

Plan your clean energy IP strategy

Clean energy innovation has taken centre stage for the US and China. **Rodger Sadler, Chi Cheung, Xiang Wang** and **Yali Hu** provide tips for companies seeking to enter the market in this increasingly essential sector

One of the greatest challenges we face this century is reducing our dependence on fossil fuels and slowing the atmospheric buildup of greenhouse gases causing climate change. The devastating oil spill in the Gulf of Mexico dramatically underscores the necessity of meeting this challenge. The US and China, the world's biggest energy consumers, energy producers, and greenhouse gas emitters, must seize the opportunity to lead in transforming how we generate, transmit, and use energy. US and Chinese leaders recognise the need to address climate change and embrace low carbon energy technologies through public policy and investment.

In China, the country's leaders are investing an estimated \$12.6 million every hour to green the economy, according to the Center for American Progress. In 2009, Pew Charitable Trusts reports that China took the top spot for overall clean energy finance and investment, pushing the US into second place.

Eager to identify additional opportunities for cooperation and collaboration, US Commerce Secretary Gary Locke toured China this summer with representatives from 24 US clean energy companies. Beijing also recently hosted the first ever US-China Renewable Energy Forum.

Opportunities abound

China has been working to strengthen its IP laws since entering the WTO in 2000. Prime Minister Wen Jiabao has vowed to make China a "country of innovation" and urged Chinese companies to "raise their independent innovation capabilities and have independent intellectual property". Companies like China's Thermal Power Research Institute are taking heed. *The New York Times* has reported that the company recently licensed its clean coal technology to Future Fuels in the US for about \$100 million.

China's increasingly sophisticated high-tech economy is even enticing top American clean energy innovators to build R&D facilities there. Applied Materials, one of Silicon Valley's most prominent tech companies, recently built its newest and largest solar research lab in Xi'an, China, and relocated its chief technology officer to Beijing.

The next frontier

Clean energy innovations continued to thrive in 2009 despite the global economic crisis, and the number of US clean energy patents granted has nearly doubled over the past decade. Clean energy patents were directed to technologies in four major areas: wind, solar, hybrid or electric vehicles and fuel cells.

The clean energy industry has so far seen relatively little patent litigation compared to more mature industries such as the semiconductor and mobile phone industries. However, as the market for clean energy technology expands, and the financial stakes increase, companies will become more aggressive in using their patents to grow market share or revenues in an increasingly competitive environment.

Patent litigation may already be heating up in the area of smart grid technology. Last year Sipco sued Florida Power & Light and Silver Springs Networks in Florida, alleging infringement of three of its smart grid patents. Earlier this year, EMS Technologies sued over a dozen companies (including General Electric and Silver Springs Networks) in Texas for allegedly infringing its smart grid patent. The number of patent infringement cases being filed in US federal courts is certain to increase as the smart grid sector grows into a multi-billion dollar market.

The US International Trade Commission (ITC) is becoming an increasingly popular forum for owners of US patents. ITC actions proceed much faster than traditional US federal court lawsuits, and are particularly powerful against foreign importers because the ITC can block infringing technology from entering the US.

One-minute read



Both US President Barack Obama and Premier Wen Jiabao of China have commented on the importance of leading the world in the development of low carbon

and green technologies. Innovation will be critical to tackling the climate change challenge and developing and implementing the sources of clean, renewable energy needed for continued economic growth. Strong systems for protecting IP will help spur the necessary innovation and attract the investment capital needed for development, manufacturing, and commercialisation. As the market for clean energy technology grows, and the financial stakes increase, it will be important for cleantech innovators to adopt and follow through on intelligent strategies for developing and protecting their IP.

American companies are beginning to leverage their US patents at the ITC in the fight with foreign importers for market share in the country's growing clean energy sector. For example, General Electric, facing stiff competition from Mitsubishi Heavy Industries, filed an ITC patent action seeking to block allegedly infringing Mitsubishi wind turbines from being imported into the US. Although General Electric was ultimately unsuccessful, ITC litigation will continue to increase as US patent owners seek to better position themselves in the competition with foreign imports.

In China, to encourage independent clean energy innovations, both the legislative and judicial branches have been active in promoting patent protection. For example, the Law of the People's Republic of China on Regenerable Energies has helped protect and promote cleaner and renewable energies. Judicial guidelines have also been circulated to emphasise the importance of ensuring robust patent protection for renewable energy and environmental protection technologies.

