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Clean Energy

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AN ULTRA-DYNAMIC GAME OF CHESS

Keeping pace with the rapidly-changing clean energy industry can be a real challenge. Successfully positioning a community to reap clean energy jobs and investment is an even trickier proposition. Understanding some of the less visible segments of the industry is one possible solution.

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Championing clean energy is like playing chess with the pieces AND the squares constantly moving around. Multiple forces are at work shaping, pushing, and pulling the industry. Legislation is ephemeral. Polysilicon prices have been extremely volatile over the past five years. Cheap natural gas complements wind power as a back-up source when the wind stops but also competes with it for market share. Game-changing technology is an ongoing occurrence. The game pieces (or in this case, industry sectors) all have their unique strengths and limitations.

In chess, the object is to capture the opponent's king. In clean energy, the object is to provide alternative energy sources that will meet the world's insatiable (and growing) demand for electricity, as well as protect our environment. Many add energy independence as an objective here in the United States. Meeting these objectives will require masterful orchestration of all the pieces and perhaps sacrificing a few pieces along the way, especially as many of the "game pieces" are competing against their teammates as well as their opponents for funding and talent.

This article will touch briefly on some of the most salient squares (industry fundamentals), move on to the most dynamic and versatile of the game pieces (industry sectors), and close with some thoughts on how economic developers can successfully play the game.

The reader is invited to pay particular attention to the sidebar conversations regarding the often-overlooked suppliers of the industry sectors. When someone mentions alternative energy, companies like First Solar, Hemlock, Vestas, Acciona, Th!nk, and others come to mind. But these are just the most visible elements of clean energy. There are extensive, less visible "root systems" forming to support alternative energy. In fact, the interconnectivity of the sectors is comparable to the root system of a tree grove, where the root systems are connected and the entire group of seemingly individual trees is actually just one tree.

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THE SHIFTING GAMEBOARD

Politics

Ever-changing governmental incentives and policies (or a lack thereof, some would argue – especially at the federal level) make long-term planning nearly impossible.

According to Grubb and Ellis's Clean Energy Practice Group, at the state level, "California is consistently the trendsetter, but not all regulations are industry-friendly. Other states come in and out of stardom based on incentive programs. New Jersey enjoyed strong growth in solar installations during 2011, but Massachusetts and Connecticut are expected to join California as top destinations in 2012, with Rhode Island ramping up for 2013." *(Source: Grubb and Ellis 2012 Real Estate Forecast)*

Traditionally, alternative energy grows most rapidly during periods of predictability in federal government incentives.

There are currently four key programs impacting industry expansion in clean energy:

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1. **Production Tax Credit (PTC) –** The renewable energy production tax credit was first passed in 1992 and has been heavily utilized since its inception. The PTC establishes a 10-year income tax credit of 2.2 cents per kilowatt-hour for electricity production from utility-scale turbines. Historically it has been renewed for only one to two years at a time, which does not allow for adequate project planning. For example, wind and solar generation projects require over a year of field testing before construction can begin. The current PTC legislation will expire on December 31, 2012.
2. **Investment Tax Credit –** The ITC was originally created by the Energy Policy Act of 2005 and later amended by the Emergency Economic Stabilization Act of 2008 and the American Recovery Act in 2009. It provides an uncapped 30 percent investment credit for residential and commercial solar projects.
3. **1603 Treasury Program –** The 1603 Program was passed in 2009 in response to an economy that was producing little in the way of tax liabilities from ailing corporations. Reduced tax liability due to the flailing economy meant a stagnant market for the PTCs and ITCs. Another means of incentivizing clean energy projects was needed. The 1603 Program allowed companies to elect a grant instead of a tax credit. The grants were equal to 30 percent of the qualified investment. Project construction must have begun by December 31, 2011 and be completed by the end of 2016 in order to qualify.
4. **Renewable Fuel Standard (RFS2) –** RFS2 sets national targets for the production of biofuels and is the key piece of legislation driving bioenergy. The current target is 36 billion gallons by 2022, which would equate to 15 percent of total transportation fuel consumption in the United States.

