

ENERGY

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Oil (石油)

Trump ends Obama block on Keystone XL and Dakota Access pipelines

President Donald Trump has quickly moved to reverse another of Barack Obama's signature policies, backing two multibillion-dollar oil pipeline projects that became test cases for Washington's commitment to addressing climate change.

Mr Trump said the Keystone XL and Dakota Access pipelines would help to meet his campaign promise of producing new blue-collar jobs at home, insisting that any portions built in the US would have to use domestically produced steel.

"We will build our own pipes, like we used to in the old days," the president said in the Oval Office as he signed presidential memoranda to advance construction on both projects.

In recent years, oil pipelines emerged as totems in a wider war between the fossil fuel industry and environmentalists. Keystone XL was the most controversial such project, and the Obama administration delayed its final verdict on the scheme for four years, rejecting it only on the eve of 2015 global climate talks in Paris.

The \$8bn pipeline is designed to carry crude from oil sands in Alberta, Canada, to refineries in the US, and pitted opponents who feared more greenhouse gas pollution against an energy industry that promised to create US jobs. Oil sands generate more greenhouse emissions than many conventional oil and gas sources due to the energy required to extract and process the heavy crude.

"We are going to renegotiate some of the terms [with Canada], and if they'd like, we'll see if we can get that pipeline built," Mr Trump said.

The \$3.8 billion Dakota Access pipeline, which is already more than 92 per cent complete, also drew months of fierce protests, including from Native Americans who fear the 1,100-mile pipeline would endanger their water supplies. Mr Trump said approval for the last remaining section would be "subject to terms and conditions, to be negotiated by us".

特朗普支持推进两条石油管道的建设

奥巴马政府曾出于环保考虑决定停建这两条管道，特朗普上台后迅速推翻了这一决定，并强调建设用钢必须产自美国。

美国总统唐纳德·特朗普(Donald Trump)迅速采取行动推翻了巴拉克·奥巴马(Barack Obama)的另一项招牌性政策，对两个耗资数十亿美元的石油管道项目表示了支持。这两个项目曾是考验美国政府作出的应对气候变化的承诺的试金石。

特朗普表示，Keystone XL 和 Dakota Access 管道可帮助兑现他在竞选期间作出的、在国内创造新的蓝领就业机会的承诺。他坚称，任何建于美国国内的部分都必须使用美国生产的钢材。

特朗普在椭圆形办公室(Oval Office)签署总统备忘录推进这两个项目的建设时表示：“我们将修建我们自己的管道，就像我们过去曾经做的那样。”

最近几年，石油管道成为化石燃料行业与环保主义者之间更广泛斗争的象征。Keystone XL 是其中最受争议的一个项目，奥巴马政府将对该计划的最终裁定推迟了 4 年，并在 2015 年巴黎全球气候谈判前夕

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否决了它。

这条耗资 80 亿美元的管道旨在将原油从加拿大阿尔伯塔省的油砂矿输运到美国的炼油厂，担心此举会加剧温室气体污染的反对者与承诺创造美国就业机会的能源业围绕这条管道陷入对峙。由于开采和加工这种重质原油需要大量能源，油砂石油造成的温室气体排放超过很多常规油气资源。

特朗普表示：“我们将（与加拿大）就某些条款重新展开谈判，如果他们愿意，我们会看看我们是否能建成这条管道。”

耗资 38 亿美元的 Dakota Access 管道已完工逾 92%，该项目也引发了长达数月的强烈抗议，包括美国原住民的抗议，后者担心这条长 1100 英里的管道会危及他们的水供应。特朗普表示，是否批准最后一个遗留区段的建设，将“取决于有待我们商定的相关条款和条件”。

End Of Crude Oil Export Ban Could Have Negative Unintended Consequences

The repeal of the crude export ban, which Congress just passed and the president signed as part of the omnibus appropriations bill (read “budget”), may end up being one of those “watch out what you wished for” events. The ban goes back to 1975 when OPEC, in charge of oil supply, liked to deny us the resource from time to time with embargoes. The thinking at the time was that, by keeping all domestic crude oil inside U.S. borders, prices would be lowered, and at the same time, supply and national security would be protected.

Back then, the United States could easily use all of the oil it produced and America's daily production was already waning. But the dramatic increase in U.S. crude production from hydraulic fracturing of shale formations has altered those circumstances. Domestic producers, finding a crude glut at home, have been clamoring for access to international markets where their product might fetch higher prices. Environmentalists and domestic refiners, however, wanted exports to remain off-limits.

U.S. refiners, who have been investing billions to increase state-side refining capacity for the lighter, sweeter domestic crude, say refining jobs will be lost in the U.S. Environmentalists say that more crude on the world market means that more refining and producing will take place, thus feeding the world addiction to hydrocarbon fuel and upping carbon emissions, and that the increased refining will happen in countries with little or no environmental regulations.

The playing field is made even more uneven against domestic refiners by a piece of 95-year-old legislation called the Jones Act. The Jones Act mandates that cargo being moved between U.S. ports can only be carried by ships that were built in the United States and that are owned by U.S. companies flying U.S. flags. This means that refiners on the East Coast pay about three times the transportation costs to acquire ship-borne U.S. crude than do their competitors in Canada, Europe, or Asia.

It's worth noting that, just in the Southeastern Pennsylvania region, refineries that were on the brink of shuttering just a few years ago at the estimated cost of 24,000 jobs, today pump \$2.5 billion in wages into the local economy and account for an economic impact of \$15 billion to \$20 billion.

Some very credible people are also warning that a major assumption in the equation to repeal the crude export ban, namely the low price of crude, is not going to stick for much longer:

As they say, the cure for low prices is low prices. Rob Kaplan, the president of the Federal Reserve Bank of Dallas, gave everyone a dose of reality in his public remarks on Nov. 18 at the University of Houston. Kaplan pointed out that it is expected that the current imbalance in oil production versus consumption, which is driving and keeping oil prices low, is expected to come more into balance by late 2016 or early 2017."

It's a complicated issue with myriad implications, a fact outlined in a longer piece that I recently wrote with Blank

Rome Partner Matthew J. Thomas for The Legal Intelligencer, where we dissect the case for both sides.

How will lifting of the ban affect this currently vibrant domestic refining sector of our economy? Will it do more harm than good? It can't be said for sure right now. But we can only hope that Congress takes less than 40 years to course-correct if it turns out that the law of unintended consequences hoists us by our own petard.

美国解除原油出口禁令可能会造成的意外影响

作为美国国会上周通过并由美国总统签署的联邦政府 2016 财年综合拨款法案（即预算）的一部分，原油出口禁令的废除可能最终会成为那些“小心你所许下的愿望”的事件之一。这项禁令可追溯到 1975 年，当时掌控石油供应的石油输出国组织（OPEC，简称欧佩克）时而喜欢以禁运来拒绝给予我们这项资源。当时美国设立原油出口禁令的初衷是，通过让所有国产原油留在美国境内，原油价格会下跌，而且同时供应和国家安全会得到保护。

当时，美国可以很不费力地用掉所有国产原油，而且美国的原油产量已然处于下滑状态。但是，美国页岩层水力压裂开采的原油产量急剧增加已经改变了这种情况。发现国内原油过剩的美国国内生产商一直大声要求进入国际市场，因为在那里他们的产品可能会获得较高的价格。然而，美国环保人士和国内炼油企业希望原油出口依然是被禁止的。

已经为提高国内轻质低硫原油的炼油产能，美国炼油企业投入了数十亿美元。这些企业警告说，一旦解禁原油出口，国内炼油行业将会流失大量工作岗位。环保人士说，世界市场上的原油增加意味着更多的炼油和生产将会发生，从而加重全球对碳氢燃料的成瘾程度，增加碳排放，而且增加的炼油业务将会发生在没有多少甚至完全没有环保法规的国家里。

由于一项已有 95 年历史的法案——称为《琼斯法案》（Jones Act），市场竞争环境变得更加不公平。《琼斯法案》规定，在美国港口之间运输的货物只能由在美国制造、为美国公司所拥有并且悬挂美国国旗的船舶运载。这意味着，位于美国东海岸的炼油企业在购买用船装运的美国原油时，支付的运输成本是加拿大、欧洲或亚洲竞争对手的三倍。

值得一提的是，仅在宾夕法尼亚州东南部地区，短短几年前还濒临关闭、估计要造成 2.4 万人失业的炼油企业，如今给当地经济注入 25 亿美元的工资，并且产生高达 150 亿至 200 亿美元的经济影响。

一些非常可信的人也告诫说，为废除原油出口禁令而需综合考虑的多种因素中的一个主要假设——即原油价格下跌——不会持续更长时间：

“正如他们所说，解决价格低迷的对策就是低价。达拉斯联邦储备银行（Federal Reserve Bank of Dallas）行长罗布·卡普兰（Rob Kaplan）11 月 18 日在休斯顿大学发表的公开讲话中给大家一剂清醒剂。卡普兰指出，预计到 2016 年年底或 2017 年年初，当前正在驱使油价下跌并让油价保持低迷的石油供需失衡状况将会趋于平衡。”

这是一个复杂的问题，可能引发多种后果，这个事实在我最近与博锐律师事务所（Blank Rome）合伙人马修·J.托马斯（Matthew J. Thomas）为《法律情报员》（The Legal Intelligencer）撰写的一篇篇幅较长的文章中得到了概述。我们在那篇文章中仔细分析了正反双方的理由。

美国石油出口禁令的解除将会如何影响前充满活力的国内炼油行业呢？这样做会弊大于利吗？对此现在还不能作出肯定的回答。但是，我们只能希望，如果事实证明意外后果定律导致我们搬起石头砸自己的脚，那么美国国会不需再花 40 年的时间才修正方向。

Oil price lost momentum

Refueling activities at gas stations in Jakarta, Indonesia on January 5, 2017.

Oil prices faltered at the start of the second week of the year, as fears set in about a rapid rebound in U.S. shale

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production. For the better part of two months, optimism surrounding the OPEC deal has buoyed oil prices, but bullish sentiment from speculators are showing early signs of abating, raising the possibility that the oil rally is running out of steam.

WTI and Brent sank more than 2.5 percent in intraday trading on Monday, after a report at the end of last week showed another solid build in the U.S. rig count, the tenth consecutive week that the oil industry added rigs back into the field. Aside from a single week in October, the U.S. oil industry has deployed more rigs in every week dating back to June, a remarkable run that has resulted in more than 200 fresh rigs drilling for oil. The gains in the rig count come even as oil prices have held steady in the mid—to low—\$50s per barrel.

At the start of 2017, there are two major dynamics at play occurring at the same time, each pushing in opposite directions on the market. The OPEC deal is slated to take oil off the market, while U.S. drilling is expected to add new supply. The pace and magnitude of each trend will ultimately drive oil prices one way or the other.

On the positive side of the ledger, there are early signs that OPEC members are meeting their commitments. Saudi Arabia said last week that it is lowering its production in January by 486,000 barrels per day, a volume that it promised to cut as part of the November deal. That will take output down to 10.058 million barrels per day, a level that Riyadh was only required to meet as an average over the January to June time period. Cutting to that level ahead of time is a sign of good faith from Saudi Arabia, and increases the chances that OPEC will stay true to its promises.

On top of that, Kuwait's envoy to OPEC said that Qatar, Kuwait and Oman were also complying with the cuts. In an interview with Bloomberg, Kuwait's Nawal Al-Fezaia said that those countries already told customers that cuts were imminent. "It's a good time to do maintenance on oil fields during production cuts," Al-Fezaia said, noting that Kuwait will lower output from 2.89 mb/d in December to 2.7 mb/d by the end of January.

Market analysts paused a bit on news that Iraq's oil exports from its southern ports on the Persian Gulf hit a record high in December, but the data has no bearing on whether or not Iraq will comply with the agreed upon cuts. "Achieving this record average will not affect Iraq's decision to cut output from the beginning of 2017," Oil Minister Jabbar Al-Luaibi told Bloomberg in an emailed statement. "Iraq is committed to achieving producers' joint goals to control the oil glut in world markets."

It is still early but all signs point to a stronger commitment from OPEC to adhere to the specifics of the cuts than market analysts might have given them credit for. That bodes well for a narrowing supply surplus—and ultimately a deficit—as well as falling inventories. In other words, OPEC is succeeding in putting upward pressure on prices.

However, the flip side of the equation is faster drilling from the U.S., where rig counts continue to climb. Oil output, according to EIA weekly surveys, is up roughly 300,000 bpd from summer lows, with more supply expected to come online in the months ahead as drilling picks up pace.

It is unclear, at this point, how rising U.S. supply and falling OPEC output will ultimately balance out. For now, the consensus seems to be tightening conditions in the first half of 2017, with much greater uncertainty in the second half, but that remains to be seen.

What is clear is that oil speculators have built up such a large bullish bet on oil that they have opened up crude to near-term downside risk. According to Reuters, hedge funds and other money managers amassed net-long positions in WTI and Brent equivalent to 796 million barrels in the last week of December, which was nearly double the amount from mid-November. The OPEC deal clearly fueled a huge speculative rush in rising oil prices, which, not coincidentally, corresponded with real gains in crude prices.

But at this point, there are very few short positions left in oil, while a massive volume of long bets have built up. That suggests two things, both of which are bearish for oil: there is not a lot of money left to go long, lowering the chances of further prices gains; and the potential for a correction in prices is very high at this point. Indeed, in the most recent week for which data is available, net-long positions declined a bit, raising the possibility that bullish bets have peaked. All it will take is a bit of bearish news to spark a downturn in prices.

There are a few minor worrying signs for oil prices that could crop up as additional bearish forces in the next few weeks. The U.S. DOE announced on January 9 a “notice of sale” from its strategic petroleum reserve, with plans to sell 8 million barrels for delivery over the course of February, March and April. Meanwhile, Libya is seeing rapid gains in oil exports after the reopening of a key export terminal, with output jumping to 700,000 bpd, according to the latest data, up sharply from the 580,000 it produced in November and the 300,000 bpd it exported before it started restoring output last summer. Moreover, Nigeria – which, like Libya, is exempt from the OPEC deal—is intent on restoring production. It may struggle to do that with the recent shuttering of the Trans Niger Pipeline, potential strikes from oil workers unions and the announcement from the Niger Delta Avengers that attacks will resume this year. In fact, production appears to have declined in December, falling 200,000 bpd to 1.45 mb/d, because of some of these issues. But if those problems can be overcome, Nigeria has latent production capacity that could come back online at some point.

And in a sign that there is not a lot of room on the upside, a kerfuffle in the Persian Gulf over the weekend did nothing to affect oil prices. A U.S. Navy destroyer fired three warning shots towards Iranian ships, an incident that in the past would have led to a sharp, even if brief, rally in crude prices. Instead, the markets shrugged off the incident—WTI and Brent sank on the first trading day after the event, on unrelated news. “The market is overbought and under a lot of downward pressure,” Bob Yawger, director of the futures division at Mizuho Securities USA Inc., told Bloomberg. “The shots fired at the Iranian boats in the Strait of Hormuz didn’t do anything to the market. A few years ago that would have added a couple dollars to the price.”

油价为何将失去上涨动力？

2017年1月5日，印尼雅加达，加油站的加油业务

出于对美国页岩油产量迅速反弹的担忧，新年刚刚进入第二周，石油价格便开始摇摇欲坠。在两个月来的大部分时间，对于欧佩克协议的乐观情绪支撑着油价，但投机商们的乐观情绪已经初步表现出消退的迹象，这也提高了油价上涨将失去动力的可能性。

上周末有报道显示，美国钻井数量再次稳步增长，石油行业油田钻井数量已经连续 10 周保持增长，因此在周一，西德克萨斯中质油和布伦特原油在当日交易中下跌超过 2.5%。除了去年 10 月的一个星期外，从 2016 年 6 月开始，美国石油行业的钻井数量一直在增加，这一不平常的趋势所带来的结果是，美国现在已经新增 200 多座石油钻井。即便当石油价格稳定在每桶 50 至 55 美元左右时，钻井数量依旧在增加。

2017 年伊始，同时出现了两个重要的趋势，推动着市场向两个相反的方向发展。欧佩克的协议计划减少市场石油供应，而美国的钻探活动预计将增加新的供应。这两个趋势的速度和量级，最终将决定油价的走势。

乐观的一面是，已经有初步迹象显示，欧佩克成员国将遵守承诺。沙特阿拉伯在上周宣布，1 月将石油产量减少 486,000 桶/天，这也是其在去年 11 月的协议中承诺削减的产量。这意味着，沙特的石油产量将下降到每天 1,005.8 万桶，在 1 月至 6 月期间，利雅得的平均产量仅需维持到这一水平即可。提前削减产量表明了沙特的诚意，也增加了欧佩克遵守承诺的可能性。

除此之外，科威特驻欧佩克的代表说，卡塔尔、科威特和阿曼也将遵守削减产量的协议。在接受彭博社采访时，科威特的纳维尔·阿尔-费塞亚表示，这些国家已经告知客户它们即将执行削减产量的计划。阿尔-费塞亚称：“在削减产量阶段，可以对油田进行维护。”他表示，科威特的石油产量将从去年 12 月的 289 万桶/天，减少至 1 月底的 270 万桶/天。

伊拉克位于波斯湾的南部港口在去年 12 月的石油出口量创历史新高的新闻，曾经引起了市场分析师的关注，但这一数据与伊拉克是否会遵守产量削减协议无关。伊拉克石油部长贾巴尔·阿鲁艾比通过电子邮件对彭博社表示：“平均出口量创纪录，并不影响伊拉克从 2017 年开始削减产量的决心。伊拉克将致力于实现产油国的共同目标，以控制全球市场的石油供应过剩。”

虽然现在说仍为时尚早，但所有迹象均表明，欧佩克遵守产量削减承诺的决心，比市场分析师预期的更为强烈。这预示着供应过剩将不断缩小，最终实现供不应求，降低库存。换言之，欧佩克将成功给石油

价格施加上行压力。

但天平的另一方面，则是美国钻探速度加快，钻井数量持续增加。据美国能源信息署（EIA）每周的调查显示，美国的石油产量从夏季的低谷增加了约 300,000 桶/天，而在未来几个月，随着钻探活动加快，石油供应还会继续增多。

目前尚无法确定，美国日益提高的供应与欧佩克不断削减的产量，最终将如何抵消。当前的普遍观点是，在 2017 年上半年，市场状况将不断收紧，但下半年的不确定性大增，不过目前仍然需要拭目以待。

现在可以确定的是，石油投机商大规模做多石油，已经使原油价格面临短期下行风险。据路透社报道，去年 12 月的最后一周，对冲基金和其他财富管理机构累积的西德克萨斯中质油和布伦特原油净多头头寸已经相当于 7.96 亿桶，几乎比 11 月中旬增加了一倍。很显然，欧佩克的协议将刺激对石油价格上涨的投机行为，而这通常意味着原油价格的实际上涨，这并非巧合。

但目前，石油空头头寸非常少，同时已经建立起规模庞大的多头头寸。我们由此可以得出两个结论，这两个结论都将看跌油价：目前已经没有太多做多的资金，因此降低了油价继续上涨的可能性；目前价格回落的可能性非常高。事实上，在最近有可用数据的一周，净多头的头寸已经略有减少，进一步证明看涨押注可能已经达到最高峰。现在只需要一些看跌的消息，便会引发价格的下跌趋势。

未来几周，可能突然出现一些次要的令人担忧的油价信号，加剧看空行情。美国能源部（DOE）在 1 月 9 日宣布将出售其战略石油储备，计划在 2 月、3 月和 4 月，出售 800 万桶。与此同时，据最新数据显示，在利比亚主要出口码头重新开放之后，其石油出口量将迅速增长，石油产量大幅增长至 700,000 桶/天，其在去年 11 月的产量为 580,000 桶/天，而在去年夏天，利比亚产量开始恢复之前的出口量为 300,000 桶/天。此外，与利比亚一样不参与欧佩克协议的尼日利亚，也计划恢复生产。不过，其国内的跨尼日尔管道（Trans Niger Pipeline）于近期关闭，石油工人工会可能举行罢工，尼日尔河三角洲复仇者（Niger Delta Avengers）又宣布将在今年继续发起攻击，因此，尼日利亚恢复生产的工作可能会面临困难。事实上，在去年 12 月，由于这些问题的影响，尼日利亚的产量似乎已经开始下降，减少了 200,000 桶/天，降至 145 万桶/天。但如果尼日利亚能够克服这些问题，其潜在的生产能力可能随时爆发。

周末，波斯湾的混乱并没有影响石油价格，也表明油价没有太多上涨的空间。一艘美国驱逐舰对伊朗船只进行了三次警告性射击，在过去，这种事件可能会引发原油价格的大幅波动，虽然可能持续时间较短。相反，市场对此事件不屑一顾——在事件发生后的首个交易日，西德克萨斯中质油和布伦特原油价格因为不相关的消息出现了下跌。瑞穗证券美国公司（Mizuho Securities USA Inc.）期货部门总监鲍勃·杨格尔对彭博社表示：“市场现在处于超买的状态，面临着巨大的下行压力。美国军舰在霍尔木兹海峡射击伊朗船只，并未对市场造成影响。如果在几年前，油价肯定会因此上涨一两美元。”

New Energy（新能源）

Beyond Sharing Report – Part 2: Barrier Busting

Originally published at ilsr.org.

Barrier Busting

There are three big tools for breaking down the barriers to community renewable energy: using non-tax-based incentives for renewable energy, simplifying the process of raising capital, and adopting formal “community energy” laws that enable power sharing. The impact of adoption could be enormous. In the community solar market alone, the National Renewable Energy Laboratory estimates that residential and commercial customers who can't have their own rooftop solar array could be participants in 5,500 to 11,000 megawatts of solar (a 22 to

44% increase over the total installed base) by 2020 with the right rules in place.

Below is part two of our Beyond Sharing Report, a report released in April 2016 about how community-owned renewable energy can capture renewables’ economic power. Be sure to read part one, and stay tuned for part three early next week.

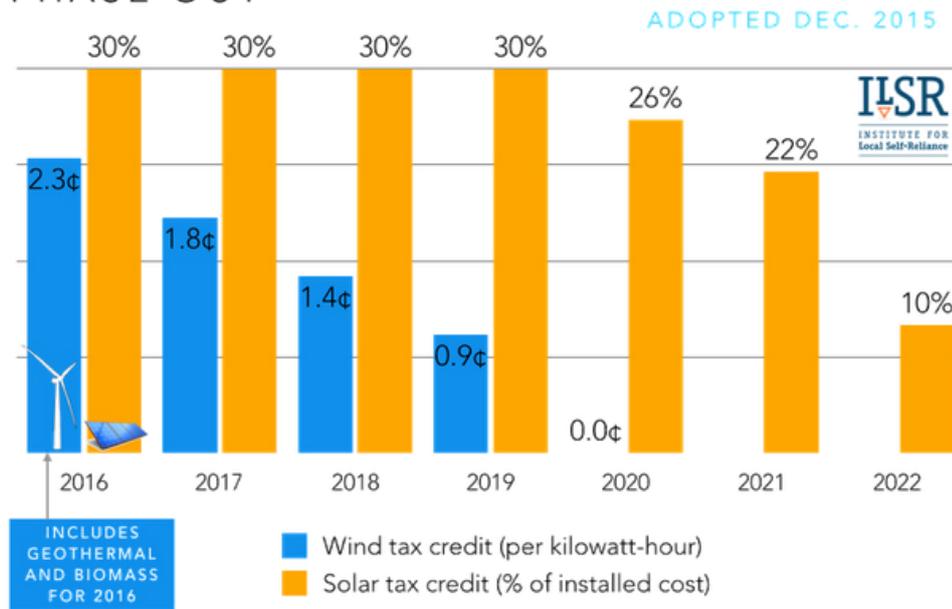
Tax Structure

There are two solutions to the federal tax incentive problem for community renewable energy projects. One is to change federal incentives so they do not favor taxable over nontaxable entities. For example, Congress could opt to offer the incentive as a cash grant, as it did during the financial crisis (2009-2011). Later, we feature two examples of community wind projects enabled by this time-limited opportunity.

Although the tax credit for both wind and solar remarkably won extension in late 2015, its design wasn’t improved relative to non-taxable entities. This is in part because the rules of legislating typically require a single Congressional approval for tax credits, but at least two votes for cash payments: authorization and appropriation. Political simplicity means greater financial complexity for community ownership.

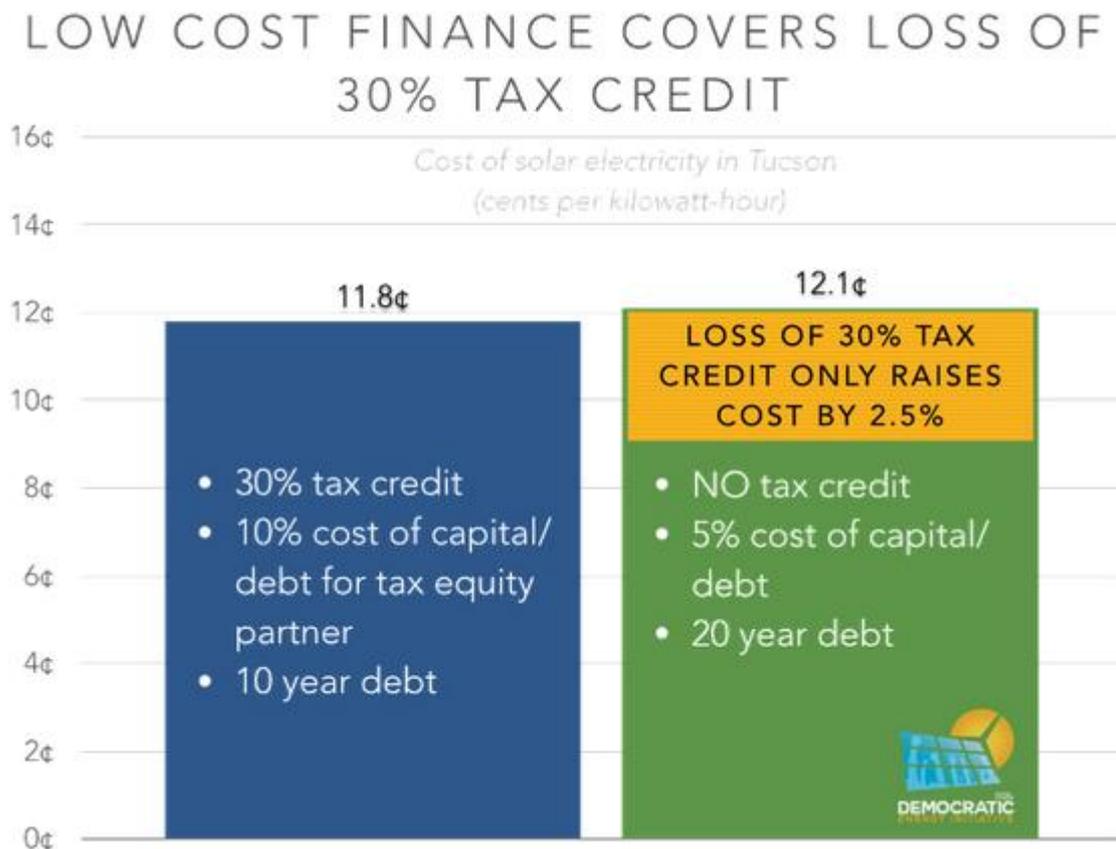
The second solution to the unequal incentive problem is to move to low cost financing rather than relying on tax incentives. The 2015 federal tax credit extension already includes a scheduled phase out (shown below), by 2020 for wind, geothermal, and biomass projects and by 2023 for solar.

FEDERAL RENEWABLE ENERGY TAX CREDIT PHASE OUT



This eventual expiration may reduce the disincentive toward public and community ownership structures because developers (community or otherwise) will no longer have to seek Wall Street “tax equity” partners to absorb the tax incentives. Such partnerships have been expensive.

The following chart shows how losing the 30% residential solar tax credit would only increase the cost of solar energy by 2.5%, if by forgoing tax equity partners the residential solar developer can access debt or equity at 5% interest instead of 10%. The assumption is that without a tax equity market (limited by the number of potential investors and their ability to demand high returns), financing for solar would be taken up by more conservative, institutional investors with an eye toward stable and less lucrative long-term returns.



Although phasing out incentives for wind and solar unfairly gives fossil fuel power plants an economic advantage (despite their significant and unaccounted for environmental cost), it may result in more diverse renewable project ownership structures.

(The Promise of) Financing in the Crowd

In 2012, a California-based organization called Solar Mosaic garnered significant attention with its launch of crowd financing for community-based solar projects. Mosaic’s platform allowed ordinary folks in California and New York, and accredited investors everywhere, to make a modest (4 to 6%) investment return on community-based solar installations in their state, with the company expected to expand to other states. By 2014, Mosaic had expanded to two dozen projects and over 3,000 investors, supporting a variety of projects on private and community buildings, such as a youth employment center in Oakland, CA, and a convention center in Wildwood, NJ. It had yet to use crowd-sourced dollars to support community-owned solar, but Mosaic president Billy Parish expressed interest in the idea in this 2014 podcast with ILSR’s John Farrell.

Concurrent with Mosaic’s rise in prominence, the federal government passed the JOBS Act, promising a new way for small groups of ordinary people to pool their money to invest in renewable energy (and many other kinds of) projects.

The excitement of crowd finance in those years makes the ensuing silence much more profound.

Sometime in 2015, Mosaic changed strategy to finance individual residential, rather than community-based, installations. Investors could still make a return, but by providing low-interest loans (5% over 20 years) to individuals for solar on their own property, to promote ownership rather than leasing. And the federal rules? Draft rules were released for comment in October 2013, but not finally adopted until October 2015, with an additional 6-month delay until implementation.

The adopted rules promise to less onerous compliance rules for small dollar projects, and an avenue for ordinary investors to participate (more detail in the Appendix).

It remains to be seen whether the new federal rules will prove a boon or not, because they may not be significantly less onerous than other securities requirements. Business lawyers at national law firm Dorsey and Whitney aren't very optimistic:

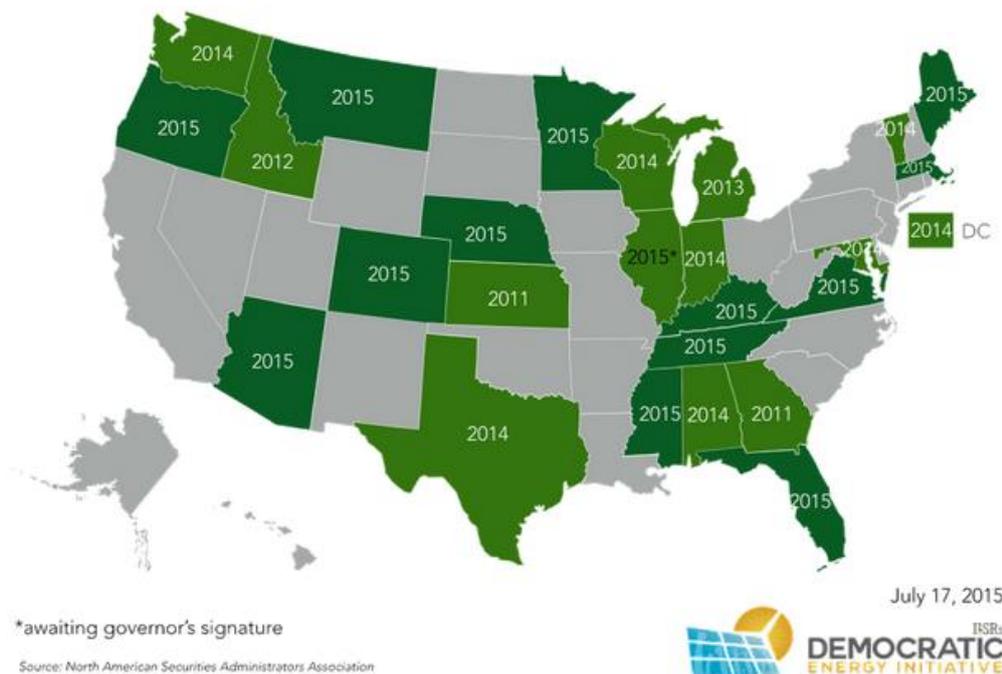
“Compared to a traditional private placement under Regulation D, the costs of compliance – particularly the preparation of the offering statement, necessary financial statements, as well as the ongoing reporting requirements –in relation to the maximum offering size, may impede widespread reliance on the new crowdfunding rules.”

On the whole, the rules may not provide much advantage over existing exemptions from federal crowdfunding rules, other than allowing interstate investment. And the state rules have been in place, sometimes for several years, while the federal government was evaluating its rules.

State Crowdfunding Laws

Many state level crowdfunding laws, based on existing exemptions from federal oversight, were implemented while the federal rules were bogged down. Through 2015, 25 states plus the District of Columbia adopted rules to simplify financing for small projects (see map below).

STATES WITH CROWDFUNDING LAWS



The adopted state laws (more detail in the Appendix) have very similar terms to the recently adopted federal crowdfunding rules.

Despite the more rapid adoption of policies, the state crowd funding programs haven't scaled up quickly. According to the New York Times, through June 2015 just 95 companies successfully raised capital using state-based crowd funding laws despite being available in half of U.S. states.

The lone exception to the general malaise of crowd financing community renewable energy is the donation model. Oakland-based RE-VOLV has a unique offer: a “pay-it-forward” contribution. So far, 765 donors have made over \$120,000 in tax-deductible contributions to fund solar installations on a food cooperative, place of worship, and dance studio. The solar recipients pay nothing upfront, but lease the system from RE-VOLV (paid for by their

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energy savings). RE-VOLV, in turn, uses the lease revenue as seed money to fund the next community solar project. It's the "people funded sun pay-it-forward" model, with a promise of accelerating growth as the existing projects continue to help fund future ones.

Although crowd funding has enjoyed significant success when "investors" are making donations, as with Kickstarter (for a variety of products) or RE-VOLV (for solar), there remains significant tension between securities laws to protect investors and the relatively unsophisticated market of community renewable energy projects.

Community Shared Solar

The most promising policy for breaking the community renewable energy barrier has been commonly called "shared solar." In most cases, these projects are owned by the electric utility or third parties, with participants purchasing a "subscription" for a share of the electricity output for a limited time (e.g. 15-20 years).

The upside is that a subscription (rather than ownership) limits exposure to risk and simplifies raising capital. Subscribers don't have to process or manage filing for tax incentives, and shares can be purchased for as little as \$250. Furthermore, the subscriber model insulates projects from securities law limitations because instead of being investors, subscribers are essentially pre-paying for electricity that will be credited to their bill.

This upside is also the downside: shared solar projects are not collective ownership.