Intense competition between domestic and foreign players in the Chinese clean energy market is already well underway. In *China Environmental Project Tech, Inc v Fujikasui Engineering Co Ltd* (Fujian High Court, 2008), the owner of a Chinese patent claiming technology for reducing sulphur dioxide emissions in electrical power generation was recently awarded more than Rmb50 million (\$7.4 million) against a Japanese water treatment company and a Chinese power plant.

Investment-worthy inventions

There are a number of technology areas that have attracted particular attention from potential investors.

Smart grid

The electric power grids in the US and China are outdated and incapable of handling the amount of clean, renewable energy the countries need for continued economic growth. As the countries take steps to modernise their power grids, there will be plenty of opportunities for innovations in smart grid technology. Morgan Stanley predicts that the smart grid market worldwide will grow from \$20 billion in revenue this year to \$100 billion a year by 2030. General Electric estimates China alone will spend \$60 billion over the next decade to reinvent its power transmission and distribution system into a modernised,

smart grid. Given the still relatively open patent landscape in the smart grid sector, inventors who patent their smart grid innovations will likely be rewarded with key patents – there are less than 200 issued US patents, and less than 50 pending US patent applications, directed to smart grid technology.

Enabling and interface technologies

The commitment to modernising the US and Chinese electric power grids creates opportunities to develop valuable innovations at the interface between sources for generating clean energy and the grids for transmitting and distributing it to end users. Consider an invention developed for use in connecting the output of a wind farm in North Dakota, or in western China's Gansu province, to a power grid without causing fluctuations in frequency and voltage. Valuable patent claims to this invention could be written to cover the interface between the grid and any fluctuating source of renewable energy (whether that source is wind, solar, geothermal or wave power). In this way, a single, carefully-drafted patent application may cover applications or sectors beyond those initially contemplated by the inventors.

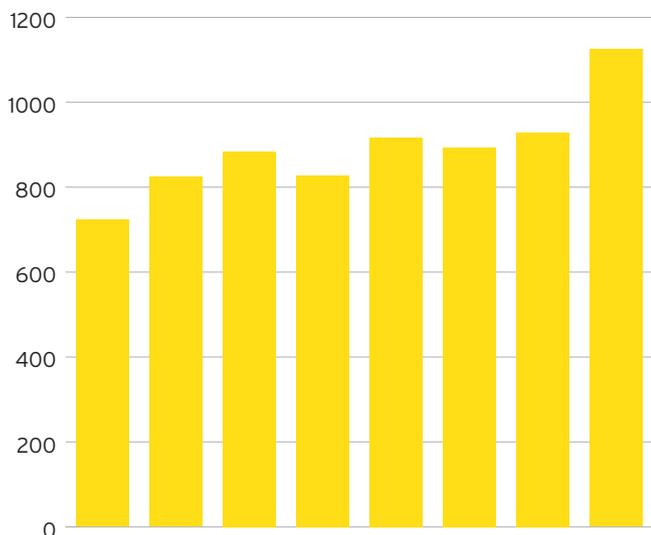
Energy storage technologies

Energy storage will be a fundamental enabling technology in the low carbon economy. Powering electric vehicles, smoothing out fluctuations in supply of electricity from renewable sources like wind or solar farms, and extending home appliance functionality all require energy storage technology. Innovations addressing energy storage issues will become particularly valuable as leaders in the US and China invest in modernising the countries' power transmission and distribution grids.

Carbon capture and storage

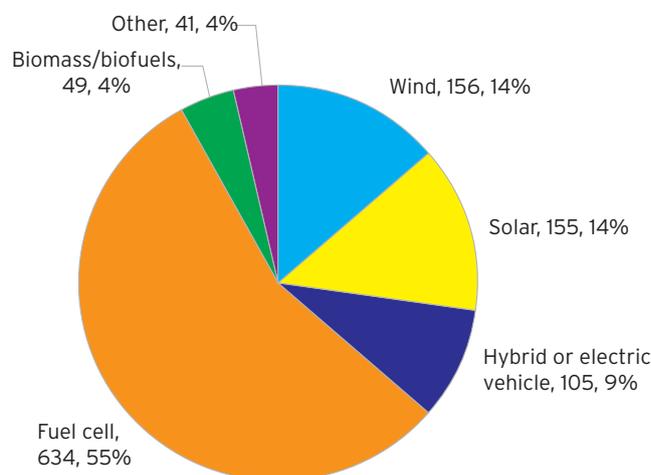
Many countries, including the US and China, will likely continue to rely on burning coal to generate base-load electrical power for many years. Developing increasingly efficient and effective carbon capture and storage technologies therefore will be critical to meeting greenhouse gas reduction goals. Clean energy innovators should seek out opportunities to develop and patent these technologies in the largest markets. Silicon Valley start-up Calera, for example, has developed and patented innovative technology for taking carbon dioxide and other pollutants from coal-fired power plants and running it through seawater to form

