

Tomohiro Ohsumi/Bloomberg/Getty Images

An employee performs a final inspection on solar cells on the production line at the Trina Solar Ltd. factory in Changzhou, Jiangsu Province, China in 2015. (Tomohiro Ohsumi/Bloomberg via Getty Images)

Solar panels are key to Biden's energy plan. But the global supply chain may rely on forced labor from China

By [Clare Duffy](#), CNN Business

Updated 1:48 AM EDT, Fri May 14, 2021

China's Xinjiang region has evolved over the past two decades into a major production hub for many of the companies that supply the world with parts needed to build solar panels.

But new research suggests that much of that work could rely on the exploitation of the region's Uyghur population and other ethnic and religious minorities, potentially tainting a significant portion of the global supply chain for a renewable energy source critical to combating the climate crisis.

The [report](#) published Friday — titled "In Broad Daylight: Uyghur Forced Labor and Global Solar Supply Chains" — presents evidence of a troubling reality: that components for clean energy may be created with dirty coal and forced labor. An advance copy of the report was shared exclusively with CNN Business.

China has [repeatedly denied](#) all allegations of human rights abuses in Xinjiang.

The Chinese Ministry of Foreign Affairs did not respond to a request for comment from CNN Business on the report. But asked Wednesday about allegations that forced labor in Xinjiang has tainted solar panel supply chains, Foreign Affairs spokesperson Hua Chunying called such claims "an outrageous lie."

"A few Western countries and anti-China forces went all out to hype up the so-called 'forced labor' in Xinjiang's cotton-growing industry. Now they are turning to the solar energy industry. Xinjiang cotton is speckless and solar energy is clean, but those in the US and the West who are hyping up the issue have a dark and sinister intention," she told reporters. "They are trying to fabricate lies like 'forced labor' to create 'forced industrial decoupling' and 'forced unemployment' in Xinjiang to suppress Chinese companies and industries to serve their malicious agenda to mess up Xinjiang and contain China."

Allegations have been raised before that forced labor in Xinjiang has been used to produce polysilicon, a key component for making solar panels. But this latest research indicates that the practice is also used in the mining and processing of quartz, the raw material at the very start of the solar panel supply chain.

"The global demand for solar energy has encouraged Chinese companies to go to great lengths to make our climate responsibility as inexpensive as possible," the report states, "but it comes at great cost to the workers who labor at the origin of the supply chain."

The report was co-authored by Laura Murphy, professor of human rights and contemporary slavery at the Helena Kennedy Centre for International Justice at Sheffield Hallam University, and supply chain analyst Nyrola Elimä, who lived in the Uyghur region for 19 years. CNN [previously reported on Elimä's family's case in Xinjiang](#), where her cousin has been sent to an internment camp. The report was compiled with the help of "forced labor and supply chain experts fluent in Chinese, Uyghur and English." It cites hundreds of publicly available corporate disclosures, government statements, state media articles, social media posts, industry reports and satellite imagery, and details their investigation into more than 30 solar products companies to determine whether they may be exposed to forced labor in their supply chains.

For years, the US government [has claimed that up to two million](#) Uyghurs and other Muslim minority groups in Xinjiang have been imprisoned in re-education camps. Western governments and human rights organizations have alleged that minorities in the region have been subjected to physical abuse, attempted indoctrination and forced labor. Many industries — including tech, [agriculture](#) and the [hair trade](#) — have faced claims that their supply chains are compromised. Beijing, meanwhile, has repeatedly denied human rights abuses in the region, saying its facilities there are "vocational training centers" where people learn job skills, Chinese language and laws.



Greg Baker/AFP/Getty Images

This May 2019 photo shows a watchtower at a high-security facility near what is believed to be a re-education camp where mostly Muslim ethnic minorities are detained, on the outskirts of Hotan, in China's northwestern Xinjiang region.

The report will likely draw additional scrutiny to China's outsized role in the global solar power industry. The country has between 71% and 97% of the world's capacity for various solar panel components, according to market research firm [Bernreuter Research](#). Xinjiang alone produces nearly half of the world's solar-grade polysilicon, and is home to factories for some of the industry's biggest players.

