 member countries. Members include the U.S., Canada, Australia, Japan, Turkey and most European nations. In 2000, about half of coal demand was in Europe and North America, while Asia accounted for less than half. However, Asia now accounts for nearly 75 percent of coal demand, according to the IEA.

“Because of the implications for air quality and carbon emissions, coal has come under fire in recent years, but it is too early to say that this is the end for coal,” said Keisuke Sadamori, director of IEA’s energy markets and security directorate. “Coal demand is moving to Asia, where emerging economies with growing populations are seeking affordable and secure energy sources to power their economies. This is the contradiction of coal—while it can provide essential new power generation, it can also lock in large amounts of carbon emissions for decades to come.”

Because it is relatively affordable and widely available, coal remains the world’s premier fuel for generating electricity, producing steel and making cement, IEA information shows.

In the U.S., coal consumption dropped by 15 percent in 2015, precipitated by competition from cheap natural gas and cheaper renewable power, notably wind power.

Preparation by electricity producers such as American Electric Power and FirstEnergy Corp. for regulations such as the Clean Power Plan and the Mercury and Air Toxics Standards also has been cited as a reason for the decline in U.S. consumption.

## 全球煤炭需求持续下降

Murray 能源公司的官员证实 Powhatan No.6 矿场关闭，这导致数百名矿工面临不确定的未来，同时国际能源署预测全球煤炭需求将在未来一年内停滞不前。

据“工人调整和再培训通知法案”的通知，贝尔蒙特南部矿区今年雇佣了多达 492 名工人。Murray 的官员在五月宣布了一项计划性的关闭，原因是该工厂达到了其“生产寿命”的末期，因为这里不再拥有能够以经济方式提取的任何矿物质了。

“是的。关闭，” Murray 能源发言人 Gary Broadbent 通过邮件于周二告知 Powhatan 矿场。他并没有作

## Mcanxixun Information

---

进一步评价。

Murray 经营着工会和非工会矿场。马歇尔县矿山、俄亥俄州矿山以及 Powhatan No.6 的小时工有联合矿业工人代表。

“当矿井关闭时，永远都不可能成为一个好日子，” UMWA 的发言人 Phil Smith 于周二表示。“然而，我们很高兴我们能够该地区其他 Murray 能源联盟矿山的成员找到工作。”

矿山安全性和健康管理局的数据显示，Powhatan 矿山今年生产了 272 万吨煤矿，与去年的 476 万吨相比有所下降。在 2015 年，员工在矿山工作了 115 万小时，但是这个时间量在今年下降至 495939 小时。

煤炭行业的领导者对于共和党唐纳德·特朗普当选总统后的业务前景感到乐观。然而，国际能源机构预计，煤炭全球电力产量组合中的份额将在 2021 年下降至 36%。

IEA 是致力于向 29 个成员国提供能源数据的一个自主组织。成员包括美国、加拿大、澳大利亚、日本、土耳其及大多数欧洲国家。在 2000 年，约一半的煤炭需求来自欧洲和北美，而亚洲的需求量还不到一半。然而，根据 IEA，亚洲目前占据了煤炭需求的近 75%。

“由于空气质量和碳排放量的影响，煤炭近年来受到了打击，但是现在称这是煤炭的终结之日还为时过早，” IEA 能源市场和安全局局长 Keisuke Sadamori 称。“煤炭需求正在向亚洲转移，在该地区新兴经济体以及不断增长的人口正在寻求廉价并且安全的能源来振兴他们的经济。这是煤炭的矛盾之处——虽然它能够提供基本的新动力生产，但是它也会锁定未来数十年的碳排放量。”

IEA 信息展示，由于相对廉价及广泛可用性，煤炭仍然是世界上发电、生产钢铁和制造水泥的主要燃料。

在美国，2015 年的煤炭消耗量下降了 15%，这是由于廉价天然气和更便宜的可再生能源的加入，特别是风力发电。

电力生产商的制备，例如美国电力公司和 FirstEnergy 公司为符合清洁电力计划和汞和空气毒物标准的规定所作出的准备也被认为是美国消耗量下降的一个原因。

## Argentina's power struggle

Macri's government has cut oil subsidies to rebalance the economy and pave the way for a clean energy future, writes Fermín Koop

For over a decade Argentina's oil sector has profited from the government's policy to keep domestic oil prices low. But when new President Mauricio Macri took office last year he vowed to reduce energy subsidies in an effort to tackle the country's multi-billion dollar deficit.

In November, a year after Macri's election victory, his centre-right administration announced that subsidies for oil producers would be stopped and prices aligned with international markets. The result was a rapid 25-30% fall in the local value of crude. However, no timeline has been set for changes.

The implications of this decision for Argentina's efforts to resolve its stubborn economic problems, reform its creaking energy sector and address the blackouts that plague its capital will be keenly watched, and not just by the Argentinian people at the sharp end of fluctuating fuel prices.

In a world of falling oil prices, foreign governments are facing a similar challenge to reduce or remove subsidies for high carbon energy and reorient investment into low carbon alternatives. Argentina is a notable laggard when it comes to exploiting renewable energy resources but as it gets on board, the opportunity for China, which is one of its biggest financiers, to build new partnerships is set to grow.

Protecting oil industry profits

In 2016, Argentinians paid more than double the international market price for oil. At their peak, prices reached US\$67.50 per barrel, compared to the WTI international crude price of US\$33.26.

The decision of former President Cristina Fernández de Kirchner's administration to maintain an artificially high oil price was supposedly to protect jobs in the Argentinian oil and gas sector as the price of oil tumbled on global markets.

Argentina is Latin America's third biggest economy after Brazil and Mexico. It is also home to the second-largest shale gas reserves and fourth largest shale oil reserve globally. Faced with a US\$6 billion energy trade deficit in 2014, Kirchner's government also sought to bolster what it considered to be a stable industry facing a period of uncertainty.

This policy meant that energy companies in Argentina made an additional US\$5 billion from consumers in 2015, and a further US\$3.5 billion this year, according to data from FIEL.

The main beneficiaries have been state-controlled YPF and Pan American Energy. More than 40% sits in the pockets of oil companies, 12% has gone to oil provinces as royalties; and the remainder into raising salaries and paying higher prices for suppliers.

Martín Prieto, director of Greenpeace Argentina, said that the government should be focusing on renewables and not oil.

“Argentina is assuring domestic companies that the wellhead price they receive is higher than in the rest of the world. It is neither economically nor environmentally justified. It is an incentive to continue investing in oil extraction. Renewable energy development is the only way to go,” he told chinadialogue.

Initially, pressure from the municipal governors to maintain oil bonuses led Macri to continue supporting the subsidised price. But the wider economic ramifications, such as the increasing deficit and complaints from other industries about a loss of competitiveness, motivated the government to remove support.

### Dropping consumer subsidies

Elimination of consumer subsidies, which could commence this month, is now expected by the oil and gas sector. Madalena Energy, a Canadian company operating in Argentina, believes the crude oil price will be reduced by 30%.

“The labour unions and provinces are against this taking place but we all know that subsidies will eventually have to end,” said David Tawil, founder of the investment fund Maglan Capital, and owner of a stake in Madalena Energy.

Government sources have also maintained that negotiations are in progress between the labour unions, oil producing companies and oil provinces for the elimination of the subsidy.

“The Energy Minister's policy is to continue with a gradual elimination of the subsidy scheme. It is a complicated task but the aim is geared towards the international price. Current prices artificially distort the competitiveness of renewable energy. The long-term goal must be to abandon fossil fuels,” stated Gerardo Rabinovich, director of the General Mosconi Energy Institute.

Argentina has one of the most significant hydrocarbon deposits in the world known as Vaca Muerte (literally “Dead Cow”). The decline in international crude prices has slowed down the area's once thriving activity.

The reduction in subsidies for crude oil follows similar cuts in support for natural gas and electricity earlier this year.

This was one of the first measures adopted by the Macri government after more than ten years without a price adjustment for the cost of public services such as natural gas, electricity and water in Buenos Aires.

“Price rationalisation in Argentina makes investment in renewable energy attractive and is an invitation to energy saving. In Argentina, energy waste was encouraged in the absence of any incentives for rational energy consumption,” said Prieto.

The previous administration's decision not to increase prices resulted in an extraordinary increase in energy

## Mcanxixun Information

---

subsidies, which rose from 0.2% of GDP in 2004 to 2.9% in 2014, totalling 342 million pesos (US\$21.3 million/ 147 million yuan) in that period, based on a report from the Argentine Association of Budget and Public Financial Administration (ASAP).

But that was not the only problem. The tariff freeze discouraged energy distribution companies from making the required investments in technical upgrades due to the lack of liquidity, resulting in frequent power outages during summer and winter. Meanwhile, the subsidies, which were supposed to benefit lower income groups, became skewed towards those with higher incomes.

“Energy subsidies were transformed into the second largest state expenditure and this largely explains Argentina’s deficit. More is spent on energy subsidies than on health and education combined. They are also poorly distributed. The richest 20% receive four times as much in subsidies,” said Rafael Flores, president of ASAP.

Having only reduced rather than eliminated subsidies, Argentina will finish the year with another increase in its budget deficit. To date, it has increased 10% on last year, amounting to 133 billion pesos (US\$8.3 billion/ 57.3 billion yuan).

### Renewable energy

Oil and natural gas subsidies have also deterred investment in renewable energy, despite the country’s significant potential. Argentina’s energy mix remains dominated by high carbon energy sources with wind and solar energy less than 2% of the energy mix.

While hopes are pegged on Vaca Muerta, low crude prices are bringing challenges to the oil industry. Investment in shale continues in parallel with investment in renewables. Furthermore, Macri seeks to be seen as a leader of Latin America’s green agenda. Upon his election he announced he would review Argentina’s international commitment to reducing greenhouse gas emissions. In pushing for renewables he is looking to solve Argentina’s energy crisis and improve his own public image.

In 2017, 8% of Argentina’s electricity generation is expected to be supplied by wind, solar and small hydroelectric energy plants, among other sources, based on a recent law approved by Congress. The regulation also requires renewables supply to increase to 20% in 2020.

The government has already started auctioning renewable energy capacity through the Renovar programme. A total of 17 projects, totalling 1,109 megawatts (3.2% of the country’s total installed energy capacity) have been awarded. This includes 12 wind projects, four solar PV and one biogas, with a required investment of US\$1.8 billion. Following significant investor interest, a further government tender is expected to award another 600 megawatts.

“Argentina has been transformed into a major place for attracting investors in renewable energy. The matter has become a state policy,” said Juan Bosch, chairman of SAESA, a company that develops renewables projects.

He added: “Diversification of our energy mix is now the great challenge for the country.”

## 新政府撬动阿根廷能源改革

阿根廷新政府正着手削减石油行业补贴，大力发展新能源。

十多年来，阿根廷的石油产业一直从政府的优惠政策中获利。但当毛里西奥·马克里去年就任阿根廷总统之后，他承诺要削减能源补贴，以解决该国数十亿美元的赤字及其造成的全国各大城市的电力短缺、断电以及社会不满情绪。

今年十一月，在竞选获胜后一年，马克里的中右翼政府宣布将停止向石油生产商发放补贴，并根据国际市场行情定价，但没有给出明确的时间表。其结果就是当地原油价格几乎应声下降 25% 到 30%。

马克里的这一决定旨在解决阿根廷顽固的经济问题、改革陈旧的能源行业并解决困扰其首都的断电问

题。密切关注这一政策影响的将不仅仅是直接受到燃料价格波动影响的阿根廷国民。

在当今全球油价下跌的背景下，其它国家的政府同样面临着如何削减高碳燃料补贴、将投资导向低碳能源的挑战。阿根廷在探索可再生能源潜力方面是著名的“后进分子”，随着该国的奋起直追，作为阿根廷最大投资国之一的中国在阿根廷构建新的合作伙伴关系的机会也必定会增加。

### 解绑石油行业利益

2016年，阿根廷人购买汽油付出的成本是国际市场油价的两倍。阿根廷石油价格最高曾达到67.5美元一桶，而WTI国际原油价格只有33.26美元一桶。

为了保护阿根廷油气产业的就业岗位，该国前总统克里斯蒂娜·费尔南德斯·德·基什内尔政府不顾全球市场油价的下跌，人为地维持高油价。

阿根廷是拉丁美洲第三大经济体，仅次于巴西和墨西哥。该国的页岩气储量和页岩油储量分列世界第二和第四。2014年该国面临60亿美元能源贸易赤字，基什内尔政府于是试图提振被认为处于阶段性低迷中的油气产业。

根据拉丁美洲经济调查基金会数据，这一政策意味着阿根廷的能源企业2015年从消费者身上多赚取了50亿美元，今年又从消费者身上多赚取了35亿美元。

该政策的主要受益人是国家控制的YPF和泛美能源。超过四成的油气销售收益进入了石油公司的口袋，油气资源省份靠卖开采权获得12%；余下的则用于提高行业人员工资和供应商价格。