The following graphic from the Department of Energy's SunShot initiative illustrates the difference between the community-driven financial models (where investors pool money to sell electricity to a community) or group purchasing (where individuals bid together for solar arrays for their individual use) and the offsite or onsite "shared solar" concept.³¹

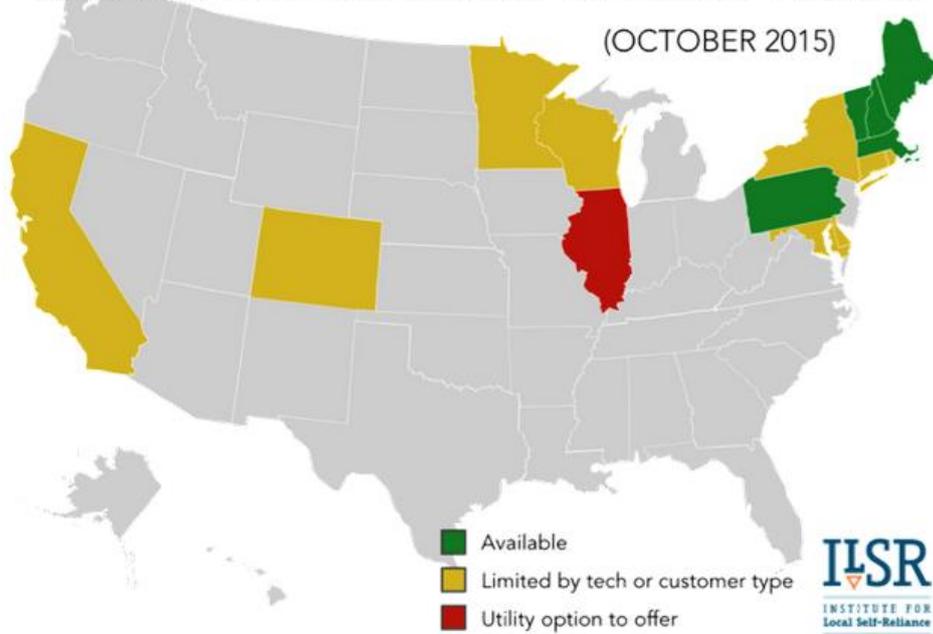


The key policy to enable on- or off-site shared solar is often called "virtual net metering."

Unless a utility offers a program voluntarily (typically one in which they own the solar array), shared solar is enabled by virtual net metering or explicit community solar laws.³³ Most of the 16 states with such laws restrict availability to solar energy and many limit availability to municipal governments or select electric customers. The following map illustrates.

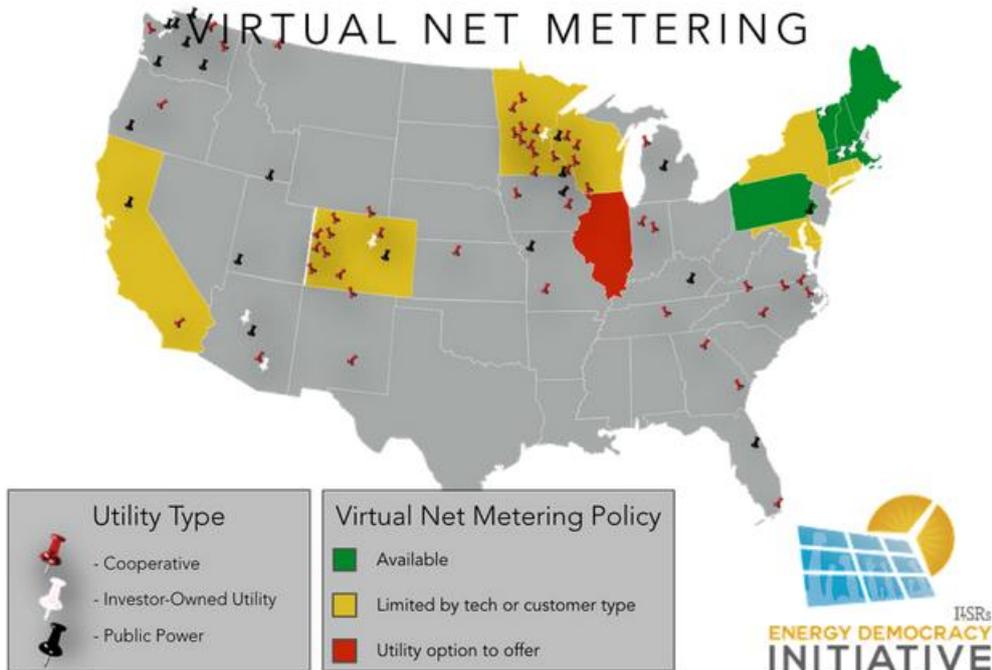
16 STATES WITH VIRTUAL NET METERING POLICIES

(OCTOBER 2015)



The map below shows the success of implementing good state policy. Most existing community solar programs overlap with favorable state policy regimes. Washington is an interesting exception, where the state lacks a virtual net metering policy, but has a history of a very generous state tax incentive for community-owned solar that spawned a number of projects.

COMMUNITY SOLAR PROJECTS AND VIRTUAL NET METERING



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Although much more likely there, community shared solar projects aren't limited to states with adopted policies. A number of utilities—particularly rural electric cooperatives—have offered community solar projects to their customers in other states including Georgia, Iowa, Michigan, and North Carolina. New policies are also under active consideration in New Mexico and Virginia. Hawaii enacted a law in 2015, and its program launch is awaiting a “value of solar” determination after an initial (poorly designed) utility program was shut down by the state's Commission.

Colorado company Clean Energy Collective has pioneered the development of a shared solar model that has been successful across eight states and even more utilities. The company sells 50-year ownership shares in community solar projects arranged in partnership with the hosting electric utility. The for-profit company is able to capture and pass through the federal tax credit, thereby lowering the cost of purchasing or financing a share of ownership. Perhaps its biggest contribution is solving the issue of sharing electricity output by negotiating arrangements with utilities that are not compelled by law.

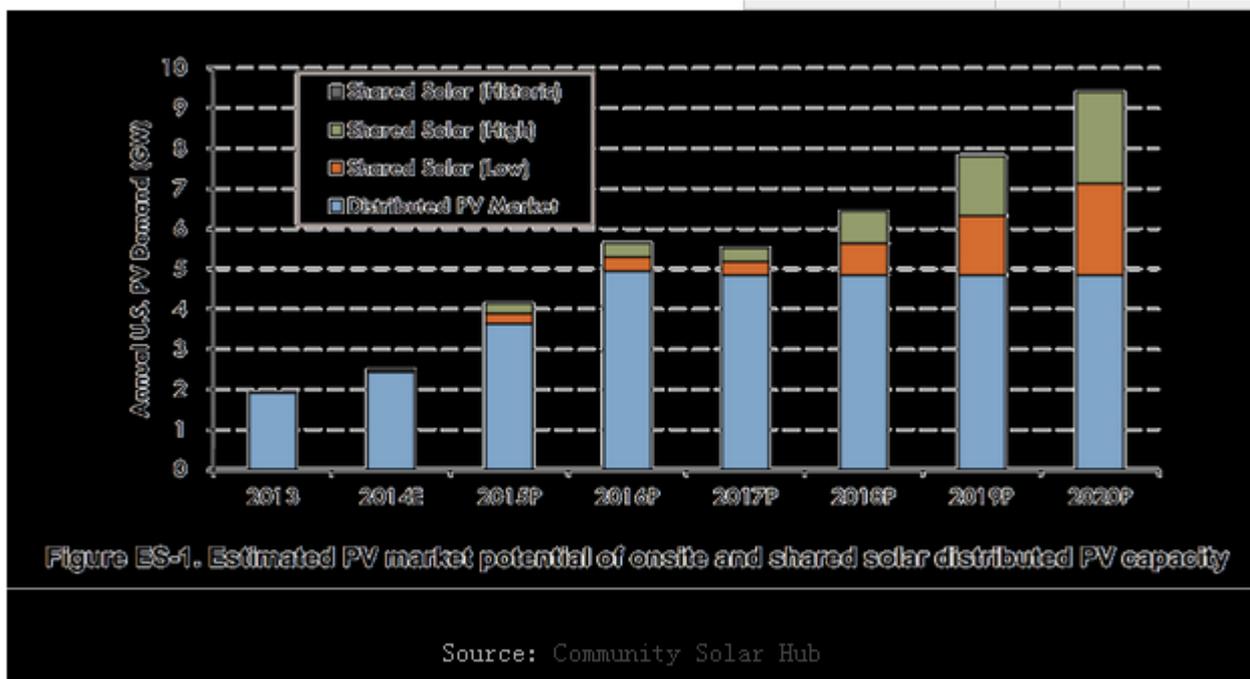
The company is also striving to solve the upfront cost barrier (at least for credit-worthy Massachusetts customers) by offering a “pay as you go” option. With the “SolarPerks” program, customers pay nothing upfront and simply substitute power from Clean Energy Collective for power from their utility, at a price that is “below the prevailing retail rate.”

Their community solar offerings may also offer a discount relative to individual ownership, for those who have the option. In a recent project developed for the Wright-Hennepin electric cooperative in Minnesota, for example, the Collective's community solar project offered a 12-year reduction in payback for a solar investment, from an abysmal 32 years to a still-long 20 years.

The “Simple Solar” offering by the Cedar Falls, IA, municipal utility is another good illustration. Customers will receive a credit to their electric bill for their share of electricity production, but (unlike with net metering), the energy credit will be based on the “market energy supply costs for the billing period.” Originally much smaller, high demand led the utility to increase the size of the solar project to 1.5 megawatts, and it now has over 1,200 residential and business subscribers. The increased size also drove down the price to \$270 per 170 Watt panel (\$1.59 per Watt), far less than a comparable individually-owned system (typical installed costs are around \$3.00 per Watt).

A relatively recent community renewable energy model piloted by a Vermont law clinic may take advantage of electricity sharing laws and avoid securities regulation issues. The model has participants purchase their shares directly from the solar installer, rather than via the community solar organization. Instead of acting as an aggregator of capital, the community solar organization (usually a limited liability company) has a more limited role, and “jointly maintains the array, sharing expenses for insurance, taxes, cutting the grass.” The direct purchase means each individual is shopping separately, not investing collectively, and thus there is no security to advertise. However, the model hinges on the Vermont's virtual net metering law, allowing each individual to net the production from their share of the community solar array against their home energy use.

Aided by new policy, community shared solar is expected to expand rapidly in the next five years. In a report published by the National Renewable Energy Laboratory in April 2015, researchers estimated that shared solar could account for 5 to 11 gigawatts of solar capacity, for residential and non-residential participants, by 2020. With relatively high participation rates (213 participants per megawatt) in early community solar projects, these figures suggest that over a million Americans could participate in shared solar in the next 4 years.



The big questions for the subscriber model, aside from falling short of collective ownership, is whether it can meet the other principles for community renewable energy, including tangible benefits, be additive to other renewable energy policies, and ensure access to all.

Limitations of Shared Solar

The biggest limitation on shared solar is policy. Community shared solar may be simpler than the ownership model, but to be developed by anyone other than the utility company, it requires utility cooperation (e.g. such as Clean Energy Collective) or enabling state legislation.

Be even where implemented, shared solar has room for improvement.

For one, shared solar programs should always offer ownership options beyond utility ownership, and program rules should facilitate collective ownership where possible. In most cases, ownership is retained by the utility or a third party, giving the participants little say in the decisions of the community solar project, from hiring to contracts with other local businesses, to the project location. The tradeoff seems relatively inexpensive when tax law limits how much of the tax benefits can be captured locally, but as the incentives fade in prominence, the loss of control may be more than it is worth.

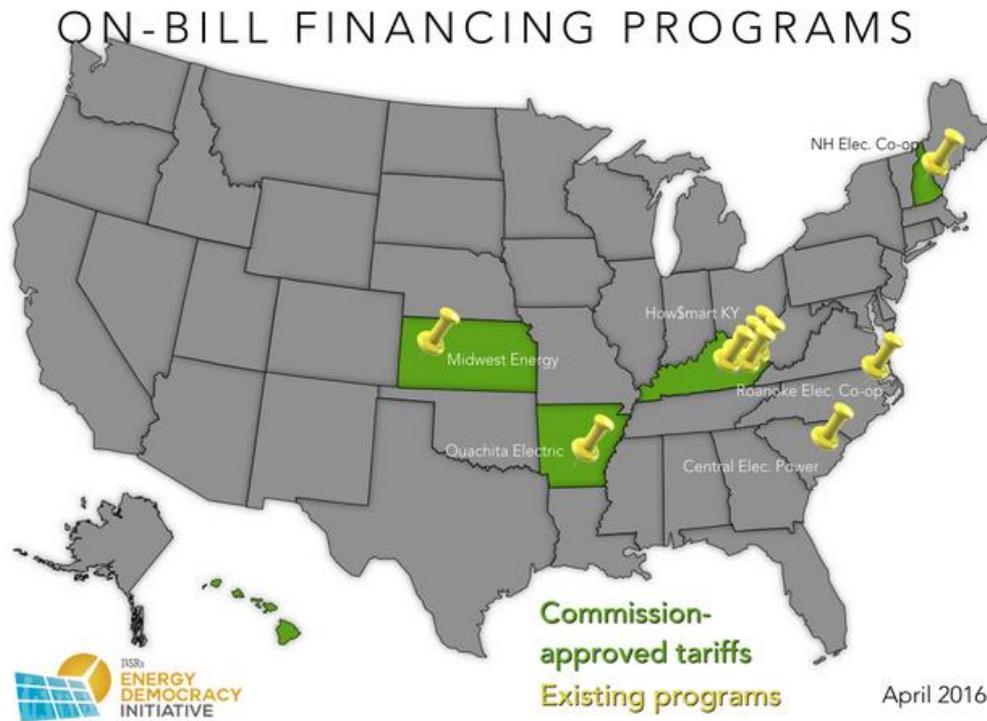
Another potential improvement is expanding beyond solar. Community wind projects have proven popular with community ownership, but face many of the same barriers as community-owned solar. Shared renewables policies should be broadened to include non-solar technologies, from wind to geothermal (as district heating, for example) to anaerobic digesters, to provide a workaround for securities limitations.

A third place for improvement (in all forms of community renewables, not limited to shared solar) is financing. Especially with early shared solar programs, participants had to pay an upfront cost from several hundred to several thousand dollars to buy a share. Even as the programs have expanded to include financing, only participants with high credit scores are able to access financing. Full deployment of community solar will require financing options that can be accessed by low- and moderate-income households. Some promising options include on-bill repayment of subscription costs via the utility bill, which have much lower default rates than consumer loans, or institutional anchor tenants for community solar projects that are committed to claiming subscriptions of participants who fall short on payments.

Despite having a heavy reliance on large-scale fossil fuel generation, rural electric cooperatives have been much

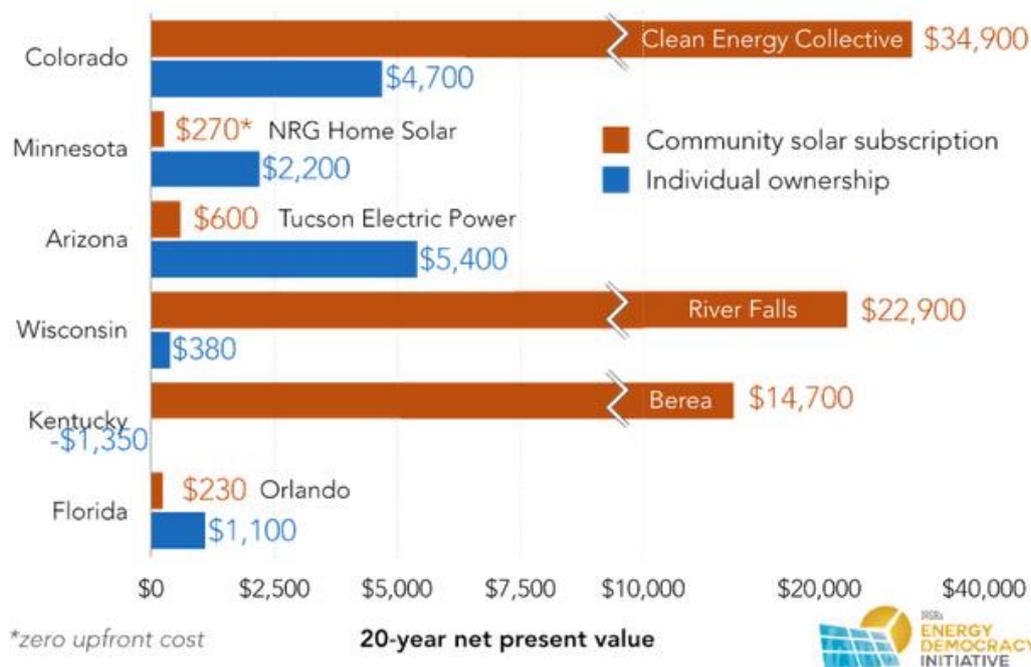
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more likely to experiment with community solar and tools like on-bill financing to allow member participation. The following map shows active on-bill financing programs, almost entirely provided by rural electric cooperatives.



A final issue for shared solar is transparency of participant costs and benefits. Early program and project designs vary widely, leading to wide variance in financial benefits. The following chart compares the 20-year benefits of a 5-kilowatt community solar subscription (top bar of each set, in orange) to a comparable 5-kilowatt customer-owned solar array on their property (bottom bar, in blue).

COMPARING COMMUNITY SOLAR VALUE



Utility sponsored programs in Arizona (Tucson Electric Power) and Florida (Orlando Public Utilities Commission) create very modest savings, and are less lucrative than an individual having solar on their own roof. In the case of Tucson, the financial benefit is basically a roof rental fee from the utility, far less than the value of reducing energy purchases with a rooftop solar array. In Orlando, the bill credit starts out several cents lower per kilowatt-hour than the retail electricity price, costing the customer more out of pocket until the credit rises above the retail rate in approximately year 10.

In contrast, utility-offered programs by municipal utilities in Kentucky and Wisconsin both offer significant benefits over the long term. In both cases, relatively low upfront costs are offset quickly by energy savings, even though the savings rates in both cases are less than 8¢ per kilowatt-hour.

In Colorado, where third parties provide community solar, the community solar savings (from Clean Energy Collective, in this case) far outstrip individual panel ownership, because the full retail credit quickly offsets the high upfront cost. In Minnesota, a similar program structure is a strength, with bill credits actually higher than the retail rate due to the inclusion of solar renewable energy credits of 2-3¢ per kilowatt-hour. The savings from the NRG Home Solar program are smaller than for ownership over 20 years because the subscription cost escalates, potentially faster than the bill credit. But with zero upfront cost for credit-worthy customers, it may be more attractive than the modestly higher returns from having a solar-adorned roof.

California provides an example of where “shared solar” becomes a lot like “green pricing,” where customers pay a premium for power from community solar. Part of the program is literally that, where customers will be able to green up their electricity supply from utility-owned solar arrays, but will have to pay 15 to 35% more per kilowatt-hour. For the more traditional “shared solar” model, the program is likely to be stymied by bill credits of around 8¢ per kilowatt-hour, far less than the retail electricity prices.

Ultimately, shared solar is a relatively new tool with ample opportunity to improve. Despite the relatively large number of states with programs and voluntary utility-provided programs, there are just over 100 megawatts of community solar projects online (a tiny fraction of total U.S. electric generating capacity).

Community Group Purchasing

Acting collectively doesn’t always mean collective ownership, and one successful tool has been to organize individual homeowners and businesses to buy into solar together. The “SUN” chapters of the Community Power Network, for example, organize cooperative associations of homeowners to collectively bid for solar installations on their homes, lowering prices by as much as 25%.

The notion was pioneered by the Mt. Pleasant Solar Cooperative in Washington, DC. This local effort helped get solar installed on 10% percent of properties in the neighborhood, and spawned several buying cooperatives in other DC neighborhoods. By 2015, the Network served communities in D.C., Maryland, Virginia, and West Virginia. In total, it has aided low-cost installation of nearly 6.5 megawatts of solar for thousands of participants.

Another example is the “Solarize” model started on the opposite coast, in Portland, OR. “The Solarize approach allows groups of homeowners or businesses to work together to collectively negotiate rates, competitively select an installer, and increase demand through a creative limited-time offer to join the campaign.” Solarize campaigns are now operating in California, Connecticut, Maryland, Massachusetts, New Hampshire, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Texas, Utah, Vermont, Washington, and Wisconsin. Several of these campaigns are government or utility sponsored and, cumulatively, the various Solarize efforts have installed over 20 megawatts of solar, at a modest price discount to individuals acting alone.

For more information on group purchase programs, see the Solarize Guidebook published by the NW SEED in partnership with the National Renewable Energy Laboratory.

Selling on a De-Monopolized Grid

Another possibility is that community renewable energy projects will become wholesale power providers. In this case, the community-owned project simply sells power into the competitive market, with revenue shared among participants. As more states consider de-monopolizing the distribution grid, in particular, there may be greater

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opportunities for sales at the local level, replacing the need to share electricity output with a simpler revenue-sharing model.

Cooperatives

It may seem odd to distinguish between “community” and “cooperative” renewable energy projects. However, “community” can describe geographic or ethnic or simply solar-loving groups of people, whereas a cooperative is a formal legal structure with a history of democratic governance and equitable distribution of benefits.

Cooperatives are common in other economic sectors but in electricity are almost entirely represented by decades-old and conservative monopoly rural electric cooperatives. Despite this, the cooperative structure—used to first bring electricity to many communities that would have otherwise gone without—could be last century’s gift to solve this century’s problems of organizing community renewable energy projects.

There are unfortunately few examples of cooperatives in the renewable energy field. There are a few worker-owned cooperatives, owning an enterprise that provides renewable energy services but not developing community renewable energy projects. At PV Squared, a solar installation company in the Pioneer Valley of Massachusetts, the workers make the decisions about the direction of the company and share in the profits. Namaste Solar is also a worker-owned energy services companies, and it is also a part of the Amicus buying cooperative (discussed below) for solar installers.

Cooperatives can also pool their buying power for consumers or businesses. Cooperative Community Energy is a member-owned solar and energy services company in California. Members get access to bulk discounts on hardware, the cooperative lobbies for more favorable policy, and members get a dividend check if the cooperative turns a profit. The Acorn Renewable Energy Cooperative in Vermont provides bulk purchase benefits on a variety of renewable resources, including wood chips, heat pumps, and solar. Amicus Solar is a cooperative of dozens of solar installation companies, giving them a collective purchasing power that can compete with the largest installers in the country, without having to merge companies. Cooperative Energy Futures is a small, for-profit cooperative in Minneapolis that has organized households to provide energy efficiency and solar energy services with bulk purchasing. In 2014, they began offering a solar leasing program and in 2016 they plan to offer their first community solar project under the state’s community solar program. Cooperative Community Energy is a full service residential and commercial solar installer cooperative in California.

In many European countries, there are hybrid electricity cooperatives where the cooperative owners are consumers of power, but also producers.

“In the 1970’s, three rural Danish families banded together and installed a wind turbine, creating the world’s first green energy co-op. Today, the 10,000-member Middelgrunden co-op owns and operates the world’s largest offshore wind farm outside Copenhagen harbour.” Overall, 80% of Danish turbines are cooperatively owned by over 150,000 families.

The success of wind cooperatives in Denmark is based on a history of cooperative ownership of utilities and very favorable policy. Beginning in 1979, wind projects could get a 30% capital subsidy, a policy that morphed over time into a fixed payment for production (a feed-in tariff). The fixed payments were supplemented with an income tax exemption (with tax rates exceeding 50%) for revenue from cooperatively-owned wind projects. In the U.S., challenges with accessing renewable energy incentives have meant most “cooperative” ownership models for renewable energy have used limited liability corporations, like MinWind.

There are also advantages to cooperatives being used for community renewable energy. Timothy Den-Herder Thomas of Minnesota-based Cooperative Energy Futures notes that the cooperative structure can solve the securities challenges that face typical projects because they can raise unlimited amounts of capital from members. Cooperatives also don’t have to file separate securities registration, cutting the cost to raise capital by 90% or more. In his November 2015 interview with ILSR, Timothy also warned that the use of cooperatives can’t just be for the purposes of raising capital. Cooperatives can only raise capital from members, who have to be “materially involved in the cooperative...you can’t become a member just to invest.”

Not coincidentally, Cooperative Energy Futures is one of the first non-utility cooperatives to develop community renewable energy projects (along with Acorn Renewable Energy Cooperative in Vermont and Vineyard Power in Massachusetts).

In addition to solving securities issues, the upside of cooperatives is that they increase the potential community energy project value for participants. In the case of the Shiloh Temple project in Minneapolis (organized by Cooperative Energy Futures), member-subscribers will get electric bill credits but also dividends should the project turn a profit. It's likely to, since most solar developers offering community solar projects earn a profit on the difference between subscription fees and the project cost, and member-owned Cooperative Energy Futures is both owner and developer. After project debt is retired in the first 10-15 years, the organization may have additional revenue to distribute.

Cooperatives won't automatically solve the challenge of accessing federal tax incentives, although they are at no greater disadvantage to other typically non-taxable entities. For one, cooperatives can act as for-profits, distributing profits (and tax credits) through to members, although this would likely trigger the same passive income barrier mentioned earlier. Cooperatives could also secure a tax equity partner to absorb the tax credits, as have other non-profit organizations. In the next few years, however, the federal tax incentives will sunset, and cooperatives may prove even more advantageous in addressing the remaining barriers.

分享报告——第 2 部分：打破屏障（2）

障碍破坏

现在有三个大工具，被用于打破社区可再生能源的障碍：对可再生能源使用非税收激励，简化筹集资本的过程，以及采用能够实现权力共享的正规的“社区能源”法律。工具一旦被应用，其影响应该很大。国家可再生能源实验室估测，到 2020 年，独立应用太阳能的市场，像不能拥有自己的屋顶太阳能阵列的住宅和商业客户会参与 5,500 至 11,000 兆瓦的太阳能（占已安装总量的 22% 至 44%），而且规划会越来越到位。

以下是我们超越共享报告的第二部分，该报告是 2016 年 4 月发布的，关于拥有可再生能源的社区捕获可再生能源的经济实力的报告。一定要阅读第一部分，并在下周初期继续关注第三部分。

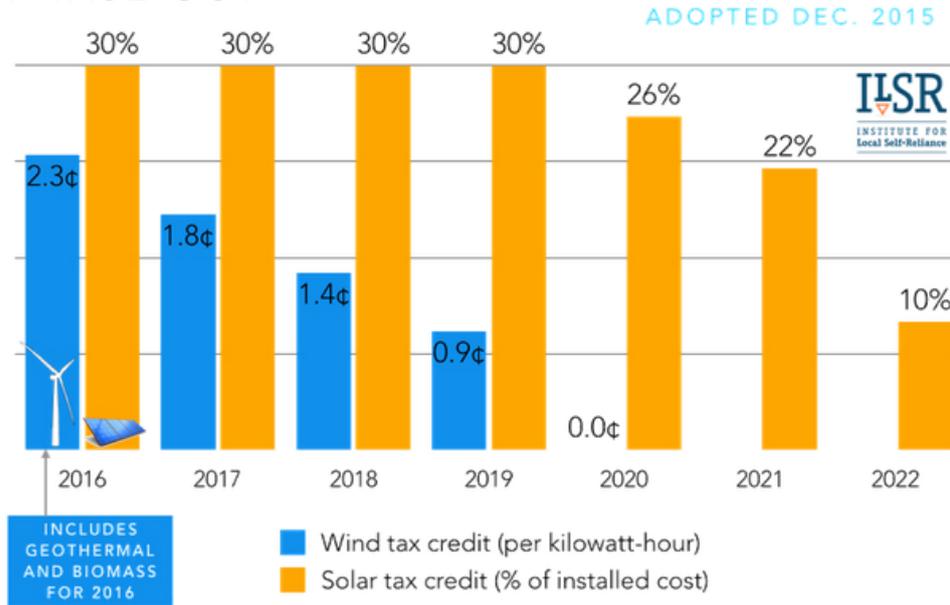
税务结构

社区可再生能源项目的联邦税收激励问题有两种解决方案。一个是改变联邦奖励，不对不可税实体征税。例如，国会可以像在金融危机期间（2009-2011 年）一样，选择提供奖励作为现金赠款。后来，我们举了两个社区风力项目的例子。这是个时间有限的机会。

虽然风能和太阳能的税收抵免在 2015 年底得以持续执行，但其设计相对于非应税实体而言，并没有得到改善。这是因为立法规则通常需要国会批准减税，但这期间至少仍需要两次现金支付：授权和拨款。政治越简单就意味着社区所有权的财务越复杂。

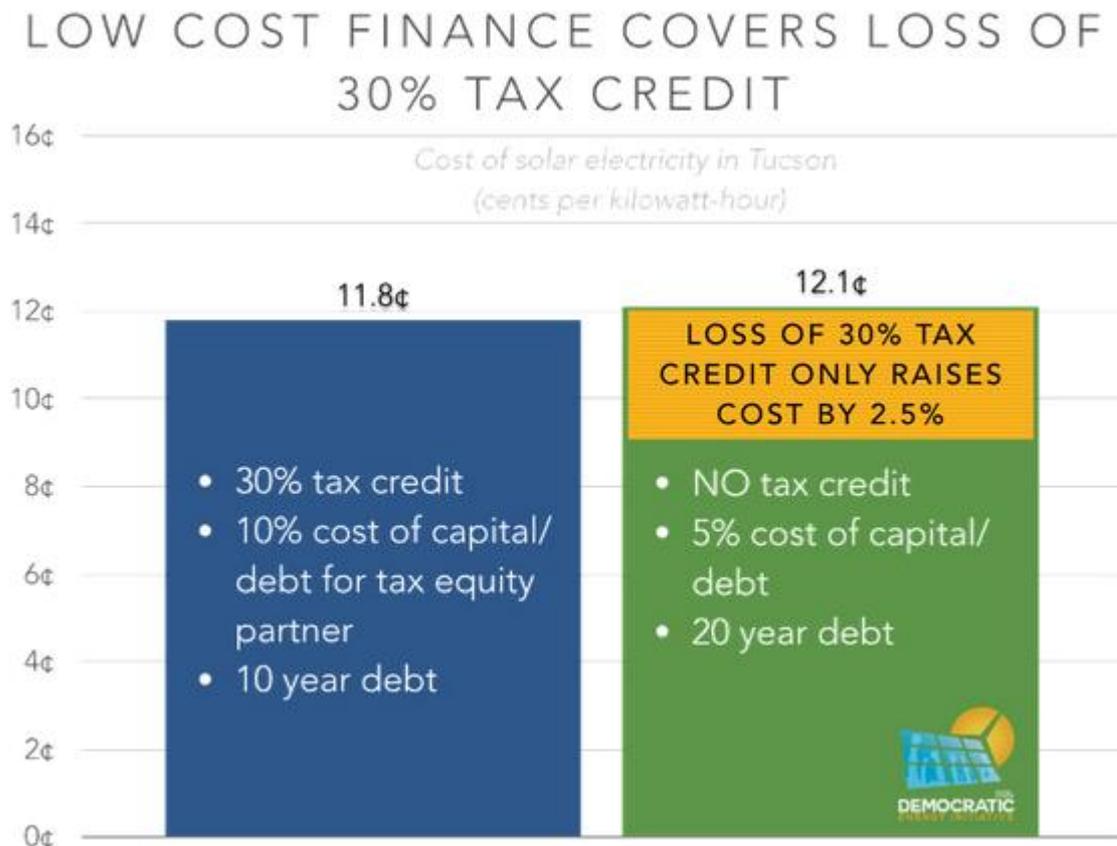
对不平等激励问题的第二个解决方案是转向低成本融资，而不是依靠税收激励。2015 年联邦税收减免政策到 2020 年已经涉及到了风力。地热和生物质项目已被预定淘汰（如下所示），在 2023 年会被太阳能取代。

FEDERAL RENEWABLE ENERGY TAX CREDIT PHASE OUT



能源的最终到期可能会减少对公共和社区所有权结构的阻碍，因为开发者（社区或其他方面）不再需要寻求华尔街的“税务公平”合作伙伴来吸收税收优惠。这种合作的成本是很高的。

下面的图表显示，如果上市的税务合作伙伴，住宅太阳能开发商可以 5% 利息而非 10% 的利率获得债务或股权。失去 30% 的住宅太阳能税收抵免将只会增加 2.5% 的太阳能成本。假设，如果没有税收股权市场（受潜在投资者数量及其需求高回报的能力的限制），太阳能融资将由更保守的机构投资者承担，那太阳能的发展将是一个很缓慢的利润少、周期少的过程。



虽然逐步取消对风能和太阳能的激励不公平，会使化石燃料发电厂更具经济优势（尽管它们对环境成本有重大和不明朗的影响），但它也可能会导致更多样化的可再生能源项目所有权结构。

在人群中融资（的承诺）

2012年，一家名为太阳能马赛克的加利福尼亚州组织因为推出了一次针对社区太阳能项目的人群的融资而受到了极大关注。Mosaic的平台允许加利福尼亚州和纽约的普通人以及各地的投资者在其州内基于社区的太阳能装置上获得适度（4%至6%）的投资回报。该公司的融资预计还会扩展到其他州。到2014年，Mosaic已扩展到二十二个项目，有了超过3,000的投资者。他们接手私人 and 社区建筑物的各种项目，如加利福尼亚州奥克兰的青年就业中心和新泽西州怀尔德伍德的会议中心。它虽然还没有使用众包美元来支持社区拥有的太阳能，但马赛克总裁比利·帕里什在2014年的播客中对ILSR的John Farrell表示出了兴趣。

在Mosaic获得显著增长的时候，联邦政府通过了JOBS法案，承诺小群体的普通人可以用他们自己的钱，投资可再生能源（和许多其他类型的）项目。

人群金融在那些年很受广大人民的爱戴，但之后它的副作用也显现出来了。

在2015年的某个时候，马赛克改变了战略，开始为个人住宅，而不是社区的安装太阳能。投资者仍然可以得到回报，但必须把自己的房产变现，然后为个人提供低息贷款（20年内5%），以促进所有权的推广而不仅仅只是租赁。联邦规则怎么样？规则草案已于2013年10月开始征求意见，但当时没有被通过，直至2015年10月，延迟了六个月后，它才被实施。

所采用的规则是承诺为小额美元项目提供较不严格的合规的规则，并为普通投资者提供参与的渠道（详见附录）。

新的联邦规则是否会带来好的影响，这还有待考核，因为它们不会比其他证券要求地那么繁重。国家律师事务所Dorsey和Whitney的商业律师有些悲观地说：

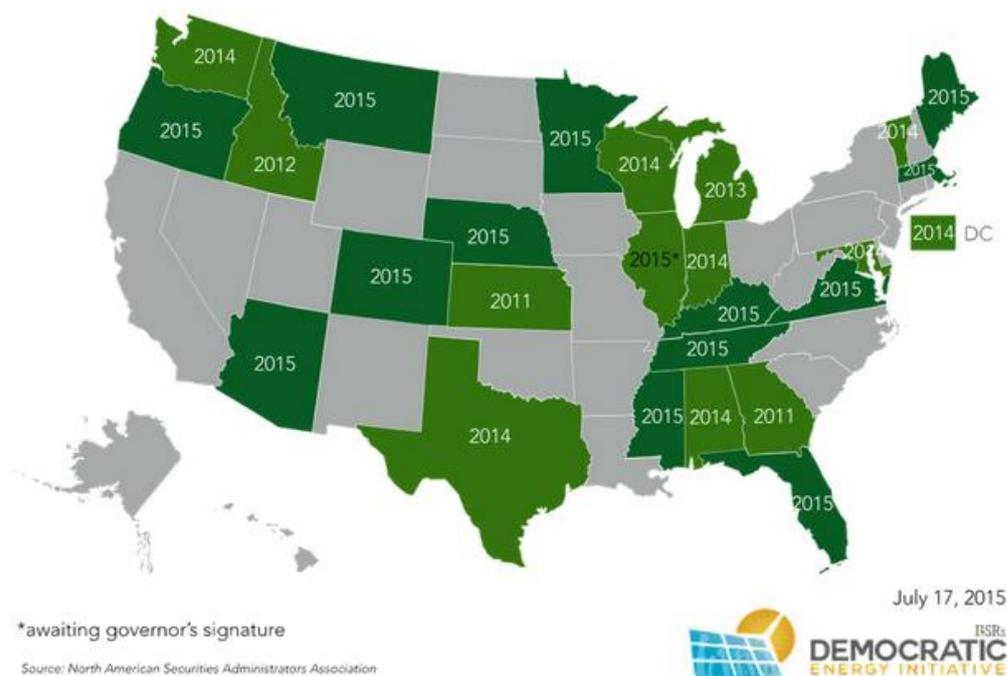
“与根据条例 D 的传统私人融资相比，合规成本（特别是准备发行声明，必要的财务报表以及持续的报告要求）与最大发行规模相关，这可能会导致过度依赖新的众筹规则。”