Meanwhile, many countries are betting on solar as a critical form of renewable energy as they work to transition away from more polluting power sources. Renewable energy, led by solar power, could make up 80% of the growth in electricity generation over the next decade, according to an October [report](#) from the International Energy Agency.

Over the next decade, three times as much solar capacity is [expected to be deployed](#) in the United States as was installed by the end of 2020. In the European Union, power generated from renewable sources such as wind and solar surpassed that from fossil fuels [for the first time last year](#), and solar deployment growth is [expected to continue](#).

Revelations of the industry's alleged ties to forced labor in Xinjiang could have huge consequences for those plans. There could also be implications for consumers and corporations that want to contribute to a greener future but may be unwittingly buying products that contain components made with forced labor and from electricity produced by burning dirty coal.

Solar panel companies in Xinjiang create "green energy by consuming cheap, carbon-emitting coal," the report states. They also "sacrifice human labour conditions in the bargain," it adds.

'This wasn't their way of life'

Over the past four years, the Chinese government has faced numerous allegations that it runs huge, fortified internment centers in Xinjiang. Former detainees have [told CNN](#) they experienced political indoctrination and [abuse](#) inside the camps, such as food and sleep deprivation.

On January 19, the outgoing Trump administration [declared the Chinese government was committing genocide](#) in Xinjiang. Western parliaments [have also passed similar motions](#) despite opposition from their leaders.



A street near a mosque in Xinjiang, China, Aug. 5, 2019.

China has also been [previously accused](#) of facilitating forced labor. US Customs and Border Protection recently blocked imports of [cotton](#), tomato and hair products made in Xinjiang over concerns about forced labor, and the [United Kingdom](#) and [European Union](#) are considering similar restrictions.

The Chinese government is open about operating what it calls "surplus labor" programs, which [facilitate relocations](#) of minority workers in Xinjiang to industrial centers. By the Chinese Communist Party's [own count](#), such programs have systematically relocated millions of citizens from rural towns and farms in Xinjiang to factories within the region and around the country to work in labor-intensive industries.

Beijing says the programs are necessary for alleviating poverty and tamping down religious extremism. But the researchers who compiled the report on solar panels said they are rooted in a darker truth.

"You have to understand that there's really rabid racism in Xinjiang," said Murphy, of Sheffield Hallam University. "The basic premise of these poverty alleviation programs is that Uyghur people cannot get themselves out of poverty, or that they want to be impoverished because they've been ideologically programmed to believe it's better."

The "labor transfer" programs also provide cheap labor to solar panel components suppliers, according to the report.

Murphy and Elimä said people from small Uyghur villages are forced to move hundreds or thousands of miles to do intense manual labor in industrial centers. After being relocated to work sites, adult couples are sometimes housed in dorm-like bunks with other workers, the report states, citing state media articles about surplus labor programs.

"This wasn't their way of life before," Elimä said. "We have our home, our garden, we're living with our parents or sister ... and now suddenly, someone is living in one city, their parents living in a nursing home, kids in a separate orphanage. What is going on here?"

Uyghur and other minority workers could put themselves and their families at risk of detention in an internment camp if they turn down or leave these labor placements, according to the report.

Tainted supply chains

One company, Xinjiang Hoshine Silicon Industry, is presented as a "case study" in the report for the trickle-down effect of alleged forced labor on the entire solar panel supply chain. Hoshine is the world's largest producer of metallurgical-grade silicon, a component created from mined and crushed quartz which is then sold to leading polysilicon makers.

The Chinese government places "surplus" rural workers at Hoshine's factories, the report states. It cites a Chinese state media [article](#) from 2017 in which a local government agency said its surplus labor training program could provide 5,000 workers for the company.

Hoshine has also received compensation from the Xinjiang Production and Construction Corps (XPCC) — a state-run, paramilitary corporate conglomerate in the region that operates similarly to a prefectural government — for training it provided to "rural surplus laborers," according to the report. The US Treasury's Office of Foreign Assets Control last year [issued sanctions](#) against the XPCC "in connection with serious rights abuses against ethnic minorities" in Xinjiang.

Government recruitment efforts on the company's "behalf depend on coercive strategies that suggest non-voluntary labor," the report states.