Number of US clean energy patents issued 2002-2009



Source: Clean Energy Patent Growth Index

Clean energy patents issued in 2009 by type



Source: Clean Energy Patent Growth Index

Clean energy patenting tips

Clean energy companies should consider these important patent prosecution strategies:

Know where to file

Patent applications should be filed in countries with significant markets for the invention, as well as in countries that will produce large numbers of products incorporating the invention. The US, China, Japan, and South Korea eventually all will be hotbeds for production and use of clean energy technology, so clean energy innovators should be making every effort to obtain patent protection in each of these countries, at a minimum.

Until recently, anyone who invented something in a Chinese facility was required to file for patent protection in China before filing in the US or other countries. Under recent revisions to Chinese patent laws, inventors in China may file for patents in other countries first, as long as they submit their inventions to a security review beforehand.

Filing for patent protection first in the US gives applicants opportunities for excluding potential prior art by taking advantage of the first-to-invent system, which is different from the first-to-file system used in most other countries. Because an applicant's invention date may occur well in advance of the filing of a patent application, the scope of potentially invalidating prior art may be narrowed significantly. In an environment where many clean energy companies around the globe are likely working on closely related innovations, this narrowing of the scope of potential prior art

could be invaluable.

When considering where to file patents, inventors should also consider countries that provide fast and cost-effective redress for patent infringement. Germany, for instance, is known for its experienced and specialised courts. Roughly 1000 new patent cases are filed in Germany every year. Furthermore, unlike the US, Germany provides for injunctions as a remedy of right, which can provide inventors with immense leverage against infringers operating in or even outside Germany.

More and more Chinese factories and workshops possess the talents and skills to copy most of the world's advanced technologies. For those entities that desire to protect their new energy inventions in China, filing a Chinese patent application is among the most effective measures.

Accelerating examination

There may be situations where the market for a cleantech invention already is so robust that the owner will want a patent to issue as quickly as possible. The term of a US patent is 20 years from the date the application is filed. Therefore, shortening the time between filing the application and issuance of the patent can effectively extend the useful life of the issued patent. On average, it takes nearly 40 months to obtain a US patent. Reducing this time could lessen the cost of prosecuting the patent and enable a clean energy patent owner to start earning money sooner from market exclusivity or from licensing the issued patent.

One option for reducing the prosecution time is taking advantage of a recently expanded USPTO green technology pilot programme for accelerating examination of certain pending clean energy technology patent applications.

Keep related applications pending

Companies seeking patent protection for their innovations always run the risk of competitors trying to design around the patent. Any patent applicant, cleantech or not, should try to keep related applications pending long after an original application issues as a patent. Related applications are those filed after an original application is filed, but before the original application issues as a patent, and that involve similar or related technologies. The benefit is that if a competitor somehow successfully designs around the issued patent, the claims of the related application may still be modified during prosecution in a way that covers the competitor's design-around.

Defensive publication

If a cleantech company cannot afford to patent every one of its inventions, it should instead consider publishing the inventions to establish them as prior art. Publication should prevent competitors from patenting the inventions themselves and then using the patents down the road to interfere with the business of the clean energy company that decided not to seek patent protection.

a type of synthetic limestone that can be processed into cement. China's largest power producer, China Huaneng Group, has partnered with American companies to incorporate its clean coal technology into new US and Chinese power plants.

Emissions measuring and trading

Innovations in trading emissions credits or measuring greenhouse gas emissions also are areas of opportunity. Both the US and China have committed to reducing greenhouse gas emissions in the years to come. Some studies predict that if a cap-and-trade programme ever is implemented in the US, the value of the American carbon trading market alone quickly could reach \$1 trillion per year. Beating the US to the punch, Chinese leaders are considering implementing a domestic market for trading carbon emissions credits as early as 2011.