绿色和平阿根廷分部总监马丁·普列托（Martín Prieto）表示，政府应该将工作重心放在可再生能源而不是石油上。

“阿根廷向国内的公司保证他们得到的井头价高于世界其他地区。这无论从经济上还是环境上都是没有道理的。这种政策只能激励有关方面继续投资于石油开采。发展可再生能源才是唯一的出路，”他告诉中外对话。

起初，油气大省为了维持油气资源红利而施加的压力使马克里延续了石油补贴价格政策。但是赤字增加以及其他行业丢失竞争力等经济大局问题促使政府最终撤销了对于油气行业的支持。

### 削减消费者补贴

预计将于本月开始的削减消费者补贴的政策如今已在油气行业的预期当中。在阿根廷营业的加拿大企业马达莱纳能源公司（Madalena Energy）认为，原油价格将降低三成。

“工会和各省都反对这一政策，但我们都知道补贴早晚要取消，”马达莱纳能源公司股东之一的Maglan Capital投资基金创始人大卫·塔维尔（David Tawil）表示。

政府人士坚称工会、石油生产企业和油气资源省份在就削减补贴问题进行的协商取得了进展。

“能源部长的政策仍然是逐步撤销补贴。这项工作十分复杂，但目标是逐渐与国际价格接轨。目前的价格人为地打压了可再生能源行业的竞争力。长期来看化石燃料必须让路，”莫斯科尼将军能源研究院主任热拉尔多·拉比诺维奇（Gerardo Rabinovich）表示。

阿根廷的Vaca Muerte（字面意思是“死牛”）油田是世界上最重要的油气资源地之一。国际原油价格的下跌导致这一地区从此前的繁荣逐渐走向衰退。

除了原油，阿根廷政府已经在今年早些时候减少了对天然气和电力行业的支持。

这是马克里政府上任后采取的首批措施之一。此前十多年，布宜诺斯艾利斯的天然气、电力和水资源等公共服务的价格一直保持不变。

“阿根廷各项资产和服务价格的合理化使可再生能源投资变得更具吸引力，并对节约能源起到了推动和促进作用。在阿根廷，由于缺乏能源合理消费的激励机制，能源浪费实际上是受到鼓励的，”普列托表示。

前任政府不提价的决定造成能源补贴的大幅上涨。根据阿根廷预算与公共财物管理协会（ASAP）报告，能源补贴从2004年占GDP的0.2%增长至2014年占GDP的2.9%，期间补贴总额高达3.42亿比索（约合2130万美元或1.47亿人民币）。

但这并非唯一的问题。冻结电价导致配电公司流动性不足，因而不愿对技术升级进行必要的投资，造成夏天和冬天经常停电。与此同时，本应使低收入群体受益的补贴反而向高收入群体倾斜。

“能源补贴变成了第二大国家支出项目，并且在很大程度上导致了阿根廷的财政赤字。能源补贴的总支出甚至高于民众医疗和教育方面的总支出。另外，能源补贴的分配也极不合理。最富裕的 20% 人口享受到的补贴是其余人的四倍，” ASAP 总裁拉斐尔·弗洛雷斯（Rafael Flores）表示。

在减少而非彻底废除补贴的情况下，阿根廷本年度的预算赤字将进一步增加。到目前为止，阿根廷预算赤字较去年已经增长了 10%，达到 1330 亿比索（约合 83 亿美元或 573 亿人民币）。

### 加速可再生能源发展

石油和天然气补贴还阻碍了对可再生能源的投资，尽管阿根廷极具可再生能源发展潜力。阿根廷的能源构成中高碳能源占 87%，而风能和太阳能仅占 1.8%。

虽然阿根廷对 Vaca Muerta 油田仍然抱有很高的期望，但低原油价格正在给石油行业带来挑战。页岩油气资源投资依旧与可再生能源投资相当。此外，马克里希望被视为拉丁美洲绿色发展的领导者。当选后，他立即宣布将重新审议阿根廷的气候变化国家自主贡献（NDC）。他希望推动可再生能源发展能够解决阿根廷的能源危机，并且同时提升其个人公众形象。

根据阿根廷国会近期审议通过的一项法律，2017 年，阿根廷将有 8% 的电力来自风能、太阳能以及小型水力发电站。这项法律还要求到 2020 年将这一比例提高至 20%。

政府已经开始（通过雷诺瓦计划）以竞拍的形式对可再生能源项目进行招标，共涉及 17 个项目，总装机 110.9 万千瓦（占阿根廷总装机容量的 3.2%）。其中包括 12 个风电项目、4 个太阳能电池板发电项目和一个沼气发电项目，总投资需求为 18 亿美元。此次竞拍引起了投资者极大的兴趣，后续政府将再次进行招标，预计涉及装机 60 万千瓦。

“阿根廷已经成为吸引可再生能源投资者的重要目的地。这已经成为了阿根廷的国策，”从事可再生能源开发的 SAESA 公司董事长胡安·博什（Juan Bosch）表示。

他补充说：“能源结构多样化如今是这个国家面临的主要挑战。”

## Australia lobbies China-led AIIB to add coal to lending priorities

The Australian government is lobbying hard for the China-led Asian Infrastructure Investment Bank to include coal among its lending priorities, as the country seeks to defend its lucrative exports.

The AIIB, billed by some as Beijing's answer to the World Bank, launched last year with a promise to be a “green bank” with an emphasis on renewable power. But with a draft energy strategy due to be published this month, it has not ruled out funding coal projects.

With 57 members including Germany, France and the UK joining the lender despite initial warnings from the US not to do so, the AIIB marks China's most ambitious foray into financial diplomacy yet. Its capital is about half that of the US-led World Bank.

Indonesian officials have asked the AIIB to finance coal-fired power plants in the archipelago, and other Asian nations are said to be interested. But Australia, with huge natural gas and coal exports, is primarily concerned with preserving overseas markets.

“The [Australian] government wants the AIIB energy strategy to acknowledge that fossil fuels will play a significant role in energy generation in the region for decades to come,” said Kate Williams, a Treasury spokeswoman, adding that their inclusion would ensure that “Australia is not disadvantaged competitively”.

The bank's draft energy plan, to be finalised early next year, will determine which projects it supports in Asia. The

region needs \$8.74tn of investment in energy between 2016 and 2025, according to AIIB forecasts.

An issue paper published by the bank in October prioritises the upgrading of existing energy projects to raise efficiency and proposes investing in renewable energy, including less-intrusive types of hydropower dam, and advises against any nuclear investment. But it does not exclude the possibility of new coal projects.

The paper noted that fossil fuel production has had “severe negative impacts” on the environment, especially in Asia’s densely populated cities. “Coal and oil-fired power plants would exceptionally be considered if cleaner technologies are not available for well-founded energy security or affordability reasons,” it said.

That has worried Australia’s powerful coal lobbies. The Minerals Council of Australia, the country’s biggest industry lobby, accuses the paper of ignoring clean coal technologies, while the Business Council of Australia has written to the AIIB that Australia’s higher-quality coal can help curb emissions growth in Asia.

When asked this week about Canberra’s lobbying of the AIIB, Julie Bishop, minister for foreign affairs, said Australia had to be realistic and pragmatic as there was a place for coal in the world’s energy requirements for decades to come.

“It will be essential for some countries to be able to reach an acceptable level of development to have supplies of cheap reliable energy and given the number of people around the world who still do not have access to electricity this is a fundamental human right,” she said.

### 澳大利亚游说亚投行将煤炭列入投资重点

澳大利亚政府正大力游说中国领导下的亚洲基础设施投资银行(AIIB)把煤炭项目列入优先贷款清单，该国寻求保护自己利润丰厚的出口。

被一些人视为中国对世界银行(World Bank)发起挑战的亚投行，在去年成立时曾承诺做一家“绿色银行”，重点投资于可再生能源。但是，本月将发布能源战略草案的亚投行，目前尚未排除资助煤炭项目的可能性。

由于拥有包括德国、法国和英国——它们没有理会当初美国发出的不要加入的警告——在内的 57 个成员国，亚投行成为迄今中国在金融外交领域最雄心勃勃的尝试。亚投行的资本约为美国领导下的世界银行的一半。

印尼官员已请求亚投行资助该国的燃煤电厂，亚洲其他国家据称也有此兴趣。但天然气和煤炭出口量巨大的澳大利亚，主要关心的是保住海外市场。

“(澳大利亚)政府希望亚投行能源战略承认，化石燃料将在未来几十年亚洲地区的能源生产中发挥重要作用，”澳大利亚财政部发言人凯特·威廉姆斯(Kate Williams)说。他接着说，化石燃料纳入亚投行能源战略将确保“澳大利亚不会在竞争中处于劣势”。

计划于明年初敲定下来的亚投行能源战略草案，将决定在亚洲支持哪些项目。亚投行预测，2016年至2025年亚洲需要的能源投资将达8.74万亿美元。

亚投行10月发布的一份问题纪要，提出优先升级现有能源项目以提高能效，提议投资于可再生能源（包括环境干扰较少的水电大坝），并反对投资核电项目。但是，该文件没有排除投资新的煤炭项目的可能性。

该文件指出，化石能源生产已对环境产生了“严重的负面影响”，尤其是在亚洲人口稠密的城市里。“如果更清洁能源因理由充分的能源安全考虑而不可行，或者价格难以承受，才将破例考虑使用煤炭和石油发电的电厂，”该文件称。

这让澳大利亚强大的煤炭游说团体感到担心。该国最大行业游说团体澳大利亚矿业协会(Minerals Council of Australia)谴责该文件忽略了清洁煤炭技术，而澳大利亚商业理事会(Business Council of Australia)已写信给亚投行称，澳大利亚更高质量的煤炭可以帮助抑制亚洲的排放增长。

当在本周被问及堪培拉方面对亚投行的游说时，澳大利亚外长毕晓普(Julie Bishop)表示，该国必须持现实与实用的立场，因为在未来几十年满足世界能源需求方面，煤炭是有一席之地的。

“对于一些国家而言，有能力达到一种可接受的发展水平、获得廉价可靠能源的供应，将是非常重要的；鉴于世界上至今尚未用上电的人口还非常多，这是一种基本的人权，”她说。

## **Devastated villages pay the price for ignoring coal's environmental impact**

Years of coal development in Shenmu, on the banks of the Yellow River, has left a broken landscape, writes Xie Yujuan

A desolate land

Seven or eight years ago Wei Zhengfa was moved from his village of Wuchenggong in the Shaanxi province, northwest China, to resettlement housing in Lijiapan. Although his ancestral village is now overgrown and weathered by drifting sands, Wei still goes back to farm several mu (hectares) of land.

Both Wuchenggong and Lijiapan are in Shenmu country, home to China's largest known coalfield, Shenfu-Dongsheng. For hundreds of years little changed in the village until recent decades, when villagers' lives have been transformed by the arrival of large-scale mechanised mining.

Each spring and summer, Wei cycles back up the mountain to plant corn and soybeans near his old home. Much of the land is abandoned now; tufts of grass force their way through the loose soil, approaching knee-height. Everything – the land, grass, and mountains far off in the distance – is the same colour as the loess soil. Half the nearby hillside has been quarried away, the rocks exposed as if cleaved with an axe.

It's hard to believe that this was once a shady wooded spot.

Over thirty years Shenmu became China's top coal-producing county, and the biggest generator of coal-fired power in western China. But the coal boom was also accompanied by a host of environmental problems: land subsidence, dried-up rivers, and loss of vegetation, with knock-on effects for people's livelihoods.

In 2008, Chinese media site Xinhua reported that 56.16 square kilometres of Shenmu's land had been affected by subsidence from mining, with 15 square kilometres (23,000 mu) of farmland affected, and 6,700 villagers in 1,900 households becoming environmental refugees.

Wei's home was in the middle of the affected area and now looks utterly ruined. The building has collapsed, and two long cracks run through the remaining walls. Cracks in the ground outside are large enough to fit a fist into. The mouth of the well in the courtyard is a quarter of its former size.

From a distance you can see an area of several kilometres in circumference has sunk by four or five metres. At the edges the line of subsidence is clearly visible.

Most of the villagers have left, but a few families cling on. Wei Zizhen and her husband have opted to stay. "Nobody dares to come back," she says. Even her daughter won't stay the night, and just visits for dinner before leaving.

Coal and water

Follow the local river, the Kuye, downstream and the banks are lined with industrial buildings. The chimneys and cooling towers of coal-fired power plants smoke and steam and the rumble of machinery is clearly audible.

The river bed is 100-metres wide and almost entirely dry and grassed over with only a few streams and rivulets left. This tributary to the Yellow River has been devastated by the expansion of the coal industry.

Wei Zhengfa recalls the river being 200-metres wide and flowing so fast in summer that it swept away the Erlangshan bridge downstream.

But that all changed in the 1980s.

In 1982 a prospecting team made a huge discovery; 87.7 billion tonnes of coal lying under an area of 7,894 square kilometres, including the Shaanxi counties of Shenmu and Fugu. This put it alongside the world's largest coalfields: Donbass in Ukraine and Russia, the Ruhr in Germany and the Powder River Basin in the United States.

According to the county government's website, coal output in 2014 reached 229 million tonnes, an average annual growth of 9.7% since 2009.

