World Politics Review®

"Geopolitics Redrawn: The Changing Landscape of Clean Energy," by Ryan Hodum, was originally published by World Politics Review on Feb. 16, 2010.

The HTML version of this article can be found here:

http://www.worldpoliticsreview.com/article.aspx?id=5128

# GEOPOLITICS REDRAWN: THE CHANGING LANDSCAPE OF CLEAN ENERGY

## BY RYAN HODUM

A large-scale deployment of clean energy technology is gaining speed on the global stage, causing shifts of significant geopolitical consequence. As clean energy moves from margin to mainstream, it is set to alter the balance of energy security and energy power among key regions of the world. Nations will redraw the energy map, both by assessing access to renewable resources and evaluating their traditional alliances. The degree to which frameworks are established so that clean energy drives not just competition, but also cooperation, will be key to determining the impact it ultimately has on international relations.

Energy transitions take time. It took 100 years for coal to go from supplying 10 percent to 60 percent of the world's commercial energy. Thereafter, it was 60 years after the introduction of oil as a fuel source before it supplied 50 percent of the world's energy. But even though it is only now gaining prominence, the shift to clean renewable sources of energy is well underway, with current investments exceeding $200 billion per year.

Increasingly, global leaders have begun to characterize the clean energy transition as a race for innovation, jobs, and -- in no uncertain terms -- economic prosperity. In his State of the Union address, President Barack Obama took a page from New York Times columnist Thomas Friedman, saying, "The nation that leads the clean energy economy will be the nation that leads the global economy. And America must be that nation." Although it is politically convenient to characterize this 21st-century trend in a competitive frame, clean energy deployment will also deliver renewed levels of bilateral and multilateral cooperation. In other words, clean energy deployment does not have to be a zero-sum game, even if that assertion doesn't make for headline-grabbing sound-bites.

Last year, the "race" for clean energy leadership received a shot in the arm from the near-term stimulus measures with which major countries responded to the financial crisis. The resulting global allocation of capital into low-carbon energy sectors amounted to more than $500 billion, according to HSBC, with most of the investment coming from China, the United States, South Korea, and the European Union, in that order. The bulk of this capital infusion is being driven into energy efficiency, mass transit, renewable energy deployment, and Smart Grid technologies.

It's no surprise that in the midst of a global economic downturn, clean energy is being touted for the long-term savings it represents. After all, the "true cost" of the current energy system is best accounted for not only in its volatile prices and tight supplies, but also in the environmental impact of climate change -- as evidenced by water scarcity, reduced food access and damaged ecosystems. According to the World Resource Institute, over 60 percent of global greenhouse gas emissions are linked to energy production, delivery, and use. Globally, the International Energy Agency projects an extra $500 billion in costs to cut carbon emissions for every year that countries delay serious action to mitigate.

But if those cost considerations have begun to compel action, the transition to clean energy is not a panacea and will come with as many challenges as opportunities. As a result, the tension between competition and cooperation will have to be well-managed as clean energy remaps key features of the geopolitical landscape. Four areas in particular will play a growing role in determining the impact of clean energy on global power redistribution: the redirection of capital flows to clean energy; limited access to materials needed in clean energy manufacturing; intellectual property rights in the distribution of clean energy technology; and the emerging importance of clean energy in international diplomacy.

### CLEAN ENERGY CAPITAL FLOW

Over the last five years, total global annual investment in clean energy has grown from $36 billion to $145 billion, according to New Energy Finance, a leading provider of clean energy research and trends, with total transactions amounting to over $200 billion in 2009. In January of this year, U.S., European and Australian investor groups representing $13 trillion in assets called for rapid action on carbon emission limits, energy-efficiency and renewable energy-financing mechanisms, and other policies that will accelerate clean energy investment. These signals make it clear that global investors believe there are competitive advantages to adopting comprehensive climate and clean energy policies which benefit what has come to be known as the "triple bottom line": people, planet and profit.

> Clean energy deployment does not have to be a zero-sum game.