Clean energy companies strongly support these legislative initiatives and are constantly lobbying for their extension and/or expansion. The short-term (typically one to three years) and last-minute nature of the extensions is the biggest concern, as clean energy projects take multiple years to ramp-up, plan, and implement. Industry leaders argue they need a more stable landscape.

Transmission

"Currently, almost 300,000 megawatts of proposed wind projects, more than enough to meet 20 percent of our electricity needs, are waiting in line to connect to the grid because there is not enough transmission capacity to carry the electricity they would produce." (American Wind Energy Association)

Transmission constraints must be addressed if states are to achieve their renewable portfolio requirements, which IHS Emerging Energy Research estimates will require over 70 gigawatts (GW) of new renewable energy capacity by 2020.

China

The expansion of China's overall energy consumption is staggering. According to the International Energy Agency, China's consumption was less than half that of the United States as recently as 1990. In 2009 its consumption surpassed that of the U.S. and is on track to exceed it by 68 percent by 2035. *(Source: http://www.iea.org/index_info.asp?id=1479)*

Meanwhile, China is reputed to have taken over the title of the world's largest wind energy producer, and Forbes reports that China has gone from producing less than 1 percent of the world's solar panels in 2003 to producing over 50 percent by 2010. *(Source: http://blogs.forbes.com/kerryadolan/2010/11/30/the-china-clean-tech-divide-threat-or-opportunity/)*

Expect to see big growth in biomass in China, too. According to China Business News, the country plans to "expand its installed generation capacity of biomass power to 13 million kilowatts by the end of 2015. The figure doubled the former goal proposed by the China Electricity Council and is even higher than the planned installed capacity of solar power." *(Source: http://www.chinadaily.com.cn/business/2011-07/11/content_12878618.htm)*

Investment Capital

If the sustained deployment of capital into an industry is a measure of the industry's long-term viability and health, clean tech is doing well, with clean energy specifically leading the way. Because so many of the technologies, facilities, and companies in clean energy are new, venture capital has been a key ingredient to the industry's growth.

- According to Clean Tech Group, clean tech venture investments totaled $2.14 billion in Q3 2011. This was an increase of 6 percent over the previous quarter and 18 percent over the same quarter last year. *(Source: http://research.cleantech.com/resources/)*

Courtesy of DOE/NREL, Photoshop work performed by Raymond David

Transmission infrastructure constraints represent one of the biggest challenges to the future of renewable energy.

Key supply chain link: Inverter manufacturers

Inverters are needed to convert the energy by solar panels to alternating current electricity, which is then transferred to transmission power lines.

The inverter market has been tumultuous over the past several years, but the overall trend is growth. Recent statistics from IHS's PV Inverter Market Tracker indicate photovoltaic (PV) inverter shipments declined slightly in 2011 but will rebound to 5 percent growth in 2012 and more than double by 2015. *(Source: http://www.isuppli.com/Photovoltaics/Pages/PV-Inverters-Surviving-the-Storm.aspx?PRX)*

Power-One, the second largest manufacturer of solar power inverters globally, recently opened manufacturing centers in Phoenix, Arizona, and Toronto, Canada.

According to IMS Research, unlike all other aspects of PV manufacturing, inverter assembly is labor intensive and not reliant on manufacturing equipment. Supply and demand dynamics can be adjusted quickly via workforce reductions and additions when necessary.

At the same time, large central inverters "are typically highly engineered, with advanced functionality and design which attract healthy margins and also prevent low-cost competitors from stealing market share," says Ash Sharma, PV research director at IMS Research.

Courtesy of DOE/NREL Credit – Williamson, Robb, NREL Contract Photographer

Inverters and battery storage for photovoltaic system

- New Energy Finance reported global investment in clean energy and carbon markets was up 30 percent in 2010 over 2009, representing the highest investment since New Energy Finance started tracking the data in 2004.
- Drawing on data from Dow Jones VentureSource, Ernst & Young LLP reported a 73 percent increase overall in U.S. venture capital investment in clean tech in Q3 2011 versus Q3 2010, with fuel cell and energy storage companies accounting for the largest portion of the $1.1 billion total.