总的来说，除了允许州际投资之外，这些规则可能不能提供比联邦众筹规定的现有豁免的更多的优势。国家规则已经到位，有的或许还需要几年的时间才能到位，而联邦政府此时已经开始评估这些规则了。

国家众筹法

许多州级众筹法律因为有联邦监督的现有豁免权，所以可以在联邦规则陷入僵局的情况下继续实施。到 2015 年，25 个州和哥伦比亚特区通过了这项规则，以简化小型项目的融资（见下图）。

STATES WITH CROWDFUNDING LAWS



通过的州法律（附录中的更多细节）与最近通过的联邦众筹规则具有非常相似的条款。

尽管政策被很快采用，但国家人群资助计划并没有因此而迅速扩大。根据“纽约时报”的报道，截至 2015 年 6 月，只有 95 家公司成功利用国家的人群资助法来筹集资金。这个数量并不算多，尽管它覆盖了美国一半的州。

人群融资社区可再生能源虽然普遍不适，但也有一个例外，就是捐赠模型。基于奥克兰的 RE-VOLV 有一个独特的提议：“付费转发”。迄今为止，765 个捐助者已经为一个食品合作社，礼拜场所和舞蹈工作室的太阳能装置提供了超过 12 万美元的免税捐款。太阳能接收者不需要支付任何费用，但必须用 RE-VOLV 的租赁系统（由他们的节能支付）。RE-VOLV 反过来利用租赁收入作为种子资金为下一个社区太阳能项目提供资金。这就是“人民资助的太阳能转移支付”模式。它对投资者有加速增长的承诺，因为在推广方面，他们不差钱。

虽然人群资助在“投资者”进行捐赠方面取得了巨大成功，如 Kickstarter（针对各种产品）或 RE-VOLV（针对太阳能），但与证券法的关系并没有得到缓和，这其实利于保护投资者和相对不成熟的市场社区可再生能源项目。

社区共享太阳能

打破社区可再生能源障碍的最有希望的政策通常被称为“共享太阳能”。在大多数情况下，这些项目由电力公司或第三方拥有，参与者购买“订阅”的一部分电力其输出时间有限（例如 15-20 年）。

进步的一方面是，订阅（而不是所有权）限制了风险暴露，并简化了资本筹集。订阅者不必处理或管

理税务优惠申请，而且只需 250 美元即可购买股票。此外，用户模型之所以能将项目与证券法限制隔离，是因为是用户，而非投资者，预付了被记入其账单的电力。

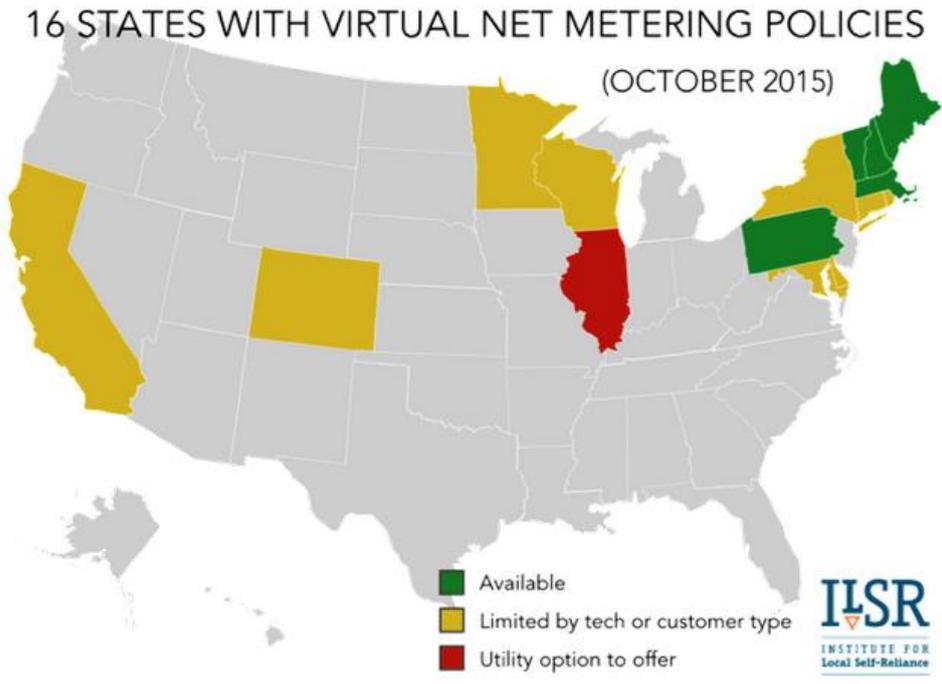
这种进步也有副作用：共享的太阳能项目不是集体所有权。

来自能源部的 SunShot 计划用以下图形说明了社区驱动和金融模式（投资者将资金用于向社区销售电力）或团体采购（其中个人一起竞标太阳能电池阵列用于个人使用）之间的差异，区分了非现场或现场“共享太阳能”的概念。

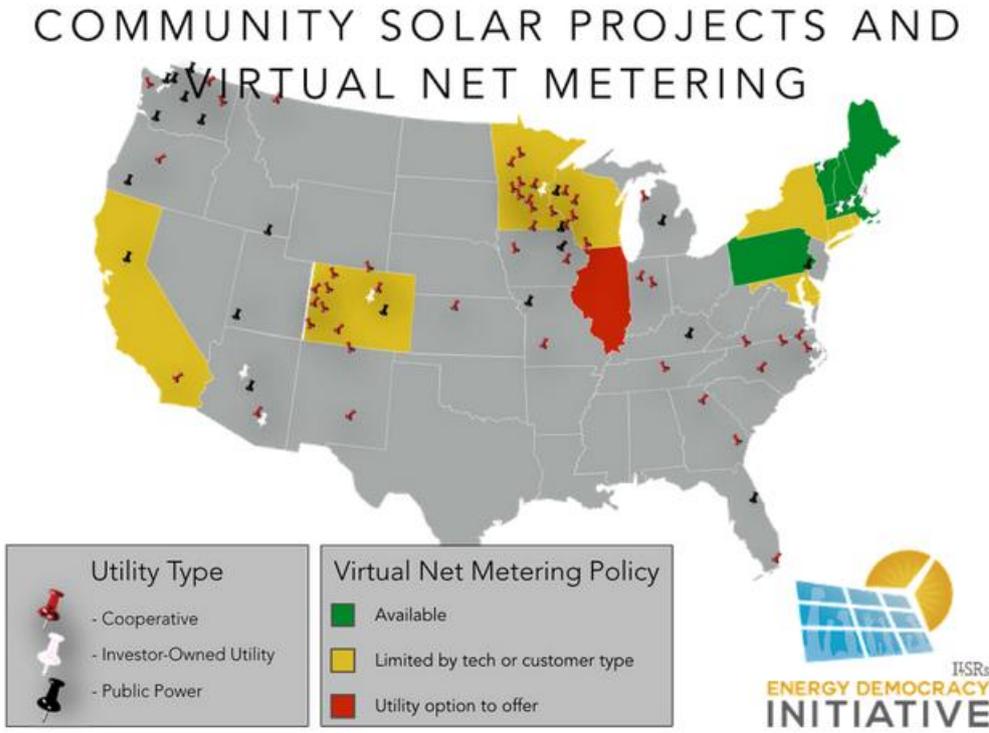


用以实现现场或非现场共享太阳能的关键政策通常被称为“虚拟网络计量”。

除非公用事业自愿提供程序（通常是他们拥有太阳能电池阵列），要不然，共享太阳能只能通过虚拟网络计量或明确的社区太阳能法律实现。实施这些法律的 16 个州中的大多数会限制太阳能的可用性、市政府或选择电力客户的可用性。下图说明。



下图显示了实施良好国家政策的重要性。大多数现有的成功的社区太阳能方案得以实施都是因为与有利的国家政策制度相结合。华盛顿是一个例外。在这个区域，没有国家虚拟净计量政策，但有一个非常慷慨的国家税收激励的社区所有的太阳能的历史。这使它产生了一些项目。



社区共享的太阳能项目不局限于已采纳政策的国家，相反，在这些地方反而更容易被推广。许多公用事业公司，特别是农村电气合作社，已经向其他州，包括格鲁吉亚，爱荷华州，密歇根州和北卡罗来纳州的客户提供了社区太阳能项目。新墨西哥和弗吉尼亚也正在积极考虑新政策。夏威夷在 2015 年颁布了一项法律，但其计划之所以还没有正式被启动，只是因为他们还在进行一个“太阳能价值”的评估，因为之

前的一个初始（设计欠佳）的实用程序被国家委员会关闭了。

科罗拉多州清洁能源集团率先开发了一个共享的太阳能模型，已经在八个州和更多的公用事业公司取得了成功。该公司出售了与主机电力公司合作安排的社区太阳能项目的 50 年所有权份额。营利公司避免了联邦的税收，所以降低了购买或融资所有权的成本。但这都不是使其最大的贡献。其最大的贡献是解决了通过与不受法律强制的公用事业的谈判安排来分配电力产出的问题。

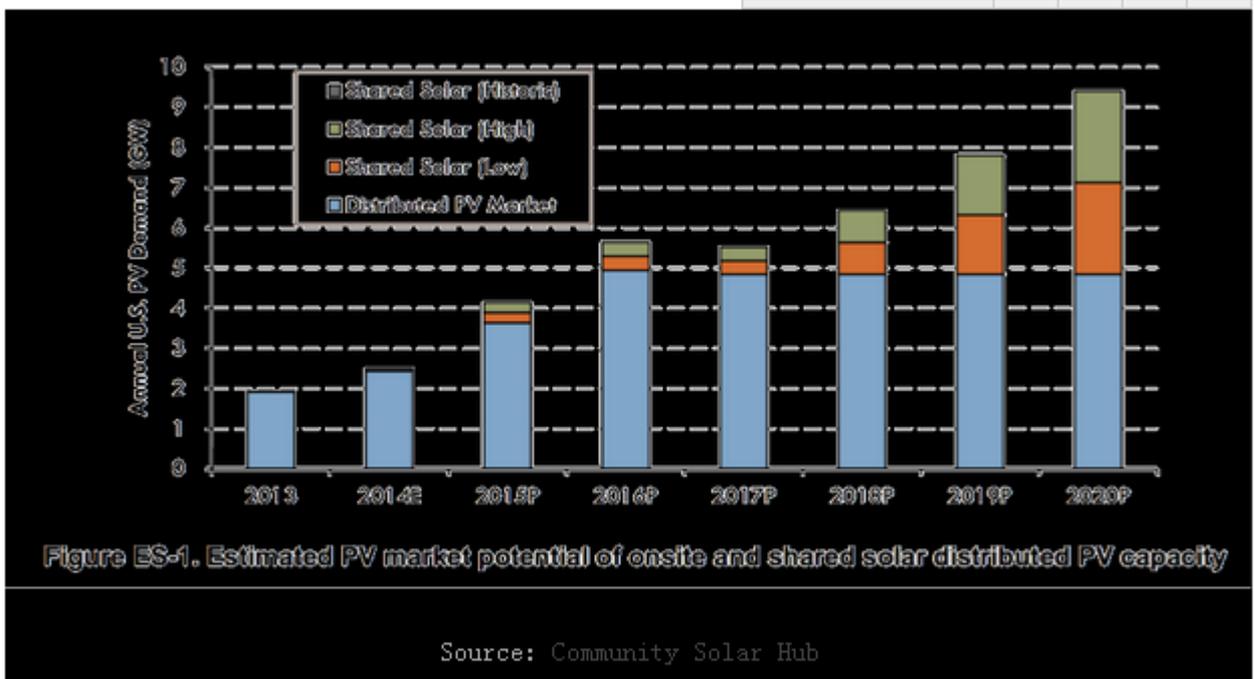
该公司还努力通过提供“即付即用”的选项来解决前期成本障碍（至少对信誉值得的马萨诸塞州客户）。通过“SolarPerks”计划，客户不需要支付任何费用，只需将清洁能源集团的电力替换为其公用事业公司的电力就可以了，这样，价格就会低于当前的零售率。

对于那些有选择权的人来说，他们的社区太阳能产品也可以提供相对于个人所有权的折扣。例如，在最近为明尼苏达州 Wright-Hennepin 电力合作社开发的一个项目中，集体社区太阳能项目为太阳能投资带来了 12 年的投资回收期，把糟糕的周期由 32 年缩短到了 20 年。

“简单太阳能”由雪松瀑布，IA 提供。市政公用事业就是另一个好的例证。客户将收到他们的电费账单中的电力生产份额的信用，但（与净计量不同），能源信用将基于“计费周期的市场能源供应成本”评定。最初的市场有些小，但因为高需求，电力公司将太阳能项目规模在短时间内迅速增加到 1.5 兆瓦，他们目前也因此而拥有了超过 1200 个住宅和商业用户。增加的尺寸也使价格降低到每 170 瓦面板 270 美元（每瓦 1.59 美元），这远远低于一个类似的个人拥有的系统（典型的安装成本是每瓦约 3.00 美元）。

佛蒙特州法律诊所试行的一个相对较新的社区可再生能源模型可以利用电力共享法律，避免证券监管的问题。该模型有参与者直接从太阳能安装者购买他们的股份，而不是通过社区太阳能组织。社区太阳能组织（通常是有限责任公司）不是作为资本的聚合者，他们的作用很有限，即“共同维护阵列，分担保险费用，税收，削减草地”。直接购买意味着每个人是分开购物，不是集体投资，因此没有安全性可言。然而，该模型用的是佛蒙特州的虚拟网络计量法，允许每个人根据他们在社区太阳能电池阵列中的份额来抵消他们的家庭能源使用。这可以净化生产。

在新政策的帮助下，社区共享的太阳能有望在未来五年内迅速扩张。在 2015 年 4 月由国家可再生能源实验室发表的一份报告中，研究人员预计，到 2020 年，共享太阳能可以为住宅和非住宅参与者提供 5 到 11 千兆瓦的电力。与参与率相对较高的数据相比（每人 213 人兆瓦），这些数字表明，超过一百万美国人可以在未来四年获利于共享太阳能。



Mcanxixun Information

除了缺少集体所有权之外，订户模型的大问题是它是否能够履行社区可再生能源的其他原则，包括有形的好处。或许，它需要做的是加入其他可再生能源政策，并确保所有人都能从中获利。

共享太阳能的局限性

共享太阳能最大的限制是政策。社区共享太阳能可能比所有权模式简单，但要由事业单位以外的任意单位进行开发，需要公用事业公司（如 Clean Energy Collective）的合作或国家立法。

在已经实施的地方，共享太阳能依然有改进的余地。

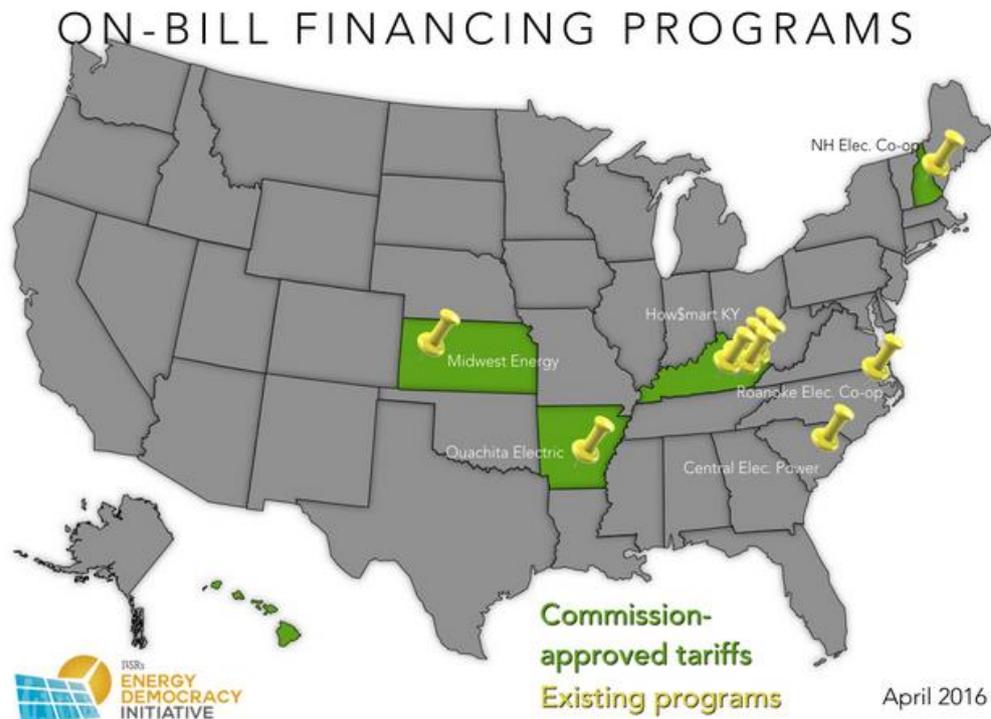
一方面，共享太阳能项目应始终提供公共事业所有权以外的所有权，程序规则应尽可能促进集体所有权。在大多数情况下，所有权是由公共事业单位或第三方保留，使参与者很少参与社区太阳能项目从雇用、与其他当地企业的合同，到选择项目地点等决策。当税法限制了当地税收优惠的多少时，这种让步似乎相对便宜，但随着激励机制逐渐消失，控制权的损失可能超过其价值。

另一个潜在的改进是将资源共享的范围扩大到不只包含太阳能。社区风项目已被证明可以应用社区所有权，但与社区所有太阳能面临许多相同的障碍。共享可再生能源政策应扩大到包括从风地热（如地区供热）到厌氧沼气池等非太阳能技术，为其有限责任提供解决方法。

第三个可以改进的方面（对于所有形式的社区可再生能源，不仅限于共享太阳能）是融资。特别是那些投资者必须支付几百美元到几千美元的前期费用来购买股票的早期共享太阳能项目。即使该计划已扩大到包括融资，只有高信用的投资者能够获得融资。社区太阳能的全面部署将需要低收入家庭和中等收入家庭的融资选择。一些有前途的选择包括法案通过公用事业法案，基础利率比消费者贷款低得多的费用表认购成本科目账上支付，或为社区太阳能项目设立机构锚租户，承诺为难支付的投资人偿还认购费用。

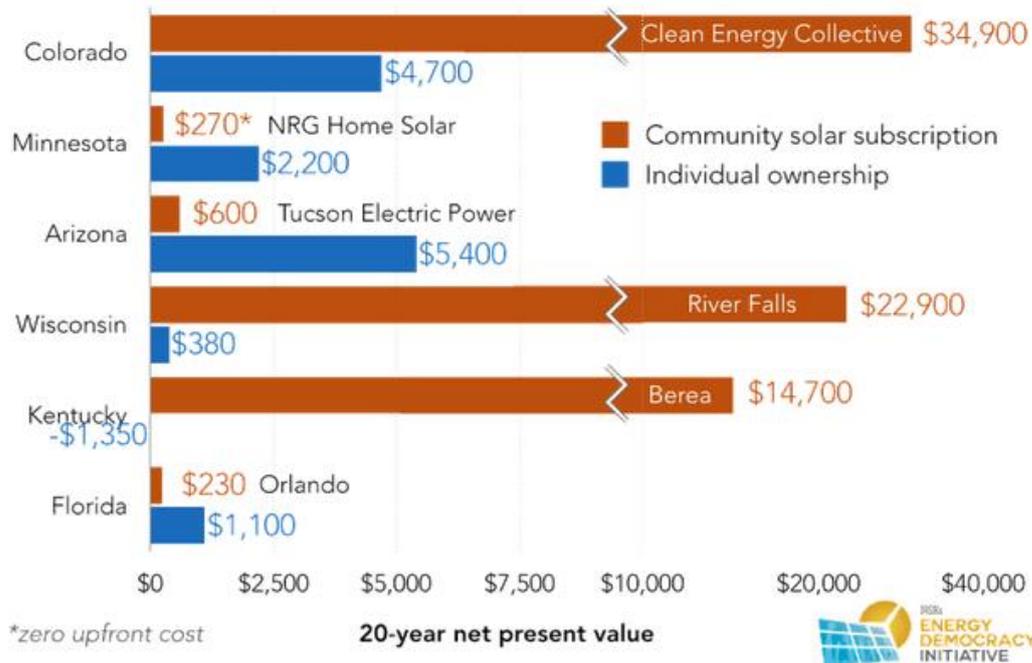
尽管严重依赖大型化石燃料发电，农村电力合作社更容易用票据融资等工具进行社区太阳能实践，让社区成员参与其中。

下图显示，票据融资计划的活跃性，几乎完全由农村电力合作社提供。



共享太阳能的最后一个问题是参与者的成本和收益的透明度。早期计划和项目设计差别很大，导致财务效益差异普遍存在。下面的图表比较了 5 千瓦的社区太阳能认购 20 年的效益（顶栏的橙色部分）和 5 千瓦的客户拥有的太阳能在他们的财产中的情况（底栏，蓝色）。

COMPARING COMMUNITY SOLAR VALUE



亚利桑那州（图森电力）和佛罗里达州（奥兰多公用事业委员会）的公共事业资助计划创建非常微薄的储蓄，不如一个人在自己的屋顶太阳能有利可图。在图森电力的项目中，经济效益基本上来自公共事业公司支付的屋顶租赁费，远远低于一个屋顶太阳能电池阵列降低能源采购的成本。在奥兰多，票据信贷每千瓦时电价比零售店价格低几美分，使客户直到约十年后信贷上升超过零售率上升时才不赔钱。

与此相反，肯塔基和威斯康星公用事业的公共设施提供方案从长远看都有显著的优势。在这两个案例中，相对较低的前期成本很快被积蓄能量偏移，即使在这两种情况下的储蓄率低于 8¢每千瓦小时。

在科罗拉多，在那里第三方提供社区太阳能，社区太阳能储蓄（在清洁能源集体，在这个案例中）远远超过单个面板的所有权，因为全零售信贷可以迅速弥补前期的高成本。在明尼苏达州，一个类似的项目结构是一种优势，因为票据信用其实比零售率高由于将每千瓦小时 2-3¢的太阳能可再生能源信用纳入其中。由于认购成本的增加可能比票据信用快，NRG Home Solar 计划节省的成本小于 20 多年的所有权。但是，对于具有信用价值的客户来说，零前期成本比太阳能屋顶的回报更高。

加利福尼亚提供了一个例子中，“共享太阳能”变得非常像“绿色定价”，这种方式下由用户支付社区太阳能电力溢价。该计划的一部分就像字面上说的，通过公共事业部门所有的太阳能电池阵列，客户将能够绿化他们的电力供应，但将为每千瓦时电力多支付 15-35%费用。更为传统的“共享阳光”模型中，项目可能会将票据信用限制在在每千瓦时 8¢，远低于零售电力价格。

总之，共享太阳能是一个相对较新的工具，有充分的机会来改善。尽管有相当多的州有项目和自愿提供的公用事业项目，但在社区太阳能项目上只有 100 兆瓦（仅占美国总发电量的很小部分）。

社会集团购买

集体行动并不总是意味着集体所有权，一个成功的工具是组织个人业主和企业共同购买太阳能。例如，社区电网的“太阳”分会，组织业主的合作协会，共同竞标他们家的太阳能装置，可将价格降低 25%。

这一概念是由在美国首都华盛顿的 Mt. Pleasant 太阳能公司发起的。这种当地的努力有助于获得太阳能安装在 10%的物业在附近，并在 D.C.的其他几个区域催生了几个购买合作社。2015 年前，这个网络服务的社区已遍布华盛顿 D.C.，马里兰州，弗吉尼亚和西弗吉尼亚州。总的来说，它为数千名参与者提供了近 6.5 兆瓦太阳能的低成本安装。

另一个例子是在对面的海岸或者说在波特兰开展的“太阳能化”模式。“太阳能化的方法使家庭或企业团体一起合作共同协商利率，选择有竞争力的一个安装程序，并通过创新的有期限合同提供参加这个活动的机会。“太阳能化活动现在在加利福尼亚，康涅狄格，马里兰州，马萨诸塞州，新罕布什尔州，纽约，北卡罗莱纳，俄勒冈，宾夕法尼亚，罗德岛，德克萨斯，犹他，佛蒙特州，华盛顿，威斯康星等地区进行。这些活动是政府或公用事业赞助的，总之，在各种太阳能化的努力下已经安装了 20 兆瓦的太阳能，得到比起个人单独行动低廉的价格折扣。

团购项目的更多信息，见太阳能化在与美国国家可再生能源实验室合作西北种子发布指南。

阿德垄断电网销售

另一种可能性是，社区可再生能源项目将成为批发电力供应商。在这种情况下，社区拥有的项目简单地将权力出售到竞争激烈的市场，所欲投资者的收入共享。特别是随着越来越多的国家考虑取消垄断的配电网，社区生产的电力可能会有更多的机会在当地销售，这替代了对于一个简单的收入分成模式共享电力输出的需求。

合作社

区分“社区”和“合作”可再生能源项目，似乎有些奇怪。然而，“社区”可以描述的地理或种族或简单的太阳能电池组的人，而“合作社”是一个有民主治理和利益公平分配历史基础的正式的法律结构。

合作社在其他经济部门很普遍，但在电力方面几乎完全由几十年保守的垄断性农村电力合作社为代表。尽管如此，这种合作结构首次为一些社区带来电力——如果没有合作社，这些社区可能已经消失了。这可能是上个世纪为解决本世纪组织社区可再生能源项目的问题遗留下来的礼物。

不幸的是，在可再生能源领域合作社的例子很少。有少数是工人所有的合作社，工人拥有一个提供可再生能源服务的企业，但不开发社区可再生能源项目。在光伏广场，一个马萨诸塞州先锋谷的太阳能安装公司，工人们为发展方向，公司和利润分享做出决策。Namaste 太阳能也是一个工人所有的能源服务企业，也是 Amicus 购买的太阳能安装合作的一部分（在下面讨论）。

合作社也可以为消费者或企业汇集购买力。合作社区能源公司是加利福尼亚太阳能和能源服务公司的成员。成员可以得到硬件的批量折扣，合作成员在获得更优惠政策方面的帮助，如果合作盈利则可获得股息支票。佛蒙特州橡子可再生能源公司提供各种可再生资源包括木屑、热泵、太阳能等的大宗采购订单。Amicus Solar 是一个数十家太阳能安装公司的合作体，这种模式给他们一个规模的购买力，可以与该国最大的安装厂商竞争，而不需要合并公司。合作能源期货公司是一个小型的，以营利为目的的公司，在明尼阿波利斯组织家庭提供能源效率和太阳能服务与大宗采购。2014，他们开始提供太阳能租赁计划，并在 2016，他们计划根据国家的社区太阳能计划提供他们的第一个社区太阳能项目。合作社区能源公司是加利福尼亚州一个全服务的住宅和商业太阳能安装厂商。

在许多欧洲国家，有混合电力合作社的合作业主既是电力的消费者，又是生产者。

“1970 年代，丹麦的三个农村家庭聚集在一起，安装风力发电机，创造出世界上第一个绿色能源合作公司。现在，这个有用 10000 个成员的米德尔格伦登合作社拥有并经营着世界上最大的海上风电场哥本哈根港。”总的来说，丹麦涡轮机 80%是由超过 150000 个家庭共同拥有的。

在丹麦的风力合作社的成功以公用事业的合作所有权的历史和非常有利的政策为基础。从 1979 开始，风电项目可以获得 30%的资金补贴，这一政策随着时间的推移变成固定支付生产（feed-in tariff）制度。固定收益的补充共有的风力项目的收入所得税免税额（税率超过 50%）。在美国，可再生能源激励的挑战意味着最“合作”的所有权模式的公司正使用着有限责任公司制度，像 MinWind。

合作社用于社区可再生能源也有着其优势。Timothy Den-Herder Thomas of Minnesota-based Cooperative Energy Futures 指出，合作结构可以解决典型证券项目面临的挑战，因为他们可以从成员处筹集无限数量的资本。合作社也不必单独办理证券登记，这可降低资金募集成本的 90%以上。在他 2015 年十一月采访法律与社会研究所时，蒂莫西还警告说，合作社的使用不能仅仅是为了募集资金的用途。合作社只能筹集成员的资金，他们必须“实质性地参与合作社……你不能只为了投资而成为一个成员。”

并非巧合的是，合作能源期货公司是第一个非公共设施公司的社区发展可再生能源项目之一（连同佛蒙特州和葡萄园在马萨诸塞州的权力橡子可再生能源公司）。

除了解决证券问题，合作社的好处还在于，他们增加了潜在的社区能源项目价值的参与者。在（由合作能源期货公司组织的）明尼阿波利斯的希洛寺项目案例中，会员用户将不仅获得电费信用，还有项目的利润分红。这是可能的，因为大多数太阳能开发商提供社区太阳能项目通过预定费和项目成本的差价赚取利润，而用户拥有的合作能源期货公司既是业主又是开发商。在项目贷款中第一个 10-15 年还完，组织可能会有额外的收入分配。

合作社无法自动解决联邦税收优惠的挑战，虽然他们对于其他典型的非应税实体没有更大的劣势。一方面，合作社可以作为盈利企业，通过成员分配利润（和税收抵免），虽然这可能会引发与前面提到的情况相同的被动收入壁垒。合作社也可以确保税收股权合作伙伴吸收税收抵免，有其他非营利组织。然而，在未来几年，联邦税收优惠将弱化，合作社可能会被证明更有利的解决剩余的障碍。

Will solar power and electric vehicles transform our energy landscape?

Rapidly falling costs for solar PV and batteries will lead to major reductions in oil demand by the mid-2020s, writes Ajay Gambhir

Whilst international resolve to tackle climate change appeared at an all-time high after the Paris Agreement in December 2015, it's still not clear how we'll chart a path from our fossil fuel-intensive way of life to a low-carbon, possibly zero-carbon, future. But in the background of this international policy activity, big changes have been happening.

There has been a buzz around the falling costs of solar photovoltaics (solar PV) for many years now. It has become clear that reductions in the cost per watt is not just the result of China's massive scale-up in production and the resulting global oversupply, but also the result of manufacturing cost reductions.

Solar PV modules now cost less than US\$0.5 per watt, whilst more importantly, the cost of whole installed utility-scale solar PV systems is below US\$1 per watt in the US. This was achieved three years before the US Department of Energy's "Sunshot" programme targeted this ambitious goal. Some studies produced in the last decade didn't foresee such costs until the end of the 21st century so the rate of innovation is much faster than many thought possible.

Aside from solar PV, we've also seen a frenzy of activity around lithium ion batteries, which have gone from being a newcomer in the 1990s to completely dominate the portable electronic devices markets. Lithium ion is now the battery technology of choice in electric vehicles, whose annual sales are heading towards half a million units per year.

Tesla's "gigafactory", the world's largest lithium ion battery production plant, is now up and running, and Tesla's talk of scaling up production and driving down battery costs is coming to fruition, as we are now seeing a raft of announcements for electric vehicles that are expected to be cost-competitive with petrol and diesel cars by the early 2020s.

So what does the innovation and cost reduction in these two key technologies mean for our efforts to tackle climate change? And perhaps more importantly in the near-term, what implications will these technologies have on the fossil fuel industry? The new study by the Grantham Institute at Imperial College London, in partnership with Carbon Tracker addresses these questions, with a view to understanding the global fossil fuel markets for the next three decades, as well as the temperature pathways that we might be on as a result of recent developments.

We show that we're on a pathway that leads to an approximate 2.5C level of global warming by 2100. This

depends on most countries acting on their 2030 Paris climate pledges in good faith by implementing at least moderate support for new low-carbon technologies, and accounting for some of the damage done by burning fossil fuels. This is more promising than the many “business-as-usual” pathways that would see temperature changes in excess of 4C by 2100, but still leaves much to be done if we’re to get to the “well below 2C” long term goal of the Paris Agreement.

More significantly, perhaps, the study shows that oil and coal demand could take a serious hit as a result of their falling importance in the road transport and electricity generation markets, crowded out by electric vehicles and solar PV, respectively. Solar PV takes a 30% share of the global power generation market by 2050, whilst electric vehicles take a 70% share of the road transport market by this time. For coal, this means it could have absolutely no role in the power sector by the 2040s, whilst oil would be confined to the road freight, aviation and shipping parts of the transport sector by this time. Both fuels would see their global demand peak in the 2020s.

These shifts, particularly in oil demand, could be extremely significant from an industry and macro-economic perspective. To put our study’s findings in context, we are forecasting that electric vehicles will displace two million barrels per day of oil demand by the mid-2020s – which is the supply-demand imbalance seen during the recent oil price collapse. By 2050, electric vehicles could have displaced more than ten times this amount of oil, according to our assumptions.

This study has some good news and some bad, then. On the plus side, we’re expecting a rapid penetration of new, low-carbon technologies to address part of the climate change challenge. This will shift temperature change pathways from traditional business-as-usual (an increasingly redundant concept) to lower-temperature pathways.

Unfortunately, this is still not enough to meet the ambitious Paris Agreement goals. So we need to think hard about which other technologies can be deployed cost-competitively and at scale to displace fossil fuel technologies. More importantly for the near-term, the shifts envisaged in this study could have profound and potentially destabilising consequences for the fossil fuel industry if they are not fully understood and planned for. It’s time we looked to these future mega-trends with our eyes open, so as to expect the unexpected.