Clean energy is also benefiting from global investors' focus, in the aftermath of the financial crisis, on stable investment environments, by

driving policy in ways that will attract investment. Deutsche Bank, for example, has concluded that "investors will become increasingly concerned about regulatory risk and thus countries that deploy a transparent, long-lived, comprehensive and consistent set of policies will attract global capital." It has subsequently identified certain countries with a lower risk profile for climate change investments, including China, Brazil, Germany, France, Japan and Australia. Similarly, Ernst & Young's "Renewable Energy Country Attractiveness Indices" evaluates national support for clean energy technologies -- including wind, solar, and biomass. In their most recent assessment, the United States and China rank first and second in deploying clean energy and creating a policy environment for growth and investment.

In addition to investors mobilizing capital as part of the clean energy transition, many leading pension funds -- such as ABP in the Netherlands, Sheet Metal Workers Pension Fund in the United States and USS in the United Kingdom -- have begun to respond to the threat posed by climate change by directing some of their assets to clean energy funds. As these global capital flows increasingly reward forward-looking policy, they are likely to create a "virtuous cycle" for clean energy development and implementation.

However, amid this unparalleled level of capital investment, controversy over clean energy has begun to spring up "at the border." The comprehensive climate and energy bill recently passed by the United States House of Representatives included provisions for trade barriers against countries that fail to adopt aggressive measures to reduce emissions. This has introduced a level of green protectionism into discussions on clean energy deployment, something that is not limited to American posturing. In January, French president Nicolas Sarkozy announced his support for a carbon tax at the borders of the European Union to tackle the effects of climate change and encourage clean energy deployment. This particular border tax-adjustment proposal also received support from German Chancellor Angela Merkel, among others.

The redirection of capital flows to clean energy has resulted in widespread support for low-carbon technology, a trend that will continue well into the next decade, despite the recent financial collapse. However, as governments begin to evaluate their options for low-carbon growth, concerns about unfair advantage and competitiveness will remain prevalent.

Clean energy trade disputes will not be resolved immediately. Taking the U.S.-China bilateral relationship as an example, where clean energy has been elevated to a priority issue between both governments, the so-called G-2 is beginning to systematically address trade tensions related to clean energy deployment -- but not without difficulty. Recent successes include a visit to China by U.S. Commerce Secretary Gary Locke during which the Chinese government announced it would drop its domestic content requirement mandating that 70 percent of wind-power components be produced within China. However, at the same time in the U.S., protectionist fears were directed against the Chinese-owned firm A-Power Energy Generation Systems when it applied for federal Recovery Act grants through a consortium building a wind farm in western Texas.

In fact, there is much more to be gained through collaboration on clean energy development between the two countries than through protectionist competition. The North Carolina-based public utility company Duke Energy has been negotiating a wind power deal in the United States with China's biggest power-generation enterprise, China Huaneng Group. That effort complements Duke's ongoing engagement with China State Grid to develop a joint venture to set up power transmission lines in the United States -- a sector in which China has already been leading, with the world's most-advanced ultra high-voltage transmission lines.

Similar opportunities have been abundant for both countries. Examples include: First Solar, the American thin-film solar module manufacturer, signing an agreement to build the world's largest photovoltaic power plant to date in Inner Mongolia; Suntech Power, the Chinese solar photovoltaic manufacturer, announcing plans to build a manufacturing facility in Arizona; and American Superconductor Corporation entering into more than $700 million in contracts with Beijing-based Sinovel Wind.

The challenges and opportunities of clean energy deployment are being exploited by innovative companies in both countries, with measured government support delivering a needed policy framework to foster collaboration. If such a model were to be applied more widely, it could preclude tensions that otherwise lead to knee-jerk protectionism and subsequent conflicts.

## LIMITS TO CLEAN ENERGY GROWTH

As recently as 10 years ago, most clean energy technologies were considered cost-prohibitive compared to their conventional counterparts. However, recent advances in technology and manufacturing have delivered improvements to performance, reliability, and price. In 2008, according to REN21, both the United States and the European Union added more capacity from renewable energy than from conventional power sources. Clean energy solutions have been tested, deployed and scaled in nearly every major country: Canada is advancing carbon capture and storage techniques, Japan has been a global leader in energy efficiency for decades, China has recently taken the lead as the world's largest wind turbine manufacturer, while ethanol in Brazil, Smart Grid systems in Denmark, and geothermal in Iceland are just some of the many other breakthrough clean energy technologies.