WHICH GAME PIECES ARE ON THE MOVE?

Solar Generation

In chess, the knight is the most unusual piece. Because it can move in an L-shape pattern in any direction, one square forward and two to the side OR two squares forward and one to the side, it is arguably the most versatile piece on the board, especially as it is the only piece that can jump over any other piece, making it particularly useful on a crowded board.

Likewise, solar has shown great versatility. It can be deployed to heat a swimming pool or residential home or a large manufacturing facility. Large solar farms provide utility-scale generation, but solar technology can also power everything from hand-held calculators to desk lamps to traffic lights.

As with any young industry, solar has experienced and will experience transitions and consolidations, as illustrated by the well-publicized bankruptcies of Solyndra and Evergreen. While these events have implications for the federal financing programs that had invested in the companies, a certain degree of fall-out is to be expected as technologies and business models are proven or fail. The failure of a few companies should not be interpreted as an omen for the entire industry.

The precipitous decline in polysilicon prices, while bad for the polysilicon sector, has improved solar's competitive position in the race for parity. Clean Edge projects "installed solar PV [photovoltaic] costs in the U.S. – without subsidies – will be competitive with residential electricity prices in more than half the states by 2020."

The growth in solar is not just about the solar panel manufacturers and the polysilicon plants. A lot of components and technology are required as well. Engineering companies are needed to do the resource field testing and IT specialists to design the monitoring systems.

- Shoals, which makes solar panel components, set up shop in Gallatin, TN, a couple of years ago.
- Xtreme Power is another rapidly expanding company, headquartered in Kyle, Texas, and manufacturing at multiple, U.S. locations. It designs, engineers, manufactures, and operates integrated energy storage and power management systems.
- Draker Labs of Burlington, VT, provides monitoring solutions for commercial and utility-scale PV systems.
- Unirac, based in Albuquerque, makes PV mounting systems and is doing very well. It just opened a manufacturing plant in Ontario, CA.

Wind Generation

The bishop, like wind energy, is a foundational part of any strategy. The bishop can move on any diagonal, for any distance, making it both powerful and flexible. However, it is limited to half of the squares on the board, either the black or the white. Likewise, wind generation is more limited than some of the alternative energy sectors in that not all locations have sufficient wind resources.

Offshore is a growing segment of the wind industry.

Wind energy has been around since before the industrial age and is arguably the largest and most established of the alternative energy sectors.

Bloomberg New Energy Finance predicts wind energy will be competitive with natural gas by 2016. *(Source: http://www.renewableenergyworld.com/rea/news/article/2011/11/wind-electricity-to-be-fully-competitive-with-natural-gas-by-2016-says-bloomberg-new-energy-finance??cmpid=WNL-Wednesday-November16-2011)*. Pike Research predicts a doubling of total installed wind capacity in North America over the next six years. Community and offshore wind are growing in importance and market size.

As mentioned earlier, though, we need to look beyond the big wind farm developers and turbine manufacturers to see the full impact of the growth of this sector. Metal components make up nearly 90 percent of the weight and over one-third of the value of a wind turbine. The annual demand for turbines is projected to double during the next few decades, which means we're going to need forges, foundaries, fabricators, machine shops, and integrators.

Companies like Vestas, Nordex, and Iberdrola have been working hard to build up the supply chains they need here in the states.

Key supply chain link: Repair and parts distribution facilities

There will be greater demand for consolidated parts warehouses and repair facilities to service large, even multi-state jurisdictions rather than a particular farm. These facilities will need strong floors, big cranes, and high clear heights.

Smart Grid Technology

Like the queen, smart grid technology is clearly the most powerful force on the clean energy game board. It is the lynchpin of any clean energy strategy and all sectors – building blocks on which all of the clean energy sectors depend, and arguably traditional energy sources, as well. It's comprised of meters and software and monitoring systems, all integrated to provide optimal distribution and consumption of electricity.