Liu Jianqiang, deputy head of the county environmental bureau, said that at one point there were 300 mines operating in the area. Many of these were small-scale, inefficient operations that have since closed, leaving about 100 working mines.

The mining expansion caused a water crisis for the Kuye. Water was diverted for mining and coal processing, and for use in coal-fired power plants.

In 2014, the Yellow River Water Resources Protection Institute published a report on the environmental impact of regional planning on the river, finding that its average flow from 2001-2010 was 54% lower than the 1956-2000 average. The report analysed various factors affecting water availability and found that human activity was the main cause.

Liu said that from 2005 the county invested 400 million yuan (US\$57.6 million) in a reservoir in the town of Yanzhen to supply water for people in the county, adding strain to people's water resources.

Water is an even bigger problem for those still living in the areas affected by subsidence.

Wei Zizhen is 60 years-old and has a stoop after decades of physical labour. Every winter, her water pipe freezes forcing her to make the five-kilometre trip to a water tower to fill two buckets. Wei makes the trip every day but struggles with the buckets. "If someone lifts them onto my shoulders I can carry them, but I can't lift them up myself," she said.

She remembers a time when there was no water shortage. "It flowed off the hillside in streams as wide as tree roots, and there was water in the gullies up there as well."

In March this year Greenpeace published a report on how coal mining is aggravating a worldwide water crisis. It pointed to a severe supply and demand imbalance on the Kuye and estimated that by 2020 the coal industry alone would require more water than the entire river's supply.

The cost of coal

With the development of coal and associated industries, regional GDP in the area rose from 2.3 billion yuan (US\$300 million) in 2000 to 81.7 billion yuan (US\$411.7 billion) in 2015; an increase of 35-fold in only 15 years. But nobody knows the costs of the environmental damage caused by the coal industry, much less how long it will take to repair the damage.

"You'd come up with one number, I'd come up with another, an expert yet another. Nobody knows. Remediation could mean full treatment of the soil or planting a couple of trees," said one official from the Shenmu town of Daliuta.

The town head, Wang Xiaojun, said that in Daliuta there is no environmental remediation taking place: "We haven't got the money, or the capacity."

In fact, it is expected that an energy and chemical hub that is currently under construction will exacerbate the environmental problems.

The Greenpeace report shows that coal-fired power plants already operating in China use 7.4 billion cubic metres

of water a year; half of which is in regions where too much water is being extracted already. On the upper reaches of the Yellow River alone there are more coal power hubs being planned at Ordos, in northern Shaanxi and at Ningdong.

“There’s nothing else we can do,” explains Liu Jiangqiang, “We don’t like this type of growth either, especially in environmental terms.” But he says from a national standpoint the development is necessary, and all that can be done is to promote large-scale efficient operations and better handling of pollutants.

However, Teng Fei, deputy professor at the Institute of Energy, Environment and Economy, Tsinghua University, said that environmental and health costs are not reflected in current fossil fuel pricing. Including these costs would result in a different calculation as to whether further coal development is needed, and could help conserve resources.

“Environmental costs aren’t fully realised in the price of coal, and that’s one of the main causes of overconsumption of the fuel,” Teng said.

Teng said that in the future China will have to reform pricing mechanisms for coal and other fossil fuels, and in particular bolster environmental taxes on coal consumption. It is clear from Shenmu’s scarred landscape that that future cannot come soon enough.

### 陕西神木：煤与水的困局

位于黄河中游的中国煤炭重镇陕西神木县经过多年开发，面临水资源匮乏的局面，凸显了煤与水的矛盾。

荒芜的土地

魏正法从武成功村搬到李家畔移民区已经有七八年了，他还是每年都跑回去种几亩地。武成功村是他的祖辈世代居住的地方，现在已经被漫漫黄沙和荒草覆盖，村子的痕迹都要消失殆尽。

魏正法今年 60 岁，有一张标准的国字脸和古铜色的皮肤。他的腿脚不是很便利，走路久了常常需要用止痛片来缓解疼痛，但大多时候精气神十足。

武成功村和李家畔均隶属于陕西省神木县，村子下面就是中国已探明的最大煤田——神府东胜煤田。过去二三十年机械化大规模的煤炭开采改变了村民成百上千年的生活轨迹。

每至春夏，魏正法就从山下的李家畔移民区骑车绕山而上，在自家地里种上玉米和黄豆。这里大片的土地已经荒芜，野草从松软的沙土中抽出芽来，已经长到膝盖那么高。土地、荒草和远处的山脉是清一色的土黄。旁边的山体因采石被挖去一半，像是被一把钝钝的斧头从中劈开，黄褐色的岩石参差不齐地裸露出来。

如果不是看到照片，你很难想象这里曾是个绿树如荫的地方。

经过三十多年的发展，神木县已然成为中国第一产煤大县，也是西部最大的火电基地。但环境问题也一一凸显：地面塌陷、河水断流、草木枯死。

新华社 2008 年的报道指出，神木县因煤矿开采形成的塌陷区面积达 56.16 平方公里，损毁耕地 2.3 万多亩，1900 户 6700 多农村人口成为“生态灾民”。

魏正法的家就位于塌陷区的中央，现在看去已经非常破败。房子倒掉了一半，两道长长的裂缝将一面墙劈成了三块。屋外的地面也开裂了，裂缝有拳头那么宽。院里的井因为地面塌陷而错位，井口被压缩的只有原来的四分之一大小。

从远处看去，这片方圆几公里的区域整体沉陷了四五米，在边缘处还能清晰地看到地表下陷的痕迹。

武成功村大部分居民早已搬到移民区，但也有几家不愿下山。魏子珍和老伴就选择留在村里。“谁都不敢回来住，”魏子珍说，儿女回来看她，都是吃完饭就走，几乎不在这里过夜。

煤水矛盾

自神木沿窟野河溯流而上，可以看到岸边林立的工厂。燃煤电厂高大的烟囱和冷却塔冒着白烟，机器

轰隆隆地运转。

窟野河一百多米宽的河道已几近干涸，只有几条细流淌过，河床被大片的荒草覆盖。它是黄河的一级支流，也是深受大型的煤炭产业扩张影响的一条河流。

魏正法回忆，曾经的窟野河有两百多米宽，夏天的河水急促汹涌，把下游的二郎山大桥都冲垮了。

转折发生在上世纪 80 年代。

1982 年，陕西省煤田地质勘探队一八五队取得了重大突破：在陕西神木、府谷等 7894 平方公里的土地上，蕴藏着 877 亿吨煤。这使得它与俄罗斯的顿巴斯煤田、德国的鲁尔煤田、美国的波德河煤田等并成为世界七大煤田。神木的历史也因此被改写。

根据神木县政府网站的数据，2014 年煤炭开产量增长到 2.29 亿吨，与 2009 年相比，近 5 年来神木县煤炭开产量年均增长 9.7%。

神木县环保局副局长刘建强接受采访时称，神木县煤矿最多时达到 300 多个，其中一大部分是小煤矿。近两年对煤矿关停并转，现在运行的只有 100 多家。

伴随着对煤炭的疯狂开采，窟野河的水资源危机也越来越凸显。煤炭开采、洗选，燃煤发电等一系列的煤炭生产消费过程均与水资源紧密相关，窟野河开始季节性断流。

黄河水资源保护科学研究院 2014 年发布的《窟野河流域综合规划环境影响报告书》显示，窟野河 2001 年~2010 年河川天然径流量较 1956 年~2000 年均值减少了 54%。

《报告书》通过对自然因素（降水）、人类活动（水保工程、煤炭开采、城镇化建设等）等多方面对水资源变化的成因进行分析，认为人类活动是窟野河天然河川径流量锐减的主要原因。此外，河流天然径流量的减少使得其自净能力不足，加剧了流域内的水污染。

神木县居民也或多或少感受到了缺水的影响。据刘建强介绍，2005 年起，神木县投资 4 亿元打造了瑶镇水库至县城供水工程，以此保障县城居民用水问题。

塌陷区那些尚未搬走的村民吃水就更加困难了。

60 岁的魏子珍大约有一米五的样子，长期的体力劳作使她佝偻着身躯，看上去更矮一些。每年的 12 月到第二年 3 月底，魏子珍家里的水管就会冻住，她不得不到五里外的水塔去接水。两个水桶加起来有一百来斤重，“人给我扶起来我就背得动，没人扶我就起不来了，”魏子珍说。她每天都要往返于此。

在魏子珍的印象中，这里之前并不是那么缺水。“山上流着一股水，有树根一般粗，山里小渠渠里也有水。”魏子珍说。

国际环保组织绿色和平 2016 年 3 月发布的《煤炭产业如何加剧全球水危机报告》指出，窟野河流域水资源供需矛盾尖锐，预计到 2020 年，窟野河流域内仅煤炭产业的需水量就超过该流域规划的 2020 年总供水量。这意味着，煤炭产业的进一步扩张将使其与民生、农业和生态以及其他产业抢水的情况愈演愈烈。

煤炭的隐性成本

随着煤炭的开采及相关产业的发展，神木的地区生产总值从 2000 年的 23 亿元增长到 2015 年 817.41 亿元，短短 15 年翻了约 35 倍。然而，这些年因开采煤矿、发展煤炭产业给当地造成的生态损失究竟有多大却是一笔糊涂账，生态修复所需要的时间和成本就更不得而知。

神木县大柳塔镇一位不愿具名的官员认为，这个生态帐是算不清楚的。“你算一个数字我算一个数字，专家来了也算不清，谁也不知道。如果搞治理，土地无害化是治理，仅仅栽两棵树也是治理。”他说道。

大柳塔镇镇长王晓君也表示，目前大柳塔镇没有做生态修复的事情，“镇上没有资金，也没有这个能力。”

然而可以预见的是，正在进行的能源化工基地的建设会使得这一地带的生态变得更为脆弱。

绿色和平上述报告显示，中国已运行的燃煤电厂的年耗水量约为 74 亿立方米，且有近一半装机建在“过度取水”地区。此外，截至 2013 年底，还有装机容量约 237 吉瓦的煤电厂计划建于“过度取水”地区。仅在黄河流域中上游，就有鄂尔多斯、陕北和宁东三个计划建设的煤电基地。

对于这一困局，刘建强解释称，“不发展没办法，我们也不喜欢这样的发展，尤其站在环保的角度讲，”

但他认为，从国家的角度来讲肯定要发展，所以只能促使企业规模化生产，提高污染治理水平。

除此之外，将煤炭生产与消费的外部损害成本反应到煤炭的定价体系中也是资源保护的应有之义。

清华大学能源环境经济研究所副教授滕飞撰写报告指出，相当部分的环境和健康成本并没有体现在目前化石能源的定价机制中，因而是“隐藏”在价格之后的“真实成本”。

由于这部分成本并没有体现在定价机制中，因而企业和居民在使用化石能源时也就不会考虑其对环境和健康的损害，进而导致市场失效和化石能源的过度使用。

“环境成本没有在煤价中得到完全的体现，这是促使煤炭过量消费的一个主要原因。”滕飞说。

王晓君也坦言，“在煤炭的成本中，跟环境有关的，影响到环境需要为此负担的还是很小的一部分，很小很小。”

滕飞认为，未来中国需要进一步改革化石燃料和煤炭的定价机制，特别要加强煤炭消费环节的环境税费水平。

## *Electricity* (电力)

### **Gas plants, not wind, may have been at fault in South Australia blackout**

The role of ageing gas-fired generators may have been part of the problem in the events leading up to the state-wide blackout in South Australia in September, which experts say could have been avoided if the gas generators had been replaced by inverter linked renewables and storage.

A new study by international renewable energy and storage firm RES and engineering group Lloyds Register has modelled the events leading to the September 28 blackout, and suggested that if inverter controlled solar and storage had been in place instead of gas generators, then the blackout may have been avoided.

That's because new smart and fast reacting technology can respond much quicker to unexpected events than the ageing portfolio of gas and diesel generators. The inverters and storage that go with such systems could have smoothed out the changes in output and voltage, and not made them worse as the gas-fired generators did.

It's ironic, because the blackout in South Australia has been used by the Coalition government, the fossil fuel lobby and critics of renewable energy as proof that such technologies are not reliable and endanger the grid. The findings also challenge the idea that the situation can be resolved with more expensive transmission lines and more gas generation.

The blackout was caused when huge storms, with winds of up 260km/h, brought down three major transmission lines, in turn causing changes in output and frequency that caused the link to Victoria to separate and the grid to go "system black".

The fall in output from six wind farms, because they were not programmed to ride through multiple voltage changes, were blamed in some quarters. However, most energy experts say the blackout was inevitable no matter what generation was operating in the state.

Questions have also been raised about why the Australian Energy Market Operator took no pre-emptive action, despite clear warnings of the approaching storm. Its latest report on the blackout is due for release on Monday.