Notwithstanding this significant progress, hurdles remain. Supplies of critical materials to manufacture key clean energy technologies, like wind turbines and electric vehicle batteries, are scarce and only found in a few countries, raising concerns among technology developers and national security planners.

To use wind turbines as an example, the primary materials needed for manufacture include steel, concrete, magnetic materials, aluminum, and copper, to name a few. Obviously, there are no significant economic constraints to the bulk materials involved: One can expect that steel and concrete will not grow scarce in a global wind energy scale-up. However, the magnets used in wind turbine gearboxes require neodymium, a rare earth element. Demand for neodymium may in fact strain production and lead to dependency on insecure supplies.

The world's largest rare earth deposits are located in China, the source of more than 90 percent of U.S. rare earth imports in 2007. China recently made public its plans to strengthen its control over these materials, with the country's leading producer of rare earth metals, Baotou

Rare Earth, confirming on Feb. 12 that it had been given government approval to build a strategic reserve in Inner Mongolia.

For electric vehicles, it is not only rare earth materials that are problematic, but also the lithium used in lithium-ion batteries. Half of global lithium reserves are located in Bolivia (though they are not yet economically recoverable), and the majority of the world's recoverable reserves are found in neighboring Chile. Solar photovoltaic panels require indium, gallium, germanium and silicon, to name a few. The United States depends completely on foreign gallium and indium, and is over 80 percent dependent on imported germanium. In addition to China, these particular materials are also located in central Africa and Russia.

As a result, one concern in the transition to clean energy is that countries like the United States may be weaning their addiction to Middle Eastern oil (e.g., by investing in hybrid electric vehicles), only to develop a new dependence on imported Chinese minerals.

### INTELLECTUAL PROPERTY RIGHTS AND CLEAN ENERGY TECHNOLOGY

An additional hurdle to large-scale clean energy deployment, according to conventional wisdom, is the lack of protection for intellectual property rights (IPR). The United Nations Framework Convention on Climate Change -- the multilateral environmental treaty charged with stabilizing greenhouse gas concentrations in the atmosphere -- calls for developed countries to assist developing nations through clean energy technology transfer. The issue of IPR is central to many of the polarized negotiations regarding the deployment of clean energy technology, not only for the country members of this treaty, but across the private sector. In many cases, concerns over IPR issues pose a barrier to clean technology diffusion.

While not an explicit response, increasing collaboration in research and development is a potential method to dodge the IPR dispute. Using the case of the United States and China again, Presidents Barack Obama and Hu Jintao recently announced the development of a U.S.-China Clean Energy Research Center to facilitate joint R&D between scientists and engineers from both countries. Its initial focus will be on building energy efficiency, carbon capture and storage, and electric vehicles. At a political level, the announcement was significant, as it allayed fears that the Copenhagen negotiations would be beset by a major battle over IPR, pitting the United States and Europe against the G-77 (the loose coalition of developing nations, supported by China during climate negotiations).

There are a variety of reasons why this narrative may require a more nuanced assessment, especially with the changing geopolitical landscape. Trends to follow include China's growing concern about its own IPR protection as it begins to export more and more clean technology to global markets, as well as new open-source methods for clean energy uptake, such as the Eco-Patent Commons (an initiative to create a free collection of patents that protect the environment).

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### INTERNATIONAL RELATIONS TURN A SHADE OF GREEN

Effective diplomacy requires using both carrots and sticks, and as clean energy begins to play a greater role in international relations, it will need to be guided by similar frameworks. These incentives and threats will facilitate broader goals of global development, such as energy access, poverty alleviation, and respect for sovereignty. Indeed, the shifting geopolitical landscape has already resulted in the emergence of new organizations designed to drive clean energy with carrots, in addition to a set of sticks to compel action.