太阳能与电动汽车会改变现有能源格局吗？

随着太阳能光伏和锂电池成本的大幅下降，全球石油需求将在十年之内大幅减少，甘博赫·阿贾伊写道。

自 2015 年 12 月《巴黎气候协定》通过以来，国际社会对抗气候变化的热情空前高涨。然而到底该如何从现有的化石燃料密集型生活模式转换到未来的低碳、甚至零碳模式，目前还没有定论。尽管如此，一些重大转变已经开始出现苗头。

关于太阳能光伏设备成本下降的讨论已经持续多年。目前来看，太阳能单位发电成本下降，不只是因为中国大规模增产导致全球市场供过于求，生产成本也的确在下降。

目前，太阳能光伏组件的成本不足每瓦 0.5 美元，而在美国安装全套的供电级太阳能光伏系统每瓦成本还不到 1 美元。此成就的取得，比美国能源部颁布的 Sunshot 计划所提出的宏伟目标提前了 3 年。过去十年，有部分研究预计，至少要到 21 世纪末，太阳能系统的成本才会锐减至这一水平。行业创新的速度的确比我们大多数人想象的要快得多。

锂电池产业也是动作不断。锂电池问世于上世纪 90 年代，如今已在便携式电子装置市场独领风骚。此外，锂电池也是年销售量有望突破 50 万辆的电动汽车领域的标配能源。

特斯拉集团的“超级工厂”已经投产，它是目前全球最大的锂电池生产厂。特斯拉的大幅增产和削减电池成本的愿景正在成为现实。正如我们在一系列声明中所看到的，电动汽车的成本有望在 2020 年代初期与汽油和柴油汽车一拼高下。

技术创新和成本下降对于抗击气候变化工作又会产生什么影响？近期内这一趋势对化石燃料行业又有怎样的冲击？由帝国理工大学（Imperial College London）格兰瑟姆研究所（Grantham Institute）与碳追

踪 (Carbon Tracker) 共同开展的一份最新研究试图回答上述问题。该研究不仅力图搞清未来 30 年全球化石燃料市场的状况，同时也根据最近几年的行业与科研进展为我们模拟了未来可能的全球升温情景。

按照现有状况计算，到 2100 年全球平均气温会上升 2.5 摄氏度左右。而且，这还需要大多数国家积极诚信地兑现各自的 2030 年巴黎气候承诺，比如至少对低碳技术予以适度支持，以及对化石燃料燃烧产生的环境破坏成本进行一定的考虑等等。虽然这要比在什么都不做的情景下，2100 年全球平均气温上升幅度可能突破 4 摄氏度的情况好得多，但是要想达成《巴黎气候协定》设定的全球温度上升幅度“低于 2 摄氏度”的长期目标，我们还需做出更多努力。

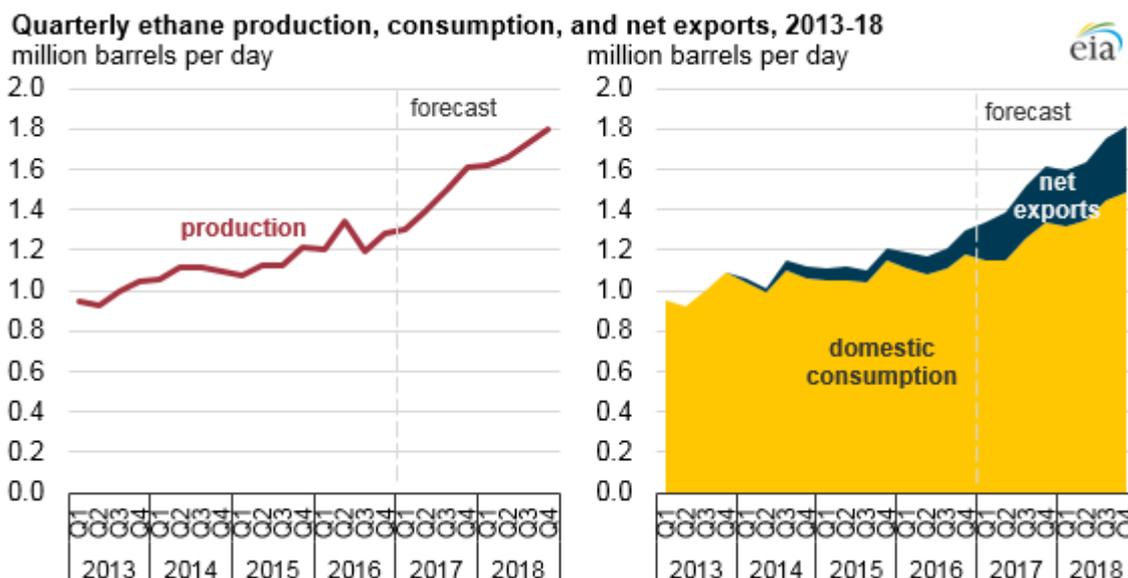
上述研究显示，由于电动汽车和太阳能光伏产业的崛起，石油和煤炭在道路运输和发电市场的需求将遭受重创。到 2050 年，太阳能光伏在全球发电市场中所占的比例将达到 30%，而电动汽车则将占据 7 成的道路运输市场。所以说，到本世纪 40 年代，煤炭在电力产业或许将彻底丧失立足之地，而届时石油也将局限于公路货运、航空海运等领域。总而言之，上述两种化石燃料的全球需求将在本世纪 20 年代达到峰值。

从行业与宏观经济角度来看，这样的转变，尤其是石油需求的变化将会产生非常重要的影响。以本次研究发现为例，我们预计到本世纪 20 年代中期，电动汽车每天可减少 200 万桶石油需求，而这与最近石油价格暴跌导致的供需失衡数量基本相当。据我们估计，到本世纪中叶，电动汽车可减少十倍于此的石油需求。

当然了，这份研究带来的并不全是好消息。从积极的方面来看，未来新型低碳科技的市场渗透速度将继续加快，并在一定程度上减缓气候变化。我们将从“照常排放”的温度变化模式，转而进入一个升温较慢的模式。

然而，这一转变依旧无法让我们完成《巴黎气候协定》设定的目标。我们需要继续寻找和挖掘其他高性价比、易推广的科技来替代现有的化石燃料技术。就近期而言，如果化石燃料产业不能充分理解这一研究中提及的模式转变，并相应做出计划，那么这个行业必将遭受深远的、甚至颠覆性的影响。我们必须睁大双眼观测未来的发展大潮，为应对不可预测的难题做好准备。

U.S. ethane production, consumption, and exports expected to increase through 2018



Mcanxixun Information

Source: U.S. Energy Information Administration, Short-Term Energy Outlook January 2017

Note: Total production includes both natural gas plant production and refinery and blender net production.

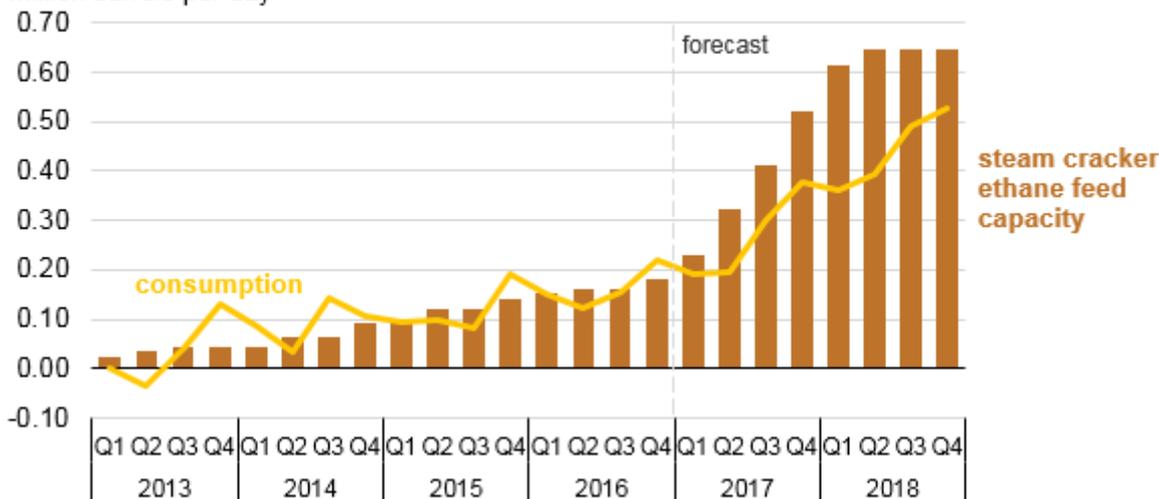
U.S. production of ethane is expected to increase from an average of 1.25 million barrels per day (b/d) in 2016 to 1.7 million b/d in 2018 according to EIA's latest Short-Term Energy Outlook (STEO). Increased ethane production is expected to be consumed in the petrochemical industry domestically as well as exported to other countries.

Ethane is a hydrocarbon with two carbon atoms that may be present in raw natural gas extracted from the ground. In recent years, the amount of ethane contained in raw natural gas has exceeded U.S. demand and exports, so some ethane has been left in the natural gas provided to end users instead of being separated and marketed as a distinct product. Increases in domestic consumption and exports of ethane are expected to support higher ethane prices relative to natural gas prices, which will encourage more ethane recovery from raw natural gas.

Ethane is used almost exclusively as a petrochemical feedstock to produce ethylene, a compound used in the creation of many plastics. Expansions at existing ethylene plants contributed to a 170,000 b/d increase in ethane consumption between 2013 and 2016. By mid-2018, construction is expected to be completed at six new ethylene plants and one restarted plant, collectively capable of using 450,000 b/d of ethane feedstock. Most of these plants are designed specifically to use ethane without the ability to switch to other feedstocks. EIA expects U.S. ethane consumption to increase by 310,000 b/d (26%) between the first quarter of 2013 and the fourth quarter of 2018 as these plants ramp up operations.

Growth in ethane feed capacity and ethane consumption since Q1 2013

million barrels per day



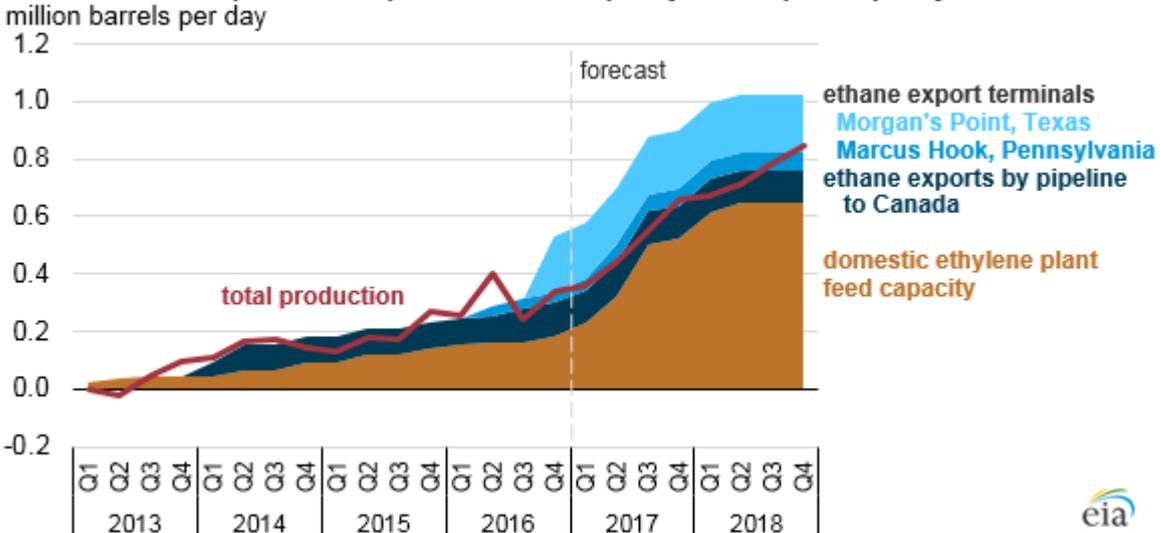
Source: U.S. Energy Information Administration, Short-Term Energy Outlook January 2017 and company announcements

Ethane exports are also expected to increase. Until December 2013, when the new Mariner West pipeline provided a route to the Canadian market, Gulf Coast petrochemical plants were the only outlet for domestically produced ethane. Since then, the completion of the Vantage pipeline project, which ships ethane to Canada, and of two marine export terminals have allowed ethane exports to expand to an estimated 130,000 b/d by the fourth quarter of 2016.

The first ethane export terminal in the United States, located at Marcus Hook, Pennsylvania, with an export capacity of 35,000 b/d, shipped its first ethane cargo in March 2016. A second export terminal, located at Morgan's Point, Texas, with a capacity of 200,000 b/d, shipped its first ethane cargo in September 2016. Morgan's Point terminal is 90% contracted, and exports are ramping up quickly. Although the first shipments out of Morgan's Point went to Europe, the facility sent shipments to India in December and January.

The shipments to India were transported on two new very large ethane carrier (VLEC) vessels, which can hold up to three times as much ethane as existing ethane-shipping vessels. These vessels are the first two of six VLECs commissioned by Reliance Industries for transporting Gulf Coast ethane to their petrochemical plants in India. EIA's Short-Term Energy Outlook forecasts exports to increase by 180,000 b/d between the fourth quarters of 2016 and 2018, as shipments ramp up at existing facilities.

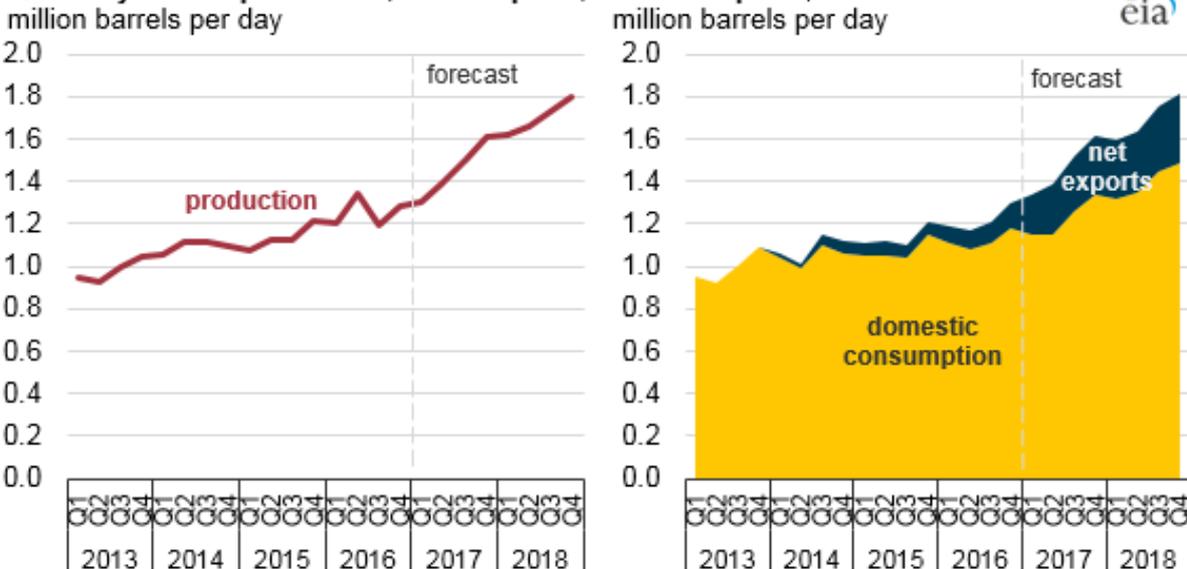
Growth in ethane production, petrochemical capacity, and export capacity since Q1 2013



Source: U.S. Energy Information Administration, Short-Term Energy Outlook January 2017 and company announcements

据估计美国到 2018 年乙烷产量、消费量、出口量将增长

Quarterly ethane production, consumption, and net exports, 2013-18



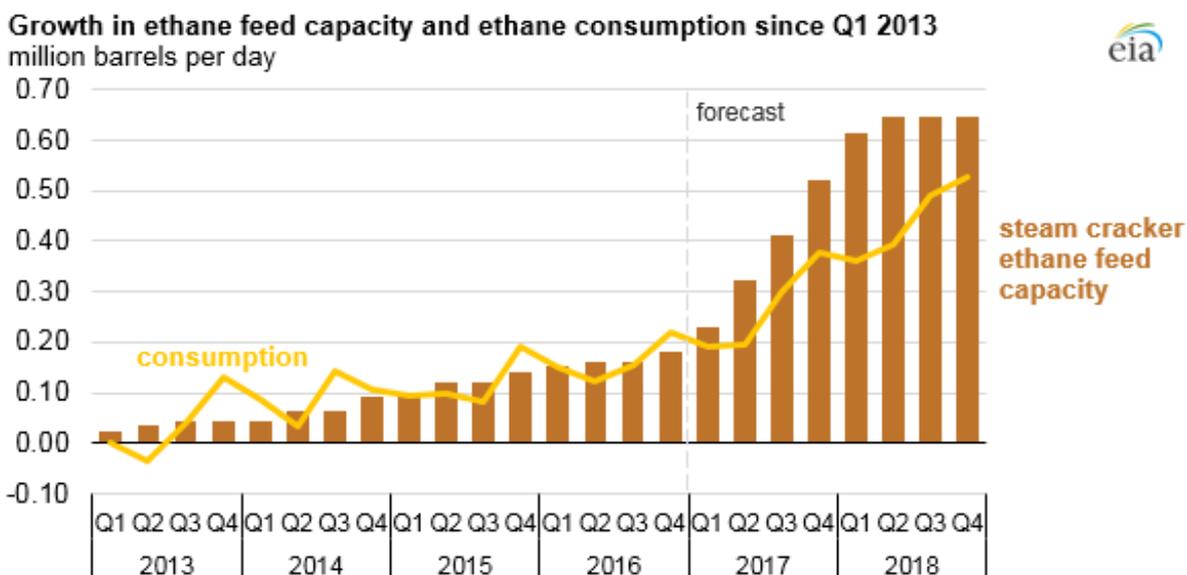
资料来源：美国能源信息署，2017 年一月短期能源展望及公司公告

注：总产量包括天然气厂产量和炼油和搅拌机净产量。

根据 EIA 最新的短期能源预测(STEO),美国的乙烷产量预计将从 2016 年的平均每天 125 万桶/天(b/d) 在 2018 年增至 170 万 b/d。增加的乙烷产量预计将消耗在国内石化行业以及出口到其他国家。

乙烷是一种含有两个碳原子的碳氢化合物，可能存在于从地面提取的天然气中。近年来，原料天然气中乙烷的量已超过美国的需求量和出口量，因此，会残留一部分乙烷在天然气供应给最终用户，而不是作为一种独特的产品被分离和销售。国内乙烯消费量和乙烯出口量的增加，预计将支持与天然气价格相关的乙烷价格，这将鼓励更多地从原料天然气中回收乙烷。

乙烷几乎全部被用作化石原料生产乙烯，一种用于制造多种塑料的化合物。在现有的乙烯生产厂的扩张在 2013 年到 2016 年期间贡献了乙烷消费 170000b/d 的增加。2018 年中之前，预计将完成六个新建乙烯生产厂和一个重新启动工厂，都能够使用 450000b/d 的乙烷原料。这些厂家大多是专为使用乙烷，没有切换到其他原料的能力。因为这些工厂开始运营，EIA 预计从 2013 年第一季度到 2018 年第四季度美国乙烷消费量将增加 310000 b/d (26%)。



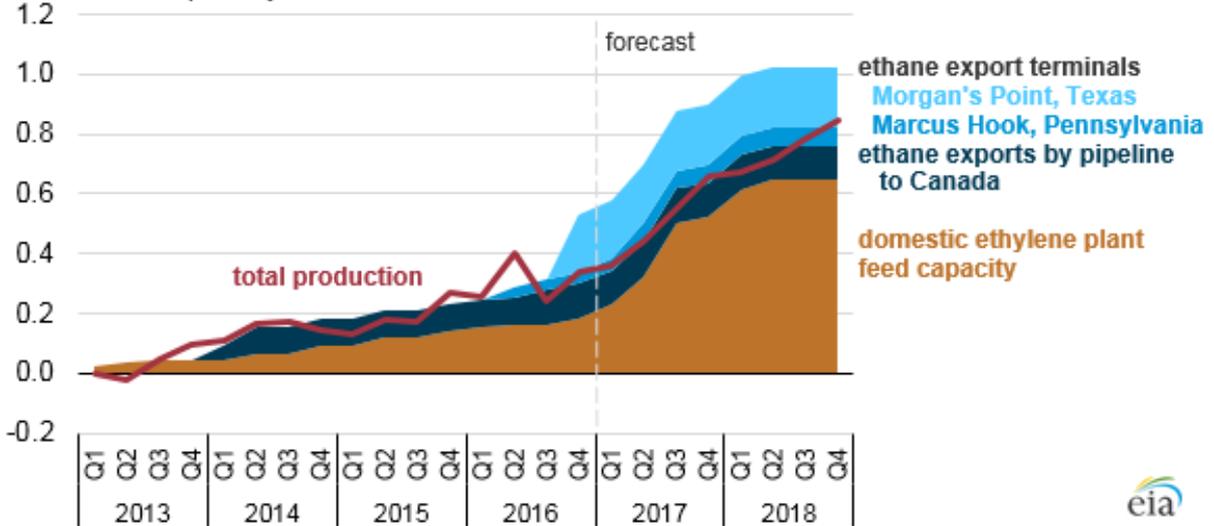
资料来源：美国能源信息署，2017 年一月短期能源展望及公司公告

乙烷出口量也有望增加。直到 2013 年十二月，新的 Mariner West 管道提供了一个指向加拿大市场的路线，海湾石油化工厂是国内生产的乙烷的唯一出路。自从运输乙烷到加拿大的管道工程完工，和两个海洋出口码头的完成之后，乙烷的出口量在 2016 年第四季度之前扩大到大约 130000b/d。

国第一个乙烷出口港口位于宾夕法尼亚州马库斯胡克市，具备 35000 桶/天的出口能力，在 2016 年三月运输了它的第一批乙烷货物。第二个出口码头，位于德克萨斯州的 Morgan’s Point，运输能力为 200000b/d，在 2016 年九月运输了它的第一批乙烷货物。Morgan’s Point 萎缩了 90%，而出口增加迅速。虽然从 Morgan’s Point 出发的第一批货物是运往欧洲，该码头于十二月和一月向印度发送了货船。

发往印度的货物由两艘新的非常大的乙烷 (vlec) 承运船只运输，可容纳现有乙烷运输船运载量的三倍。这些轮船是 VLECs 委托信实工业将海湾的乙烷输送到印度石油化工厂的六批货物中的前两批。基于目前设施的出货量的增加，EIA 的短期能源展望预测在 2016 年第四季度到 2018 年第四季度期间，乙烷出口将增加 180000b/d。

Growth in ethane production, petrochemical capacity, and export capacity since Q1 2013
million barrels per day

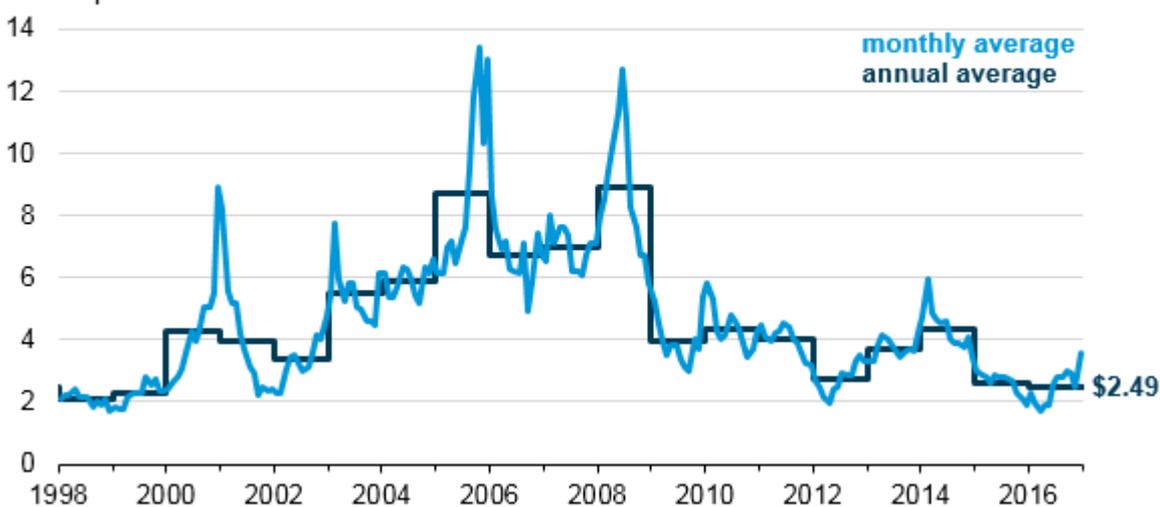


资料来源：美国能源信息署，2017年一月短期能源展望及公司公告

Natural Gas (天然气)

Natural gas prices in 2016 were the lowest in nearly 20 years

Monthly and annual average natural gas spot price at Henry Hub (1997–2016)
dollars per million British thermal unit



Source: U.S. Energy Information Administration, based on Natural Gas Intelligence

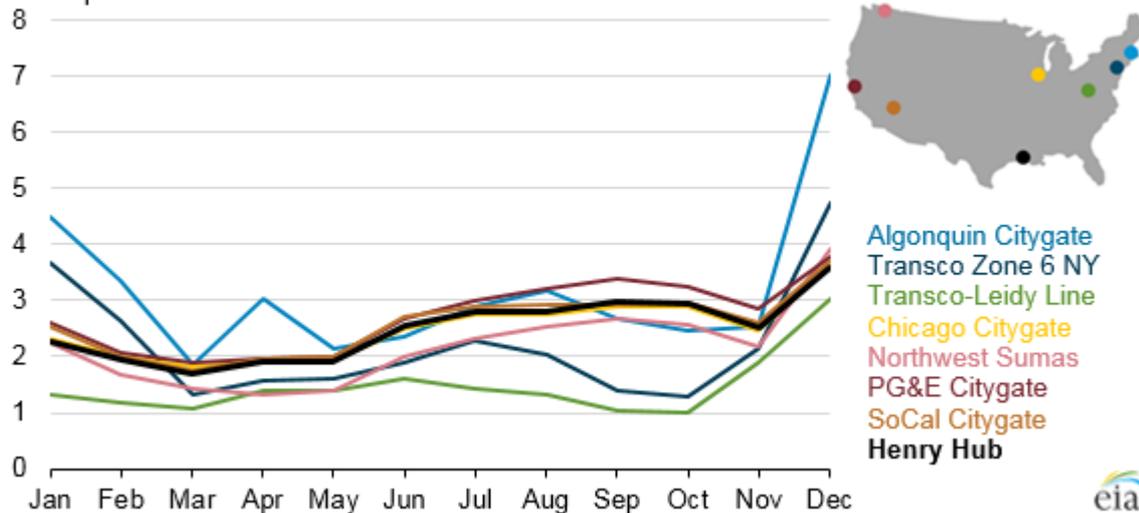
Natural gas spot prices in 2016 averaged \$2.49 per million British thermal units (MMBtu) at the national benchmark Henry Hub, the lowest annual average price since 1999. The monthly average price fell below

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\$2.00/MMBtu from February through May, but later increased, ending the year at an average of \$3.58/MMBtu in December. Warmer-than-normal temperatures for most of the year and changing natural gas demand were the main drivers of natural gas prices in 2016.

Monthly average natural gas spot prices at key trading hubs, 2016

dollars per million British thermal units



Source: U.S. Energy Information Administration, based on Natural Gas Intelligence

Natural gas prices in U.S. regional markets were volatile in 2016. In the first quarter of the year, much warmer-than-normal winter temperatures and large amounts of natural gas in storage caused prices to decrease. Prices began to gradually increase in late spring, with increased natural gas demand from multiple sectors and decreasing natural gas production, before sharply increasing at the end of the year with the onset of cold temperatures in mid-December.

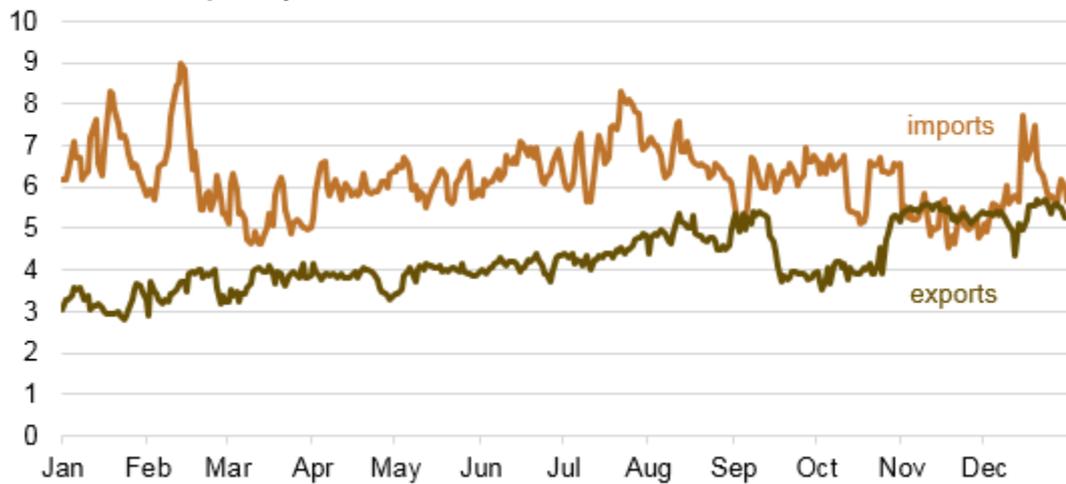
In the Northeast, where natural gas pipeline capacity is often constrained, cold weather can cause monthly average prices at hubs such as Algonquin Citygate (near Boston) and Transco Zone 6 NY (New York) to spike. Although this happened in 2016, new pipeline capacity and increased natural gas production in the Appalachian Basin, along with warmer-than-usual winter weather, contributed to price spikes that were considerably lower than in previous years.

Because of warm weather, natural gas consumption in the residential and commercial sectors in 2016 declined 7% and 4%, respectively, from the previous year. Warmer winter temperatures also limited natural gas storage withdrawals. As a result, natural gas storage inventories were at or near record levels throughout most of the year and reached a record 4,047 billion cubic feet (Bcf) for the week ending November 11.

Despite the overall decrease in residential and commercial demand in 2016, late-year increases in these sectors and increased demand from other sources contributed to increasing natural gas prices later in the year. In 2016, natural gas surpassed coal as the primary fuel used for power generation in the United States, supplying an estimated 34% of the nation's electricity, compared with 30% for coal. Electric power generation in 2016 used an average of 27.6 billion cubic feet per day (Bcf/d), exceeding the previous high of 26.3 Bcf/d in 2015.

U.S. net imports and exports of natural gas in 2016

billion cubic feet per day



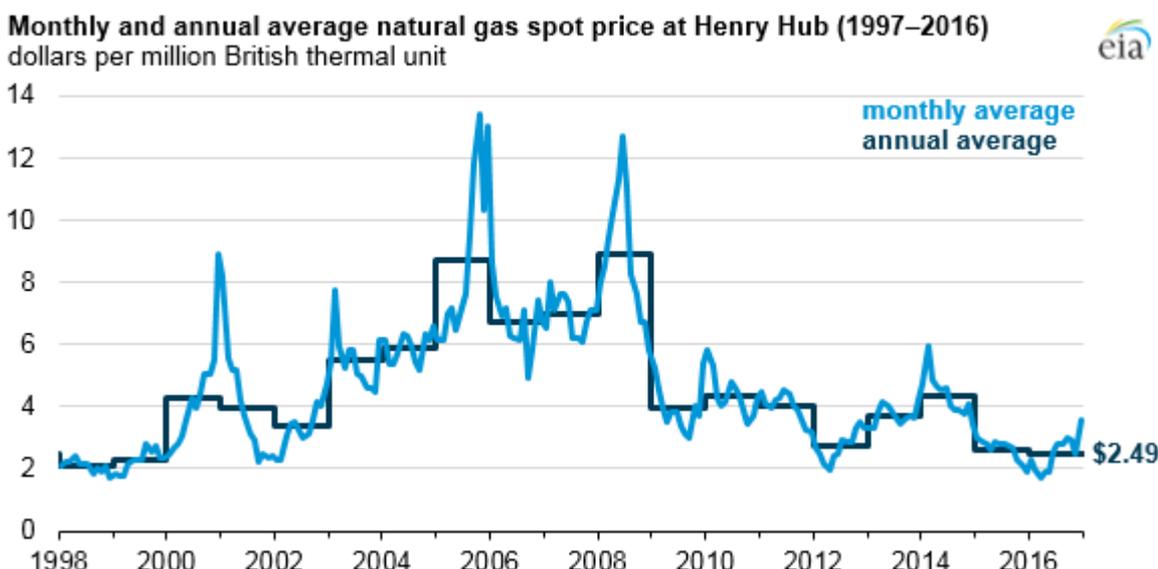
Source: U.S. Energy Information Administration, based on Point Logic Energy

In November 2016, the United States became a net exporter of natural gas on a monthly basis for the first time since 1957, based on data from PointLogic. This was supported by infrastructure improvements—including natural gas pipelines and facilities for liquefying natural gas for export—that enabled suppliers to meet increasing demand from foreign markets.

U.S. pipeline exports to Mexico continued to grow throughout 2016, making up 87% of all U.S. natural gas exports. In May 2016, the Sabine Pass liquefaction terminal began commercial operations in the Gulf Coast to export liquefied natural gas (LNG). The expansion of the Panama Canal in July 2016 further aided export ability by reducing time and transportation costs to key markets in Asia and the west coast of South America.

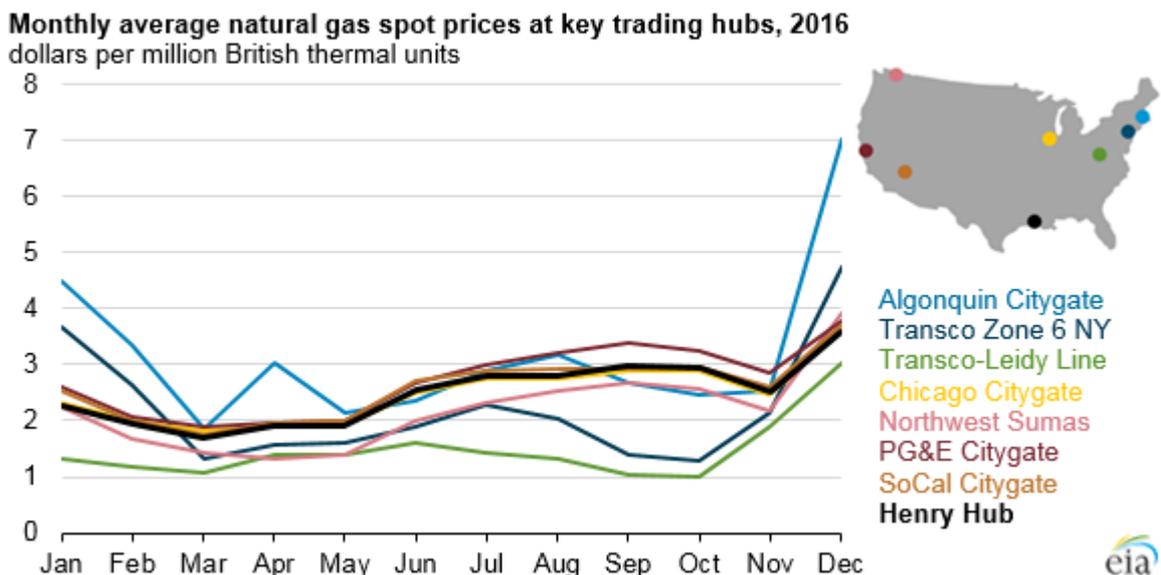
Despite growing demand in the electric power sector and export markets, low demand for space heating and low prices resulted in lower natural gas production in 2016. Based on preliminary data, EIA estimates natural gas marketed production to average 77.5 Bcf/d in 2016, 1.3 Bcf/d less than in 2015 and the first annual decline since 2005. The number of active natural gas drill rigs continued a multi-year decline, reaching 132 by the end of 2016, down 19% from the year-ago count. However, production has not fallen as sharply as the number of active rigs, as producers have continued to make gains in drilling efficiency.