Manual laborers at Hoshine's Xinjiang facility are paid to crush silicon manually at a rate of 42 Chinese yuan (around \$6.50) per ton, the report states.

Hoshine's factory is located in the Shanshan Stone Industrial Park, an industrial center located near the city of Turpan in Xinjiang. Hoshine's factory is in the northern section of the Industrial Park, according to the report, and several miles away, the southern section of the park also holds two facilities that have been identified as [detention centers](#) for the "re-education" of Uyghur people by the [Australian Strategic Policy Institute](#) (ASPI), which has researched alleged abuses against minorities in Xinjiang. The report states that it is not clear whether laborers at Hoshine's factory in the park come directly from these detention facilities.

Silicon mining and processing near detention centers

Xinjiang Hoshine Silicon Industry mines and processes quartz in the north part of Shanshan Stone Industrial Park, located near the city of Turpan in Xinjiang, China, according to new research. Several miles away, the southern section of the park (shown here) holds two facilities that have been identified as detention centers for the “re-education” of Uyghur people by the Australian Strategic Policy Institute (ASPI), which has researched alleged abuses against minorities in Xinjiang.



Sources: Maxar Technologies (satellite image), “In Broad Daylight: Uyghur Forced Labour and Global Solar Supply Chains” by Laura Murphy and Nyrola Elimä, Australian Strategic Policy Institute

Hoshine did not respond to a request for comment on the report from CNN Business.

The process of purifying metallurgical-grade silicon into polysilicon requires extremely high temperatures and significant electricity consumption. This is another reason why Xinjiang — which has a large, government-subsidized coal industry — has become a solar components hub, according to the report.

Because Hoshine is one of the major raw materials suppliers in the area, the report claims that components allegedly made with forced labor at the company’s facility make their way into products sold by many other solar firms.

One such Hoshine customer is Daqo New Energy Corporation, a publicly traded company and the third largest polysilicon manufacturer in the world in 2020, [according to Bernreuter Research](#). Around a third of Daqo’s raw materials are sourced from Hoshine, and 100% of its polysilicon capacity is produced in Xinjiang, the report states.

Daqo’s deputy chairman has pushed back on allegations that its own Xinjiang facility employs forced labor. In response to a request for comment from the researchers, Daqo’s board secretary and investor relations manager Kevin He said in an email Daqo does not participate in state-sponsored labor transfer programs, and that only 18 of the 2,021 employees at its Xinjiang facility are ethnic minorities.

But the report’s authors say that regardless of Daqo’s own practices, the company can’t vouch for its products because it buys raw materials from Hoshine.

“[Daqo’s] supply chain is tainted, and nobody’s going to look away from that anymore,” Murphy said.



A Daqo New Energy Corp. facility in Shihezi, Xinjiang province, China.

Daqo’s He told the researchers that the company has “sent a formal statement to all of our suppliers in the Xinjiang region, clearly stating our stance of zero tolerance against forced labor, child labor, discrimination, sexual harassment, unfair and unequal treatment of employees.” All of the suppliers provided “formal written confirmation” that they do not engage in such practices, “which are also illegal in China,” He said.

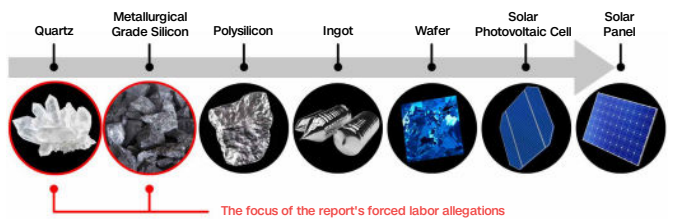
“There is a very clear definition of ‘forced labor,’” He added. “We believe that one should not judge if there is forced labor or not simply by if a company has engaged in a particular program or has received certain types of subsidies. There should be clear evidence of violation for such claims to be made against a particular organization or individual.”

In response to questions from CNN Business, Daqo on Friday reiterated that it has informed its suppliers in Xinjiang — “including Hoshine” — of its zero tolerance policy. It added that Hoshine accounts for “approximately 30-35% of all the raw materials purchased including silicon powder and others.”