Smart grid technology is what will make it possible to effectively utilize distributed energy generation (think solar panels on residential roofs feeding energy to the grid and wind energy generation in one region meeting another region's demand) and integrate energy-saving demand management features for appliances and systems at home and work.

Bloomberg New Energy Finance refers to smart grid technology as Digital Energy, citing "Digital energy is about the convergence of the traditionally unconnected energy, telecoms and information technology industries." Even more succinctly, a Duke Energy spokesperson says, "The 21st century electric company is a technology company disguised as a utility." *(Source: Duke Energy: Today's utility a technology company in disguise - FierceEnergy http://www.fierceenergy.com/story/duke-energy-todays-utility-technology-company-disguise/2011-04-26#ixzz1OFqWQCCp)*

Smart grid demonstration projects are occurring across the United States. Take for example the Pacific Northwest Smart Grid Demonstration Project (PNW-SGDP). PNW-SGDP is one of 16 smart grid demonstration projects funded by the U.S. Department of Energy. It incorporates many of the key functions of the future smart grid across 60,000 metered customers and five states (Idaho, Montana, Oregon, Washington, and Wyoming).

Many smart grid companies look like technology companies, incorporating sophisticated software to design and monitor smart grid systems:

- ***Consert:*** *smart grid technology provider,*
- ***SmartSynch:*** *smart grid infrastructure company,*
- ***Powerit Solutions:*** *energy management systems, and*
- ***Alstom:*** *converters.*

Key supply chain link: Managed services

Pike Research anticipates smart grid will create a sizable new market for managed services in the utility sector. They estimate it will increase from $470 million in annual revenue in 2010 to nearly $4.3 billion by 2015.

We're seeing players from several different industries, such as the IT sector, the communications product and services sector, and the manufacturing sector. Key categories of managed services players include the following:

1. Telecom providers like Alcatel-Lucent, AT&T, Ericsson, Verizon, and others.
2. Large traditional IT companies such as Accenture, Capgemini, CSC, HCL, IBM, Lockheed Martin, SAIC, Siemens, Wipro, and others.
3. Smart grid companies including Itron, Tendril, Trilliant, and others.
4. Application outsourcing providers such as Comverge and EnerNOC.

(Source: http://www.pikeresearch.com/research/smart-grid-managed-services)

Courtesy of DOE/NREL, Credit - Warren Gretz

Flywheel technology is one possible technology for storing energy. It is based on transferring the energy to a kinetic battery spinning at very high speeds. When the flywheel is slowed, the energy is released.

Battery Technology

One of the biggest challenges to distributed energy generation is the intermittent nature of it. The sun isn't always shining and the wind isn't always blowing. How can we store energy when we can make it and save it for those times when we can't? Battery technology will be the lynchpin in solving this issue. It can be likened to the rook in chess because its ability to cover and integrate the entire board illustrates its role as a foundational element of renewable energy.

While no one technology owns this sector, flywheel seems to be one of the most promising, with companies like Beacon Power and VYCON earning a lot of interest.

Electric Vehicles

Electric vehicles (EVs) represent the other rook. Electric vehicles have great potential, as well, and are likely to become an integrated piece of the equation.

Since 2009, the U.S. Department of Energy has invested over $5 billion to spur growth in electric vehicles and related battery manufacturing. Bloomberg New Energy Finance estimates plug-in electric vehicles could make up 9 percent of auto sales by 2020.

While the Midwest has seen significant investments from EV manufacturers, in the last few months, two manufacturers established U.S. headquarters in Los Angeles: China-based BYD and Coda Automotive. *(Source: http://www.linkedin.com/news?viewArticle=&articleID=922451026&gid=2582646&type=member&item=81366797&articleURL=http percent3A percent2F percent2Fwww percent2Escpr percent2Eorg percent2Fprograms percent2Fmadeleine-brand percent2F2011 percent2F11 percent2F18 percent2F21460 percent2Felectric-car-manufacturers&urlhash=nX9u&goback= percent2Egde_2582646_member_81366797)*

Of great interest is the massive infrastructure shift that will be required to accommodate adoption of EVs, including specialized fueling stations and fueling docks in gas stations, parking lots, personal garages, and corporate campuses. Over 1,800 electric vehicle chargers have been installed under the Recovery Act by Coulomb Technologies, ECOtality, General Motors, and others.