2016 天然气价格达到 20 年来新低



资料来源：美国能源信息管理局，基于天然气情报

2016 天然气现货平均价格为国家 Henry Hub 基准下 2.49 美元每百万英热单位 (MMBtu)，达到 1999 年以来最低的年平均价格。月平均价格从二月到五月期间跌破 2.00 美元/mmbtu，但后来转增，到去年年底收于十二月份的平均 3.58 美元/mmbtu。2016 年度天然气价格变化的主要动因是全年气温偏高和天然气需求的变化。



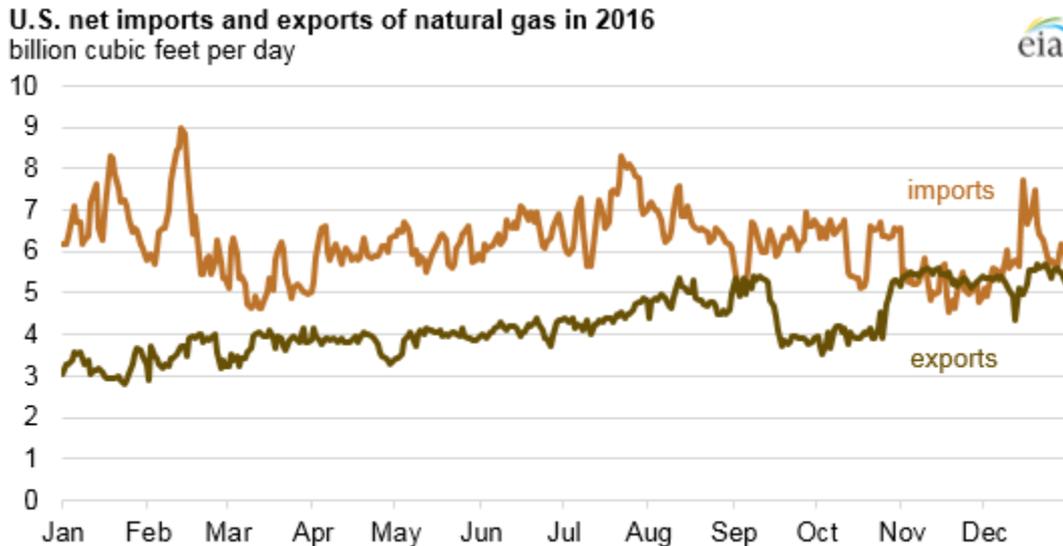
资料来源：美国能源信息管理局，基于天然气情报

美国地区市场的天然气价格在 2016 持续波动。在今年第一季度，气温比平时暖和得多，而且有大量的天然气储存导致天然气价格下降。在春末随着多个部门天然气需求的增加和天然气产量的减少，价格开始逐渐抬高，直到今年年底十二月中旬寒冷天气开始之后才急剧上涨。

在东北地区，天然气管道的能力往往有限，寒冷的天气会导致如昆城（波士顿附近）和 Transco Zone 6 NY（纽约）这些枢纽的月平均天然气价格激增。虽然这件事发生在 2016，阿巴拉契亚盆地新管道输送能力的提高和天然气产量的增加，以及比往常冬天更温暖的天气，导致价格上涨幅度大大低于往年。

由于气候变暖，2016 年住宅及商业用地的天然气消费量分别较上一年下降 7% 和 4%。暖冬气温也限制着天然气存量的减少。因此，在一年的大部分时间里天然气储存量都达到或接近创纪录的水平，在十一月十一日那一周达到创记录的 40470 亿立方英尺。

尽管 2016 年住宅及商业需求整体下降，这些部门在后半年的增长和其他来源的需求增加，导致天然气价格在今年早些时候上涨。2016 年，在美国，天然气超过了煤炭成为用于发电的主要燃料，提供了全国大约 34% 的电力，而煤炭仅提供了 30%。2016 年有平均每天 276 亿立方英尺天然气用于发电，超过之前的最高水平——2015 年的每天 263 亿立方英尺。



来源：美国能源信息管理局，基于点逻辑能源

2016 年十一月，美国成为一个以月为基准的天然气净出口国，这是自 1957 以来的第一次，基于 pointlogic 的数据。这是由于基础设施的改善，包括天然气管道和用于出口液化天然气的设施，使供应商能够满足国外市场的需求。

美国通过管道向墨西哥出口天然气，这个出口量在整个 2016 年持续增长，占有天然气出口总额的 87%。2016 年五月，萨宾帕斯液化站开始了海湾出口液化天然气 (LNG) 的商业运营。巴拿马运河在 2016 年七月的扩张，进一步增加了出口能力，减少了时间和亚洲和南美洲西海岸这些关键市场的运输成本。

尽管电力部门和出口市场需求不断增长，但供暖需求的减少和低价导致了 2016 年天然气产量的下降。根据初步数据，EIA 估计 2016 年天然气产量为平均 77.5Bcf/d，比 2015 年少 1.3Bcf/d，这是 2005 年以来第一年下降。活跃的天然气钻机的数量继续多年的下降，在 2016 年底减至 132，比去年同期下降了 19%。然而，因为生产商一直在提高钻井效率，产量并没有像钻机的数量那样急剧下降。

Minerals (矿产)

Yancoal back in the headlines with \$2.5bn Rio coal deal

The last time Sydney-listed Yancoal Australia hit the headlines was in 2015 when Noble Group was battling questions about its accounting policies.

The commodity trader had a 13 per cent stake in Yancoal that it valued at a significant premium to the prevailing market price largely on the basis of future cash flow projects.

Fast forward to 2017 and Yancoal is making news for a different reason. It has just agreed to buy the bulk of Rio Tinto's coal assets in a deal worth \$2.45bn — even though it has not secured any funding.

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Lossmaking Yancoal is proposing to fund the deal through a sale of new shares, which its 78 per cent shareholder Yanzhou Coal has said it will back.

This marks the second fund raising in a little over two years that Yancoal's parent company has agreed to back. Yanzhou was forced to inject \$2.8bn into its Australian subsidiary a couple of years ago to keep it afloat amid a crisis in the coal sector.

This time the state-controlled company has pledged to buy \$1bn shares, leaving other shareholders or new investors to stump up the rest.

In practice that means lossmaking Yancoal needs to raise \$1bn because \$500m of the purchase price is deferred and will be paid in \$100m annual instalments over the next five years. To put those figures in perspective, Yancoal's market value is currently just \$360m.

Now, it is not unusual for Chinese companies to buy first and worry about financing later. Consider China Moly. After announcing a deal to buy the Tenke copper mine from Freeport-McMoRan last year it then set about raising \$2.8bn (successfully) through a share issue to fund the deal.

But it is a risky tactic not least because Beijing is worried about capital flight. Furthermore, cash-strapped Noble remains Yancoal's second-biggest shareholder and with the company still in debt reduction mode there must be doubts over its participation.

Yancoal says it is in discussions with banks and other parties that might be prepared to underwrite its cash call and fund a deal it says would be "transformative". And it has little to lose. If the deal falls apart, all it will have to pay Rio is a break fee of \$23.5m.

Given the rebound in thermal coal prices over the past year there will certainly be investors prepared to back a deal, even if they will be slightly nervous that the global coal market now moves on the whims of policymakers in Beijing.

For its part, Rio is clearly worried about the deal collapsing because the small print of Tuesday's agreement leaves the door wide open to counter bids.

While Rio says it will not solicit other offers, it is prepared to negotiate with anyone who will pay at least \$100m more than the total value of Yancoal's offer. This includes a decade of potential production royalties, which are not included in the headline price but Yancoal has agreed to pay.

There are likely to be a couple of parties poring over the details of Tuesday's announcement.

X2 Resources, the investment vehicle of former Xstrata boss Mick Davis, came close to buying the business a couple of years ago until he was blocked by investors who didn't want to be seen investing in a dirty fossil fuel. Mr Davis has since restructured his fund.

Glencore has made no secret of its interest in the Rio coal assets, which are close to its mines in the Hunter Valley. Glencore boss Ivan Glasenberg has previously tried to engineer a merger of their operations in the region but was rebuffed by Rio former chief executive Sam Walsh.

While its doubtful Glencore could afford to trump Yancoal's offer on its own it could join forces with a deep-pocketed partner as it did recently to buy a 19.5 per cent stake in Rosneft, the Russian oil major.

The Commodities Note is an occasional online commentary on the industry from the Financial Times

兖煤澳洲拟以 25 亿美元收购力拓煤炭资产

先收购再筹钱的做法在中资企业中并不稀奇，亏损中的兖煤澳洲计划通过发售新股筹资，母公司兖州煤业已同意支持。

在悉尼上市的兖州煤业澳大利亚有限公司（Yancoal Australia，以下简称“兖煤澳洲”）上次成为头条新闻是在 2015 年来宝集团(Noble Group)努力应对针对其会计政策的质疑之时。

这家大宗商品交易商拥有兖煤澳洲 13% 的股份，当时其对这部分权益的估值明显高于市价，原因是其将预期的未来现金流作为估值主要依据。

快进到 2017 年，兖煤澳洲正以一个不同的原因制造新闻。兖煤澳洲刚刚同意通过一笔 24.5 亿美元的交易收购力拓(Rio Tinto)的大部分煤炭资产——尽管兖煤澳洲还没有搞定收购所需的任何资金。

亏损中的兖煤澳洲正提议通过发售新股来筹集这笔交易所需的资金，拥有兖煤澳洲 78% 股份的兖州煤业（Yanzhou Coal，以下简称“兖煤”）表示将予以支持。

这是在两年多一点的时间里兖煤澳洲的母公司同意支持的第二笔融资。两年前，兖煤被迫向其澳大利亚子公司兖煤澳洲注入 28 亿美元，以使其在煤炭业危机中维持运营。

这一次，这家国有控股公司承诺购买 10 亿美元的兖煤澳洲股票，剩下的部分由其他股东或新投资者认购。

这意味着亏损中的兖煤澳洲还需要筹集 10 亿美元，因为在 24.5 亿美元收购总价中，有 5 亿美元将递延支付，在接下来 5 年中以每年支付 1 亿美元的方式分期付款。为了更清楚地了解这些数字，需要了解兖煤澳洲的市值目前仅为 3.6 亿美元。

现在，中资企业先收购、后考虑融资问题的做法并不罕见。比如洛钼集团(China Moly)。去年，该集团宣布收购麦克墨伦自由港(Freeport-McMoRan)的 Tenke 铜矿之后才开始着手通过发股（成功地）募集交易所需的 28 亿美元。

但这是一种有风险的策略，尤其是因为现在中国政府担忧资本外逃。此外，现金短缺的来宝依然是兖煤澳洲的第二大股东，由于来宝依然处于债务削减的模式中，外界对其参与必有疑虑。

兖煤澳洲表示，正与银行和其他方面讨论，这些机构或许打算响应兖煤澳洲的筹资行动，为这笔兖煤澳洲所说的“革命性” (transformative) 交易提供资金。兖煤澳洲几乎没什么可失去的。如果这笔交易失败，它只需支付力拓 2350 万美元的“分手费”。

考虑到过去一年热煤价格的反弹，肯定会有投资者准备支持这笔交易，即使他们对如今全球煤炭市场随北京的政策制定者的意愿而波动略感紧张。

力拓方面显然担忧这笔交易会失败，因为周二达成的协议的附加条款为竞争性投标敞开大门。

尽管力拓表示不会主动招揽其他报价，但如果某个竞购方的报价至少比兖煤澳洲的总收购价还高 1 亿美元，力拓也是准备与其谈判的。兖煤澳洲的总收购价包含 10 年的潜在产出矿区土地使用费，这部分费用不包含在整体报价中，但兖煤澳洲已同意支付。

一些机构可能会仔细研究周二公布的协议的细节。

斯特拉塔(Xstrata)前首席执行官米克·戴维斯(Mick Davis)的投资平台 X2 资源(X2 Resources)几年前差点收购力拓的这项业务，后来被投资者阻止，这些投资者不愿让外界看到他们投资一种肮脏的化石燃料。之后戴维斯改组了他的基金。

嘉能可(Glencore)并不掩饰其对力拓旗下煤炭资产的兴趣，这些资产所在的位置靠近嘉能可在猎人谷(Hunter Valley)的矿区。嘉能可首席执行官伊凡·格拉森伯格(Ivan Glasenberg)此前曾试图促成双方合并在该地区的业务，但遭到力拓前首席执行官萨姆·沃尔什(Sam Walsh)拒绝。

尽管嘉能可独立提出胜过兖煤澳洲的报价的能力令人怀疑，但它可以与一个财力雄厚的伙伴合作。最近嘉能可可通过联合的方式收购了俄罗斯石油巨擘 Rosneft 19.5% 的股份。

Clean Energy (清洁能源)

President Xi champions low-carbon development at Davos

President-Xi-champions-low-carbon-development-at-Davos

China shows how investment in renewables can drive economic growth and create millions of jobs, writes Ma Tianjie

At the pre-meeting press conference of the 2017 World Economic Forum (WEF) at Davos, Professor Klaus Schwab, the founder of this high-profile annual meeting of global political, business and civil society leaders, started with a bleak depiction of the past year.

“The mounting backlash against the effect of economic globalisation, especially in industrial democracies, is threatening a very disruptive impact on economic activities and social stabilities in many countries,” he said.

As world leaders convene in the secluded Swiss town of Davos, which gives the conference its name, they will have to confront a disturbing global landscape of emerging populist movements, weakened and inequitable economic growth, and mounting environmental challenges. They must also demonstrate “responsive and responsible leadership”, the theme of this year’s WEF.

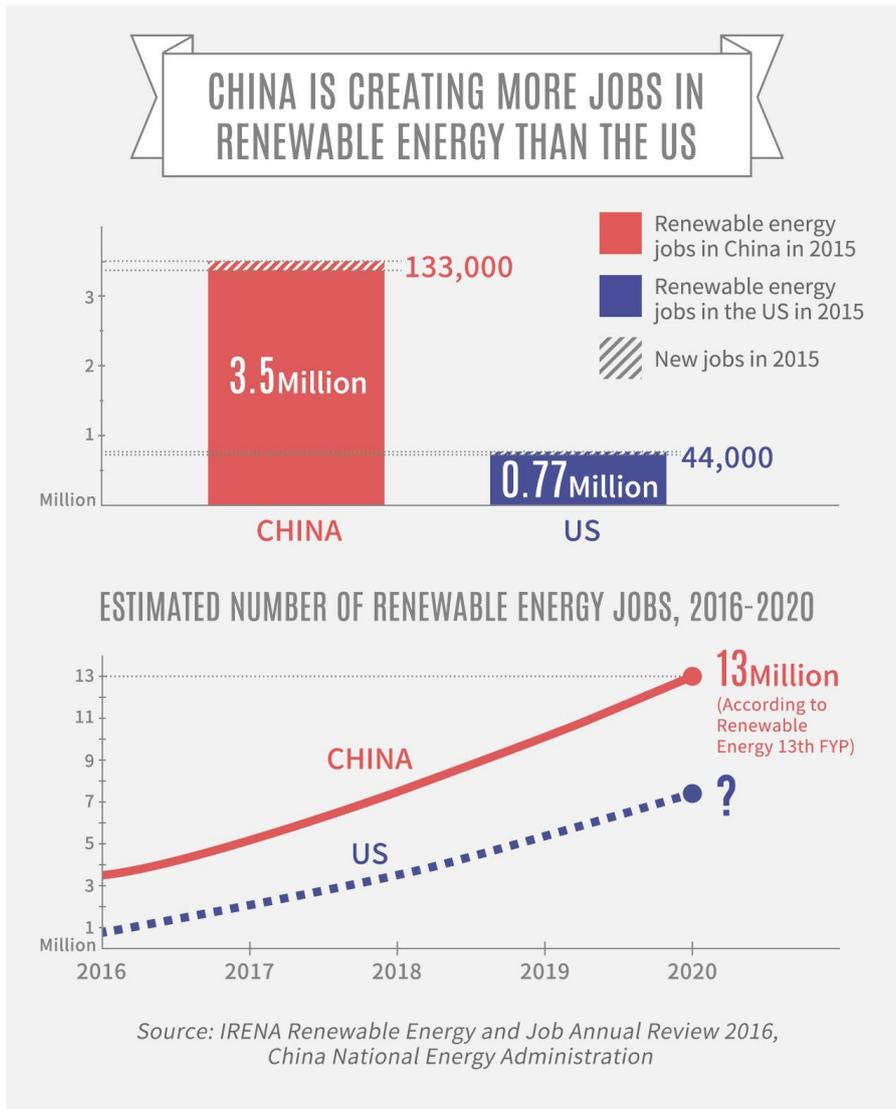
One leader that people are looking to for answers is President Xi Jinping of China. He will deliver an unprecedented opening speech at the forum on Tuesday. State media have suggested his speech will elaborate his vision of a “shared destiny of human kind” and a roadmap for renewed global collaboration.

But beyond such grand notions, leaders from around the world may also learn from China’s actual experience in recent years of seeking alternative “engines” of economic growth, a theme that this year’s Davos is keen to explore. President Xi’s entourage of Chinese business leaders this year includes some of the country’s most successful entrepreneurs. A few are from the renewable energy sector, which is one of the country’s fastest growing sectors and key to China achieving its environmental and social goals.

So what can the world learn from China’s experience of investing in renewables such as solar and wind?

Invigorating the economy


**IS THE US LOSING OUT TO CHINA
IN THE RENEWABLES RACE?**



China's renewable power capacity has grown rapidly in recent years. Wind capacity increased 31 gigawatts (GW) in 2015 to 145GW, which is more than Europe. China installed an average of two wind turbines an hour. Solar is also growing quickly, with 15GW installed in 2015 bringing total capacity to 43GW.

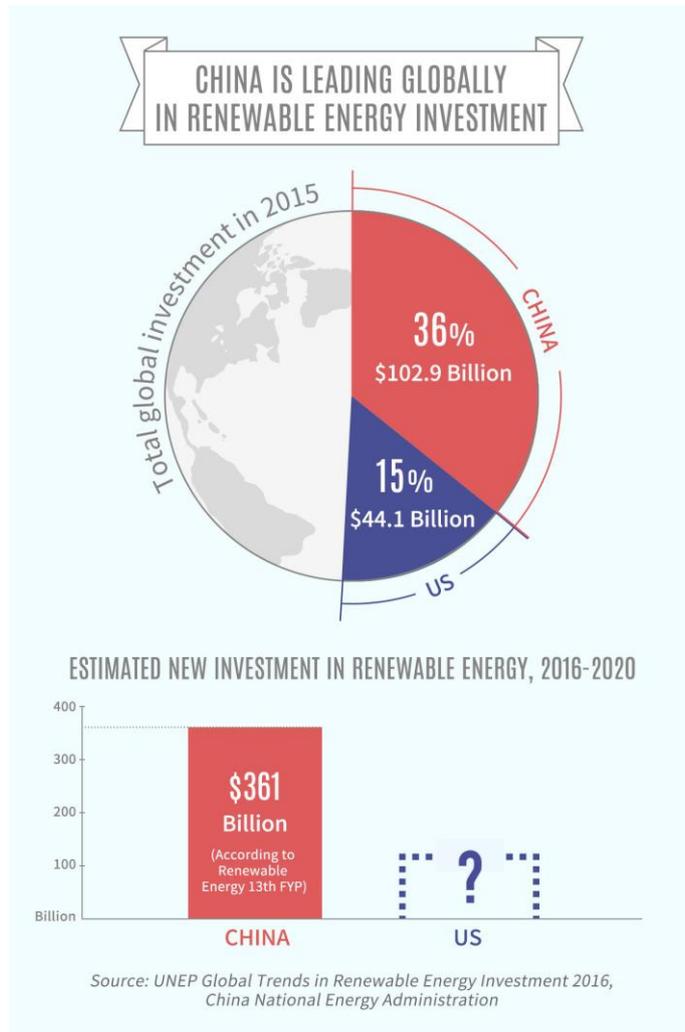
In both cases these additions were the largest one-year increases achieved by any country. For comparison, the 2015 wind capacity increase was roughly equivalent to the UK's entire renewable power capacity, while the growth in solar was roughly equivalent to adding the combined solar capacity of the UK and Spain.

As a result of this booming sector, renewable energy is a major employer in China. In 2015, it employed 3.5 million people, nearly a million more than work in the Chinese oil and gas sector. Jobs in renewables have grown by 1.8 million since 2012. In comparison, there were 769,000 jobs in the sector in the US in 2015, an increase of just 157,000 since 2012.

Mcanxixun Information

China believes that its 13th Five-Year Plan will create an additional 13 million renewables jobs by 2020. This is more than 5,000 jobs a day, assuming a constant job creation rate over the 13th Five-Year Plan period (2016-2020). These new jobs include China's current 3.5 million jobs in renewables. If we consider the fact that fewer than 55,000 people worked in coal mines in the US at the end of 2016, it means in one year, China will create 34 renewables jobs for every US coal mining job.

Commitment to invest



The strong and steady growth of renewables in China is in large part due to the country's unwavering commitment to invest in this burgeoning sector. The country's largest policy bank, the China Development Bank, for example, has been credited for shoring up the solar PV industry at times of great turbulence.

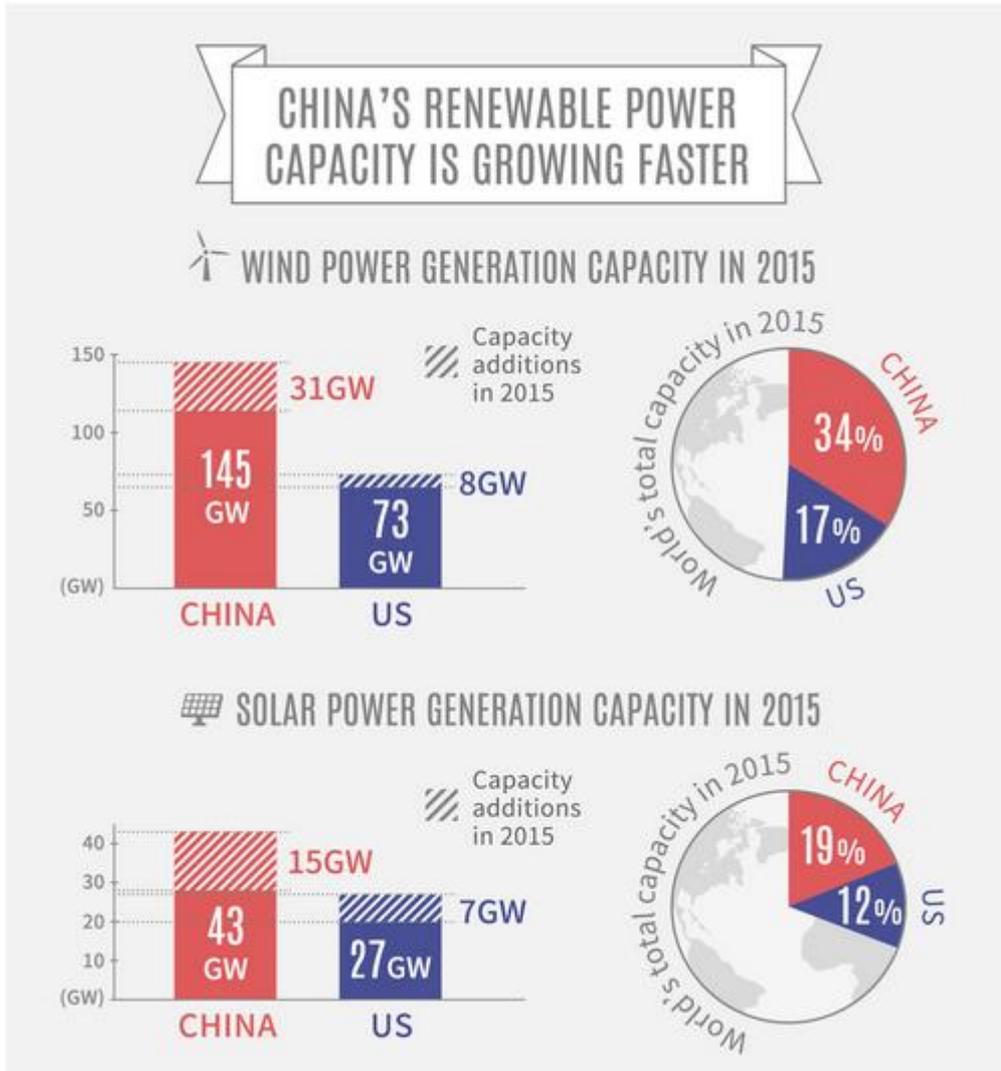
Nowadays, China is the world's largest clean energy investor, investing US\$102.9 billion (709.7 billion yuan) in renewables in 2015 (excluding large hydro power). This accounts for 36% of global investment and a 17% increase on 2014.

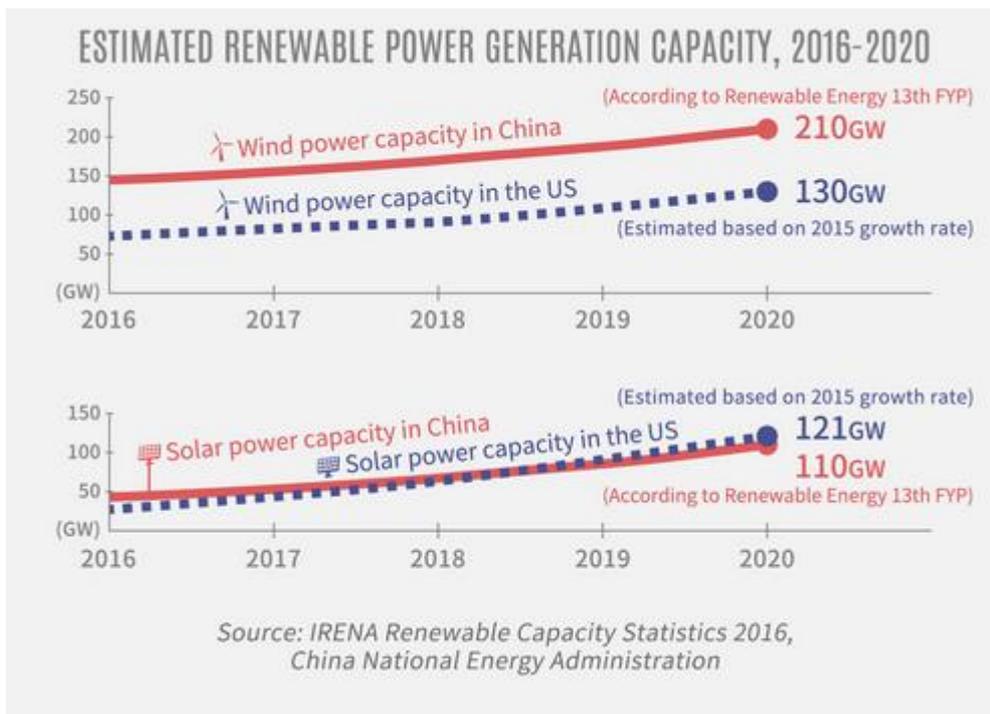
China expects to add a further 100GW of domestic wind power capacity and a similar amount of solar power capacity between 2015 and 2020, to meet its goal of peaking emissions by 2030 at the latest. This will mean investing a further US\$361 billion (2.5 trillion yuan) in renewable power by 2020. Today, Chinese companies dominate the global renewable energy market; the world's largest wind energy company and five of the top six solar firms are Chinese.

The country is also investing in clean energy internationally, taking advantage of a rapid global increase in

demand for renewable power (clean energy will be the largest single source of power capacity growth in the next five years, according to the International Energy Agency). In 2016, China's foreign investment in renewables included 11 deals worth more than US\$1 billion (6.9 billion yuan), with a total value of US\$32 billion (220 billion yuan), a 60% increase on the previous year.

Dwarfing the US





At this year's WEF, leaders may receive very different messages from the world's top two economies when it comes to renewable energy. While China is embracing a sector that many believe will be the basis of how society powers itself in the future, the incoming US administration appears focused on fossil fuels, appointing an oil company executive and a "climate denier" to head the State Department and the EPA, respectively.

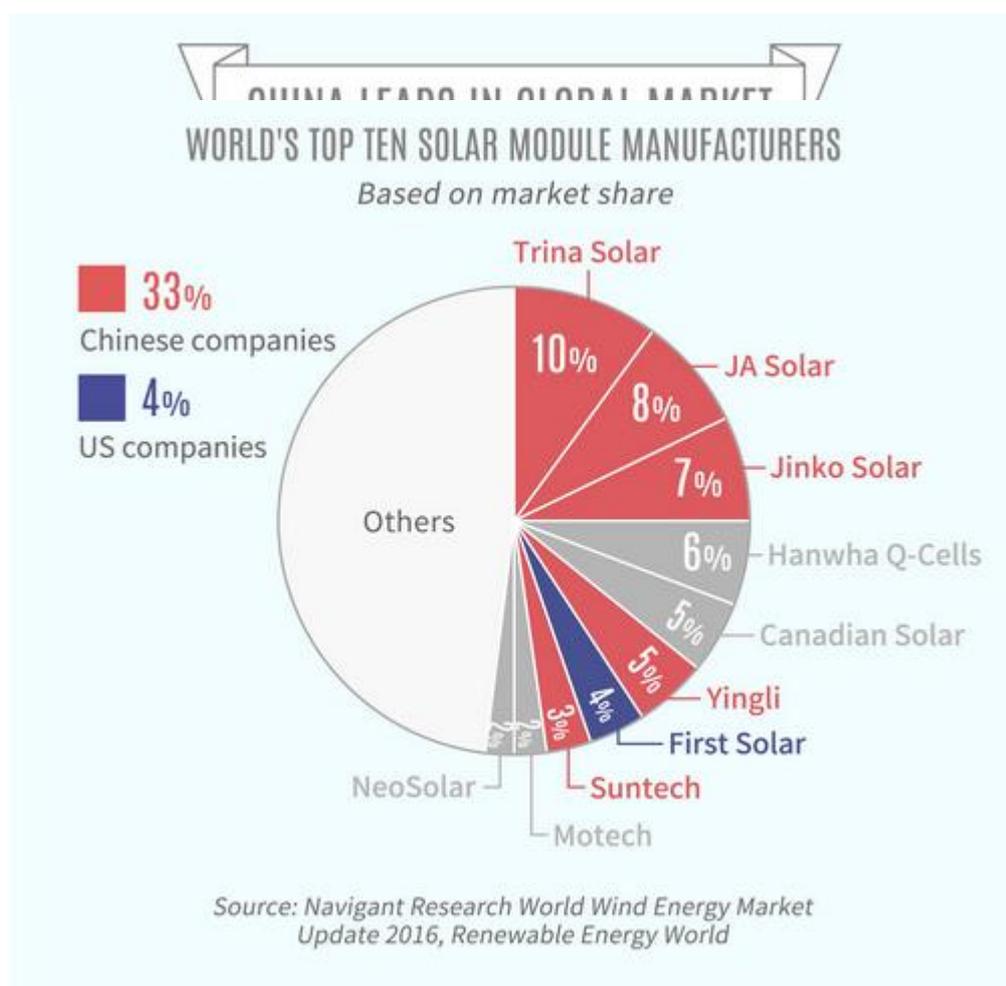
China has invested more than the US in renewable energy each year since 2012. US investment in renewables in 2015 was US\$44.1 billion (304 billion yuan) – a 19% increase on the previous year, but less than half that of China.

The number of renewable energy jobs in the US increased by around 6% in 2015 to 769,000. Employment in solar grew 12 times as fast as overall job creation in the US, overtaking oil and gas extraction (172,400 jobs in December 2016) and coal mining (53,800 jobs). These are impressive numbers on their own. But over the same period, renewable energy jobs in China increased by 133,000, nearly three times as fast.

Any change to US policies on climate action or renewables must be seen in the context of the global low-carbon transformation that is underway. Although measures to curb renewables and reward fossil fuel investments in the US could certainly drive renewables investment elsewhere, they are unlikely to pose a threat to the continued deployment of clean energy on a global scale.

Along with India and other countries, China is embracing decarbonisation. The overwhelming majority of Chinese people say they are prepared to pay more for low carbon electricity, compared to around half of US citizens, according to polls in 2013 and 2014.

As President Xi's speech at Davos will show, China is embracing more than just decarbonisation. It is poised to harness the powerful forces of the sun, the wind and other renewable sources of energy to reconfigure its massive economy and ensure its future global competitiveness.