The new study from RES and Lloyds Register suggests the problem may have been in the way that the gas-generators responded to the changes in the network. The sudden changes in output from the gas-fired

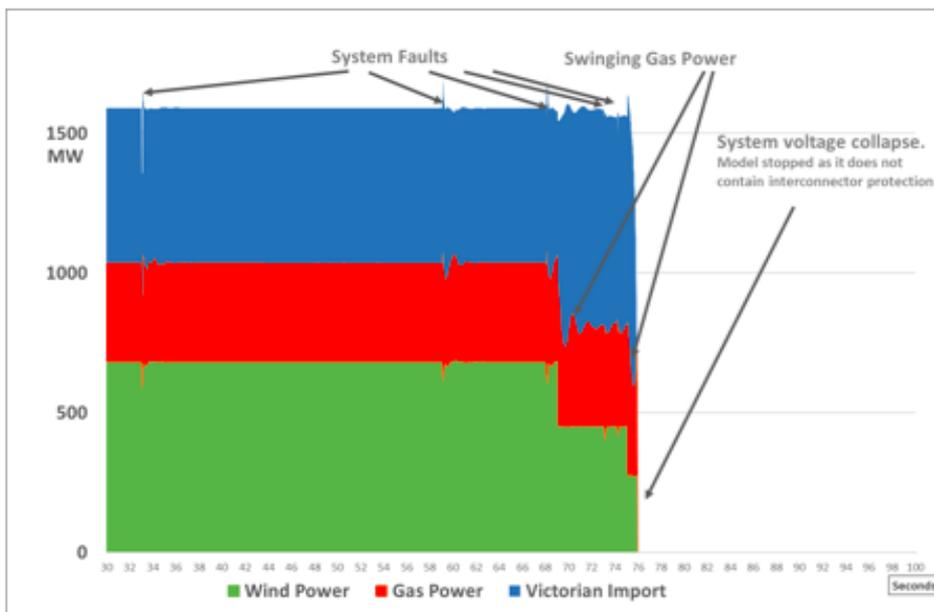
generators may have made the situation worse, as they did in a previous outage in November, 2015.

Using precise computer models of the South Australian system obtained from AEMO, RES and Lloyds Register looked to see if the system may have performed any differently if the remaining gas generation in South Australia was replaced with inverter connected batteries and solar power.

This is an excerpt from their report:

“The simulation shows the behaviour of the wind generators, gas generators and interconnectors with Victoria in the lead up to the disconnection of the Heywood Interconnector. It starts at 16:17:30 AEST, approximately 45 seconds prior to disconnection of the Heywood Interconnector.

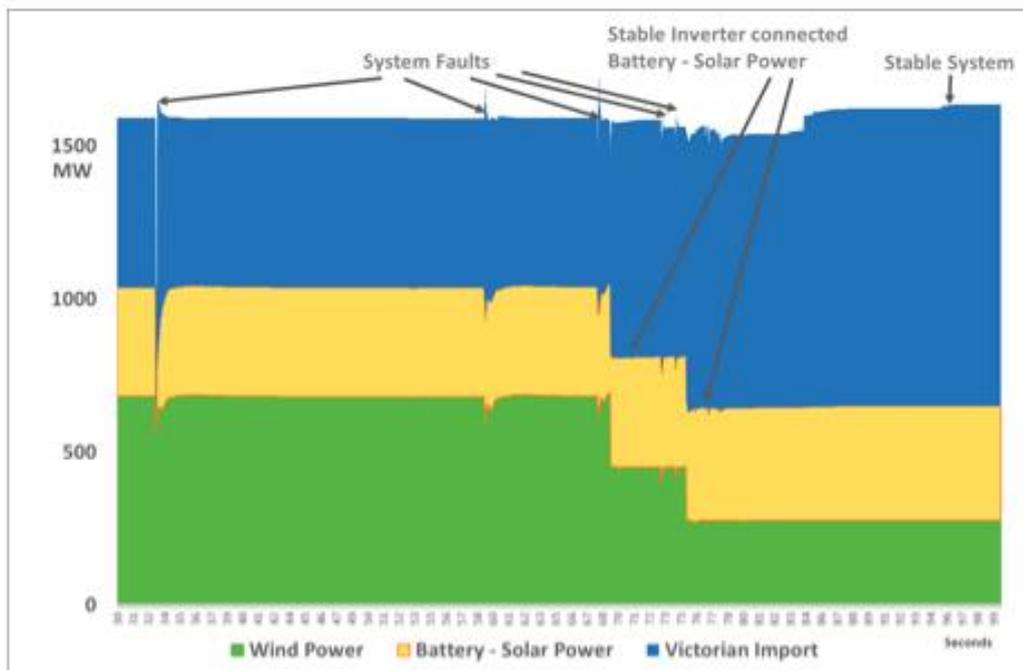
Notice the how the gas units swing up and down, causing rapid loading of the interconnection after the faults at 68 seconds and 74 sections. At the 76 second mark the system voltage collapses. The simulation is stopped at this point, as the models provided by AEMO do not include the very fast equipment protection systems that disconnected the Heywood interconnector (ref 2 p.16) at this point.



So, would the system have behaved any differently if the gas power stations were replaced with inverter connected solar and storage power stations?

To find out, the modellers repeated the simulation with the same fault sequence, and in this case the inverter generators smoothly resume power after the fault, flows on the interconnection remain stable and the system survives.

The “wobbles” in the output from the gas generators disappear, and the system remains stable.



And it should be pointed out that this occurs even with the wind farms losing output from the setting of their fault-ride through mechanisms, which in most cases have since been fixed.

What does this mean?

It shows that inverter controlled solar, wind and storage generation is offering the opportunity to provide much smarter and more stable controls than the previous combination of gas and coal-fired plants. And remember, most of South Australia's gas plants operating on the day of the blackout are 40 years old.

“While there is much discussion around the challenges of integrating renewable power into the grid, technology is advancing at a rapid pace,” the report says.

“So perhaps a fully secure and sustainable future for electricity is not so far away.”

To illustrate their findings, RES Australia and Lloyd Register are progressing plans for a 100MW lithium-ion battery storage plant in South Australia, in a location that is yet to be revealed. They hope to use this to illustrate the savings that could be achieved from avoiding construction of more transmission lines or more gas plants.

The findings of the study – which are consistent with observations made by the likes of Reposit Power, network operator ElectraNet and even AGL (pointing to benefits of renewables based micro grids), point to the rapid change in energy systems, as dramatic as the switch from internal combustion engines to electric vehicles.

Andrew Jones, from Lloyds Register, says the gas market wobbles are the natural result of a system focusing on “inertia” and “synchronous” generation. Gas plants are like giant flywheels – if the output is blocked, it will suddenly speed up, much like a car might do if you apply the clutch and keep your foot on the accelerator.

Then it tries to back off. In each case, it overheats, leading to the sort of output “wobbles” highlighted by the AEMO data.

“Because the system was on edge, this would have helped push it over,” Jones says. “We are still waiting for data from AEMO, who have said the interconnector was “out of sync” but haven't explained what they mean by that.”

“But what we do see here is that the inverter connected generation rides through the event.”

Jeremy Moon, from RES-Australia, adds: “There is a lot of talk about power system security. Inertia is seen as key in traditional power systems, but we think we should start to use the battery storage system and want to get that conversation started.”

### 南澳大利亚停电由天然气发电厂引发而不是风电场

老化燃气发电机的作用可能是九月导致南澳大利亚全州停电事件的部分原因，专家们称这个事件原本可通过将燃气发电机替换成与可再生能源和储备相关的变频器来避免的。

国际可再生能源和储能公司 RES 以及工程组 Lloyds Register 进行的一项新的研究已经模拟了这次导致 9 月 28 日停电的事件，并且表明，如果变频器控制的太阳能和储能就位，替代燃气发电机组，那么该次停电事件就可以避免了。

这是因为相比老化的燃气和柴油发电机组的组合，新型智能和快速反应技术能够更加迅速地应对突发事件。与这类系统共同使用的变频器和储能能够平稳输出和电压中的变化，并且不仅像燃气发电机那样使它们情况更加严重。

讽刺的是，南澳大利亚的停电已经被联盟政府、化石燃料游说组织和可再生能源的批评者们用来作为这类技术不稳定并且会危机电网的证据。这些发现还质疑了一个想法，即这种情况可以通过更加昂贵的输电线路和更多的燃气生产来得到解决。

该停电事件是在风暴袭击时发生的，当时风速达 260km/h，造成三座主要的输电线路倒塌，从而造成输出和频率发生变化，导致与维多利亚连接的线路中断，电网出现“系统黑”。

输出的下降来自于六座风电场，因为它们没有经过编程以处理多电压变化，而这点在某些方面受到了指责。然而，大多数能源专家称，无论该州经营的是哪种发电机组，这场停电都是不可避免的。

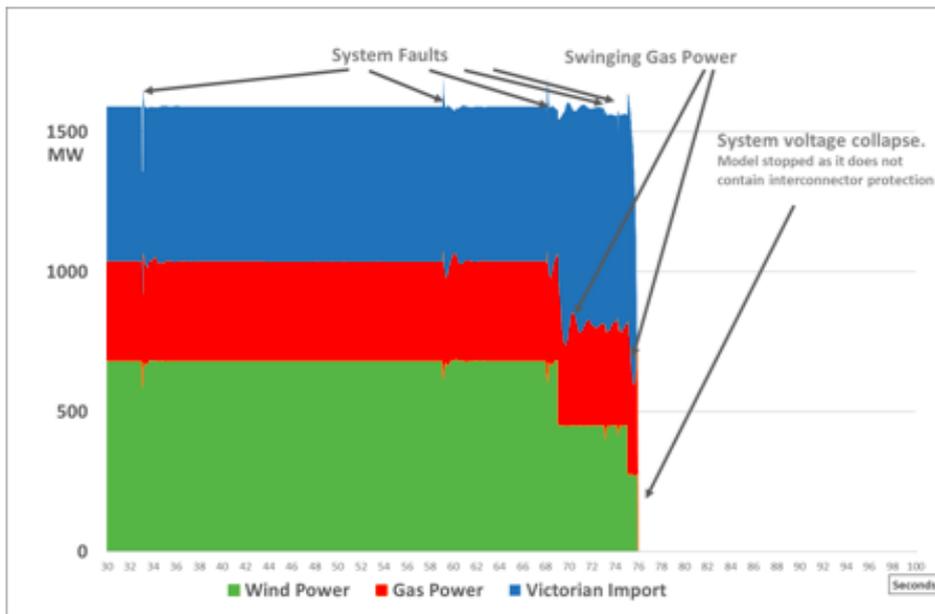
人们还就为什么澳大利亚能源市场运营商没有采取先发制人的行动，尽管他们获得了明确的有风暴接近的警告提出了一些问题。关于该停电的最新报告预计将于周一发布。

RES 和 Lloyds Register 的新研究表明，该问题可能出现在燃气发电机应对网络中变化的方式。燃气发电机组输出中的突然变化可能令情况更糟，正如他们在 2015 年 11 月发生的前一次停电中所做的一样。

利用 AEMO、RES 和 Lloyds Register 提供的南澳大利亚系统的精确计算机模型研究该系统是否在南澳大利亚剩余的燃气发电机由与电池和太阳能相关的变频器替代之后还会具有不同的表现。

他们报告中的摘录显示：

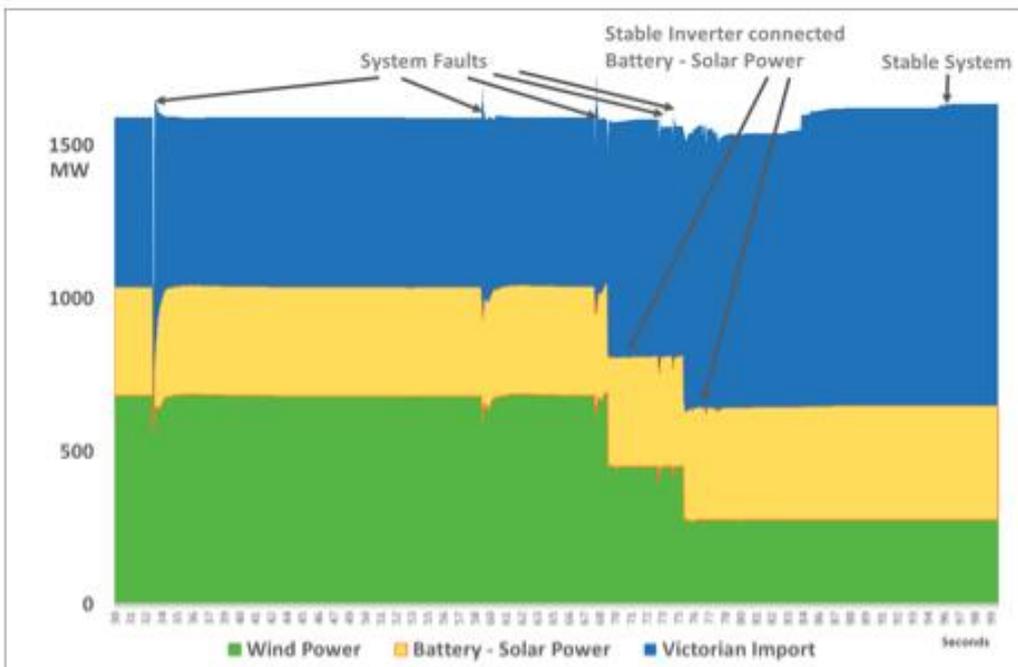
“该模拟展示了风力发电机、燃气发电机以及与连接维多利亚的网络在导致 Heywood 互连器断开时的行为。它于 16:17:30 AEST 开始，大约在 Heywood 互连器断开前 45 秒。”