Wireless charging, called inductive power transfer (IPT), could leap frog the entire charging station demand. Companies like HaloIPT and Siemens/BMW are testing IPT systems that use magnetics to transfer energy from a pad on the ground to a pad in the EV. Parking an electric car over the pad, or even just driving over it, is all that is required for an immediate, full charge. The magnetic pads could even be put directly in roadbeds, allowing EVs to keep rolling indefinitely.

GLOSSARY

Biomass – Renewable organic materials, such as wood, agricultural crops or wastes, and municipal wastes used as a source of fuel or energy. Biomass can be used directly (incineration/burning) or converted into biofuels such as ethanol and methane.

Biomass gasifier – Piece of equipment that heats the biomass to high temperatures to create "syngas" (synthetic gas), which can then be combusted as a fuel.

Distributed energy generation – Generation of electricity from many small sources in various locations as opposed to large, centralized sources such as coal and nuclear power plants. Examples of distributed energy generation include residential and industrial rooftop solar installations, small wind turbines, and fuel cells.

Feedstock – Biomass materials used to generate bioenergy, including corn, sugarcane (ethanol), algae, woody products, soybeans, and oilseeds.

Grid – Electric infrastructure for transmission and distribution of electricity, including network of power lines and accompanying equipment.

Incineration – The most common waste-to-energy technology, consisting of combustion of waste to create heat which in turn is used to boil water and power steam generators to make electricity.

Inverter – An electrical component that converts the variable DC output from solar panels into AC power that can be fed onto the grid.

Parity – The point at which renewable energy prices become competitive with the retail rate of conventionally-sourced energy. Parity is typically discussed as occurring "in the absence of subsidies for the renewable energy," although many would argue that conventional sources of electricity are also subsidized.

Photovoltaic (PV) solar – Generation of electricity through the use of solar panels and semiconductors to convert sunlight into electricity. Photovoltaic solar is one type of solar technology. The other most common technology is concentrated solar power (thermal solar), which uses mirrors to focus sunlight into a single beam which is then used to heat water and, in turn, the heated water can be used to create electricity.

Plasma gasification – A waste-to-energy technology which converts the biomass into a plasma and creates two by-products: glass-like substances which can be used for household tiles and syngas (synthetic gas) which can be converted into ethanol, natural gas or other fuels.

Pyrolysis – Pyrolysis involves the thermal decomposition of biomass. It is related to combustion and gasification but occurs earlier in the chemical reaction process. By-products include biochar, bio-oil, and syngases.

Courtesy of DOE/NREL, Credit - IKEA Orlando

Solar powered charging station for electric vehicle.

And it's not just the manufacturers of the chargers, but the companies, like Evgo, that are packaging the charging services with the hardware. The sum of $89/month buys you an installed home dock and a key card that gives you access to all public charging stations, called Freedom Stations. These Freedom Stations are going into the parking lots of places like Walgreens and Best Buy. So far, the concept has been launched in Houston and Dallas/Ft. Worth.

Bioenergy

While solar technology was likened to a knight because of its versatility, bioenergy can be likened to a knight because of its unpredictability. Bioenergy has a number of factions (including biomass, biogas, and biofuels), any or all of which have the ability to expand rapidly under the right conditions. The question is whether they will have the luxury of the right conditions – namely favorable government policies, incentives, and regulations, as discussed earlier in this article – and, if they do have the luxury, which sectors will move the fastest.

Many are expecting big things from the biofuels sectors, with significant demand coming from the U.S. military. A number of conversion technologies are proving viable.

Biomass refers to any number of materials related to living organisms that can be burned to create energy. These materials include everything from wood pellets to manure to municipal waste to crop "leftovers." These materials can be burned directly to create heat and/or power turbines and gasifiers which create electricity, or they can be converted into fuels which are then burned to power vehicles and equipment.