中国在达沃斯展现低碳经济的可能性

16.01.2017 作者：马天杰 出处：<https://www.chinadialogue.org>

全球领导人齐聚达沃斯商讨全球经济振兴之路，中国在可再生能源领域的发展为全球减排和创造就业都做出了显著贡献。

在今年的达沃斯世界经济论坛会前新闻发布会上，论坛创始人克劳斯·施瓦布(教授以回顾过去一年国际社会的纷扰为本届论坛奠定了严肃的基调。论坛达沃斯是一个汇聚全球政治、商业和民间领袖的高规格年会。

施瓦布表示：“全球，特别是工业化民主国家中的‘逆全球化’风潮，很可能给许多国家的经济活动和社会稳定带来破坏性的影响。”

如往年一样，各国领导人再度在一年伊始之际汇聚瑞士小镇达沃斯。今年，他们需要商讨的包括如何应对全球日益增长的民粹运动、日渐趋缓和分化的经济增长以及亟待解决的环境挑战。面对令人不安的世界局势，各国各界领导人必须“应势而为，勇于担当”，而这也正是本届世界经济论坛的主题。

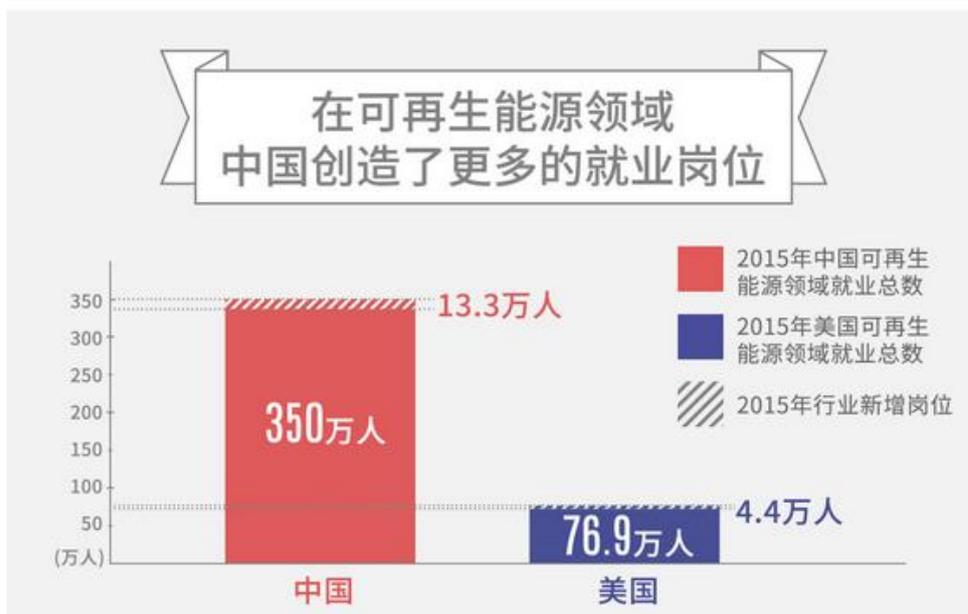
在1月17日举行的论坛开幕式上，中国国家主席习近平史无前例地发表了主旨演讲。这是一次备受瞩目的讲话，习主席的演讲着重围绕经济全球化和“人类命运共同体”等宏大主题展开，为在民粹主义盛行的当下进一步深化全球合作提供了一个“中国答案”。

在习近平讲话之外，实际上中国近年来寻求新的经济增长“引擎”的实践经验可能可以为达沃斯的各界领袖们提供更具体的样本，而这也是今年达沃斯论坛的核心主题之一。今年随同习主席出席论坛的多位

中国商业领袖中一些就来自可再生能源行业：这是中国发展最迅速的行业之一，对中国实现环境和社会发展目标作出了越来越大的贡献。那么，中国在太阳能和风能等可再生能源领域的发展能够为其他国家提供哪些经验呢？

可再生能源带动为中国经济注入活力

在发展新能源的竞赛中 中美谁是更大赢家？



中国的可再生能源装机增长迅速。2015年，中国新增风电装机3100万千瓦，总装机达到1.45亿千瓦（超过欧洲），平均每小时便新增2个风力发电机组。太阳能领域同样发展迅猛，2015年新增装机达到1500

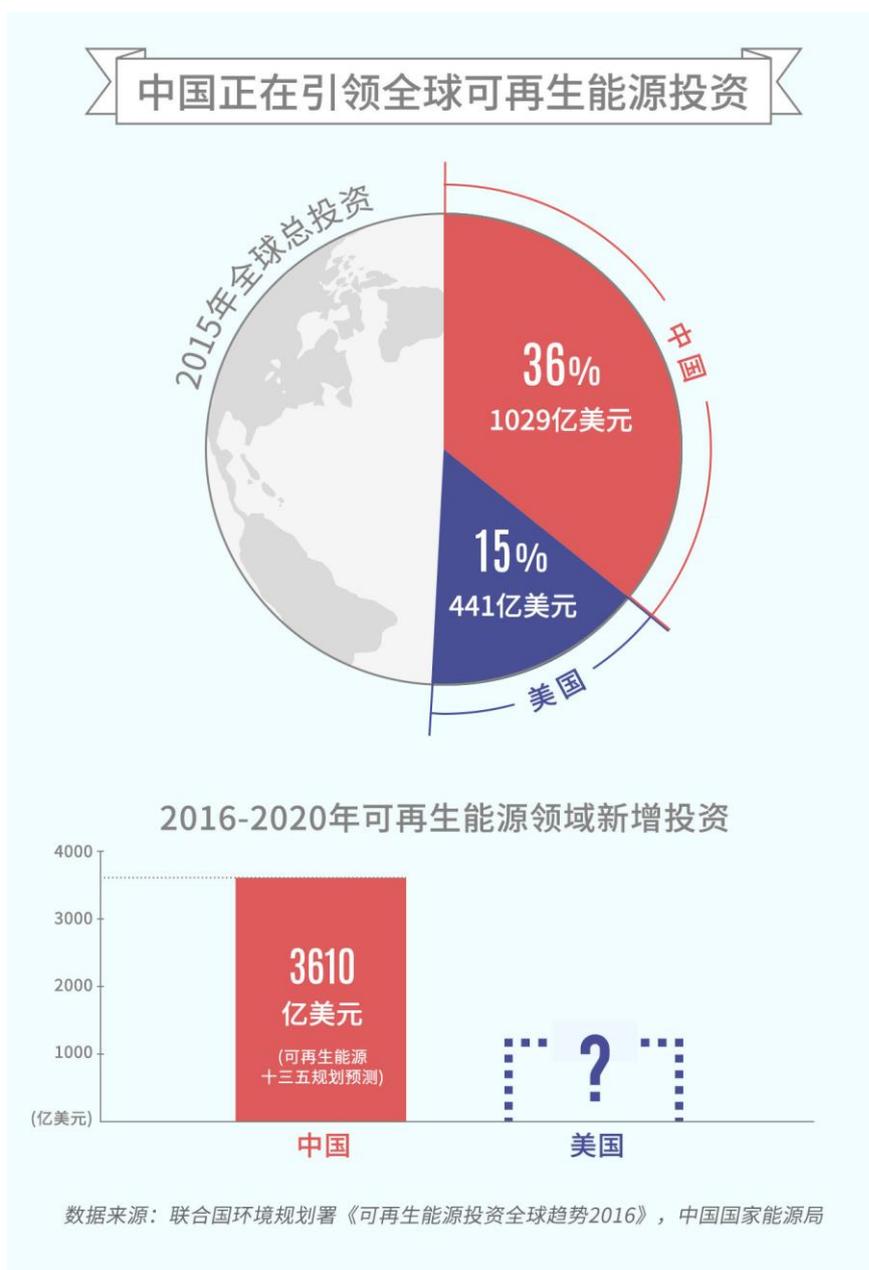
万千瓦，总装机达到 4300 万千瓦。

没有任何一个国家在一年的时间里在这两个领域取得过如此惊人的增长速度。2015 年中国风电新增装机相当于英国全国可再生能源发电装机的总和，而太阳能发电的新增装机则相当于英国和西班牙两国太阳能装机的总和。

可再生能源行业的快速发展也令其成为就业大户。2015 年，中国可再生能源领域从业人员总计 350 万人，比石油天然气领域的从业人员总量多了 100 多万。2012 年以来，中国可再生能源领域就业人数增长了 180 万。相比之下，2015 年美国可再生能源领域就业人数却只有 76.9 万，同期仅增长了 15.7 万。

随着“十三五规划（2016-2020 年）”的展开，到 2020 年，中国还将在可再生能源领域新增 1300 万个就业机会。假设“十三五规划”期间就业增速保持不变，那么即使保守计算，中国可再生能源行业每天也能创造 5000 多个工作岗位。据统计，截止到 2016 年年底，美国全国煤炭行业就业人数不足 5.5 万人。如果按照这个数字计算，那么在一年时间里，对应美国每一个煤炭行业的就业机会，中国就能增加 34 份可再生能源领域的工作。

坚定的投资支持



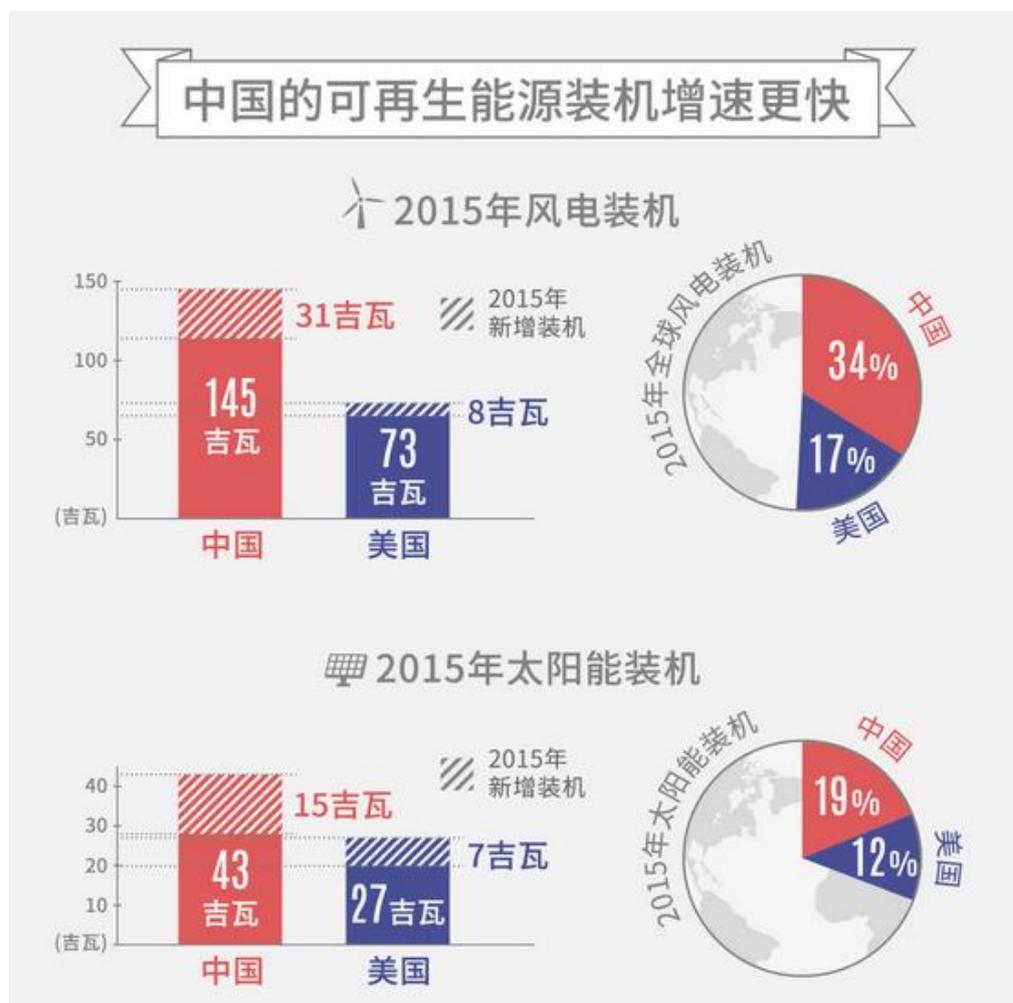
中国之所以能在可再生能源领域保持稳定强劲的增长，主要归功于中国对这个新兴产业坚定不移的投资决心。例如太阳能行业历经数度起伏而仍旧坚挺的背后，中国最大的政策银行——中国国家开发银行被认为功不可没。

如今，中国已经成全球最大的清洁能源投资者。2015年，中国在可再生能源领域（除大型水电项目）的投资总量达到1029亿美元（约合7097亿元人民币），占全球清洁能源投资总量的36%，相比2014年增长了17%。

2015年到2020年间，中国计划新增风电装机1亿千瓦，太阳能装机增幅预计也将保持同等水平，并最终在2030年前完成排放达峰目标。这意味着，中国在2020年前还要向可再生能源领域投资3610亿美元（约合2.5万亿元人民币）。如今，中国企业掌控着全球可再生能源领域市场的发展；不仅世界最大的风能企业是中国的，全球排名前6的太阳能企业中有5个都来自中国。

目前，全球可再生能源需求全面攀升。据国际能源署（International Energy Agency，简称IEA）统计，未来5年内，清洁能源将成为发电装机增速最快的能源品种。面对这样的市场需求，中国也开始在全球范围内积极开展清洁能源投资。2016年，中国在海外累计有11笔清洁能源投资，总额超过10亿美元（约合69亿元人民币），项目总价值高达320亿美元（约合2200亿元人民币），同比增长60%。

超越美国





在今年的世界经济论坛上，中美这两个世界最大的经济体在可再生能源问题上可能会发出不同的声音。对于很多人认为是大势所趋的可再生能源产业，中国的态度是敞开怀抱，拥抱未来；而即将上任的特朗普政府则似乎要重回化石燃料时代，任命一家石油集团的执行官和一位“气候变化否定论者”分别担任美国国务卿和环境保护署署长。

2012年以来，中国每年在可再生能源领域的投资都超过美国。2015年，美国在可再生能源领域的投资额为441亿美元（约合3040亿元人民币），较上年增长19%，但总量还不及中国的一半。

2015年，美国可再生能源领域就业大约增长了6%，总量达到76.9万个。太阳能领域就业增速是美国经济总体就业增速的12倍，工作岗位总数甚至超过了石油和天然气开采行业（2016年12月就业岗位总数17.24万个）和煤炭行业（就业岗位总数5.38万个）。单就其行业本身来说，这样的表现已经非常不错。但是同期中国的可再生能源领域新增就业却高达13.3万个，是美国的3倍。

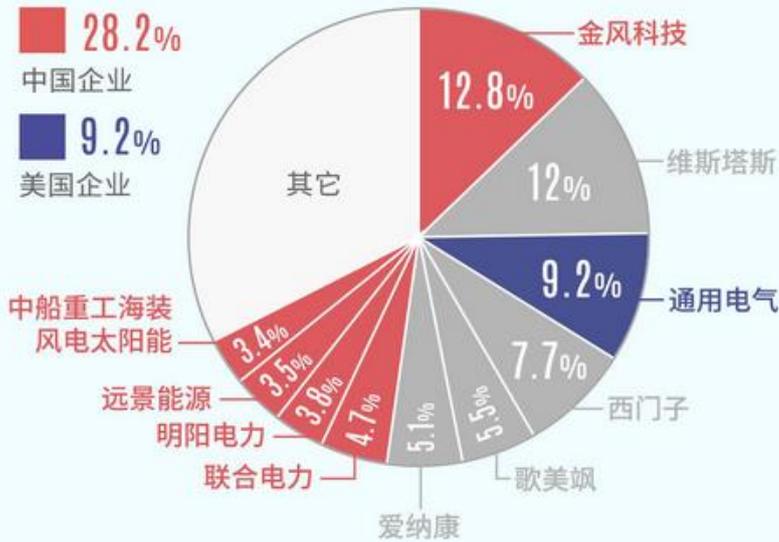
无论未来美国气候和清洁能源政策如何变动，我们都应该将其放在全球转型的背景下来分析。尽管美国的反可再生能源措施定会增加未来其他领域的投资，但是这样的变化不太可能会对全球的清洁能源发展构成威胁。

与印度等国一样，中国也在积极去碳化。2013年和2014年的几份民调显示，绝大多数中国人表示愿意为清洁电力支付更高的电费，而美国的这一数字仅为一半左右。

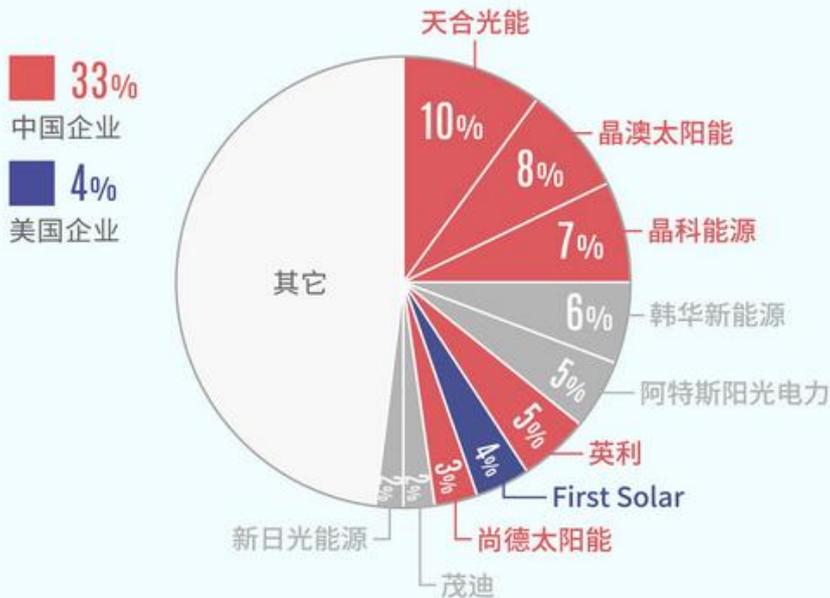
但是正如习近平主席在达沃斯演讲时所展示的，中国的雄心并不止于去碳化。她将利用太阳能、风能和其他可再生能源的强劲发展势头，发动一场规模惊人经济转型，以确保其未来的全球竞争力。

中国的风机及太阳能组件制造商
在全球市场占有更高份额

2015年全球十大风机制造商
按市场份额排名



2015年全球十大太阳能组件制造商
按市场份额排名



数据来源：Navigant研究所《世界风能市场最新资讯2016》，可再生能源世界

States, not Trump, will decide future of US energy

The Trump administration may scuttle the Clean Power Plan but states remain committed to a low carbon future, writes Frederick Weston

With the change of administration on Friday, speculation on the future of the US Clean Power Plan (CPP) is running high. During the campaign, the President-elect made his views on climate change – it’s a hoax perpetrated by China – perfectly clear. And since the election, he has appointed people to key agencies, the Environmental Protection Agency and the Department of Energy (DOE), who have by word or action expressed similar scepticism.

Trump’s transition team has made a very public inquiry into the current work of DOE, targeting for special investigation officials that have been engaged in activities related to climate change. There is every reason, therefore, to conclude that the next president will cease efforts dedicated to mitigating global warming. Foremost among them will be abandonment of the Clean Power Plan.

It won’t necessarily be easy. The CPP is an adopted rule under federal law responding to a finding (upheld by the US Supreme Court) that carbon pollution endangers public health. A president lacks the authority to unilaterally withdraw it. So though it is true that the CPP has been “stayed”, meaning its implementation has been delayed pending judicial review, supporters remain optimistic it will survive scrutiny by the Supreme Court.

The likelihood of this may be affected by the new president’s appointment of a justice to the ninth seat on the Court, which had been kept controversially vacant by the Republican-controlled Senate since the death of conservative supreme court judge Antonin Scalia a year ago. In any event, we cannot expect the new administration to defend the CPP in court or implement it if it is upheld.

It seems safe, then, to assume that the CPP will become dead paper, for the next four years at least. What does this mean for US action on climate change? An optimist will say, “Perhaps less than one might fear.” The reason for this is simple: the states.

The power of states

Climate change is, at its core, an energy problem, a problem of how we produce and use energy. The states have long recognised this and have led the clean energy revolution. The federal government has never set a comprehensive, coherent national energy policy. Yes, over the years, Congress has acted variously to support nuclear power and some renewable sectors, the exploitation of domestic fossil-fuel resources, and the opening up of the electric grid to independent power producers; but at the national level there has been no real attempt at comprehensive reform to drive energy production and use toward the lowest cost and least environmentally harmful resources.

The states stepped into the breach. Under the powers reserved for them by the US Constitution, these “laboratories of democracy” over the last forty years have filled the void created by federal inaction. They have recognised that environmental damage is a real cost of energy use and therefore made investment in end-use energy efficiency, the law of the land, as the first resource to meet demand for energy services, not the last.

States have developed and implemented programmes for financing renewable technologies, until those technologies are able to compete on fair terms in the market. They have created new markets to provide not only electricity, but also the unique services – flexibility and balancing – that electricity production needs, because kilowatt-hours cannot yet be easily or economically stored. They have seen how technological change has made small-scale, distributed clean energy a reality, and made it possible for consumers to manage their demand in ways that benefit the system and save money.

And they have implemented programmes that put a price on greenhouse gas emissions and create revenue streams for direct investment in clean energy measures, such as end-use efficiency and renewables, to accelerate emissions reduction and drive down the costs of compliance. The cumulative national carbon effects of state actions are already projected to achieve nearly all of what the CPP would require by 2030.

These innovations predated the Clean Power Plan and, whatever its future, they will go on producing significant emissions reductions. The states will continue to act because public support for action is greater now than ever. In

2016, for example, several states increased the required minimum percentage of electricity generated by renewables to be delivered to all customers.

But not all states have made progress, and it would be wrong to underestimate the consequences of the loss of the CPP. It imposes obligations on all states, and its absence will allow those that have been reluctant to act to remain so. This is too bad. The CPP is an inventive and balanced approach to addressing an urgent global threat, which cannot be ignored simply because one wishes it didn't exist.

America's leadership on climate change will suffer if the CPP is overturned. Other nations, most notably China, Germany, and India, will need to take on that extra leadership burden. Fortunately, they will have states – California, Connecticut, Massachusetts, Oregon, New York, and Vermont, to name just a few – to turn to for help and, we hope, inspiration.

特朗普来了，而美国将继续能源转型

虽然特朗普内阁可能会废除《清洁电力计划》，但是已经走上低碳发展道路的美国各州不会因为新任总统的意愿而停步，弗雷德里克·韦斯顿写道。

本周五美国将迎来新一届政府，与此同时，关于美国《清洁电力计划》（Clean Power Plan，简称 CPP）存留的猜测也甚嚣尘上。当选总统特朗普在竞选期间就明确表达了他对气候变化的看法，他认为所谓的“气候变化”就是中国恶意编造的一场骗局。自胜选以来，特朗普先后提名的几个重要机构的负责人，包括环境保护署和能源部的提名人选，都曾在言语上或实际行动中表达过类似看法。

特朗普的过渡团队已经对能源部的现有工作进行了高调的质询，目标直指曾经负责气候变化相关事宜的官员。一切迹象都表明，这位新任美国总统将会停止抵御全球变暖的努力，首当其冲的就是要废除《清洁电力计划》。

但要废除这一法案并不容易。《清洁电力计划》是基于联邦法律而被采纳的，意在应对碳排放对公众健康的威胁（这一结论获美国最高法院的支持）。美国总统无权单方面撤销该计划。因此，虽然《清洁电力计划》可能暂时处于“搁置”状态，也就是说在司法审查阶段该计划暂时无法得到落实，但是支持者们仍然乐观地认为，这项计划最终能够经受住美国最高法院的严格审查。一年前，美国最高法院大法官安东宁·斯卡利亚（Antonin Scalia）去世后，共和党控制的参议院使该席位极具争议地一直处于空缺状态。特朗普提名何人填补这一空缺将会对《清洁电力计划》的存废产生巨大影响。但无论如何，我们都不应该指望新一届美国政府会在法庭上维护《清洁电力计划》，或者说在《计划》得到法院支持后积极落实相关措施。

不出意外，至少在未来4年里《清洁电力计划》将会是一纸空文。而这对美国未来的气候变化相关行动意味着什么？乐观主义者也许会觉得这没那么可怕。原因很简单，因为美国各州层面的努力从未停歇。

州的力量

气候变化本质上是个能源问题，一个如何生产和使用能源的问题。各州政府早就意识到了这一点并引领着清洁能源转型。然而，美国联邦政府从未出台过一个全面、统一的国家能源政策。没错，在过去这些年里，国会在能源方面的政策总是让人捉摸不透，他们既支持核能发展，也支持可再生能源探索，既支持国内化石燃料资源开发，也支持取消对独立电力企业的并网限制。但是，从整个国家层面上来看，国会从未采取实际行动，全面推动能源生产和使用向低成本、低污染的方向改革。

于是各州政府纷纷行动起来。依据美国宪法赋予的权利，这些“民主实验室”在过去40年里所开展的工作弥补了联邦政府在这一方面的不作为。他们认识到，能源使用真正的成本源自对环境的破坏，所以他们将终端能效提升投资变成了不成文的法则，将提高能效作为满足能源需求的首要途径。

除此之外，各州政府还制订落实了一系列支持可再生能源发展的项目，目的是使新能源最终能够参与公平竞争。这些扶持项目不仅开拓了新的电力市场，也为电力生产所需要的新的服务——如电网系统的灵活性和平衡性——开拓了空间，因为电力还不能被简单而经济地储存起来。在这些项目的扶持下，相

关技术领域出现了很多变化：比如小型分布式清洁能源发电从无到有；再比如用户可以自主管理用电需求，既节省费用，还能造福整个电力系统。此外，各州政府还推出了排放权交易等机制，为进入能效提高和可再生能源等项目的投资带来了现金流，以加速减排进程，降低合规成本。据预测，到 2030 年全美各地这些减排措施累计起来的减排效果将接近《清洁电力计划》所设定的目标。

以上这些创新措施的出台都比《清洁电力计划》要早。因此，无论《清洁电力计划》未来的命运怎样，这些措施仍将推动温室气体排放进一步大幅降低。各州还会继续采取行动，因为公众对这些行动给予了前所未有的支持。比如在 2016 年就有多个州调高了可再生能源发电占比要求。但也不是所有州都取得了进步，所以我们也不能低估《清洁电力计划》被废除所带来的损失。因为这项计划要求所有各州必须履行减排义务，它的缺席将导致那些本就不愿采取减排行动的州继续保持不作为状态。这样的结果是我们都不愿意看到。《清洁电力计划》是应对紧迫的全球威胁的一个兼顾各方利益的、有创意的途径，不能仅仅因为有人对它不满就将它忽视。

如果《清洁电力计划》被推翻，那么美国在气候变化领域的领导力将受到重创。包括中国、德国和印度在内的多个国家就必须额外承担更多的领导责任。幸运的是，包括加利福尼亚州、康涅狄格州、马萨诸塞州、俄勒冈州、纽约州和佛蒙特州在内的多个美国地方州政府仍将与上述国家一道，为气候保护行动贡献出自己的力量。

German nuclear remains reduced at six reactors despite switchover

German nuclear availability remains reduced for weeks 3 and 4 with just six reactors online despite a switchover Friday at two reactors in the southern state of Bavaria, plant operator data shows.

The 1.3-GW Gundremmingen C unit was reconnected with the grid and currently ramped up to full capacity, the plant operator said in a statement Friday.

The reactor was taken offline earlier than planned on December 11 for additional maintenance and repairs on top of planned short refueling stop and tripped during a first restart attempt on January 6 requiring some additional repairs, the operator -- majority-owned by RWE -- said.

The 1.4-GW Isar 2 reactor is set to come offline Friday night for its annual refueling and maintenance stop, currently scheduled to last two weeks, operator PreussenElektra, a unit of E.ON, said in a statement Friday. Isar 2 and the two reactors at Gundremmingen provided around 37% of Bavaria's power demand last year, but are set to close over coming years creating a potential shortage of electricity in the state especially with the planned grid expansion lagging behind with major new North-South links unlikely to be available before 2025.

German nuclear availability this winter is at its lowest since at the least the 1980s because of a number of unprecedented winter refueling stops after the nuclear fuel tax expired at the end of last year as well as additional maintenance, which have already led to extended outages. Two more German reactors are scheduled to come offline for refueling stops in February, plant operator data shows.

Global Platts estimates combined loss of nuclear output due to non-availability of those reactors to be around 5 TWh from December to February.

Overall, German nuclear output in 2016 already fell to its lowest since at least the 1980s, with 85 TWh generated by the remaining eight reactors and the next closures scheduled for the end of this year (Gundremmingen B) and the end of 2019 (Philippsburg 2).

德国核反应堆减少到六个

在三到四周内，德国可用的核反应堆仍在减少，除星期五在巴伐利亚州南部的两个反应堆切换外，一共只有六个反应堆在线，电厂运营商的数据显示。

1.3-GW 产能的 Gundremmingen C 单元与电网重新连接，目前加速到满负荷生产，周五电厂运营商在一份声明中说。

运营商——多数由 RWE 拥有——表示，反应堆在十二月十一日早于预计下线，首先进行了额外的维护和修理在一月六日第一次尝试重启时短时，停止加油和跳闸表明设备需要一些额外的维修。

1.4-Gw 的 ISAR 2 反应器计划,在周五晚上一年一度加油和维修时下线，目前计划下线两周，PreussenElektra 运营商，E.ON 公司的一个部门，星期五在一份声明中说。ISAR 2 和 gundremmingen 的两个反应堆在去年提供了巴伐利亚 37% 的电力需求，但都将关闭。这导致在未来几年该地区将可能出现电力缺口，特别是电网扩张计划滞后，主要南北链接可能在 2025 前无法上线使用。

由于核燃料税去年年底到期和已经导致延长停电的额外维修导致了前所未有的冬季停油，德国的核供应今年冬天是至少 20 世纪 80 年代以来的最低点。由于加油停止，另外两个德国反应堆预计将在二月下线，运营商数据显示。

普氏估计，从十二月到二月，由这些反应堆下线造成的全球核输出减少量大约为 5 太瓦时。

总体而言，德国 2016 年的核输出已经跌至最低至少自 20 世纪 80 年代以来的最低点，剩余的八个反应堆和定于今年年底关闭(Gundremmingen B)和 2019 年底(菲利普斯堡 2)关闭的反应堆共输出了 85 TWh 电力。

Russia extends \$11.38 bln loan to Bangladesh to build nuclear power plant

Bangladesh will repay the actually spent loan in equal six-month installments over a twenty year period

Russia's government has extended a \$11.38 billion loan to Bangladesh to build the Rooppur nuclear power plant. The relevant document was published on the government's website containing legal information.

According to the draft inter-governmental agreement, the loan will be used from 2017 to 2024. Bangladesh will repay the actually spent loan in equal six-month installments over a twenty year period. The first installment will be paid out on March 15, 2017.

Two units of the Rooppur nuclear power plant, with a capacity of 1,200 MW each, which are being built with Russia's assistance, are planned to be put into operation in 2022 and 2023.

In mid-December 2015, Russia's Rosatom State Atomic Energy Corporation signed an EPC contract for a nuclear power plant in Bangladesh.

The construction work is being done in accordance with the inter-governmental agreement on cooperation in building a nuclear power plant in Bangladesh, dated 2011. The nuclear power plant will be located on the eastern bank of the Ganges River, 160 kilometers from the country's capital of Dhaka.

俄罗斯增加 113.8 亿美元贷款给孟加拉建核电站

孟加拉将偿还超过实际使用的二十年每 6 个月一期的分期贷款

俄罗斯政府已经提供了 113 亿 8000 万美元的贷款，为孟加拉打造 ROOPPUR 核电厂。有关文件和法律资料刊登在政府网站。

根据政府间协议草案，贷款期为 2017 至 2024。孟加拉将偿还超过二十年每 6 个月一期的分期贷款。

第一批将于 2017 年 3 月 15 日支付。

俄罗斯援建的 ROOPUR 核电站的两组发电设备，每个容量为 1200 兆瓦，计划将分别于 2022 和 2023 投产。

2015 年十二月中旬，俄罗斯的 Rosatom 国家原子能公司签署了在孟加拉建设核电站的 EPC 合同。

2011 年起，建设工作正按照在孟加拉建设核电站的政府间合作协议进行。该核电站将位于恒河的东岸，距孟加拉国首都 160 公里。

US hopeful of commercial deal for nuclear plant in India

Modi and Obama during their White House meeting last year had "welcomed" the start of preparatory work on site in India for six AP1000 reactors to be built by Westinghouse.

With the US and India making "progress" over the commercial and financing aspects of their civil nuclear agreement, the Obama administration is hopeful that a deal for a nuclear power plant in India under the landmark pact could be announced by the end of this year. "What remains (of the civil nuclear agreement) is the actual commercial deal to be negotiated and the financing to be negotiated. That I think is moving forward," Assistant Secretary of State for South and Central Asia Nisha Desai Biswal said.

"It has been our hope that the two governments, the two leaders when they last met said that they are hopeful that they would be at a point where a commercial deal and financing be announced by the summer of 2017. I am hopeful that that would continue to be the case and we would continue to work through those issues," Biswal told PTI.

The first and foremost is for the commercial partners for Westinghouse to be able to achieve the package that is satisfactory to both of them and to the Indian government, she said.

And when that package is put together for the financing terms to be negotiated, Biswal added.

"We are making progress on both of those fronts and hopefully would be able to get to that finish line later this year, as was projected by the two leaders," Biswal said.

The civil-nuclear agreements negotiated during the Bush Administration was a watershed moment because it set the two countries on a path that India and US are so far along today, Biswal said.

But that agreement left a number of important issues unresolved, including the issues of nuclear liability, she noted.

"What I think, President (Barack) Obama and Prime Minister (Narendra) Modi have been able to do is resolve those residual blocks that were there on the actual agreement itself," she said.

"So with India's ratification of the convention of supplementary compensation the liability issue by and large has been addressed. We have defined ways in which the agreement can also be in compliance with our legal statutory agreements with respect to tracking of fissile material. So I think that issue has been kind of cleared up. And that path has been unblocked," Biswal said.

Culminating a decade of partnership on civil nuclear issues, Modi and Obama during their White House meeting last year had "welcomed" the start of preparatory work on site in India for six AP1000 reactors to be built by Westinghouse.

They had also welcomed the announcement by the Nuclear Power Corporation of India (NPCIL) and Westinghouse that engineering and site design work will begin immediately and the two sides will work toward finalising the contractual arrangements by June 2017.

美国寄希望于印度核电站商业协议

去年莫迪和奥巴马在白宫的会议曾“欢迎”在印度将由西屋建造的六台 ap1000 反应堆选址的准备工作开始。

随着美国和印度在民用核协议的商业和融资方面取得了“进展”，奥巴马政府希望在具有里程碑意义的协议下在印度的核电站的协议将在今年年底前宣布。“剩下的（民用核协议）是即将谈判的实际商业协议和即将谈判的融资。我认为这是向前发展的。”南亚和中亚助理国务卿 Nisha Desai Biswal 说。

“我们一直希望，两国政府，两国领导，当他们上次会晤说他们希望他们将达到一个点，就是商业协议和融资将会与 2017 年夏季宣布。我希望那将仍然是这样的，我们将继续就这些问题工作。” Biswal 告诉 PTI 说。

首先重要的是西屋的商业伙伴能够实现封装，让他们以及印度政府满意，她说。

当封装与融资条款放在一起进行谈判，Biswal 说。

“我们正在就这两方面做出进展，并希望在今年晚些时候到达终点线，正如两位领导人计划的那样。” Biswal 说。

布什政府时期民用核协议谈判是一个分水岭，因为它让两个国家处于美国和印度迄今为止的道路，Biswal 说。

但是该协议留下了一些重要的悬而未决的问题包括核责任的问题，她指出。

“我认为，总统（巴拉克）奥巴马和总理（纳伦德拉）莫迪能够做的就是解决这些在实际协议本身上的残块。”她说。

“因此，随着印度批准《补充赔偿公约》，责任问题已经得到了广泛的解决。我们已经定义方式，这里协议也可以符合我们关于跟踪裂变材料的法定法规协议。因此我认为这个问题已经得到了澄清。那条道路也畅通了。” Biswal 说。

最后十年的民用核能合作问题，去年莫迪和奥巴马在白宫的会议曾“欢迎”在印度将由西屋建造的六台 ap1000 反应堆选址的准备工作开始。

他们也同样换用由印度核动力公司（NPCIL）和西屋的布告，公告说明工程和选址设计工作将立即开始，双方将努力到 2017 年 6 月完成合同安排。

Coal (煤炭)

The end is near for China's "zombie" coal mines

China is planning to reduce coal capacity by closing idle mines and giving markets a greater role, says Xu Zhaoyuan

Xu Zhaoyuan is a senior figure at the industrial economy department in China's State Council Development Research Centre, an agency responsible for policy research. In an interview with chinadialogue he said that the agency's focus is shifting from the reduction in coal output seen 2016 to closing inefficient "zombie" mines in 2017, which are often propped up by local government funding. In this next phase, ensuring there is adequate support for workers who stand to lose their jobs will be essential. The government also hopes to reduce its reliance on interventionist measures, such as removing surplus capacity, to control coal output and let the market play a greater role in the sector's transition.

chinadialogue (CD): The latest report from the International Energy Agency predicts a structural decline in demand for coal globally, but claims this will be very slow. It stressed that the biggest change will come from China. What are the key coal market trends in China?

Xu Zhaoyuan (XZY): Most Chinese and domestic research bodies expect coal demand to plateau for some time, with no sudden drop in the near future.

But we need to remember that coal demand, and also total energy demand, is closely linked to demand for electricity. Although we may have seen demand from some heavy industries such as concrete and steel-makers reach a peak, domestic customers still make up a large part of electricity demand. And that will increase as we see living standards rise and more electrification. There will be growth for some time to come.

Demand for electricity, including for industry and domestic use, will see slow growth, and coal-fired power will provide the vast majority of that. Coal can't be replaced in the near future, not by wind or solar, nor hydropower or nuclear. So we'll still see demand for coal power generation.

CD: 2016 saw huge changes in the price of coal. For example, coking coal has been increasing in price since April 2016, breaking the US\$300 (2,050 yuan) / tonne mark in October. Doesn't that show a reversal in supply and demand trends?

XZY: Short term fluctuations in coal and steel prices don't mean there's been a turnaround in supply and demand trends. Overcapacity in coal and steel is actually going to continue for quite some time and supply shortages will be only temporary and local. One feature of coal demand is what economists call "low elasticity" – price changes do not in the short term affect demand, unlike most other products where prices have a greater impact on demand. For example, if one brand of car becomes 10% more expensive, consumers can buy another type. But if coal goes up in price, even significantly, companies can't just quickly switch to another source of energy, and that means that short term supply shortages can result in large price fluctuations. We can't look at short term changes in the coal price and deduce that supply and demand trends have reversed.

CD: Should energy prices account for the environmental and social cost of producing coal?