Daqo has contracts to sell polysilicon to the top four global producers of solar panels — China’s LONGi Green Energy Technology, JinkoSolar Holding, Trina Solar and JA Solar — among other companies, the report found. Daqo on Friday confirmed that those are its customers.

Elements of the solar panel supply chain

Polysilicon producers in Xinjiang have previously faced allegations of using forced labor, and new research found that similar labor practices may also be used to harvest and process raw materials at the start of the solar supply chain.



Sources: Solar Energy Industries Association, “In Broad Daylight: Uyghur Forced Labor and the Solar Supply Chain” by Laura Murphy and Nyrola Elimä, Getty Images, Shutterstock
Graphic: Ian Berry, CNN

JinkoSolar is Daqo’s second largest customer, according to corporate documents cited in the report, and is one of the world’s largest producers of photovoltaic ingots, wafers and cells, products that make up solar panels (or “modules”). The company produces 42% of its ingots and wafers at its Xinjiang facility, the report states.

JinkoSolar’s panels eventually make their way, via distributors, to residential, commercial and utility solar projects [around the world](#). Its website [shows](#) the company’s solar panels, for example, in solar energy farms in California and Arizona.

However, JinkoSolar’s US division noted that its products sold and installed in the United States do not include components or materials sourced from Xinjiang. JinkoSolar US has implemented measures to audit and review its supply chain “on an ongoing basis” and it has “a zero-tolerance policy for forced labor,” Ian McCaleb, a JinkoSolar US spokesperson, said in a statement to CNN Business.

“Jinko has undertaken a number of steps to ensure that the U.S. supply chain will use long-term, contracted polysilicon, and ingot, wafer, cell and assembly facilities from regions where the U.S. readily accepts independent audit results, therefore, Daqo Polysilicon is not part of Jinko’s U.S. supply chain,” McCaleb said. “Jinko strongly condemns the use of forced labor and does not engage in it in its hiring practices or workplace operations.”

Renewable power company sPower, which is listed as the owner of several of the solar farms using Jinko panels on JinkoSolar’s site, also reiterated that supplier qualification and traceability protocols implemented by JinkoSolar help ensure that no products sPower buys from it are jeopardized by forced labor in the supply chain.

“We are committed to working with solar module manufacturers that align with our principles and ethical standards, particularly in regards to human rights,” the AES Corporation, which owns sPower, said in a statement to CNN Business.

Of the other three major Daqo customers, only Trina has a manufacturing plant in Xinjiang, though it is unclear if the company participates in labor transfer programs, according to the report.

And even the companies that do not have facilities in Xinjiang, such as LONGi and JA Solar, may be tainted because they source polysilicon from Daqo, which runs a factory in the region and buys raw materials from Hoshine.

Trina, LONGi, JA Solar and JinkoSolar's headquarters in China did not respond to requests for comment on the report from CNN Business.

"It is unethical to continue investing there," Elimä said. "You can't do business with a country that has internment camps, especially when you know there is a camp in that region."

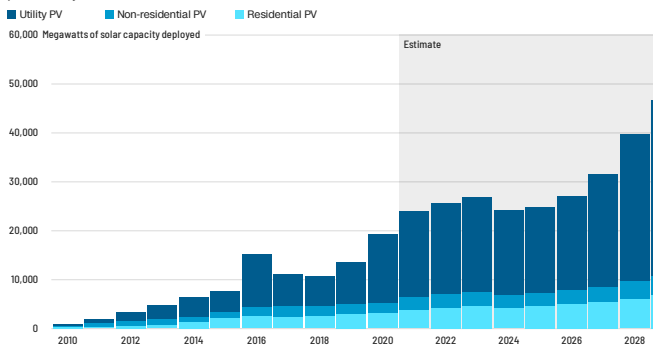
International response

Solar power is central to US President Joe Biden's plans to transition the United States to a greener energy grid.

Biden's proposed [\\$2 trillion infrastructure package](#) includes a provision that would require every state to generate all of its electricity from fuels that do not produce carbon emissions linked to climate change by 2035. Such a transition is [expected to at least double](#) the rate of spending on solar and wind power.