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According to RISI, a U.S.-based research and information firm that focuses on the forest products industry, "In both the U.S.A. and Canada, national policies have been much more heavily focused on developing biofuels production rather than biomass heat and power. The focus on biofuels is founded on national security concerns in the U.S.A., due to a heavy reliance on imported oil." RISI expects the wood-fired energy sector to have the largest share of bioenergy development, as measured by tons of biomass consumed. *(Source: http://rpn.baumpub.com/opinions/221/the-bright-future-in-biomass)*

However, the biofuel sector faces feedstock challenges. Use of food crops drives food prices higher and results in consumer outcry. Even with non-food crops, agricultural techniques are under pressure to be sustainable and minimize water consumption. Fortunately, non-food crops such as jatropha and oil from algae are showing great promise.

Anaerobic Digesters

Anaerobic digesters capture methane gas (the main "ingredient" in natural gas) from manure. Biomass Magazine reports anaerobic digesters (biodigesters) are on the rise, with the annual kWh output quadrupling between 2001 and 2007. *(Source: http://biomassmagazine.com/articles/3009/biomass'--role-in-the-energy-future)*

BioCycle offered these statistics as of April 2011:

- 167 currently operating digesters in 33 states
- 137 dairy, 23 swine, 5 poultry, 2 beef
- Top 5 states (in terms of total number of operating digesters): Wisconsin – 26, New York – 23, Pennsylvania – 19, California – 14, Vermont – 10. (Pennsylvania has had the most new systems become operational in the past year)
- 156 farm-scale, 11 centralized/regional
- Energy generation in 2010 was 453,000 MWh equivalent (compared to 374,000 MWh in 2009)

(Source: http://www.jgpress.com/archives/_free/002318.html)

Waste-to-Energy

The marriage of alternative energy generation with waste management makes a very interesting marketplace. Waste-to-energy provides benefits to both partners. In

Biomass uses organic materials and wastes to create energy.

economic terms, the demand for waste management is highly inelastic and not subject to cyclical forces, which helps to stabilize the still-turbulent alternative energy market. Meanwhile, landfill sites are increasingly difficult to come by and minimizing the amount of material sent to a landfill is a complementary sustainability initiative that pairs well with the desire to create renewable energy sources. In other words, waste-to-energy is attractive across a wide range of factors.

A recent report from SBI Energy projects markets for various waste-to-energy technologies (including incineration, plasma gasification, pyrolysis and anaerobic digestion) to grow at a rate of approximately 11 percent over the next 10 years. *(Source: http://rpn.baumpub.com/opinions/219/waste-to-energy-on-the-rise by Keith Barker, Recycling Product News, April, 2011)*

Biomass Suppliers

Growth in the biomass marketplace obviously means growth for its supplier base. The most critical suppliers are obviously the feedstock sources – waste collection organizations, farmers, etc. But the industry also requires gasifiers, grain handling equipment, wood grinders and chippers, piping, boilers, generators, and specialized design and construction firms. Most of these companies are not dedicated exclusively to biomass, which makes it difficult to find a centralized listing. Sponsor and exhibitor listings for biomass trade shows can provide insight on whose targeting this sector.

Energy Management

Comparing energy management (efficiency) to a pawn may seem belittling. However, while a single pawn is the weakest chess piece, there are more of them than any other piece. Likewise, any one energy efficiency technique deployed in a single building or home is not tremendously significant, but when taken in aggregate, energy management initiatives can be transformative. After all, the cleanest energy is the energy not used.

While smart grid, described earlier, is the most dynamic sector within energy management, efficient lighting, window tinting, and other approaches to energy management are also being increasingly adopted. As the discipline of energy management moves to the mainstream of everyday business, energy efficiency and renewable energy generation become two points on the same continuum. Users increasingly intermingle these two approaches in their efforts to lower energy costs.

HOW SHOULD ECONOMIC DEVELOPERS PLAY THE GAME?