XZY: The production and use of coal, and other sources of energy, involves environmental and social costs, and currently these aren't fully reflected in energy prices. We think those costs should be included, in the form of taxes, and this will help guide the selection of the most suitable energy mix.

When it comes to the use of coal, our suggestion is that it is used appropriately for large-scale power generation. Much of coal consumption is currently used for other purposes, for small-scale coal-burning which creates several times as much pollution. So currently, while sources of clean energy remain limited and more expensive, sources such as natural gas should be used to replace small-scale coal burning and allow for a certain expansion of coal-fired power in the short term. So although it would seem coal use for power generation is increasing, a large decrease in more polluting uses of coal use means that overall pollution is lessened.

CD: The carbon emissions from coal-fired power can't be overlooked. How will China fulfil its international emissions commitments?

XZY: We can't achieve those targets through government-ordered removal of capacity, as long as there's demand from the economy an enforced reduction in supply won't work. For example, many different approaches have been taken to reduce investment in steel recently but economic growth means there is demand and capacity has continued to increase. The key to reducing carbon emissions is to take a range of measures: development of clean energy, adjustments to the energy structure, replacement of coal with other sources of energy in small-scale uses. In the near term the government will intervene to help the sector through a difficult period, but we can't just remove capacity for the sake of it.

In general there's an overall move to cleaner energy and the public is keen to see greener companies and reduced pollution. The enforcement of environmental standards is very important here, and the environmental tax is sending a very clear policy signal.

Also, market mechanisms should be used to differentiate between companies. Those which meet emissions standards and are efficient should be more profitable than those which are inefficient and break the law.

CD: When we look at specific measures to reduce coal output, what drove the government to limit coal mines to

Mcanxixun Information

276 days of operation in 2016?

XZY: There were sustained falls in the price of coal in late 2015 and early 2016, but market mechanisms were failing. In theory, if the price of coal drops coal mines lose money, and output should be reduced to cut those losses. But many companies actually boosted production to maintain cash flows. The combination of falling prices and increasing output sent the industry into a downward spiral. Therefore the government enforced the shutdown of surplus capacity, which stabilised the market and stopped that spiral.

The nature of the coal industry means that some big firms, particularly state-owned enterprises (SOEs), are labour intensive and dominate the local economy. If those companies are at risk the livelihoods of many miners are threatened. In many places an entire city or town may rely on one coal firm. That firm going bust can do huge damage to the entire local economy and create social problems.

In early 2016 most coal firms were suffering losses, particularly the SOEs, which have larger work forces. Some coal firms hadn't been able to pay wages for months, many were facing debt crises or even closure. The government saw that the coal sector was a risk to the entire economy and took decisive action, removing surplus capacity.

CD: As the coal market changes, how will the government tackle capacity reduction in the future?

XZY: Coal prices have recovered and most companies are profitable again, so there's been an overall improvement in how the sector is working.

The year ahead won't see any change in overall efforts to reduce capacity. But the core aim of the policy isn't just to reduce output to a particular level, it's to steer the sector through a difficult time and return it to healthy growth. Market demand naturally fluctuates, and the government has no way to predict what demand will be, so output targets and actual demand will never match up exactly.

Looking forward to 2017, it was proposed at the Central Economic Work Conference that "zombie companies" – companies which are inefficient, have poor technology, and or don't meet safety standards – be removed. The government should step back and give the market more room to regulate output.

CD: For the market to play its role price signals have to be meaningful. This means that inefficient firms must be allowed to reduce their output or go bust. However, in 2016 these firms received cash injections from the banks and the local government, leading them to acquire so much debt that they became "too big to fail." So how can market mechanisms come into play?

XZY: First, the removal of inefficient firms is essential if the market is going to play an effective role, but a welfare safety net for unemployed workers is also needed. The government should bear the burden. For example, local government should be focused on creating better welfare and reemployment, rather than having SOEs take on extra responsibilities. Firms which are not competitive will only close down if there is a welfare safety net, otherwise they become "zombie" firms.

Second, legislation should be used to level the playing field. There are strict safety, quality and emissions rules for coal mining, but some companies still manage to get out of paying for environmental protection and restoration, which gives them an unfair advantage. We should have cross-regional inspections to ensure firms take on the appropriate responsibilities and costs, which will allow the best of them to flourish.

Third, coal should be price properly; and not based on government adjustments to supply and demand, but on a price that reflects the external costs of coal.

访谈：煤炭“僵尸企业”的寒冬来了

2017年中国煤炭行业去产能重点将出现调整，要重点去除效率低、技术差的产能，重点处置“僵尸产能”，同时更多地让市场决定煤炭产量。

国务院发展研究中心产业经济研究部研究室主任，研究员许召元在接受中外对话专访时说，与 2016 年大规模、普遍性的去产能不同，2017 年煤炭行业的去产能将着重在低效率的僵尸企业上。政府希望减少短期强制性行政手段的使用，让市场调节在产业转型中发挥更大的作用。

中外对话（以下简称“中”）：国际能源署最近发布的报告预测全球煤炭需求会有结构性下降，但速度会很慢，而且强调最大的变数来自中国。您对中国煤炭市场的需求形势作何判断？

许召元（以下简称“许”）：国际国内的研究机构多数都预测煤炭的需求在今后一段时期会处在平台期，不会出现短期内突然的大幅度下降。

需要留意的一点是，煤炭需求、包括能源的总需求其实和电力需求是密切相关的。虽然一些重化工业，像水泥、钢铁可能到达需求顶峰，但是还有很大的一块是居民用电，这一部分随着生活水平的提升、电气化的进一步增强、生活舒适度的增加，在相当长的时期内还是会持续增长。

所以，综合生产用电、生活消费用电，电力需求还是呈缓慢增长的趋势，其中煤电占很大比例。短期内，无论是风电、光电、还是水电、核电都不足以完全替代，所以电力这一块还会体现出对于煤炭的需求。

中：过去的 2016 年，煤炭行业的价格波动非常大。以炼焦煤为例，5 月份以来炼焦煤的现货价格不断上升，10 月份已经打破了每吨 300 美元的水平。价格的大幅度波动是否反映出煤炭市场的供需形势有了逆转的变化？

许：煤炭钢铁价格的短期波动，还不能认为总的供需形势有了逆转的变化。事实上从稍长一段时期内，钢铁、煤炭的产能过剩将持续存在，供不应求只是短期或局部地区的现象。煤炭的需求有个特点，经济学上称之为“低价格弹性”，就是说价格的变化在短期内对需求量的影响很小，而多数产品价格变化对需求量影响是比较大的。比如一种品牌的汽车价格上涨 10%，有不少消费者可能就转到其他品牌了。而煤炭价格提升甚至大幅度提升时，短期内企业很难用其他能源来代替，也就是说短期的供需不平衡可能会造成很大的价格波动。我们不能简单由煤炭价格的短期变化就对供求形势做出逆转的整体判断。

中：经济性的考虑之外，煤电利用的环境和社会成本是不是也应该列入考量？

许：煤炭和其他能源的生产和消费使用中，都会产生环境和社会成本，目前这部分成本在能源价格体系中还没有得到充分的考虑，我们认为应该通过税收的形式，让各种能源的环境和社会成本都能够有正确的体系，这样有利于选择最合适的能源结构。

具体到对于煤炭的利用而言，我们的建议是可以适当的发展其用于集中供电。因为现在煤炭消费还有很大一部分用于非发电领域，而散煤燃烧污染一般说来数倍甚至数十大于煤电，因此在目前清洁能源总量有限、价格较高的情况下，应该把天然气等能源更多的用于替代散煤，短时期内可以允许煤电一定比重的提高。这样虽然看起来煤电的消费在扩张，但是如果把散煤燃烧更大幅度的减下来，对于整体污染的改善是有好处的。

中：煤电利用的碳排放也不容忽视，那中国将如何履行减碳的国际承诺呢？

许：实现减碳的目标，不能直接通过煤炭行业行政手段去产能这样的方法，因为只要经济中有需求，硬性地减小供应不能解决问题。就如何前些年，一直在限制钢铁企业投资，采取了很多很多办法，但经济发展对钢铁有需求，产能还是上去了。对于碳排放，根本还在于发展清洁能源、调整能源结构、促进散煤替代等多方面的措施。短期内政府强力行政手段的介入是为了行业的脱困发展，不能为了去产能而去产能。

绿色、清洁是一个大的方向，公众非常关心怎样提高企业绿色生产的水平、减少碳排放。在这一方面，环境标准的执行就显得非常重要，环境税的征收也释放出非常明确的政策信号。

另外，市场化机制真正发挥作用，一定要做到企业分化，即要让合规排放、效率更高的企业效益好，低效率、不守法的企业效益差。

中：具体到去产能的方式，2016 年政府是在什么背景下做出了全国煤矿 276 个工作日的行政规定？

许：在 2015 年底 2016 年初煤炭价格持续下降的情况下，市场机制没有发挥有效的作用，存在失灵现象。因为按理说煤炭价格下降，企业产出煤炭是亏损的，理性选择应该是减少产量以减少亏损，但是有不少企业越是价格低越增加产量，以维持企业的现金流。煤炭价格在下降，部分企业还在增产，使得行业陷

入恶性循环。在这样的背景下，中央政府采取了去除过剩产能的强力手段，政府行政性手段起到托底的作用，摆脱恶性循环。

煤炭行业的一个特点是一些大企业，特别是国有企业，用工较多，而且地方产业结构单一，如果大企业出现经营风险，会涉及相当数量煤炭职工的生计。在很多地方，一个小城、一个小镇就是依靠一家煤炭企业在支撑。这家煤炭企业破产了，整个地方的经济会受到很大的冲击，面临社会风险。

2016年初，煤炭行业多数企业面临亏损，尤其是人数比较多的国有企业，比如一些煤炭集团几个月发不出工资，不少企业面临债务危机，甚至生存风险，政府意识到煤炭行业已经成为宏观经济中的重要风险点，因此果断采取了去产能的有力措施。

中：随着煤炭市场的变化，中国下一步去产能的目标和政策会有什么调整吗？

许：2016年后，煤炭价格回到了目前的水平上，多数企业实现了盈利，行业整体经营形势有所好转。

2017年“去产能”这个大的方向不会变，但是政策根本目的是为了促进行业的脱困，让其有序健康的发展，而不是说一定要把产能产量控制到一个特定的水平。市场的需求本身是波动性的，政府也没有办法很准确的预测需求就是多少，过于硬性的去产能目标与实际总会有一定差异。

展望2017年，中央经济工作会议上提出要抓住去除“僵尸企业”的牛鼻子，也就是要把注意力要转移到比较差的产能，比如生产效率低、技术水平差、安全质量不达标的企业。对于整个的产能产量，政府应该放松管理，给市场调节更大的空间。

中：市场发挥作用的前提是价格信号有意义，低效企业会削减产量或者破产倒闭，自动退出市场，但2016年的现实是这些企业依靠银行和地方政府输血，背负巨额银行债务却“大而不能倒”。那么，市场机制该如何发挥作用呢？

许：首先，企业的有效退出是煤炭市场能够发挥市场调节作用的前提，而社会保障的安全网是企业有效退出的前提。该政府承担的责任应该由政府来承担，比如地方政府工作的重点应该在更好的社会保障、就业体系，不应该让国有企业承担不属于它的社会责任。只有建立起社会安全网，在市场价格调整的时候，那些不具备市场生命力的企业才可以关闭、僵尸企业才可以处置。

第二，要通过法制塑造公平的竞争环境。现在针对煤炭生产的安全、质量、排放等都有严格的标准，但仍有一些煤炭企业逃避生态保护和后期恢复的成本，反而在竞争中获得了不公平的优势。在这一方面，应该通过跨区域之间的检查，让各种企业承担其应付的责任和成本，促进煤炭企业的分化。

第三，煤炭的价格应该调整到他本来应该的水平，这个价格不是通过行政手段调节供需所反映出的价格，而是充分体现煤炭生产外部成本的价格。

World seaborne coal trade fell 1.5 pct in 2016 – German importers

World coal seaborne trade fell 1.5 percent last year due, among other reasons, to a slowdown in big exporter Venezuela and less demand in the United States, German coal import lobby VDKI said on Friday.

VDKI, whose 69 member companies buy supplies from countries such as Russia, Colombia, Australia and South Africa, put world coal seaborne trade – imports and exports – last year at 1.1 billion tonnes. World coal demand was 7 billion tonnes.

Following are highlights from a speech delivered at VDKI's annual reception on Jan. 13 by Chairman Wolfgang Cieslik.

For a related story on German coal, please click [here](#)

- Future coal demand should remain underpinned by rising consumption in India and South East Asia, offsetting

declines in Europe, China and the U.S.

- Producer prices of steam coal for power plants were low in 2015, except for those in Russia, which achieved levels well above free-on-board costs, before doubling in 2016.
- The price driver was China, which switched to higher quality coal, prompting lower quality producers to curb output, including important supplier Indonesia.
- China also introduced tighter labour regulations, which resulted in domestic output cuts.
- Its mines may produce more whenever world prices rise under a mechanism that influences coal prices on futures exchanges.
- Prices of coking coal, used by steelmakers and typically provided by Mozambique, the U.S., Canada and Australia, rose in 2016 after falling in 2015, allowing profits for producers and importers.
- The Australian coking coal benchmark trebled to over \$250 a tonne last year and for first quarter 2017 it is indicated at \$285.
- India is trying to turn from importer to exporter, rivalling Indonesia, but VDKI reckons it will be difficult to achieve this.

Source: Reuters

2016 年世界海运煤炭贸易下降 1.5%

去年全球煤炭海运贸易下降 1.5%，除出口大国委内瑞拉经济放缓和美国需求减少之外，还有其他原因，周五德国煤炭进口组织 VDKi 说。

VDKi，其中 69 个会员公司从如俄罗斯、哥伦比亚、澳大利亚和南非等国家购买煤炭供给，使世界煤炭海运贸易 - 进出口共计 - 在去年达到 11 亿吨。世界煤炭需求总量为 70 亿吨。

以下是在 1 月 13 日由 VDKi 的主席 Wolfgang Cieslik 发表讲话强调的重点。

- 未来煤炭需求仍会被印度和东南亚的消费增长支撑，抵消在欧洲、中国 and 美国的下降
 - 2015 年发电厂动力煤的生产价格较低，只有俄罗斯达到了远高于离岸价格的水平，这个价格在 2016 年翻了一番。
 - 价格变化的动因是中国转向更高质量的煤，导致低质量的生产商控制输出，包括重要的供应商印度尼西亚。
 - 中国也收紧了劳动法规，导致国内减产。
 - 当一个机制影响到到期货交易所的煤炭价格时，它的矿产量可能会增加。
 - 焦煤用于钢铁生产企业，主要由莫桑比克、美国、加拿大和澳大利亚供给，其价格经过 2015 年的下跌后在 2016 年回涨，使生产商和进口商可以谋利。
 - 去年澳大利亚焦煤基准增加到超过每吨 250 美元，2017 年第一季度预计达到 285 美元。
 - 印度试图从进口国向出口国转化，以赶超印度尼西亚，但 VDKi 估计它将很难实现这个目标。
- 来源：路透社

India does not need any more coal-based power units till 2027: Central Electricity Authority

The country's peak power demand at the end of the financial year 2021-22 will be 235 giga watt (GW), down

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17% from the estimate made in 2012, the Central Electricity Authority (CEA) has said.

The country's peak power demand at the end of the financial year 2021-22 will be 235 giga watt (GW), down 17% from the estimate made in 2012, the Central Electricity Authority (CEA) has said. With this revision, taking into account the lower-than-estimated economic growth in the five years to March 31 2017, the CEA reckons that the country wouldn't need any more coal-based power stations, other than the 50-GW under-construction capacity, till 2027.

The revised estimates, provided in the draft national electricity plan, are also in view of the fact that many thermal power stations in the country are operating at plant load factor (PLF) far below 60%, the commercial viability threshold.

The toned down demand forecast will also make it easier for the country to meet the multilateral obligation to reduce its carbon footprint or emission intensity of the gross domestic product.

Thermal power producers FE spoke to agree that lower utilisation levels at their plants were likely to make it extremely difficult for them to make enough margins to pay for operational and interest costs. "If demand (for electricity) grows constantly at around 6-7% (CAGR), we would see improved PLFs and this might in turn help create fresh investments in the sector, notwithstanding the rapid capacity addition in the renewable space," an official associated with a thermal power producer said. He, however, added that a lot would depend on how the economic growth will pick up in the next two-three years.

For April-December 2016 period, the peak demand was 160 GW, representing an annual growth of just 4%; and energy demand was 865 billion units (BUs), up 3.2%. The current demand is way below projected in the electricity plan survey (EPS) at the start of the 12th Plan. The actual demand expected at the end of FY17 as per the survey was 200 GW. It is now estimated that that the demand for FY 17 would be 1,160 BUs and 160 GW.

The country's installed thermal capacity of nearly 210 GW has been dealt a double whammy of slow growth in demand and a surge in renewable energy capacity. As reported by FE earlier, since the power generated from renewable energy sources have a 'must-run' status, their contribution in meeting demand has grown quickly at the cost of thermal plants.

However, despite a bleak present and dire medium-term predictions, the short-term scenario is encouraging for thermal power producers. Although during the April-December 2016 period, electricity generation grew just 5.1%, December saw a growth of 6.1% in output, backed by a 7.8% increase in coal-based generation. This compares favourably with last year when the April-December growth was 4.5% and growth in December came in at 3.1%. After having touched an all-time low in August at 52%, the utilisation factor has also improved to 60% in December.

In the long-term, experts say, the base demand would come from currently unelectrified population, which is estimated to be nearly 200 million. Several electrified towns and villages continue to struggle for 24/7 electricity thus suppressing the actual demand. This demand would need a base load to be provided by thermal power plants. However, supplying round the clock power to this population is contingent on the state-owned power distribution companies (discoms), most of which are struggling for financial solvency. Success of UDAY, a scheme that aims to de-stress these discoms, would be instrumental in fixing a crucial link in the power chain.

中央电力局：2027 年前印度都不再需要煤炭供电设备

中央电力局（CEA）曾表示，国家在 2021-2022 财政年底的电力需求高峰将会是 235 GW，比 2012 年作出的预估下降了 17%。

中央电力局（CEA）曾表示，国家在 2021-2022 财政年底的电力需求高峰将会是 235 GW，比 2012 年作出的预估下降了 17%。有了这一修改，考虑到到 2017 年 3 月 31 日截止的这五年经济增长比预期的要慢，CEA 预估该国到 2027 年为止都不需要任何更多的以煤炭为基础的发电站，除了正在施工的 50GW 容量。

国家电力计划草案中提供的修订预算同样基于一个事实，国内许多热电站的运行设备负荷系数（PLF）远远低于商业可行性阈值的 60%。

降低的需求预测也同样让该国更容易满足多边业务，减少国内生产总值的碳足迹或者排放强度。

热电生产商 FE 同意在他们的工厂降低利用水平，可能对于他们来说，获得足够的利润支付业务和利息成本会非常的困难。“如果需求（对于电力）不断增长 6-7%左右（CAGR），我们将会看到改进的 PLE，这反过来将会帮助在这个部门中创建新的投资，尽管在可再生空间中容量的迅速增加。”与热电生产商相关的一位官员说。然而，他还补充说很多都取决于未来两到三年经济增长将如何回升。

2016 年 4 月到 12 月期间，高峰需求为 160GW，表示年增长仅为 4%；能源需求为 8650 亿单位（BUs），上升了 3.2%。目前的需求低于第 12 计划开端的在电力计划调查（EPS）中所计划的。根据调查，2017 财政年年末的实际需求是 200GW。目前的预测是 2017 财政年的需求将会是 1160BUs 和 160GW。

国家安装的接近 210GW 热容量受到需求的缓慢增长和可再生能源容量的激增的双重打击。正如早些时候 FE 所报道的，由于来源于可再生能源所产生的功率有一个“必须运行”状态，它们在满足需求中的贡献在热电厂的代价下增长迅速。

然而，尽管有着暗淡的当前和可怕的中期预测，对于热电生产商来说，短期的情况是令人鼓舞的。虽然在 2016 年 4 月到 12 月期间，电力生产增长仅为 5.1%，12 月的产量增长了 6.1%，以煤炭为基础的发电量增加了 7.8%。相比之下，去年 4 月到 12 月的增长是 4.5%，12 月的增长为 3.1%。在 8 月份的 52% 的历史最低点之后，12 月的利用率也提高到了 60%。

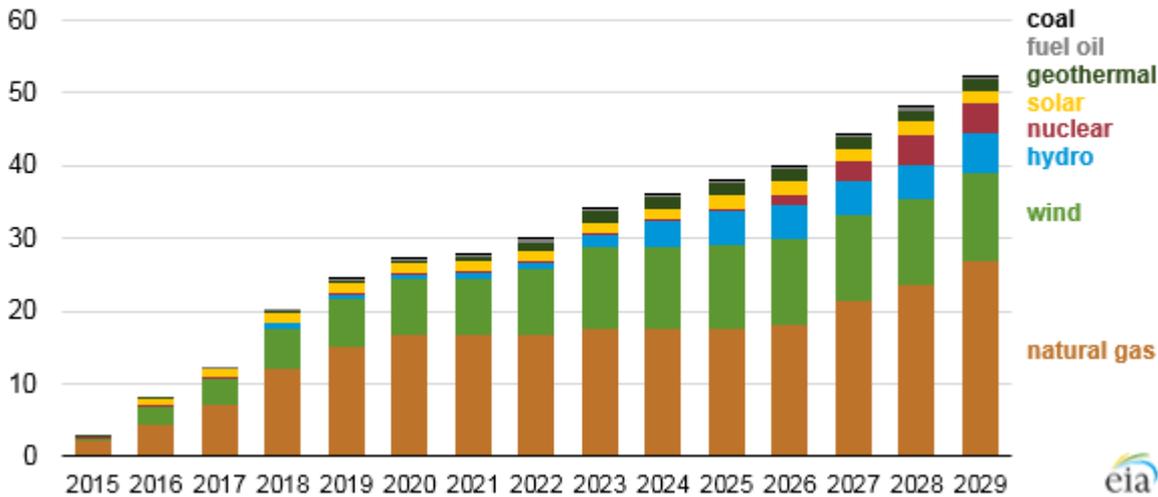
专家说，就长期来讲，基础需求将来自目前的无电人群，这部分人口预估有将近 2 亿。一些电气化城镇和村庄继续争取 24/7 电力，从而抑制实际需求。这种需求将需要由热电厂提供的基础负荷。然而，向这一人群提供全天候的电力取决于国有电力分配公司（discoms），其中大部分都在争取财政偿付能力。旨在缓解压力的这些 discoms 的计划 UDAY 的成功将会是动力链中固定一个关键环节的工具。

Electricity（电力）

Natural gas-fired power plants lead electric capacity additions in Mexico

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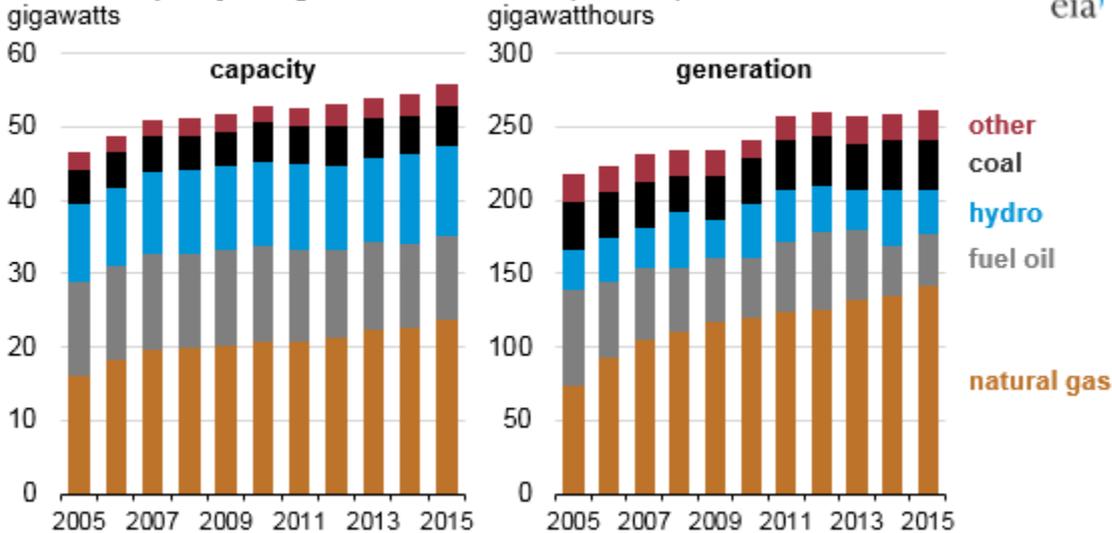
Cumulative projected generation capacity additions in Mexico by fuel type, 2015-29
gigawatts



Source: U.S. Energy Information Administration, based on reporting from Mexico’s energy ministry (SENER)

Natural gas is Mexico’s largest source of electricity generation, accounting for 54% of the country’s generation in 2015, up from 34% in 2005. According to Mexico’s national energy ministry (SENER), more than 60% of Mexico’s electric capacity additions between 2016 and 2020 are projected to come from natural gas-fired power plants, and significant natural gas capacity additions are expected to continue through 2029.

Installed capacity and generation in Mexico (2005-15)



Source: U.S. Energy Information Administration, based on SENER

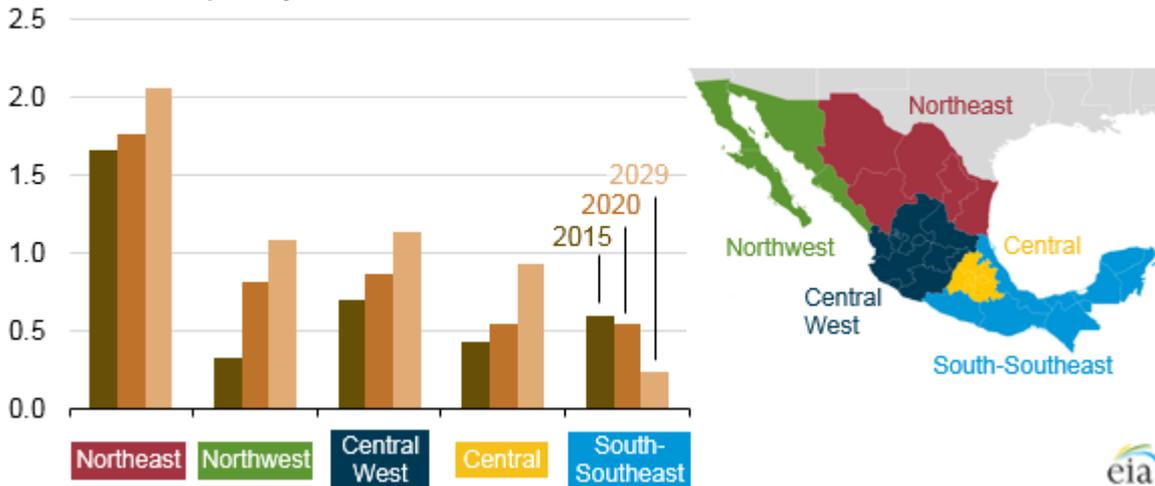
SENER projects that natural gas-fired capacity will account for 24.9 gigawatts (GW) of total capacity additions from 2016 to 2029. The remainder of Mexico’s projected capacity additions are made up of renewables (20.4 GW) and nuclear (3.9 GW). The growth in natural gas-fired capacity is projected to accelerate sharply over the next four years, with SENER projecting that 14.7 GW of new gas-fired capacity will come online by 2020. New natural gas-fired capacity additions are planned to continue through 2029, replacing more than 15.9 GW of retiring capacity, of which most are plants fueled by coal and fuel oil. Most new natural gas-fired capacity additions will be located in the northern and central parts of the country.

New natural gas-fired plants will greatly increase Mexico’s natural gas demand. SENER projects an increase in natural gas demand by the power generation sector from 3.6 billion cubic feet per day (Bcf/d) in 2015 to 5.4 Bcf/d

in 2029. Expected demand growth will be met mainly by a combination of increasing imports of natural gas from the United States and by large expansions of both cross-border U.S.-Mexico pipeline capacity and Mexico's domestic natural gas pipeline networks.

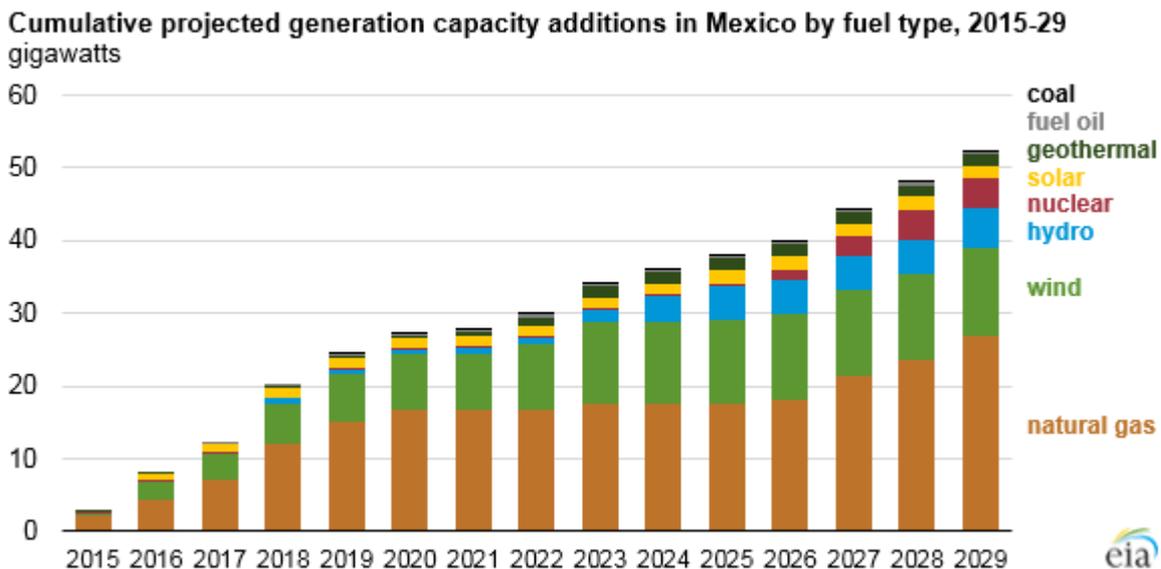
Recent reforms in Mexico's electricity sector are intended to open it to private investment and create a new wholesale power market to encourage development of cost-effective electric capacity, reduce high electricity costs, and transition Mexico's generation fleet to cleaner fuels. Much of the new natural gas-fired capacity added in recent years replaced petroleum-fired capacity. More than 4.3 GW of fuel oil units were converted to natural gas by the end of 2016. Mexico's Federal Electricity Commission is targeting a 90% reduction in the country's fuel oil consumption for electricity generation between 2012 and 2018, leaving the remaining fuel oil power plants to serve as peaking units for reliability purposes. Most fuel oil plants will be retired, with 6.2 GW scheduled to be retired from 2016 to 2020 and another 4.7 GW from 2021 to 2029, according to SENER.

Mexico projected natural gas consumption in the electric generation sector, 2015-29
billion cubic feet per day



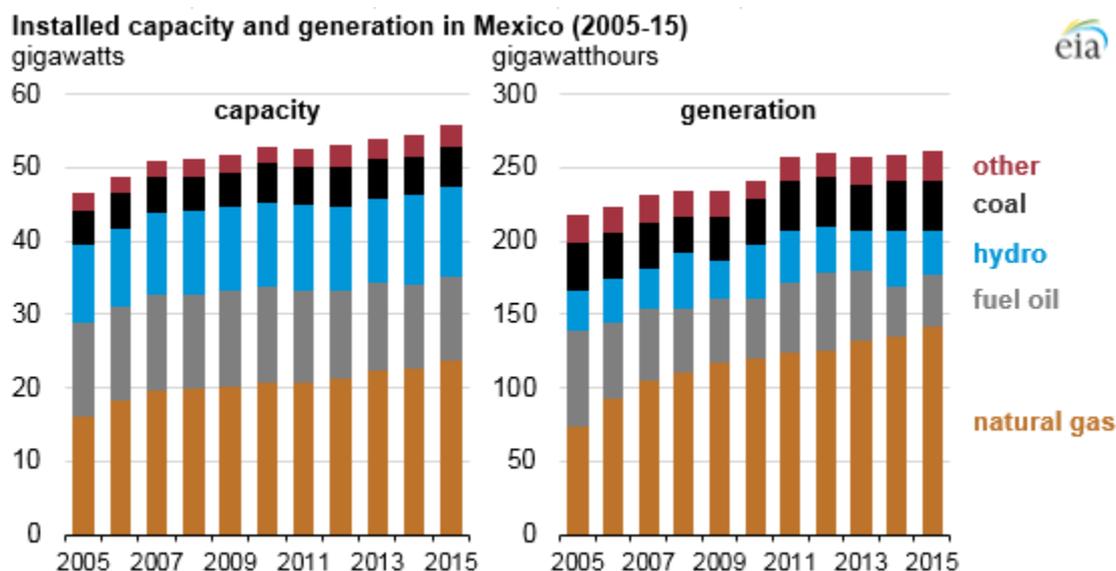
Source: U.S. Energy Information Administration, based on SENER

天然气发电厂导致墨西哥电产量增加



来源：美国能源信息管理局，根据墨西哥的能源部报告（SENER）

天然气是墨西哥最大的发电来源，从 2005 年占比 34% 增长到 2015 年占全国 54% 的发电量。据墨西哥国家能源部（SENER）的消息，2016 年到 2020 年之间超过 60% 的墨西哥电力容量的增加将来自天然气发电厂，而显著的天然气产能增加预计将持续到 2029 年。



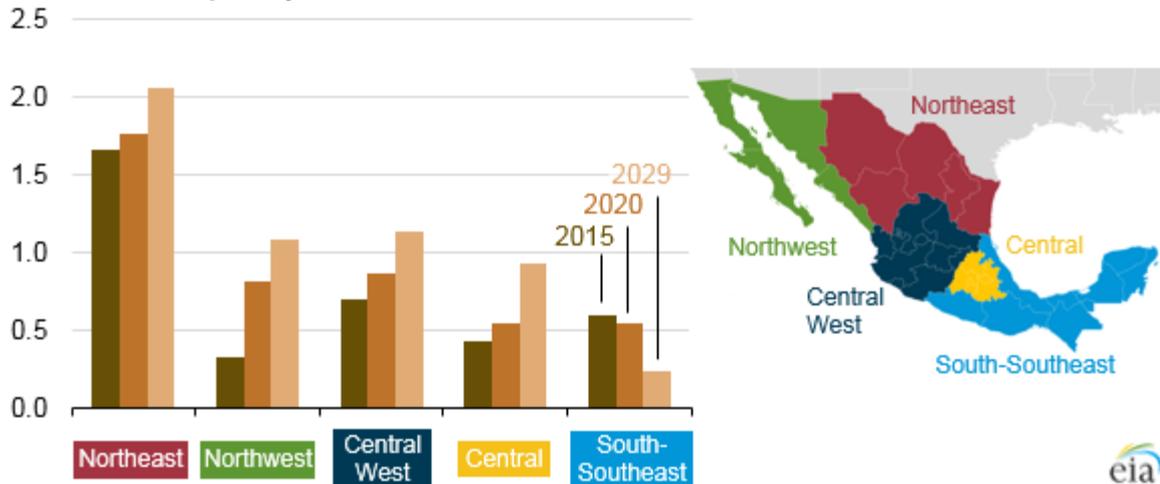
来源：美国能源信息管理局，根据墨西哥的能源部报告（SENER）

SENER 计划从 2016 年到 2029 年天然气产能的增加能达到 24.9 吉瓦（GW）。墨西哥其余部分产能的增加预计来源于可再生能源（20.4 GW）和核能（3.9 GW）。预计天然气产能的增长将在未来四年内大幅度加快，SENER 计划有 14.7 GW 的新燃气能源在 2020 年前上线。新的天然气产能增加计划将持续到 2029 年，替换超过 15.9 吉瓦的退休产能，其中大部分是燃煤和燃油的电站。最新天然气新增产能将位于该国北部和中部。

新的天然气发电厂将大大增加墨西哥的天然气需求。SENER 计划增加发电部门的天然气需求，从 2015 年的 36 亿立方英尺/天至 2029 年达到 54 亿立方英尺/天。预计需求增长将主要由增加美国天然气进口以及美国-墨西哥跨境管道和墨西哥国内天然气管道网络的大规模扩张相结合而实现。

墨西哥电力部门最近的改革旨在开放私人投资，建立一个新的电力批发市场，以鼓励发展具有成本效益的电力，降低电力的高昂成本，并将墨西哥的发电机组向使用更清洁的燃料过渡。近年来很多新增加的天然气产能替代了石油燃料发电。到 2016 年底，超过 4.3 吉瓦的燃油单位转换成了天然气。墨西哥联邦电力委员会的目标是，在 2012 至 2018 年间，将该国的燃油消耗量减少 90%。剩下的燃料油厂将作为调峰装置，以保证可靠性。大多数燃油发电厂将退役，据 SENER 称，2016 年至 2020 年，将有 6.2 GW 产能退役，另外 4.7GW 将在 2021 到 2029 年停止使用。

Mexico projected natural gas consumption in the electric generation sector, 2015-29
billion cubic feet per day



来源：美国能源信息管理局，基于 SENER

Asia’s coal plans promise development, deliver premature deaths

A new report from Greenpeace and Harvard says coal projects in Asia could lead to 70,000 premature deaths a year, writes Joanna Mills

This winter huge areas of northern China have been smothered by smog. As many as 460 million people, equivalent to the combined populations of the US, Canada and Mexico, have choked under a thick blanket of noxious air that has pushed the air pollution index to record-breaking levels.