注意燃气机组如何上下摆动，在 68 秒和 74 段的故障发生后迅速加载互联。在 76 秒标记处该系统电压崩溃。该模拟在这一点上停止了，因为 AEMO 提供的模型并不包括在这一点上非常快速的断开 Heywood 互联器（参考文献 2 第 16 页）的设备保护系统。

那么，如果燃气发电站被与太阳能和储能发电站连接的逆变器替代之后，该系统是否会有什么不同的表现？

为了发现，该模型通过相同的故障序列重复了该模拟，并且在这种情况下，逆变器发电机在故障之后平稳地恢复了供电，互连网络上的电流仍然保持稳定，并且系统存活了下来。



燃气发电机组输出中出现的“摆动”消失了，并且该系统保持了稳定。

并且其应该指出，这种情况即使是在风电场在其故障穿过机组的设备中损失了输出时也会发生，这在大多数情况下已经被修护了。

这意味着什么？

它表明，逆变器控制的太阳能、风能和储能发电将为提供更加平稳并且更加稳定的控制带来机会，而不像之前的燃气和燃煤电厂的组合。并且请记住，大部分南澳大利亚正在经营的燃气电厂在停电当天都已经运营了 40 年了。

“在关于将可再生能源电力融入电网的挑战进行了大量的讨论的同时，技术也在迅速发展，”该报告称。

“因此，或者电力完全安全和可持续的未来并不遥远。”

为了说明他们的研究发现，RES 澳大利亚和 Lloyd Register 将在南澳大利亚一位还没有揭露的地理位置计划开发一个 100MW 的锂离子电池储能厂。他们希望用此展示可能通过避免更多的输电线路或更多的燃气发电产的建设而实现的节省。

这项研究的发现——与 Reposit Power、网络运营商 ElectraNet 以及 AGL（根据微网指出可再生能源的益处）的类似发现相一致——指出了能源系统中的迅速变化，与内燃机发展到电动汽车的变化一样戏剧化。

Lloyds Register 的 Andrew Jones 表示，天然气市场的波动是专注于“惯性”和“同步”发电的系统的一个自然结果。燃气电厂就像是一个巨型飞轮——如果输出受阻，其将会突然加速，就像是一辆汽车在你踩离合器并且仍然踏向加速器时的反应一样。

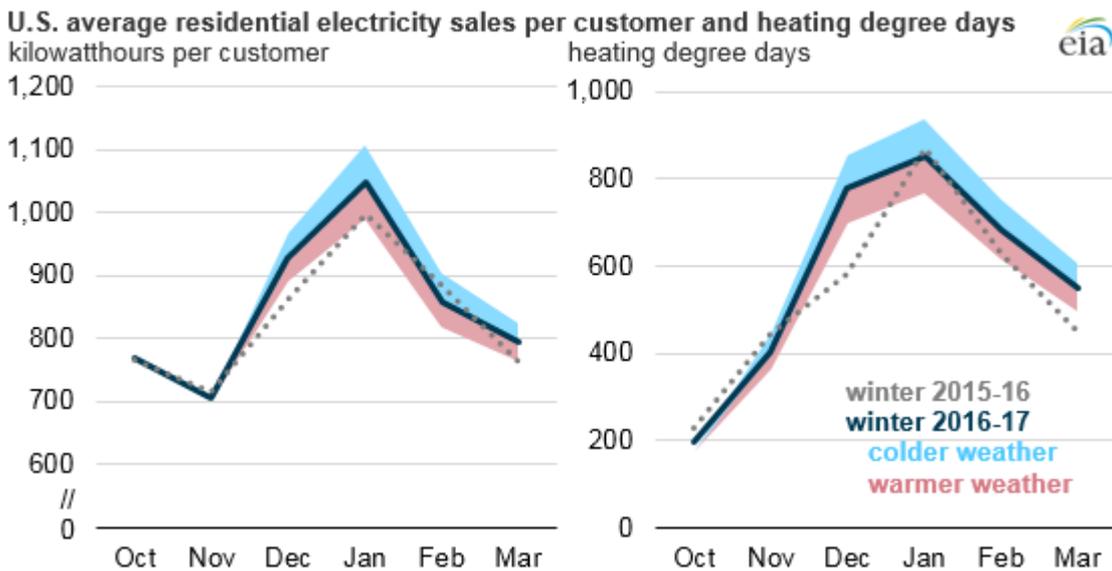
然后它试图退回。在每种情况下，它都会过热，产生 AEMO 数据所强调的输出“波动”。

“因为该系统位于边缘，这可能有助于推翻它，” Jones 表示。“我们仍然在等待 AEMO 的数据，他们已经表明互连器‘不同步’，但是并没有解释他们的意思是什么。”

“但是，我们确定在此看到的是逆变器连接的发电机通过了这次事件。”

RES-澳大利亚的 Jeremy Moon 补充称：“关于电力系统的安全性有许多话题。惯性被认为是传统电力系统的核心，但是我们认为我们应该开始利用电池存储系统，并且希望开启相关谈话。”

## Winter residential electricity consumption expected to increase from last winter



Source: U.S. Energy Information Administration, Short-Term Energy Outlook, December 2016

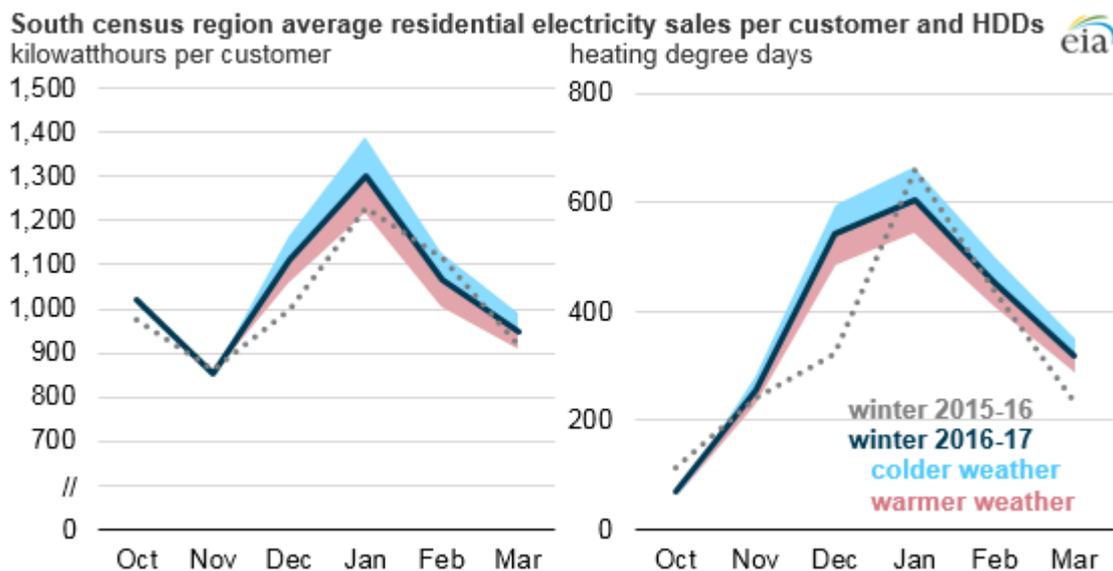
Note: Colder and warmer weather ranges represent forecast values when heating degree days are 10% higher or

## Mcanxixun Information

10% lower than expected, respectively.

EIA's Short-Term Energy Outlook (STEO) projects that the average residential customer will consume 4% more electricity over December through March compared with the same period last winter. However, this forecast is highly dependent on winter temperatures. If temperatures are warmer than expected, as they have been the past two months, average electricity use could be slightly below that of the previous winter.

Seasonal electricity consumption patterns in homes vary regionally, and some regions reach their peak electric load in the winter when the weather is extremely cold. Consumption of electricity rises in the winter because the days are shorter (i.e., more lighting usage) and some homes heat with electricity, either for their primary heating equipment, such as electric furnaces or heat pumps, or with secondary heating equipment, such as space heaters or electric blankets. Space heating with electricity is common in the South census region, where nearly two-thirds of households heat primarily with electricity. Even though this region's electricity consumption is highest in the summer, Southern electricity consumption in the winter is sensitive to changes in temperatures.

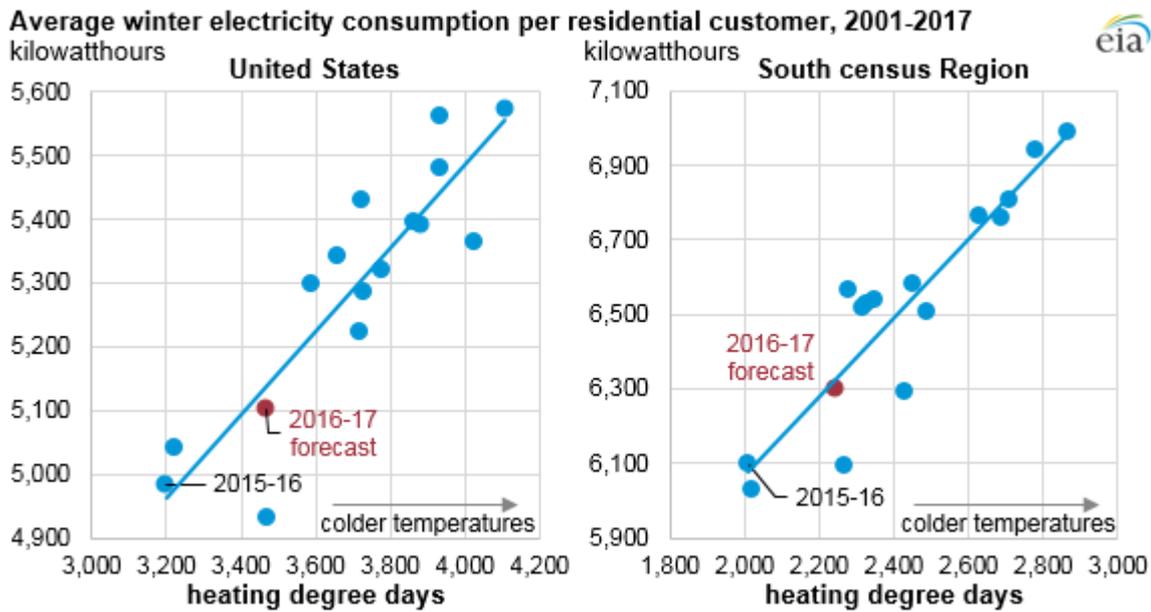


Source: U.S. Energy Information Administration, Short-Term Energy Outlook, December 2016

Note: Colder and warmer weather ranges represent forecast values when heating degree days are 10% higher or 10% lower than expected, respectively.

Most areas of the United States experienced record warmth over the winter 2015–16 as a result of a strong El Niño weather pattern over the Pacific Ocean. The average temperature for the Lower 48 states over the months of October 2015 through March 2016 was the highest on record, based on data since at least 1895. These very warm winter temperatures reduced electricity use.

The average U.S. residential customer used 4,985 kilowatthours (kWh) between October 2015 and March 2016, the lowest level since the winter of 2001–02. In the South census region, the average residential customer consumed slightly less than 6,100 kWh last winter, which was the lowest since 2011–12.

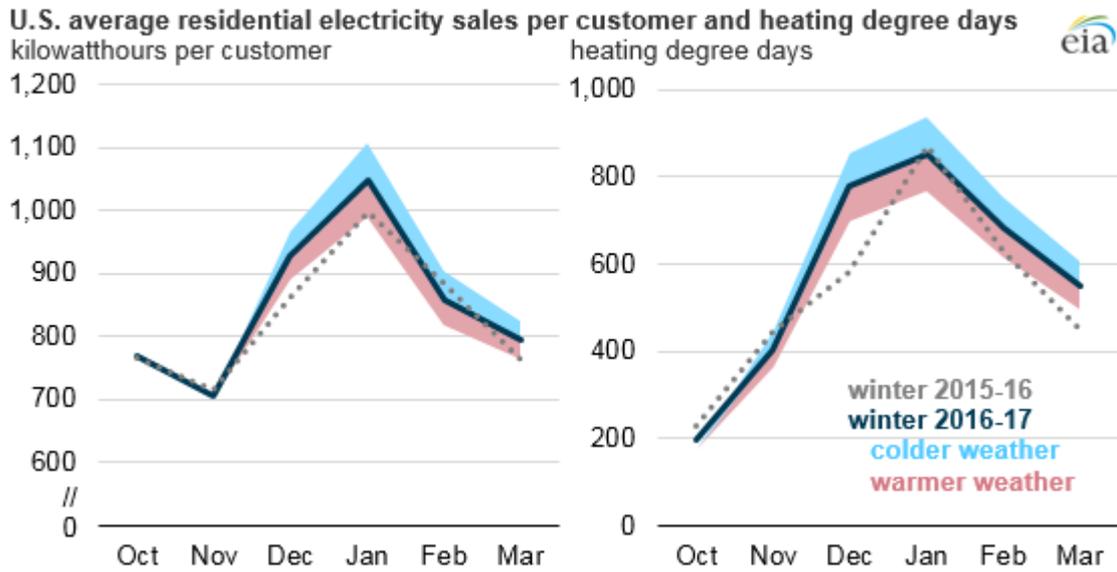


Source: U.S. Energy Information Administration, Short-Term Energy Outlook, December 2016

EIA’s Short-Term Energy Outlook uses weather projections from the National Oceanic and Atmospheric Administration’s (NOAA) Climate Prediction Center to develop the STEO’s expectations of weather and weather-related energy demand. NOAA publishes forecasts of heating degree days, which use temperature and population data to estimate expected heating and cooling needs. Warmer weather means fewer heating degree days. NOAA expects U.S. heating degree days between October 2016 and March 2017 will total 3,466. This level is about 8% lower (or warmer) than the amount of heating degree days during a normal winter. However, this level is not as warm as the winter of 2015–16, when heating degree days totaled 3,198.