A recent *Bloomberg.com* article reports a significant upward trend in inventions relating to tracking carbon emissions and trading credits, with patents issuing to, among others, US mortgage finance company Fannie Mae, which patented a system for trading greenhouse gas reduction credits earned by homeowners. Clean energy companies should focus on developing inventions for measuring emissions and trading credits. The US Supreme Court's *Bilski* decision, which issued in late June, ensures that the door remains open to patent innovative methods of doing business. However, keep in mind that more specialised claim drafting techniques may be required, since it is

not yet known precisely how the Patent Office and the Federal Circuit will assess the patentability of business method inventions in view of the Supreme Court's ruling.

Deep water wind farms

The US government recently approved construction of the country's first offshore wind farm, which will be built miles off the shore of Cape Cod in Massachusetts. As the market for offshore wind farm technology grows in the US and around the world, innovators should focus on developing technologies for the next generations of wind turbines. For example, StatoilHydro is a Norwegian oil and gas company that is leveraging its deep water oil drilling expertise to develop floating wind turbines capable of operation in deep ocean waters, miles from shore.

Electric and plug-in hybrid vehicles

The electric vehicle (EV) market is poised to boom. EV ventures made up nearly 40% of \$1.9 billion invested in 180 green technology companies worldwide in the first quarter of 2010, according to a study by the Cleantech Group and Deloitte. In America, Nissan's all-electric Leaf has not even arrived yet, but it is already sold out for this year. In China, the focus is just as palpable, with this year's Beijing Auto Show featuring nearly 100 vehicles powered by electricity or some other alternative fuel. To date, Japanese applicants

have accounted for 70% of EV patents worldwide. In China, data from the State Intellectual Property Office shows that around 1000 EV-related patent applications already have been filed. As EV development accelerates worldwide, inventors in other countries should remember the importance of seeking patent protection for the many innovations yet to come. Silicon Valley venture capital firm Kleiner Perkins believes the transportation industry is undergoing its largest transformation since Henry Ford built the Model T more than 100 years ago.

Nuclear

In both the US and China, nuclear power is an increasing focus as part of the solution to satisfying our rising demand for energy while reducing greenhouse gas emissions.

The Obama administration has asked Congress for \$54.5 billion dollars in nuclear loan authority as part of its 2011 federal budget. Energy Secretary Steven Chu estimates that this could support the construction of six to nine new reactors over the next few years. In China, leaders have approved construction of 28 new reactors by 2020, and the first 20 of these reactors are already being built. This creates a wealth of opportunities for clean energy innovators, from developing technology for using non-enriched uranium in reactors, to designing more efficient reactors, to creating novel ways for reprocessing or storing reactor waste. Intellectual Ventures recognises this and with Microsoft founder Bill Gates has formed a startup company called TerraPower to focus on developing innovative nuclear reactor technology.

Clean energy patent strategies

There are a number of ways in which IP owners can protect and exploit their rights in green technologies.

Maintain a strong patent portfolio

A strong patent portfolio often will be a clean energy company's main asset because the company is focusing on developing innovations and ideas, rather than tangible products. Even where actual products are being developed, cleantech companies regularly focus on R&D, partnering with larger companies to get products manufactured under licence.

A well-developed portfolio of patents or pending patent applications also can be key to securing financing for a cleantech startup. Venture capitalists must be certain the essence of their investment – the IP of the company – is protected properly.

Foster innovation

To thrive in the low carbon economy, companies must develop and encourage a culture of innovation. Employees should be motivated to think creatively, and be educated about the importance of innovating and obtaining patents. Companies of all sizes should establish incentive programmes that recognise and reward employee creativity – particularly where it results in inventions and patents. A recent ipPerformance Group survey finds that companies with such programmes are far more innovative.

Regular employee innovation brainstorming sessions should be encouraged. Since cleantech innovations often meld principles from traditionally separate areas of science and engineering, companies should bring employees with diverse technical backgrounds together for brainstorming sessions. Someone with a background in physics or chemistry, for instance, may offer fresh insights to a team of electrical engineers and computer scientists struggling to come up with an innovative solution for a smart grid start-up. If possible, patent attorneys should be invited to attend or review the results of every brainstorming session. Intellectual Ventures does this and, according

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to *Businessweek*, generated 500 patent applications over the course of just 70 brainstorming sessions.