In addition to existing international organizations like the World Bank and the United Nations Environment Program, new multilateral organizations have been launched to support continued deployment of renewable energy throughout the developing world. Most notable is the International Renewable Energy Agency (IRENA), the first agency dedicated to advancing clean energy worldwide. The IRENA charter tasks the agency with delivering support to governments on renewable energy policy, capacity building, and technology transfer.

Traditional geopolitical concerns also help drive the logic of clean energy implementation. In Eastern Europe, for instance, clean energy is being used as a hedge against Russian natural gas. After decades of pollution under Communist rule, many countries in the region are lessening their energy dependence on Moscow by investing in wind and bio-gas. Within two years, Belarus will increase renewable energy to 25 percent of its mix. Bulgaria is financing wind development, with a goal of over 200 MW of electricity generated by wind farms adjacent to the Black Sea within two years, up from 16.5 MW in 2009. Poland has been investing aggressively in wind energy and recently has included bio-gas installations in its portfolio.

Clean energy can also serve as a way to build connections between regions. France has been leading an effort called the Mediterranean Solar Plan to build concentrated solar hubs across North Africa, in order to develop capacity and expand energy security, in countries like Jordan and Morocco, and facilitate export of green electricity to Europe. The project is part of an initiative to bring the interests of the European Union and North Africa closer together.

Global investments in biofuels and vehicle electrification represent an attempt to turn oil into a commodity like any other (comparable to wheat or steel, for example), thereby freeing countries from being held politically hostage to oil interests. Global ethanol investments, for example, have begun to deliver some competition to the Organization of the Petroleum Exporting Countries (OPEC). Recent analysis from Merrill Lynch shows that the growing volume of biofuels in the global fuels market may be one factor helping to keep oil prices low. Recently, Royal Dutch Shell announced plans to create a

$21 billion per year ethanol joint venture with Brazil's Cosan. The investment has already been heralded as a key step toward helping ethanol become a global commodity.

Finally, clean energy might eventually play a role in efforts to reinforce the nuclear nonproliferation regime. The core concern over Iran's uranium enrichment program, for instance, is that it uses the goal of nuclear power to mask a drive to develop an atomic bomb. But with the proper incentives, Iran -- and other countries searching for a secure, domestic base-load energy source -- might be convinced to direct large-scale investment to concentrated solar power. Based on its geographic location, Iran is particularly well-suited for solar power. Such an effort would help the country diversify away from oil and natural gas reserves, not to mention domestic nuclear power, toward a technology option that does not rely on imported fuel. Last month, Iran inaugurated its first concentrated solar power (CSP) plant, according to the Iran Daily, while another -- initially a joint German-Iranian effort - is being planned. The latter, if completed, would be the world's first integrated solar combined-cycle (ISCC) power plant --- combining solar power, waste heat recovery and a gas turbine plant.

## CONCLUSION

Clean energy deployment has far-ranging implications on international trade and global energy security, not to mention the natural environment. There is already evidence that its diffusion can present a hedge against threats while delivering a more sovereign form of energy. Additionally, the global threat of climate change is shifting dynamics toward collaboration, and not limiting political actors to zero-sum competition. Various trend-lines are readily apparent on the global stage, as clean energy technology receives long-term support from both nation states and capital markets.

The contest for global investment capital is well underway, with countries continuing to support clean energy mandates and incentives as a key driver for finance. The Brazilian government has supported long-term renewable energy policies for over a decade. As a result, it currently has the highest level of clean energy investment per share of GDP.

Meanwhile, tensions between competition and cooperation persist, even if politicians and business leaders alike show selective memory on the issue. While the Danes and Germans were gaining market share in the global wind turbine industry over the last decade, few American leaders cried foul. Now, China's leap past both is drumming up protectionist fervor.

More subtle still are the initial shifts in traditional power balances revealing opportunities in diplomacy, trade relations, and security. From a strategic alliance on clean energy between the United States and China to clean energy research hubs in Abu Dhabi and base-load solar power in Iran, political leaders have only just begun to investigate the policy spectrum clean energy affords. □

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