EIA projects that the average U.S. residential customer will use 5,100 kWh of electricity this winter, 2.4% more than last winter. Based on NOAA’s projections, residential customers in the South census region should also experience temperatures colder than last winter, with EIA forecasting the average customer will use 6,300 kWh of electricity, or 3.3% more than last winter. However, household heating expenditures are not expected to change significantly because electricity prices on average are expected to be slightly lower this winter.

### 冬季住宅用电量预计比去年冬季高

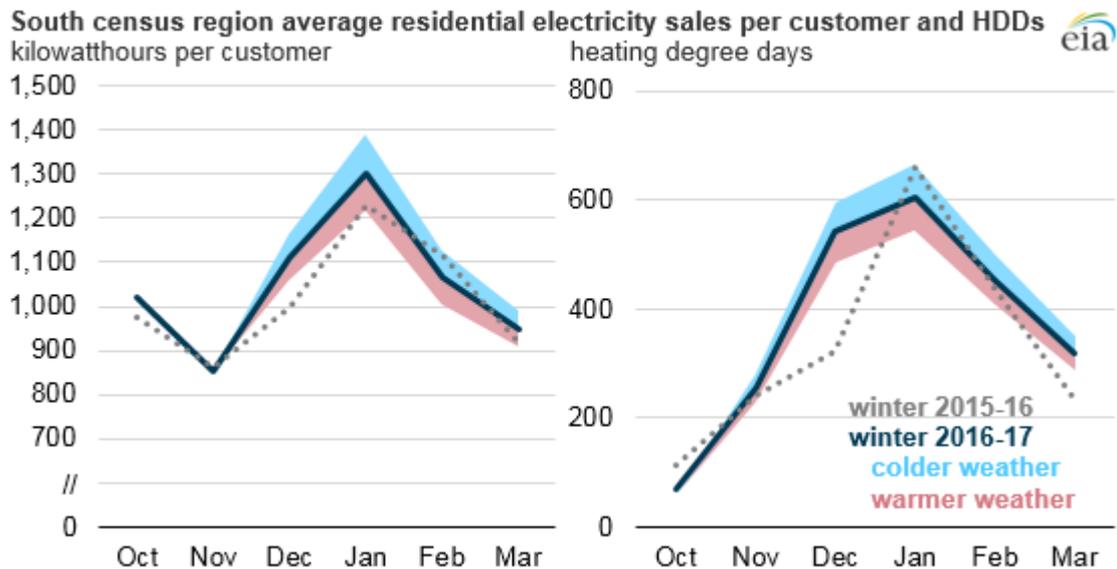


资料来源：美国能源信息署，短期能源展望，2016年12月

注：较冷和较暖的天气范围在加热天数时代表的预计数值分别比预计高出10%以及低了10%。

EIA的短期能源展望（STEO）预计，平均住宅客户在12月至三月消耗的电力将比去年同期增长4%。然而，这种预计高度依赖于冬季的温度。如果温度比预计要高，正如过去两个月的温度一样，平均电力的使用可能会比去年冬季略低。

家庭季节性电力消耗模式根据地区有所变化，并且一些地区在冬季天气非常冷时达到了他们的电负荷峰值。冬季电力消耗的增加是因为白天更短（即，使用更多的照明），以及一些家庭通过电力来供暖，要么选择他们的主要加热设备，例如电炉或热泵，或者使用辅助加热设备，例如空间加热器或电热毯。在南方普查区域，通过电力进行空间加热是非常常见的，这些地区近三分之二的家庭主要通过电力来供热。尽管该地区的电力消耗在夏季达到最高，南方在冬季的电力消耗对于温度的变化比较敏感。

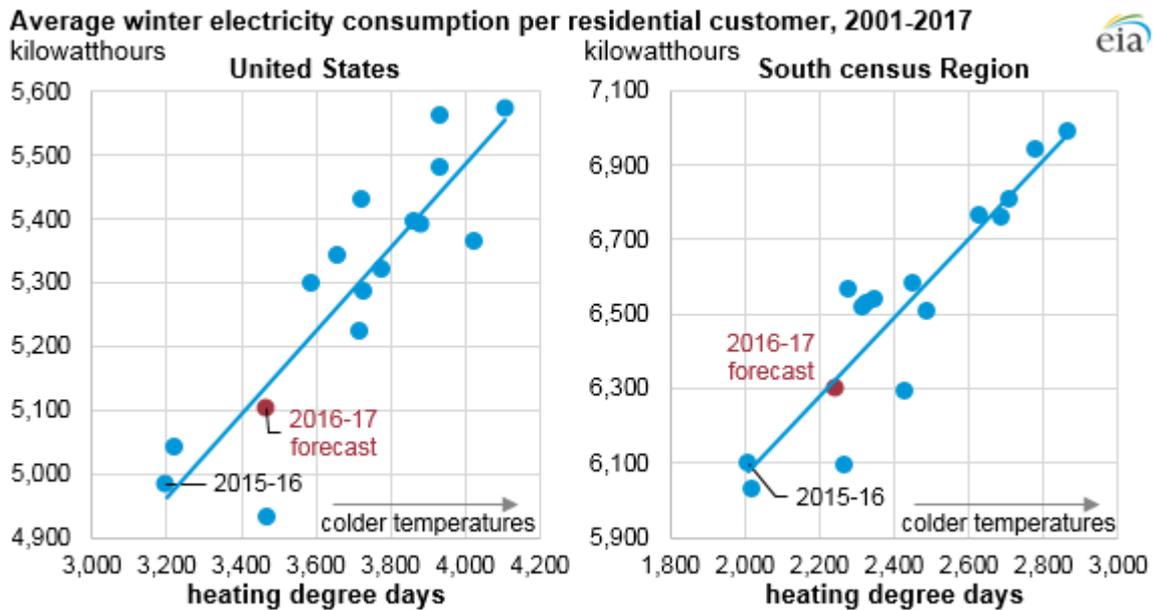


资料来源：美国能源信息署，短期能源展望，2016年12月

注：较冷和较暖的天气范围在加热天数时代表的预计数值分别比预计高出10%以及低了10%。

美国大部分地区在2015-16经历了创纪录的温暖天气，因为太平洋上强烈的厄尔尼诺天气。较低的48个州在2015年10月至2016年3月的平均温度达到了历史最高，这主要依据是在自1895年以来的数据。这些非常温暖的冬季天气减少了电力的使用。

美国住宅客户在 2015 年 10 月至 2016 年 3 月平均使用了 4985 千瓦时 (kWh)，自 2001-02 年冬季以来的最低水平。在南方普查区域，住宅客户消耗的平均水平略低于去年冬季的 6100kWh，达到了 2011-12 年以来的最低水平。



资料来源：美国能源信息署，短期能源展望，2016 年 12 月

EIA 短期能源展望利用国家海洋和大气管理局 (NOAA) 气候预测中心提供的天气预测来开发 STEO 有关天气和天气相关性能源需求的预期。NOAA 公布了加热天数的预测，利用温度和人口数据来估计预测的供暖和制冷需求。较暖的天气意味着较少的供暖天数。NOAA 预计美国供暖天数在 2016 年 10 月至 2017 年 3 月将共计 3466。这个水平比正常冬季的供暖天数量低(或暖)了大约 8%。然而，这个水平并没有 2015-16 年冬季那么温暖，当时的供暖度日总计为 3109。

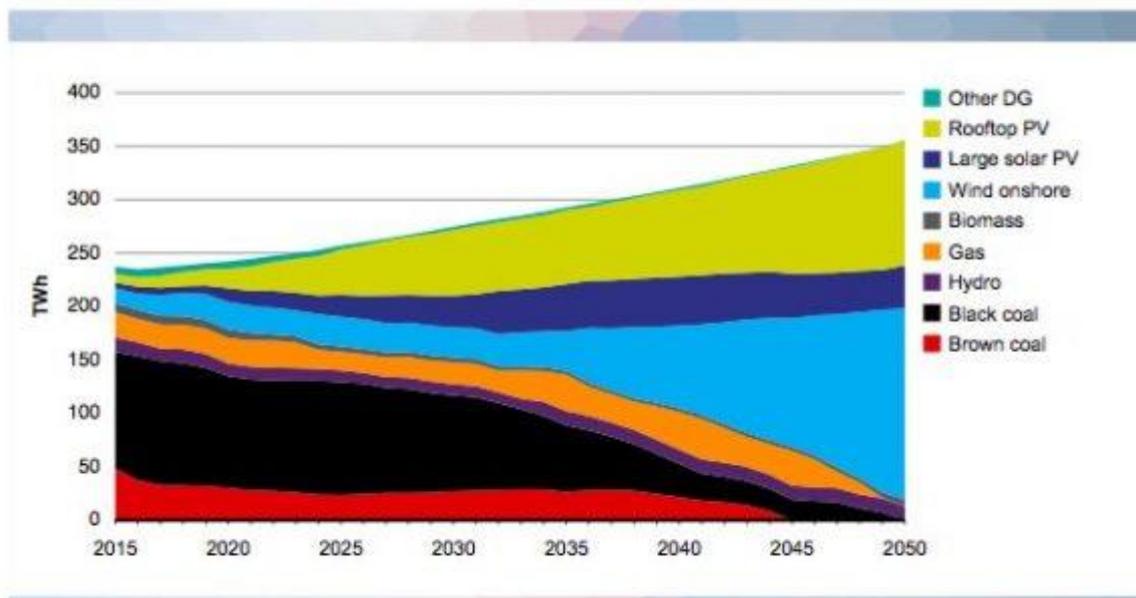
EIA 预计，美国住宅客户平均将在今年使用 5100kWh 的电力，比去年高出 2.4%。根据 NOAA 的预测，南方普查区域的住宅客户也应该会经历比去年冬季更冷的温度，其中 EIA 预计客户平均会使用 6300kWh 的电力，比去年冬季高出 3.3%。然而，家庭供暖支付预计不会发生显著变化，因为电力价格平均预计会在今年冬季略有下降。

## How much storage is needed in solar and wind powered grid?

The CSIRO and Australia's electricity network owners this week released a study that showed the best to deliver reliability, bring down costs and lower emissions in Australia was through a national grid powered almost exclusively by wind and solar.

The cost savings over business-as-usual – a grid powered primarily by coal and gas – were significant, with consumer savings of between one-quarter and one-third of their bills.

Figure II: Plausible projection of Australia's changing energy mix to 2050



But it does beg a question: If the grid is powered by “variable renewable energy” (or VRE), such as wind and solar (see graph above), what will happen when, as the detractors say, the wind don’t blow and the sun don’t shine? The answer, of course, is storage. But not nearly as much as the cynics suggest. And at not nearly the cost.

Australia will have a number of options for storage: battery storage located “behind the meter” (i.e. in households and businesses), battery storage located at grid level (next to wind and solar farms, and at various points in the network), plus hydro, pumped hydro, molten salt storage with solar towers, and other technologies such as fly-wheels.

Right now, however, it looks like the most prominent will be battery storage, if only because it will be the favoured technology of the anticipated 10 million homes and businesses that will combine rooftop solar and storage to reduce their bills, do their bit for clean energy, and to ensure energy security.

The CSIRO and Energy Networks Australia study was remarkable because it pointed out that – contrary to the political and ideological debate around wind and solar – these technologies can be relied upon to underpin the grid of the future and lower bills.

Over the past decade or two, the estimates for a “suitable amount” of variable renewable energy sources such wind and solar have jumped from as little as 10 per cent to nearly 100 per cent. This is despite the fact that some quarters are now pushing the idea that 30 per cent of total renewables is somehow the logical maximum.

CSIRO Energy chief economist Paul Graham says the 30 per cent estimate is clearly not true because South Australia has boasted more than that for several years. And until this year’s weather and network-related events, this has not been a problem.

“That estimate (of 30 per cent VRE capacity) does not seem to be grounded in reality,” Graham told RenewEconomy.

Graham says that additional storage is not needed for up to 40 to 50 per cent wind and solar penetration. That’s because the grid can rely on existing back-up (built to meet peaks in demand and for when coal and gas “baseload” generators trip or need to be repaired).