US solar energy capacity could see big growth by 2030

The megawatts of solar photovoltaic (PV) capacity — or the potential power output from solar — has been steadily growing in the United States over the past 10 years, and is expected to accelerate in the coming decade. From 2020 to 2030, three times as much solar capacity is expected to be deployed in the United States as was installed in the previous 10 years.



Source: 2020 US Solar Market Insight report by Wood Mackenzie

Europe has similar ambitions: In its [2030 Climate Target Plan](#), the European Commission will aim to reduce greenhouse gas emissions to at least 55% below 1990 levels by relying on alternate energy sources such as solar. And China has its own net-zero carbon emissions goal of 2060.

The accelerating adoption of solar raises the stakes for ensuring that the industry's supply chain does not involve forced labor.

White House climate envoy John Kerry [told lawmakers](#) Wednesday that the Biden administration is considering sanctions against China over allegations that forced labor is involved in solar panel production in Xinjiang.

Congress is currently considering a bill called the [Uyghur Forced Labor Prevention Act](#) that, if signed into law, would ban goods from Xinjiang unless the company importing them could prove that they were not made with forced labor (a slightly different version of the bill passed the House of Representatives on a bipartisan basis last fall).

Since the bill's introduction, solar trade group the Solar Energy Industries Association (SEIA) has urged US solar companies to avoid sourcing components from Xinjiang, according to John Smirnow, the association's vice president of market strategy.

"There have been concerns about forced labor tied to the solar supply chain [in Xinjiang] ... it makes products from that region very high risk," Smirnow told CNN Business. "The only way to address that risk is to show that there is no forced labor, but you need an independent, third party audit to do that, which you can't do in the region."

The association last month released the [Solar Supply Chain Traceability Protocol](#), a tool to help solar companies demonstrate to customers — and potentially US Customs — where the components in their goods are sourced.

"We wanted to give our companies a tool to provide assurances that the goods being imported in the US don't include inputs from the [Xinjiang] region and don't include inputs produced with forced labor," Smirnow said.



Holding signs saying "Stop the Uyghur Genocide," members of the Uyghur American Association rally in front of the White House, Thursday, Oct. 1, 2020. Jacquelyn Martin/AP

A [call to action](#) written by the SEIA in December to "ensure that the solar supply chain is free of forced labor" has been signed by nearly 250 solar companies, including JinkoSolar's US division, JA Solar, LONGi Solar Technology's US division, Trina Solar's US division and sPower.

The commitments suggest "a nearly industry-wide commitment to addressing the problems," raised in the new report. But many of the signatories "would have to make significant changes to ensure that they are not purchasing raw materials made with Xinjiang forced labor," it states.

The report is intended in part to help companies implementing the SEIA's protocol to identify potential issues in their supply chains, the authors said.

Experts say there are solar panel components suppliers outside of Xinjiang, and even outside China, that could help meet the needs of the United States and Europe, where governments and industry have expressed concerns about the use of forced labor and where there is greater political pressure to challenge Beijing. But these sources could be more expensive, given the Chinese subsidies and other benefits offered for operating in Xinjiang.

Still, Xinjiang has become deeply intertwined with the global solar supply chain and fully cutting it out of the system would be difficult. Take JinkoSolar, for example — an executive from JinkoSolar's US division [sits on the board](#) of the SEIA, which has urged American solar firms to stop buying parts from Xinjiang, and Jinko joined the United Nations Global Compact last month. But JinkoSolar still operates a factory in the region, and sources polysilicon from Daqo.

In response to a request for comment about whether JinkoSolar has any plans to stop operating or sourcing components from Xinjiang, McCaleb, the JinkoSolar US spokesperson, reiterated that the supply chain for the company's US division does not source components from Xinjiang. He added: "Jinko has a strong track record of industry-leading workplace practices, which include employment at will, universal premium pay and benefits, and scheduled leave for all employees at our factories."

As the Biden administration considers how to expand the use of green energy in the United States, the researchers and the SEIA's Smirnow said investing in US solar panel components manufacturing could be a way to ensure that growth happens responsibly.

"So long as the Chinese government is running internment camps and forced labor programs in Xinjiang, no company should have a factory or a subsidiary there," Murphy said. "Period."