Value incremental inventions

When formulating a patent strategy in the clean energy sector, it is important to remember that incremental innovations based on existing technology may also be patentable and commercially valuable. Thomas Edison understood this principle, and many of his most valuable patents were for incremental inventions. His patented light bulb, for example, was an incremental improvement upon an incandescent electric lamp developed 20 years earlier by another inventor, Joseph Swan. Innovations directed at incremental improvements in efficiency and profitability of existing energy technologies are excellent candidates for patent protection.

Review other patents

A wealth of information can be obtained by studying clean energy patents owned by others. Such patents can be springboards for patentable improvements or alternative designs. For years, many companies refused to look at US patents owned by others, fearful of possibly triggering liability for wilful patent infringement in an American lawsuit. These fears should be diminished now, since the Federal Circuit in *Seagate* made it more difficult to prove wilful infringement.

Being aware of the patent landscape also will help a cleantech innovator avoid investing time and money developing technology only to later learn that the technology has already been patented by someone else. However, keep in mind that many pending patent applications are unavailable to the public until they are published, or in some cases until they issue as patents, so one can never assume having complete knowledge of the landscape.

Joint venturing and cross-licensing

US and Chinese cleantech companies should consider proactively using their patent portfolios as leverage to share in the technical innovations of others. Collaborative patent portfolios will be rewarded with a greater freedom to operate and innovate, while remaining competitors will be left trying to design around a wall of cross-licensed patent portfolios. Such licensing arrangements in addition give the larger company a financial incentive to protect the invention. Would-be infringers may be deterred, and enforceability of the patents is effectively strengthened, because the expense of a patent infringement suit filed by the cleantech patent owner could be subsidised by the larger company.

Small clean energy start-ups should also consider joint venturing or licensing arrangements with larger companies, especially if the enterprise is in a foreign market the start-up wants to enter, such as the US or China. Larger companies have greater financial, marketing, distribution, and manufacturing resources, and often more extensive regulatory knowledge. This may be one reason nuclear start-up TerraPower is considering joining forces with Toshiba Corporation, one of the world's biggest players in nuclear power, and electric vehicle start-up Tesla Motors is partnering with automotive giant Toyota, according to recent reports in the *Nikkei Business Daily* and *The New York Times*.

Partnering with an established Chinese company can also help ensure that US

clean energy innovators are given a fair shake in competing for government-financed energy projects in China (and *vice versa* for Chinese innovators looking to compete for government-financed energy projects in the US).

Strategic acquisition

Clean energy companies should also consider reinforcing their IP portfolios by strategically acquiring patents or IP rights from others. Universities and research institutes can be sources of valuable inventions. MIT's website lists at least 30 different clean energy patents available for licensing. Attending patent auctions organised by IP brokerage companies such as ICAP Ocean Tomo may also be time well spent, as patent owners unable or unwilling themselves to commercialise their own clean energy inventions take advantage of the thriving marketplace for patents.

Trade secrets

In some situations, keeping innovations as trade secrets may be preferable to patenting or publishing them. When a company has taken reasonable steps to protect its innovations, trade secret protection can prevent exploitation by others of illegally obtained information regarding the innovations. This protection can potentially extend indefinitely (the recipe for Coca-Cola, for example, has successfully been kept a trade secret for more than 120 years), offering an advantage over patent protection, which normally lasts only 20 years from the date of filing a patent application.

A decision not to patent a clean energy innovation comes with risks and should be considered carefully because trade secret protection can be lost easily. If another person independently discovers the innovation, any trade secret protection is lost. This risk should not be overlooked, especially in an environment where many companies are likely to be simultaneously attempting to solve the same energy problem, and in doing so may be discovering and using similar internal processes. Opting for trade secret protection over patent protection also limits licensing opportunities because trade secrets can only be licensed under carefully drafted nondisclosure agreements.

Toward a clean culture

The US and China must seize the opportunity to lead the world in tackling the climate change challenge and transforming how we generate, transmit, and use energy. Innovation will be key to seizing and maintaining this lead. Companies in the clean energy sector in both countries will thrive by fostering a culture of constant innovation and adopting and following through on intelligent strategies for protecting their IP.

On managingip.com

- EPO to reveal new green energy classification, April 2010
- Get your green technology to the head of the line, March 2010
- EPO leads debate on patents and climate change, February 2010
- USPTO pilot will expedite green patents, December 2009
- IP owners rally to protect green patents, May 2009



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