Beyond those levels, storage needs to be part of the equation. But again, not as much as many would think. But as

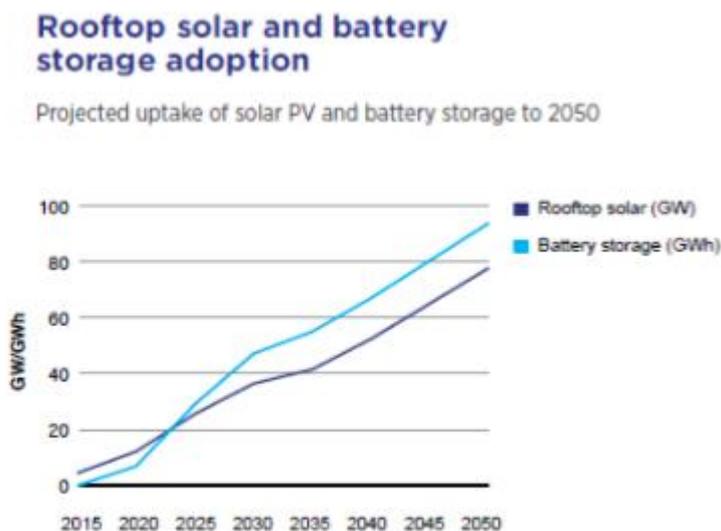
the back-up generators gradually exit the grid, they can be replaced by various storage types, until storage then becomes the principal form of back-up and grid security on the grid.

Graham says that the CSIRO modelling showed that at very high levels of wind and solar, a maximum of half a day's average demand was needed for storage. In some areas of the grid, only around three hours might be needed.

This is an important point, because some renewable critics say that about a week's worth of storage is needed, and multiples of wind and solar capacity required for back up. These would be the same people that argue that climate science is a hoax, but it is a view that has more traction than it should.

Graham says the CSIRO modelling indicated that at those very high levels, about 0.8GW of back-up was required for about every GW of wind and solar capacity. This is around the same amount of back up capacity currently needed by centralised power plants to meet peak demand and outages.

The good news in Australia's renewable energy scenario is that the storage capacity will likely be paid for anyway by households and businesses reducing their dependence on grid load, and reducing their bills.



The CSIRO and ENA study expects rooftop solar to rise five-fold between now and 2026 to reach 20GW, before nearly quadrupling again to nearly 80GW by 2050.

Battery storage is forecast to reach 32GWh by 2026, and 87GWh by 2050. Much of this will be “behind the meter” and will need to be harnessed by networks to achieve grid security, meet demand and balance the output of renewables. Such trials are already underway in various states.

Graham says that battery storage costs are falling so quickly that the CSIRO team already had to upgrade its forecasts and bring forward recommended action by five years. While South Australia is already venturing into territory where storage is needed, other states will follow over the next decade and will need to be prepared.

“What you need to be able to do is to meet is average load. You don't necessary need to size batteries to cover the capacity of everything that is built,” Graham says.

“We will be relying on dispatchable solutions for a while yet, because it is there and it is valuable to use it. As it slowly phases down, then we will replace it with battery storage.”

The CSIRO and the ENA's report envisages a system where nearly all households stay on the grid, despite their storage capabilities, and are rewarded for helping out the network by providing some of those services – stability and responding to peak demand.

But those forecasts depend on Australia quickly developing a coherent energy policy, and updating its market

rules and policies before the battery storage takes off in full flight. On either measure, however, it might be fighting against time.

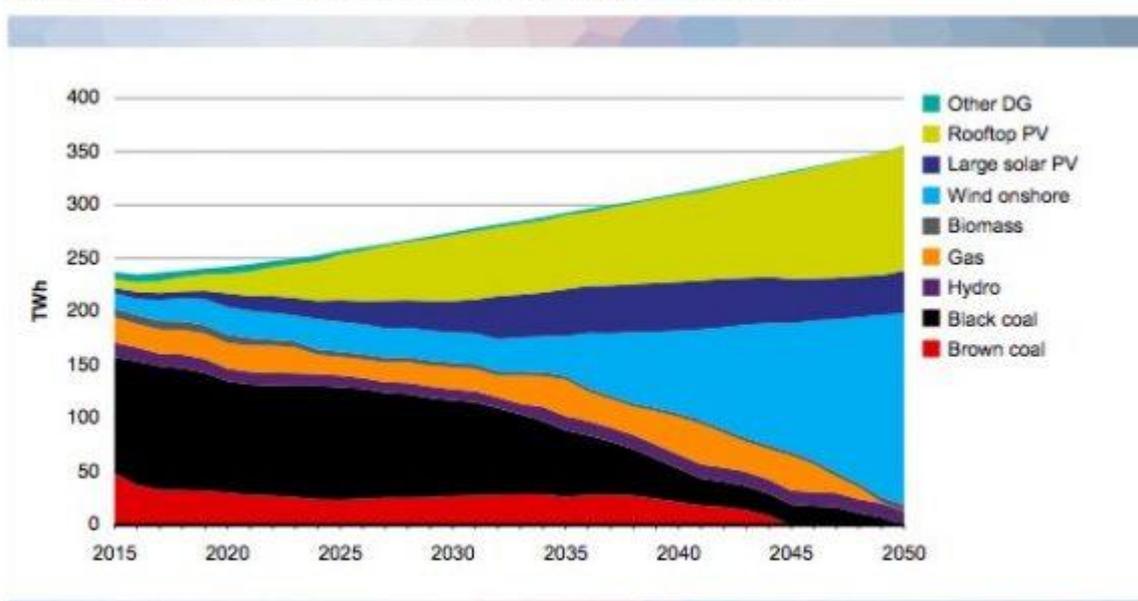
“We don’t have time to lose another five years,” Graham says. “Otherwise we are going to be locked into a different system.” And that comes from another of the CSIRO scenarios, where policy fails but technology marches on, and millions of consumers respond by quitting the grid.

### 太阳能和风能供电网需要多少储能？

CSIRO 和澳大利亚的电力网络所有者本周发布的一项研究表明，在澳大利亚提供可靠性、降低成本以及排放量的最佳方式是国家电网几乎完全由风力和太阳能供电。

在照常营业——主要由煤和天然气供电的网络——的基础上节约成本是非常显著的，其中消费者将节省他们账单中的 1/4 至 1/3。

Figure ii: Plausible projection of Australia's changing energy mix to 2050



但是它确实提出了一个问题：如果电网由“可变的可再生能源”（或 VRE）供电，例如风力和太阳能（见下表），那么如批评者所说，在风力不再刮风并且太阳不再发光时会发生些什么呢？当然，答案是存储。但是几乎没有达到批评者所建议的。并且几乎没有成本。

澳大利亚对于存储将具有一些选项：位于“表后”的电池存储（即在家庭和企业），位于电网水平的电池存储（接近风能和太阳能电场，并且位于网络的不同点），加上水电、抽水蓄能、太阳能塔熔盐存储，以及其他像飞轮一样的技术。

然而，现在，看起来最突出的将是电池存储，只要它能够成为受到预料的 1000 万个家庭和企业青睐的技术，他们将结合屋顶太阳能和存储来降低他们的成本，为清洁能源做出自己的贡献，并且确保能源安全性。

澳大利亚 CSIRO 和能源网络研究是非常显著的，因为它指出——与风能和太阳能的政府和思想辩论相反——这些技术能够受到依赖，以此来加强未来电网的基础，并且减少账单。

在过去的十年或二十年之间，可变可再生能源资源的“适当数量”，例如风能和太阳能，已经有 10% 增长至近 100%。尽管事实表明有一些地区目前正在推动 30% 的可再生能源在某种程度上是逻辑上的最大

值的想法。

CSIRO 能源的首席经济学家 Paul Graham 称，30% 的估计显然是不正确的，因为南澳大利亚多年来自夸的额度远高于此。并且直到今年的天气和网络相关事件发生之前，这都不是一个问题。

“估计值（30% VRE 的产能）似乎并没有现实根基，” Graham 告诉 RenewEconomy。

Graham 称，额外的存储在风能和太阳能份额方面不需要高达 40% 至 50%。这是因为该电网可以依赖于现有的备份（成立用于满足需求高峰以及在煤炭和天然气“基荷”发电机跳闸或需要得到修理时）。

除了这些水平，存储需要成为该方程中的一部分。但是再次，并不像人们想象的那么多。但是随着备用发电机逐渐退出电网，它们可能会被各种存储类型所取代，直到存储之后成为了备份的主要形式以及确保了电网的安全性。

Graham 称，CSIRO 模型表明，在风能和太阳能水平非常高的情况下，半天的平均需求的最大值需要存储。在电网的一些区域，可能只需要三个小时。

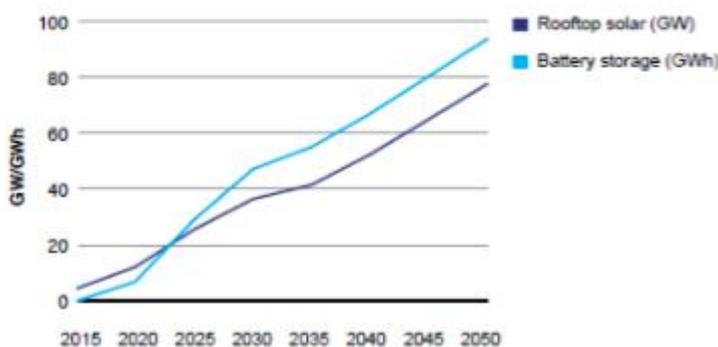
这是重要的一点，因为一些可再生的批评者称，大约需要价值一周的存储量，并且需要备份成倍的风能和太阳能容量。同一批人认为气候科学是一个骗局，但是这个观点具有更多的牵制。

Graham 称，CSIRO 模型表明，在这些非常高的水平下，每 GW 的风能和太阳能产能大约需要 0.8GW 的备份。目前集中发电厂满足高峰和中断大约也需要相同量的后备容量。

澳大利亚可再生能源形式的好消息在于，存储容量很有可能由降低了他们对电网负载的依赖性同时减少了他们的账单的家庭和企业来支付。

### Rooftop solar and battery storage adoption

Projected uptake of solar PV and battery storage to 2050



CSIRO 和 ENA 研究预计屋顶太阳能从现在到 2026 年将增长五倍，达到 20GW，到 2050 年将几乎再次翻两番，达到近 80GW。

电池存储预计到 2026 年达到 32 GWh，并且在 2050 年 87 GWh。大部分这类容量将“在表后”，并且将需要获得网络的加强，以实现电网的安全性，满足需求并且平衡可再生能源的输出。这样的试验在各个国家已经在进行之中了。

Graham 称，电池存储成本会迅速下降，CSIRO 团队已经更新了其预测，并且提前五年采取了建议的行动。在南澳大利亚已经冒险进入了需要存储的领地时，其他州也将在接下来的十年内效仿，并且需要进行准备。

“你做到这点所需的是满足平均负载。你不一定需要大量的电池来涵盖建立的所有事物的产能，”

Graham 称。

“我们将在一段时间内依赖于调度解决方案，因为存在这种方案并且利用它是非常有价值的。随着

## Mcanxixun Information

---

其缓慢地阶段性减少，我们将用电池存储来进行替换。”

CSIRO 和 ENA 的报告设想了一个令所有家庭都在电网中的系统，尽管他们都具有存储能量，并且因帮助电网，提供一些服务而获得回报——稳定性以及应对高峰需求。

但是这些预测取决于澳大利亚在电池存储全面启航之前迅速发展出一个连贯的能源政策，并且更新其市场规则和政策。然而，无论哪一种措施，它都有可能与时间斗争。

“我们没有时间再失去五年，” Graham 称。“否则我们将困在一个不同的系统中。”并且来自于另一个 CSIRO 情形，其中政策失利，但是技术却继续前进，数百万客户将通过退出电网而作出回应。

## Aruba Promises 100% Clean Electricity By 2020

Aruba, a 19 mile long island in the southern Caribbean Sea, is dependent on imported fossil fuels, with more than 80% of the island's electricity generated using heavy fuel oil. But over the next half dozen years, that is going to change. Aruba has pledged to transition to 100% renewable electricity by 2020 with particular emphasis on variable wind and solar for renewable energy.

Aruba is making progress toward sustainability as it develops a renewable energy framework, which requires overbuilding capacity or integrating storage technologies to compensate for the variable nature of wind and solar. The Vader Piet wind farm generates part of Aruba's electricity needs, and there is a second wind farm in development. Additional planned projects include an Airport Solar Park, a waste-to-energy plant, solar panels on residential and commercial buildings. When completed, these projects will generate a substantial percentage of Aruba's power needs. Aruba is also researching ocean thermal energy conversion, geothermal power, and energy storage technologies.

Aruba will also look to new ways to convert waste to energy and increase energy efficiency. To leverage its resources, the island must address barriers, such as limited open land and steeply sloping seabed. The utility company is working to provide air conditioning using ice that is produced at night when electricity costs are lower. Advanced technology such as floating offshore wind turbines and novel applications of commercial technology may be needed to reach the ambitious 100% clean electricity by 2020 goal.