Economic developers are being asked to foresee the unforeseeable in order to position their community and businesses for the future. Getting it wrong means making the headlines if you support a company or technology that doesn't make it. ***Not*** making the headlines can be just as bad, if your stakeholders are expecting you to cash in on this "obvious" clean energy trend they're all reading about in the media.

Do we know what the world will look like in five years? No, but we know it won't look like what it does now. So if you do nothing, you're ***guaranteed*** to fall behind. If you do ***something***, you have a chance of getting at least some things right.

As with all economic development efforts, understanding what you have is the first step. In your inventory of current activities and companies, take a close look at universities and military installations, as they will frequently be active in the clean energy sector.

Given the fluctuation in the industry, the temptation is to use a shotgun approach. Resist that temptation and try to specialize according to your community's existing assets and/or capacity to build key assets. Not all areas are a good fit for wind energy generation or polysilicon manufacturing, but clean energy's breadth offers opportunities for virtually any kind of community. Bioenergy is particularly well-suited for rural areas, and smart grid manufacturers can be found throughout the country.

As with all economic development efforts, understanding what you have is the first step. In your inventory of current activities and companies, take a close look at universities and military installations, as they will frequently be active in the clean energy sector.

One of the smartest, easiest things economic developers can do to stay in the game is to avoid fixating on the "tip of the iceberg." While the polysilicon plants, turbine assembly operations, and solar panel manufacturers are clearly the big trophies, these projects will be few and far between in the grand scheme. Meanwhile, suppliers, service providers, engineering companies, software companies and the like are all finding that their business is being increasingly driven by the clean energy industry. Understanding which companies in the community are likely to experience growth from this segment, and particularly identifying those that could benefit if given a bit of technical or financial assistance, is an important role for economic development.

Clean energy companies are exceptionally involved in political matters related to energy. This creates a number of reasons for economic developers to be involved as well. Obviously, economic developers will want their state and local regulations to be as favorable as possible. It's also simply good PR to demonstrate your commitment to the industry. Likewise, economic developers can lead local efforts to establish favorable permitting conditions and interconnection agreements.

One of the more interesting dynamics in clean energy is the ability of the government to use incentives and regulations to create demand, be it for solar installations, electric vehicle usage, or fuel cell deployment. Some communities may elect to take their clean energy initiatives to the next level by incorporating some of these "carrots."

It would be foolhardy to focus on growing your clean energy sector without working hand in hand with your utility provider(s). As the largest customers of the clean energy companies, as well as providers to the related manufacturing facilities, utilities are an inextricable part of the equation. Depending on the structure of the utility, economic developers may find they need an additional contact beyond their traditional economic development liaison, as the purchasing side of the business is historically not the domain of the utility economic developer.

Demonstration projects are one possible way of demonstrating a community's commitment to clean energy while earning media coverage. Consider for example Indianapolis's Project Get Ready, which is focused on accelerating the market introduction and penetration of electric vehicles and related technologies in the Indianapolis region. The project builds on and complements the electric vehicle manufacturing and battery technology development already occurring in Indiana.

For those that have the scale to recruit new investment at a national or international level, trade show attendance is a must. Clean energy trade shows attract the decision makers and typically offer a great opportunity to network and learn about who's doing what.

Investment recruiters will also want to keep a close eye on European companies, as Europe can be characterized as the cradle of the clean energy movement. Meanwhile, China and India are hotbeds of growth.

Don't forget the larger sustainability movement that encompasses clean energy. Economic developers may find opportunities to assist local companies in reaching their sustainability goals and reducing energy bills by ***deployment*** of clean energy applications, such as rooftop solar or on-site fuel cell generation. This may be the biggest value-add opportunity for economic developers in communities that are not well-positioned to target clean energy manufacturing or generation projects.

Most importantly, economic developers can't think about clean energy as an encapsulated industry. It represents a fundamental shift in the way we power our homes, businesses, and transportation modes. Its implications will touch everyone in some way. The economic developer's challenge is to recognize the economic changes being driven by clean energy and to help his/her community visualize future implications and opportunities.