In a study of 31 of China's provincial capitals and municipal cities, one in seven premature deaths was found to be the result of air pollution. Each “airpocalypse” sees thousands of people admitted to hospitals, many for respiratory diseases. The culprits are well-known – heavy industry like steel and cement and, most of all, coal-fired power.

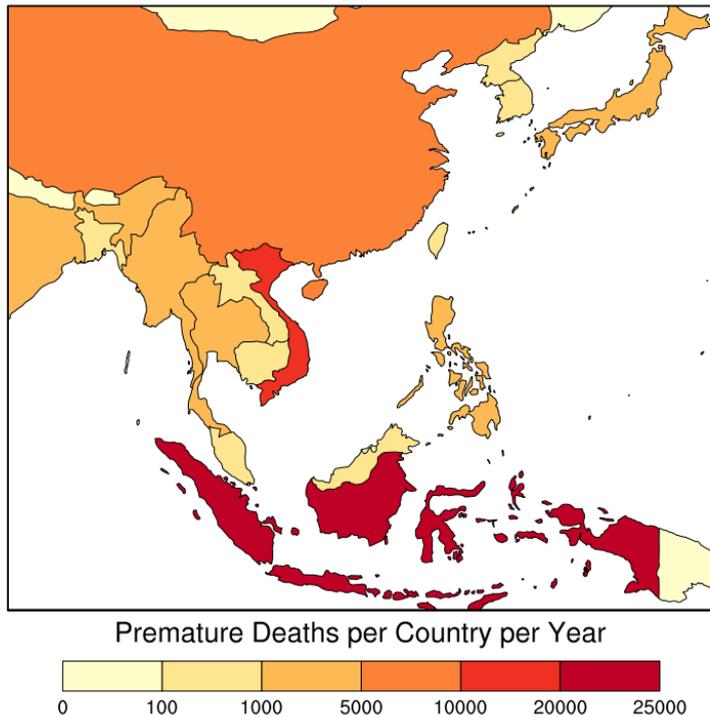
The severity of the air pollution problem has prompted China to take action at home by reducing coal usage and reining in approvals for new coal-fired power plants. But across the rest of Asia, countries continue to invest in coal-fired power. Much of this funding is from Chinese companies.

Chinese investors are backing nearly 80 coal-fired power plants worldwide, typically in countries with much weaker emission controls than China. The country is not alone; Japanese and Korean institutions are also committing billions of dollars for coal power and banks in both Asia and the West are ignoring their environmental and social guidelines to finance coal projects.

Air pollution from coal-fired power plants in Southeast Asia is already responsible for 20,000 premature deaths a year. If planned coal projects go ahead that figure could rise to 70,000 from illnesses such as lung cancer, strokes and respiratory disease, according to new research from Harvard University and Greenpeace International.

About 9,000 of these excess deaths in 2030 are in China. This means even as Chinese emissions from coal decline in the coming decades, transboundary pollution from rising coal emissions in Southeast Asia may become an increasing issue.

Annual Mortality from Southeast Asian Coal by 2030



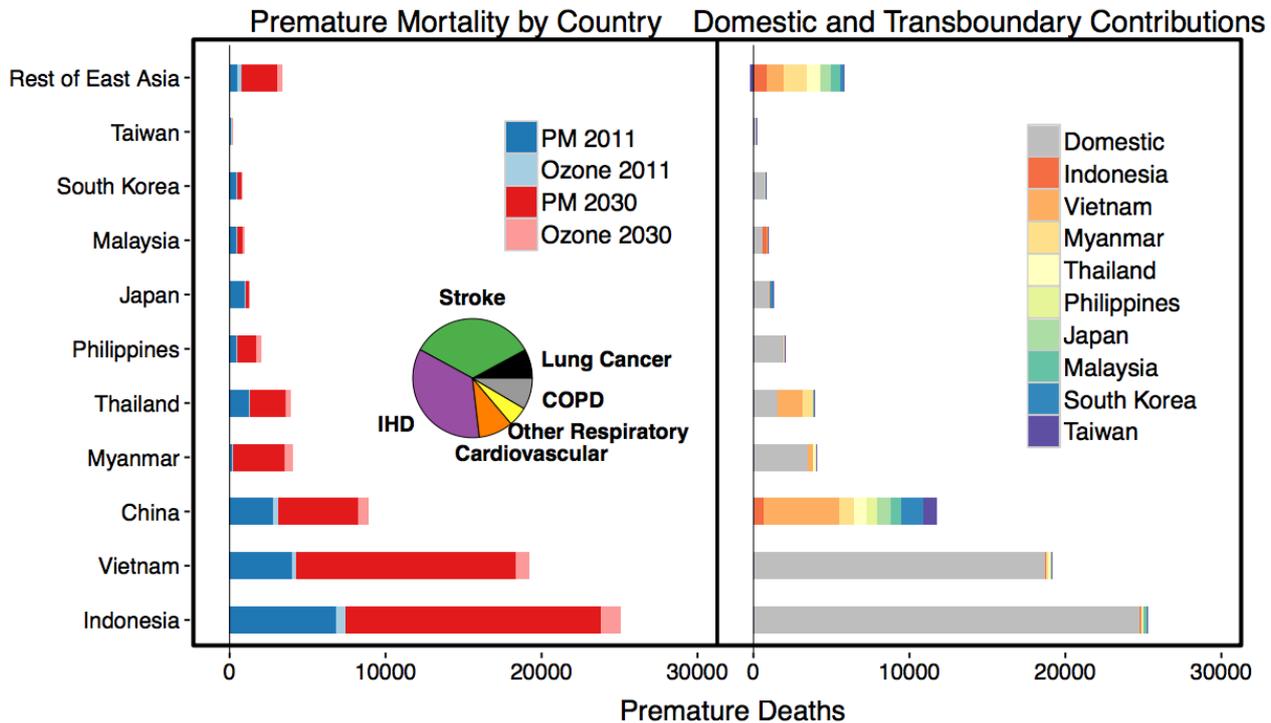
Health costs of coal

The team of researchers mapped out current emissions from all coal-fired plants in the region and projected emissions to model how much air pollution levels would increase in future, then assessed the health impacts.

In some of those countries, particularly Indonesia and Thailand, there is growing electricity demand and coal is viewed as the easiest and cheapest way to meet it. But this requires governments to ignore the broader costs to people's health and the environment. In Indonesia, the estimated health costs of existing planned projects could easily swamp the country's annual health budget.

The figures should make sober reading for any government and compel them to review their plans. If all proposed coal-fired power projects go ahead, emissions from coal will triple by 2030. The World Bank president has said such an expansion would be "a disaster" for our planet because of the impact on climate change.

It's also not the case that the death toll would be offset somehow through development benefits. Coal does not lift people out of poverty, as a report from 12 leading aid agencies recently confirmed. In fact, it does exactly the opposite. Governments should not use poverty-reduction to justify coal projects that would condemn millions to a life of poor health.



Transboundary pollution will hit China

At a time when major industrialised countries are switching to clean, renewable energy and turning their backs on coal, countries and regions across Asia seem stuck in the last century. China has been the world’s coal behemoth for the past decade but is now the only country taking serious steps to reduce its coal dependence and build a clean energy future – driven, in part, by the huge cost of air pollution.

Such pollution ignores international frontiers. While domestic emissions are responsible for most coal-related deaths, by financing coal projects in neighbouring countries, China will continue to suffer as many as 9,000 premature deaths a year in 2030 resulting from transboundary air pollution from neighbouring countries and regions.

Governments and businesses across Asia seem in thrall to coal. Investment decisions being made today will cause harm for decades to come. This winter’s airpocalypse across northern China is a warning of what that harm could look like.

煤电扩张可致亚洲国家早死人数激增

绿色和平和哈佛大学共同发布的新报告称，亚洲地区拟建的煤炭项目可能导致每年 7 万人过早死亡，乔安娜·米尔斯写道。

今冬中国华北遭受雾霾影响的人口多达 4.6 亿，相当于美国、加拿大和墨西哥的人口总和。浓重的雾霾如同密不透风的厚毯，空气污染指数更是达到历史最高水平。

2015 年北京大学和绿色和平东亚分部合作的一项研究发现，在 31 个中国省会城市和直辖市的居民中，每 7 例过早死亡中就有 1 例是由空气污染导致。一场严重雾霾可以令数千人患病，呼吸道疾病尤甚。造成这一情况的罪魁祸首众所周知，除了钢铁、水泥等重工业之外，最主要的就是燃煤电厂。

严重的空气污染促使中国采取行动削减国内煤炭的使用，并严格控制新燃煤电厂的审批。但亚洲其他

国家仍在继续投建燃煤电厂，其中不少拿到了来自中国企业的投资。

中国企业在全球近 80 座燃煤电厂中持有股份，这些电厂中的大多数位于污染排放标准弱于中国的国家。不仅中国，日韩企业也在投资数十亿美元发展煤电。西方国家的银行投资煤电的积极性也很高，在逃避环境和社会责任上也并不输给亚洲同行。

目前在东南亚，燃煤电厂的空气污染可能造成的过早死亡人数已经达到每年 2 万人。哈佛大学和国际环保组织绿色和平的新研究显示，目前拟建的煤电项目一旦启动，这一数字将升至 7 万，而造成这类死亡的疾病包括肺癌、中风和呼吸道疾病等。

一项哈佛大学和哥伦比亚大学的联合研究显示，2015 年印度尼西亚森林大火可能造成超过十万例过早死亡。如果东南亚煤电项目全数开展，那么每年这一地区煤电造成的过早死亡人数将接近这次大火。

研究团队将这一地区所有燃煤电厂目前的排放量在地图上标出，基于未来的预测排放量模拟了空气污染水平的增长情况，然后对健康影响进行评估。

以印度尼西亚和泰国为代表的部分东南亚国家正面临着电力需求的持续增长，而燃煤发电被视为满足这一需求最简单、廉价的方法。但与此同时政府必然忽视由此造成的民众健康和环境代价。在印度尼西亚，拟建煤电项目的健康成本预计很容易就能耗尽这个国家的年度卫生预算。

任何一个政府看到这些数据都会冷静下来，重新审核自己的计划。如果所有拟建燃煤电厂项目都获通过，2030 年全球燃煤产生的温室气体排放量将会是现在的三倍。世界银行行长表示，如此规模的燃煤扩张所带来的气候变化影响，对我们的星球将是“一场灾难”。

经济发展的红利也并不能弥补人口死亡所带来的损失。正如 12 家知名援助机构近期发布的一篇报告所证实，煤炭无法帮助人们脱贫，事实上其影响恰恰相反。政府不应该以减轻贫困为借口，为那些让数百万民众健康受损的煤炭项目开脱。

就在各主要工业化国家纷纷放弃煤炭，向清洁可再生能源转型的时候，亚洲国家和地区却似乎困在了上个世纪的发展模式之中。过去十年，中国一直是全球煤炭消费大国。而如今，中国却成为唯一一个认真采取措施减轻煤炭依赖、构建清洁能源未来的国家。中国之所以这么做，部分原因是因为空气污染已经带来了巨大代价。

空气污染不分国界。虽然煤炭相关的死亡多数由国内排放造成，但如果中国继续投资邻国的煤炭项目，到 2030 年其国内每年因跨境空气污染过早死亡的人数将可能多达 9000 人。

亚洲各国政府和商界似乎依旧无力摆脱煤炭的控制。中国北方的霾情已经为东南亚国家敲响了警钟：如果今天不做出正确的投资决定，空气污染将贻害数十年。

2017 set to be a bleak year for coal

China cancelled many power projects in 2016 but the sector looks set to get squeezed further this year, writes Feng Hao

Last year was the “year of cancelling coal” declared some Chinese media outlets, but the latest coal power policies suggest that 2017 is going to be even worse for the sector.

The first blow landed less than two weeks into the New Year, when on January 13 a government letter started to circulate among industry insiders about plans for coal power expansion across the provinces.

The letter was issued from the National Energy Administration’s (NEA) Electricity Department to the development and reform authorities of at least eleven provinces and autonomous regions.

The letter said that in accordance with the 13th Five-Year Plan (2016-2020) coal power capacity must be reduced and projects awaiting approval would be pushed back to 2021-2025 for review.

Six large provinces in the north-west received the letter, including Qinghai and Shaanxi, with the other five in

central and southern China. According to one coal industry website similar letters were received in Sichuan in the south-west and Liaoning in the north-east.

Energy reform

In November 2016, the government published its national level programme for developing the electricity sector in the 13th Five-Year Plan (FYP). It set a target for reducing the proportion of coal-fired power in the overall energy mix to 55% by 2020, down from 59% in 2015.

To help achieve this, it placed a cap on coal power capacity of 1,100 gigawatts. At the time, Han Shui, the NEA's chief engineer, announced that 150 gigawatts of capacity would be cancelled or postponed during the period up to 2021 to support this effort.

News platform Caixin.com calculated that the latest order will affect 101 projects that are already in planning and building stages and that amount to investment of about 430 billion yuan (US\$62.5 billion) and a total capacity of 100 gigawatts.

The latest order follows an announcement in September 2016 by the NEA cancelling 15 projects, totalling 12.4 gigawatts, which were still awaiting construction approval across nine provinces, including Jilin, Shanxi and Shandong.

In less than four months China has cancelled coal projects with the generation power equivalent to five Three Gorges Dams. An unnamed official with the NEA's Electricity Department was quoted in the New Business Daily saying that the cancellations have halved planned coal power construction in the country.

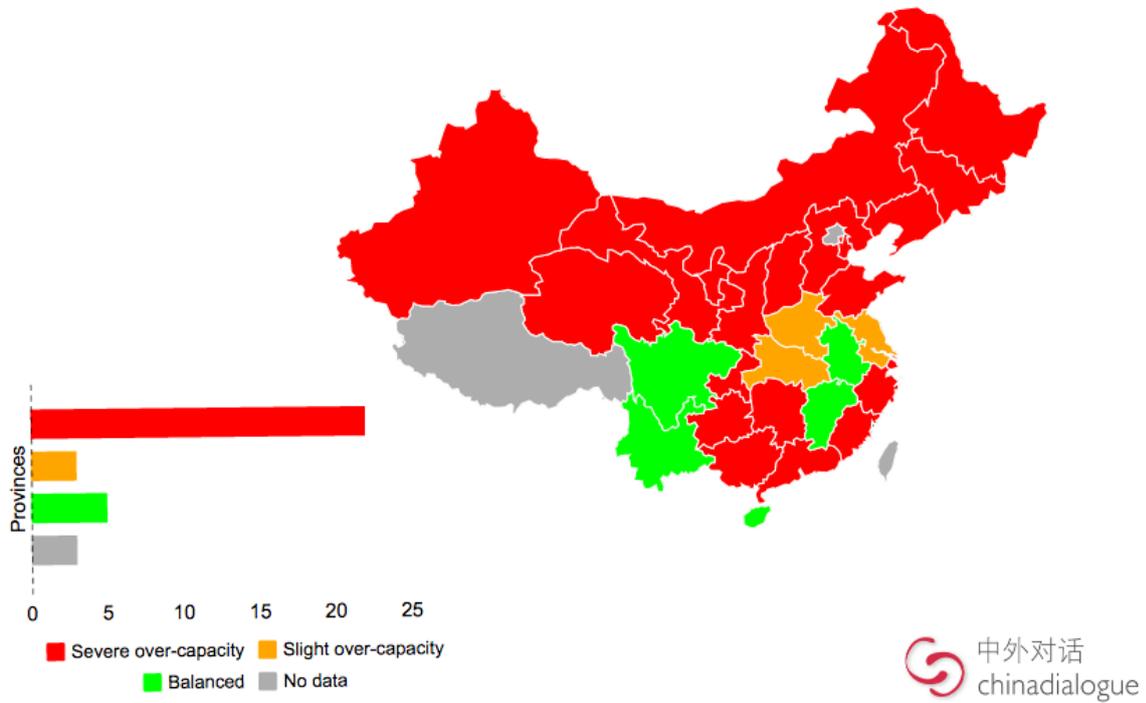
Coal overcapacity

The outlook for new coal construction from 2020 looks similarly bleak. Under the NEA's early warning system, designed to flag up financially risky coal investments, it is almost impossible to get approval in a province where there is already a surplus of coal-fired power.

That system classifies provincial power grids based on three criteria: profitability of coal power; the rate of utilisation of existing capacity; and resource constraints (availability of coal and water, and the degree of air pollution).

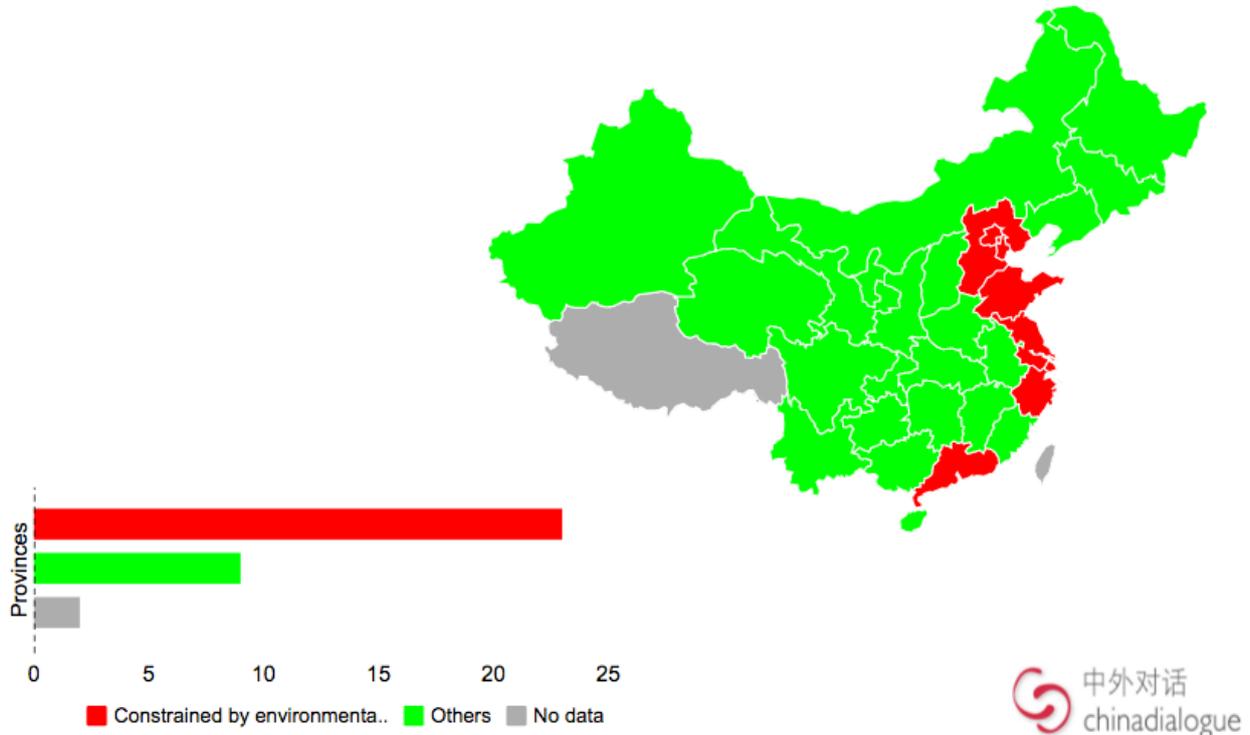
In 2016, 28 of 33 provincial level power grids were given the highest red warning, triggering local governments to delay the approval of new coal-fired generation.

Surplus coal capacity by province



Key: Red: Redundant capacity; Orange: Adequate capacity; Green: balanced capacity. Grey: no data

Provinces with environmental constraints



Key: Red: Serious resource and environmental problems; Green: other; Grey: no data

The warning system itself arose out of an urgent notice issued by the NEA and the National Development and Reform Commission in March 2016, which stated that provinces with electricity surpluses should not, in principle, allow any new coal power construction.

Thirteen provinces were identified as having electricity surpluses (see Fig. 1) and were ordered to halt new approvals, while a further fifteen were ordered to halt construction of projects that had already been approved.



Danger of industry-wide unprofitability

The new measures taken in January bring the total cancelled or delayed coal capacity to 1,100 gigawatts. This suggests that the risk of overcapacity was even graver than initially expected.

NEA data on China's overall electricity consumption published this month shows that coal-fired power plants operated for an average of 4,165 hours in 2016, a fall of 199 hours year-on-year and a sign that the trend for electricity consumption to decline continues.

The number of annual hours of operation is a good indicator of how much power plants are being utilised. Within the coal power industry it is generally held that a figure of more than 5,500 hours means a region is short of electricity and more investment is possible.

If the figure falls below 4,500 hours there is a surplus and new capacity should not be built. If 5,500 hours is the threshold at which coal-fired power becomes investable, then China's current coal capacity is already 25% too high.

Nur Bekri, head of the NEA, has said that the rapid increase in coal-fired power construction in recent years has made the risk of over-capacity more apparent.

"If development continues in this way in the coming years, the coal-fired power sector will end up in the same situation as the coal mining and steel sectors today," said Nur.

Nur was blunt about the outlook for 2017: the scope for expansion is only going to narrow, and there's a risk of industry-wide unprofitability.

中国煤电加速降温

从 2016 年开始愈演愈烈的煤电项目叫停风潮显示，新的一年中国煤电行业将面对更加狭小的生存空间，冯灏写道。

如果说刚刚过去的 2016 年被一些中国媒体称为“煤炭叫停年”，那么新年的第一波煤电政策似乎显示，2017 年将会是 2016 年的升级版。

新年刚刚到来两周，煤电行业就迎来了本年度的第一个重大打击。1 月 13 日起，多份《关于衔接省“十三五”煤电投产规模的函》在业内流传。至少 11 个省或自治区收到国家能源局电力司发往省一级发展改革委员会的函件，其内容大同小异：这些地区被要求压减“十三五”期间（2016-2020 年）的煤电投产规模，没有达到“核准建设条件”的一律推迟到“十四五”（2021-2025 年）及以后。

目前收到相关函件的省（区）包括青海、陕西等西北六省，其余五省位于中部和南部。据中国电力行业资讯网站 bjx.com.cn 报道，西南的四川和东北的辽宁两省也接到了同样的命令。

据财新网核算，这批禁令叫停的新建、在建煤电项目达到至少 101 个，总装机超过 1 亿千瓦，涉及的总投资额在 4300 亿元左右。

此前，国家能源局已经于 2016 年 9 月宣布“取消一批不具备核准建设条件煤电项目”。位于吉林、山西、山东等九个省（区）的 15 个煤电项目被取消，装机总量 1240 万千瓦。

不到四个月的时间里，中国取消的煤电项目装机量超过了五个三峡水电站。每日经济新闻援引不具名的能源局电力司官员称，1 月的这一批叫停措施将让目前中国各地规划中的煤电装机总量直接减半。

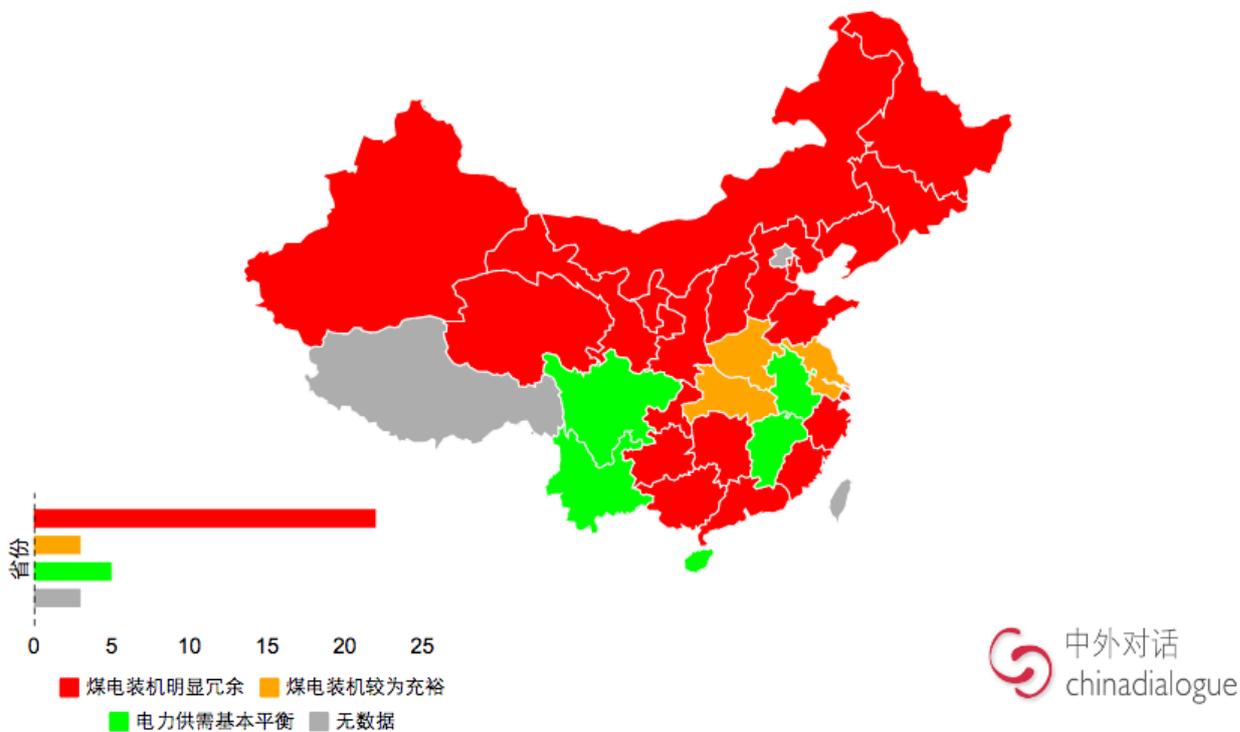
煤电风险警报响起

那么，一个煤电项目要想在 2020 年开工建设，要怎样才能达到国家的“核准建设条件”？按照 2016 年 4 月国家能源局出台的各省煤电规划建设前景的风险预警机制，处于煤电装机已经过剩地区的项目已经基本没有机会获批。

这个机制将中国的省级电网被按照三个指标分级：首先是经济性，即投资煤电项目的收益率；其次是煤电装机充裕度，可由发电设备的闲置时间体现；最后是资源约束指标，包括煤炭和水资源的充裕程度和空气污染程度。

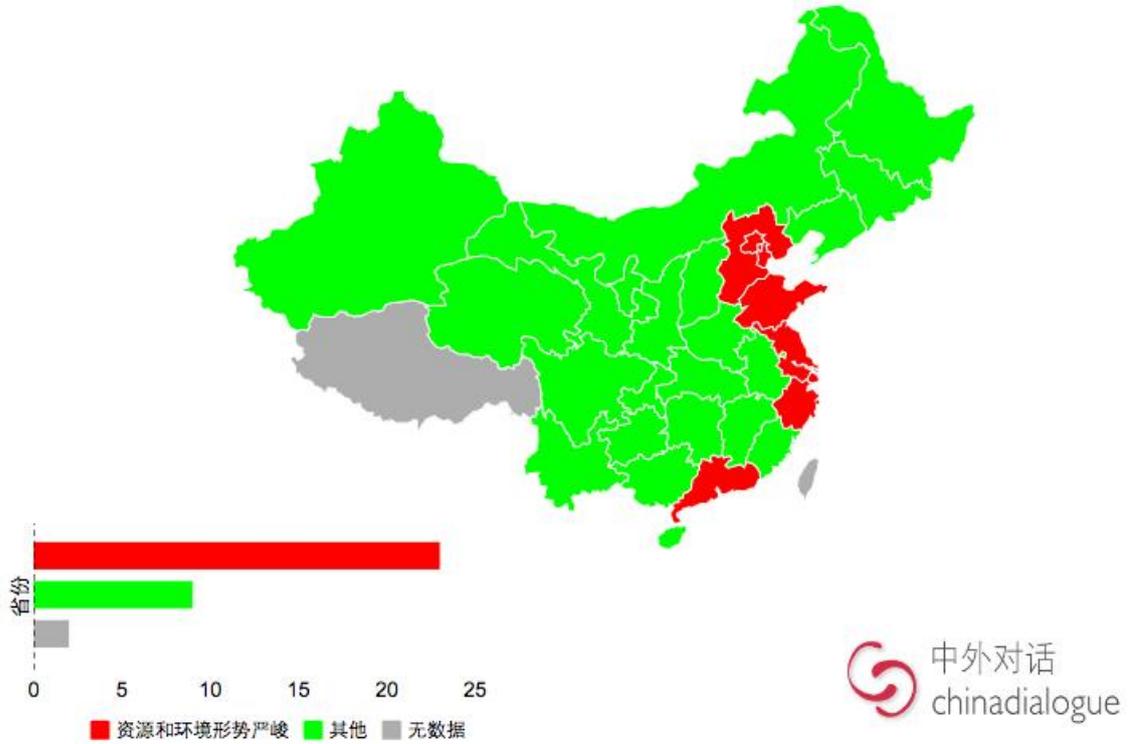
2019 年煤电规划建设风险预警结果显示，33 个省级电网区域（包括蒙东、蒙西和冀北、冀南）中的 28 个区域为预警程度最严峻的“红色”，在这些省区规划新的煤电项目被认为是不明智的，地方政府要暂缓核准。

煤电装机充裕度预警指标地图



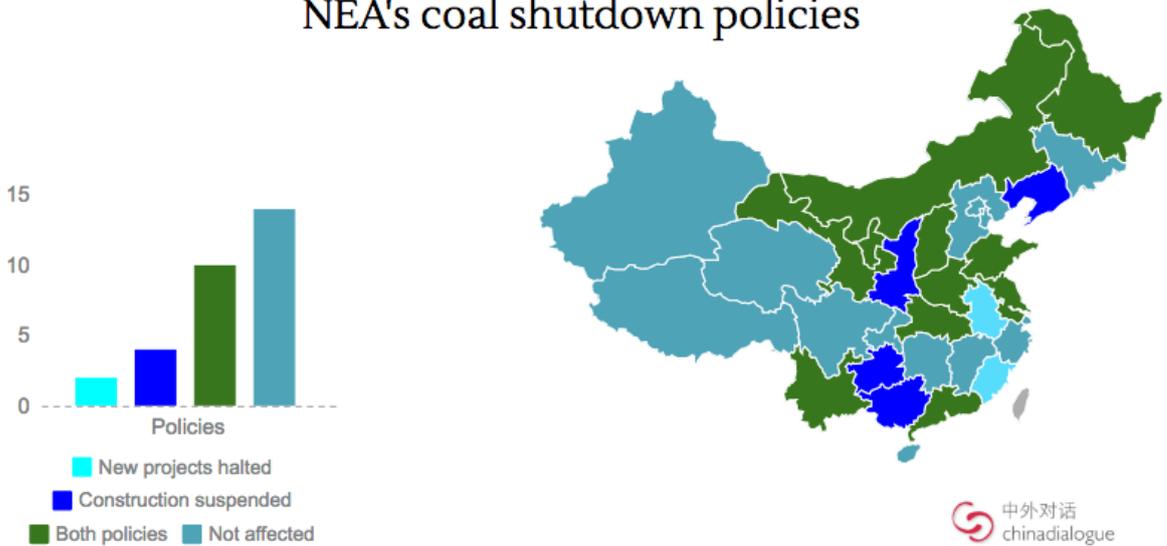
关键：红色：冗余容量；橙色：容量足够；绿色：平衡容量。灰色：无数据

资源约束指标地图



关键：红色：严重的资源环境问题；绿色：其他；灰色：无数据

NEA's coal shutdown policies



在全国政策方面，2016年11月7日，《电力发展“十三五”规划（2016-2020年）》正式对外公布，在

电力结构方面设定的指标是将煤电在全国电力总装机中的比例由 2015 年的 59% 下降到 2020 年的 55%，总装机不得超过 11 亿千瓦。国家能源局总工程师韩水还表示，“十三五”期间（2016 年-2020 年）将取消、推迟煤电建设项目至少 1.5 亿千瓦。

全行业亏损的风险

然而，时间刚到 2017 年的第一个月，全国被叫停的煤电装机就已经来到了 1.1 亿千瓦以上，这意味着煤电行业面临的产能过剩可能比预想的要严重得多。

能源局 2017 年 1 月公布全社会用电量等数据，其中 2016 年火电设备平均利用小时为 4165 小时，继上年再次下降，同比减少 199 小时。

发电设备平均利用小时数是发电厂发电设备利用程度的指标。按照电力行业的一般规则，如果某一地区的全年设备利用小时数高于 5500 小时，表明该地区用电紧张，可继续增加电源投资。如果低于 4500 小时，则表明该地区电力富余，一般不能再新增发电装机。以 5500 小时的火电盈亏平衡点测算，过剩程度已近 1/4。

国家能源局局长努尔·白克力此前表示，近年来煤电装机规模快速增加，煤电产能过剩潜在风险逐步显现。“如果按这样的发展态势，未来几年，我国煤电行业将会变成现在的钢铁和煤炭行业。”

对于 2017 年，这位中国能源政策掌门人更是直言：煤电的增长空间只会更小，面临全行业亏损风险。