Justin Locke, director of the island energy program at the Carbon War Room, an international nonprofit, says it makes sense for islands to switch to clean power. “Islands currently pay some of the highest electricity prices in the world. At the same time, they also have some of the best renewable energy resources.”

To move beyond the transition to renewable energy to smart growth, Aruba's plans include:

- creation of world-class walkable destinations for tourists and residents;
- providing incentives for household retrofitting and commercial energy efficiency;
- implementing a sustainable approach to smart growth in the tourism
- industry to create an inspirational holiday destination; and,
- creating an Agriculture sector in Aruba that makes the best use of water

resources.

The Green Platform has been the foundational mechanism to develop an land-use and urban planning component for Aruba that promotes the transition to renewable forms of energy.

The Government of Aruba has goals to balance quality of life and sustained economic growth through a sustainable and shared prosperity. To achieve these goals, Aruba promotes economic growth, social equity, and environmental awareness. Aruba has designed an initiative to develop the island as a gateway between Europe and the Americas in the areas of green technology, business support services, and creative industries, which is intended

to bring greater economic diversification, stability, growth, and increased sustainability to Aruba.

“Islands provide an incredible blueprint, or guiding light, for what a renewable economy could look like from a technical, financial, and regulatory perspective,” according to Locke, “because they are actually moving in that direction now.”

### 阿鲁巴岛承诺 2020 年 100%清洁电力

阿鲁巴岛是加勒比海南部 19 英里长的岛屿，依赖进口化石燃料，岛屿电力的 80%都是重油发电。但是接下来四年，会发生变化。阿鲁巴岛已承诺到 2020 年过渡到 100%的可再生电力，尤其是风能和太阳能。

阿鲁巴岛正在走向可持续性发展，因为它在提高可再生能源框架，这需要建设能力或集成存储技术来弥补风能和太阳能的可变性。阿鲁巴岛维德斯风电场满足部分阿鲁巴岛的电力需求，第二个电厂还在建设中。其他计划项目包括太阳能电厂、废物能源工厂、太阳能电池板住宅区和商业用楼。完成后，这些项目将满足相当大比例的阿鲁巴岛用电需求。阿鲁巴也研究海洋温差发电、地热发电和储能技术。

阿鲁巴岛还在寻找新的将废物转化为能源以及提高能源效率的方法。为了充分利用其资源，该岛屿必须解决障碍，如限制开放土地以及陡峭的倾斜海床。公用事业公司正在努力让空调在晚上使用冰块制冷，这样会使用很少的电量。像海上浮动风力涡轮机和商业技术的新应用等先进技术可能需要到 2020 年才能达到 100%清洁电力的雄伟目标。

国际非盈利性组织碳作战室的岛国能源计划主任 Justin Locke 说，岛国改用清洁能源是有道理的。“岛国目前是世界上付电费最多的国家。同时，他们也拥有着一些最好的可再生能源资源。”

为了推动可再生能源的理性增长，阿鲁巴的计划包括：

- 创建对游客和居民年适宜步行的世界级目的地
- 为家庭改装和商业能源效率提供奖励
- 实现旅游业可持续途径的理性增长
- 打造鼓舞人心的度假胜地行业；以及
- 创建阿鲁巴的农业部门，使水资源得到最好的使用

绿色平台已经成为促进向可再生能源过渡的基本机制，来提高阿鲁巴的土地利用率以及城市规划组合。

阿鲁巴政府的目标是，通过可持续发展和共同繁荣，实现生活质量和经济可持续增长的平衡。为了实现这些目标。阿鲁巴促进经济增长、社会公平、提高环境意识。阿鲁巴在欧洲和美洲之间设计了一个主动发展绿色技术、业务支持服务、创意产业的岛屿，这是为了给阿鲁巴带来更多样化的经济、稳定、增长以及可持续发展的增长。

根据 Locke，“从科技、金融、监管的角度来看，可再生经济看起来像什么，岛国为其提供了一个令人难以置信的蓝图或指明灯。因为，他们确实在朝着这个方向前进。”

## Wind Energy Is Behind A Historic Shift in US Electricity Production

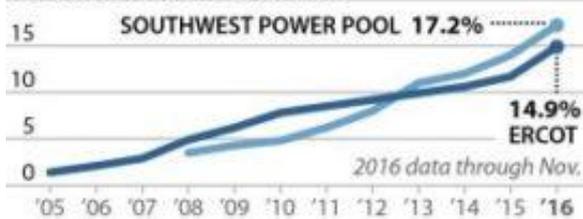
## Mcanxixun Information

---

### A Power Shift Across the Great Plains

Electricity generated by wind is providing a record share of all power on two major grid systems this year.

20% share of all power generated



The increase, which has driven wind's share of generation to 48 million MWh in the first 11 months of 2016 from 36 million MWh in the first 11 months of 2015, has displaced over 11.6 million MWh of electricity that would otherwise have been produced at fossil-fired plants.

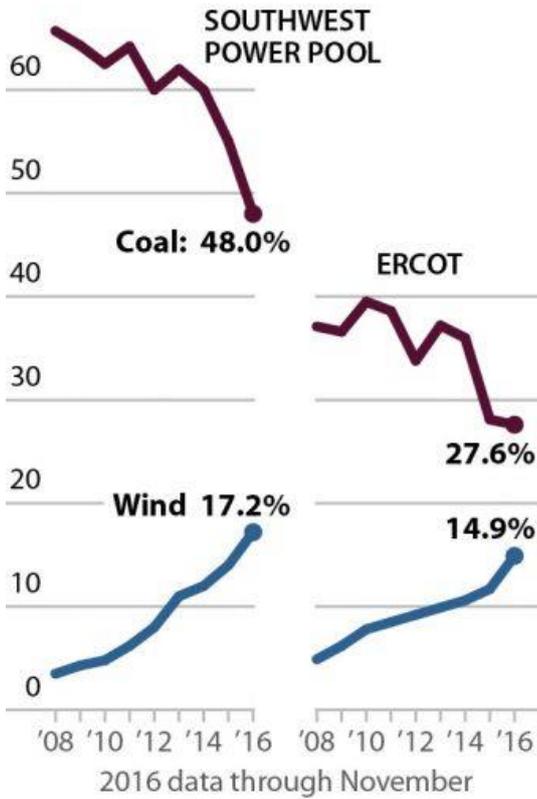
This shift is not surprising given that the amount of wind capacity in ERCOT, which includes most of Texas and more than 20 million electricity customers, had reached 17,000 megawatts by the end of October, driven by 1,200 megawatt of new wind-generation installations this year. An additional 2,000 megawatts of wind capacity is expected to come online this month.

It's part of a trend we described in a report we published in September detailing a historic shift across ERCOT, which is shorthand for the market operated by the Electricity Reliability Council of Texas.

### Wind Power Growing Quickly On Great Plains Grids

The share of electricity that is generated by wind keeps setting records in a belt of states covering the Great Plains.

70% share of all electricity generated



Less than a month ago, on Nov. 28, wind generation produced a record 15,000 megawatts of the electricity used in ERCOT. The record for percentage of the total ERCOT load served by wind was set earlier in the year, on March 23.

This year's increase in ERCOT follows similar increases in previous years; wind generation in ERCOT has soared

## Mcanxixun Information

by more than 84 percent since 2011. The trend has contributed to a steep decline in coal-fired generation, which provided 27 percent of total electricity generation in ERCOT in the first 11 months of 2016, down from 39 percent in 2011.

And wind's share of ERCOT electricity generation can be expected to continue to grow significantly in coming years.

A SIMILAR SHIFT IS OCCURRING ACROSS THE VAST REGION OF MIDDLE AMERICA SERVED BY THE SOUTHWEST POWER POOL (SPP), an area known also as the Saudi Arabia of wind. It includes all or most of Kansas, Nebraska, North Dakota, Oklahoma, South Dakota, and significant chunks of other states.

SPP reported having more than 12,000 megawatts of wind capacity in service this year, with as much as an additional 4,000 expected to come online soon.

More than 33,000 megawatts of wind projects are in various stages of development across the region, which—as SPP itself has said—has “more potential wind energy in [its] footprint than SPP could absorb.”

It's an export industry in the making.

As with ERCOT, SPP wind-powered electricity production has surged. Last winter, wind produced 17.7 percent of electricity generated in SPP, a 70 percent increase from two years earlier. This past February, wind provided about 21 percent of SPP electricity, and on a number of occasions this year, wind has provided almost half of the region's total generation. Overall, wind accounted for more than 17 percent SPP generation in the first 11 months of 2016.

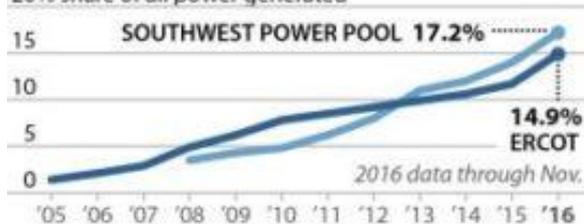
Meanwhile, the amount of power generated by coal-fired generators has fallen. It dropped to 48 percent of the total generation in SPP in the first 11 months of 2016 from more than 62 percent in 2013.

## 风能是美国电力产业历史性转变的后盾

### A Power Shift Across the Great Plains

Electricity generated by wind is providing a record share of all power on two major grid systems this year.

20% share of all power generated



最初发表在 IEEFA。

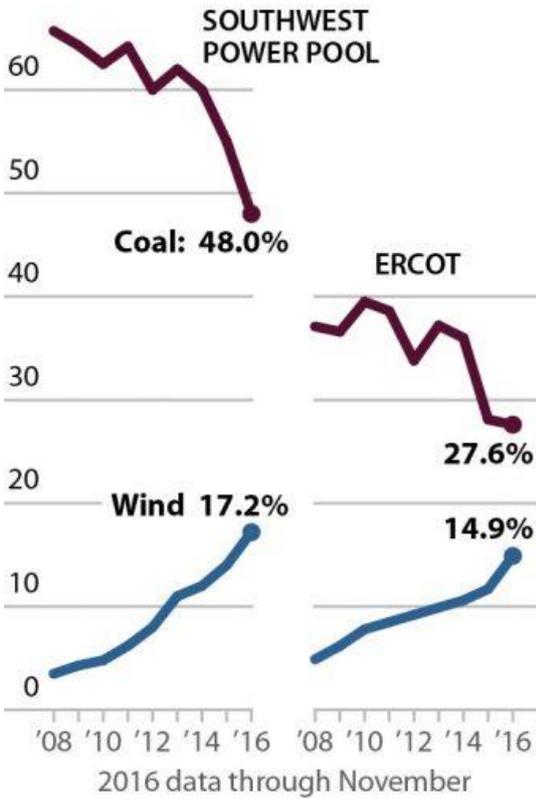
该增长推动风能份额从 2015 年的前十一个月的 3600 万兆瓦时增长到 2016 年的前十一个月 4800 万兆瓦时，取代了本该在火电厂的 1160 万兆瓦时电力。

鉴于 ERCOT 的风能，包括德克萨斯州大部分电力和 2000 多万以上的电力客户，这种转变并不令人意外，且由今年新的 1200 兆瓦的风力发电设施驱动的风能，在十月底达到 1.7 万兆瓦。多余的 2000 兆瓦风力预计将在本月上线。

### Wind Power Growing Quickly On Great Plains Grids

The share of electricity that is generated by wind keeps setting records in a belt of states covering the Great Plains.

70% share of all electricity generated



我们在九月份发表的报告中详细描述了 ERCOT 的历史性转变，这是趋势的一部分，这是德克萨斯电力可靠性协会的工作速记。

不到一个月前，11月28日，风力发电产生了 ERCOT 用电创纪录的 1.5 万兆瓦。记录占 ERCOT 总负荷的百分比在今年早些时候，3月23日设置。

## Mcanxixun Information

---

今年 ERCOT 的增长类似于前几年的增长；ERCOT 的风力发电从 2011 年已经飙升超过了 84%。这个趋势导致燃煤发电的急剧下降，占美国发电总量从 2011 年的 39% 下降到 2016 年的前十一个月的 27%。

美国风力发电的比例在未来几年将继续大幅增长。

根据西南电力联营服务（SPP），美国中部广大地区也发生着同样的转变，有一个地区被称为风之沙特阿拉伯。它包括堪萨斯州、内布拉斯加州、北达科他州、奥克拉荷马州、南达科他州和其他州重要部分，这些地方的全部或大部分。

SPP 报告，今年有 1.2 万多兆瓦的风力发电投入使用，额外的 4000 兆瓦也将很快上线。

不同地区的 3.3 万多兆瓦的风电项目处于处于不同的发展阶段，正如 SPP 自己说的——“比 SPP 能吸收的风能有更多潜在风能。”

这是一个出口行业。

SPP 与 ERCOT 一样，风电产业激增。去年冬天，风产生的电能占 SPP 发电的 17.7%，比两年前增长了 70%。今年二月，风提供了 spp 电能的 21%，在今年多数时刻，风提供了区域总用电的几乎一半的电能。总之，2016 年前十一个月，风占 SPP 发电的 17% 以上。

同时，燃煤发电产生的电量已经下降。占 SPP 总电量的百分比从 2013 年的 62% 下降到 2016 年前十一个月的 48%。