
Nicolas L Boittin, American University, Washington College of Law
INTRODUCTION

As fossil energy sources are becoming rare and more expensive, private investors, states and the federal government are turning to alternative forms of supply.

Petroleum companies, utilities, venture capital funds and private equity funds are investing in renewable energy projects. Shell revealed a plan to invest $1.63 billion in a joint venture with a Brazilian ethanol producer and Exxon Mobil is currently investing $600 million in an algae-to-fuel start-up.\(^1\) General Electric recently announced plans to invest approximately $453 million to develop offshore wind turbine manufacturing in Europe.\(^2\) Venture capital funds and private equity investors have turned towards private start-ups like Powervasion Ltd. and Iberdrola Renovables SA, respectively involved in power-saving semiconductor chips and wind farm development.\(^3\)

Investment in renewable energy is not only driven by expectations of high returns in the next decade but it is also the result of the current legal framework and fiscal incentives, offering greater legal predictability.

---


More than half of the states have created “renewable portfolio standards” (RPS) programs to maintain or increase the contribution of renewable energy to the electricity supply mix. For example, the Nevada legislature passed a statute requiring state electricity producers to provide 20 percent of electricity supply from renewable energy sources by 2015.4

The U.S. Congress passed the Emergency Economic Stabilization Act of 2008, which provides considerable fiscal incentives in energy-efficiency and wind farm projects with certain investment tax credits extending to January 2017.5 Not only is the current legal and fiscal framework favorable to renewable energy investment and production but it is bound to be even more so in the decade to come. The House of Representatives passed the American Clean Energy and Security Act of 2009, which includes a national renewable portfolio standard of 20 percent by 2020 and through 2039.6 The bill has not been debated in Senate yet but many investors, particularly venture capital funds and private equity funds interested in green energy, are convinced that this is a clear sign that some form of carbon cap or tax will be coming.7 Investors are thus also turning to renewable energy because they believe technologies associated to wind, solar or energy efficiency will become more competitive on the market as carbon-generating sources of energy will suffer from heavier taxation.

Private equity and venture capital funds invest by taking control for a period of approximately 10 years before implementing a quasi-automatic exit strategy, either through initial public offering (IPO) or sale to private investors. While venture capital

---

6 American Clean Energy and Security Act, H.R. 2454, 111th Cong. § 610(d) (as passed by House of Representatives, June 26, 2009).
7 See Gold supra note 3, at B11.
funds target start-ups or early stage businesses usually developing new applications of new technology, private equity investors are interested in existing businesses with some degree of commercial history.\(^8\) Even though venture capital funds and private equity funds invest in portfolio companies at substantially different maturity stages, both types of funds invest to take control over the management of the corporation, to generate higher rates of return and ultimately sell the business after a period of time determined at the very start of the take-over. The classical buy-out structure implemented by private equity funds is to acquire the targeted corporation with debt, instead of available funds, turning the operation into a leveraged buy-out (LBO). The use of debt in private equity is another distinction from venture capital.\(^9\) Securities play two essential roles in venture capital and private equity: to keep control over the corporation during the period of investment, by changing the management team if need be, and to decide freely on when to implement the exit strategy.

As far as the renewable energy sector is concerned, venture capital, and private equity to a lesser extent, are making a bet that some of the investment companies, usually start-ups specialized in green energy technology, will provide a high yield of return on investment when sold on the public market in approximately 10 years. Even if renewable energy is for the most part more costly to produce today than other sources of energy\(^10\), particularly coal, the economic reality is likely to have changed in 10 to 15 years. Venture capital funds are interested in this possibility of highly increasing the value of targeted corporations that produce new generations of wind turbines or electric batteries

\(^8\) See Guy Fraser-Sampson, Private Equity as an Asset Class 115 (2007).
\(^9\) See id. at 52.
\(^10\) Wind and energy are cost competitive as of today already. See infra part I) B.
Moreover, venture capital funds are investing primarily in corporations producing technology, then sold to utilities or actors willing to generate electricity. Because venture capital funds invest in portfolio companies not directly involved in the final production of energy but that are selling technology applications to electricity producers, the profitability of the portfolio companies is only indirectly affected by the final cost of electricity production.

However, the investment is obviously driven by larger economic realities, including final economic profitability and production cost of renewable energy as compared to competing sources of energy. Investors have chosen corporations producing renewable technology and energy efficiency applications because production of renewable energy has a very high profit potential if cost of production can be reduced.

Because portfolio companies are in need of important amounts of money when they call on venture capital funds, the initial owners of these businesses usually forget the importance of management in venture capital and private equity industry. Management is key to higher profits during the investment period, allowing the fund partners (General Partners) to get paid through carried interest, and crucial to a higher return on investment when the shares, hopefully increased in value, are sold on the public market in the end. Venture capital funds seek control through share ownership to introduce highly efficient management. The management skills brought by venture capital and private equity funds are precisely what the clean technology industry needs to become competitive. Bound to high profitability and ready to assume higher risks, teams appointed by these types of

---

11 See Prequin, Prequin Special Report: Private Equity Cleantech (June 2009) [hereinafter Prequin Report], at 2, available at www.prequin.com/docs/reports/Cleantech%20Research%20Report.pdf (revealing approximately a 300% increase in private equity funds created in 2008 and investing in clean technology either in part or in whole, as compared to 2004).
funds and managing the portfolio companies will be looking for maximum efficiency to reduce cost and final resale price of technology, making applications of the technology less expensive on the market. Management skills will also be used to increase the scale of production and meet higher production capacity, essential for renewable energy to compete with other sources of electricity.

Even though cost of production is still high today, renewable energy ranks among the most promising and profitable forms of alternative energy because of its multipurpose potential.

By definition, this form of energy is based on non-scarce resources such as wind, sun or biomass. This will inevitably alleviate energy shortage issues linked to fossil fuels. Not only is the source of energy unlimited but it is also free. Once initial investments have been made, the free cost is the greatest strength of renewable energy over other types of sources.

Turning to renewable forms of energy is also a way of achieving energy security and independence. In a study published by the Center for Naval Analysis, Lieutenant General Laurence P. Farrell Jr. stated that there are military impacts caused by our energy consumption. He mentioned the energy issue: “Solving the energy problem solves a real security problem. You get to choose your points of engagement. It’s like one of the things your grandmother told you. ‘Don’t go looking for trouble. If you find trouble, you have to deal with it—but don’t go looking for it!’ Well, when we go looking for oil, we’re really looking for trouble.”

Hence, as renewable energy offers a solution to national security, governments and legislatures will inevitably favor such technologies over other forms of

---

foreign energy sources.

Renewable energy also offers a solution to air pollution and climate change because it does not emit greenhouse gases (GHG). Legislation and regulation, both on a national and international scale, will ultimately become more aggressive towards polluting sources of energy and likely be more favorable to clean energy.

This paper will argue that greater legal stability and economic viability in the field of renewable energy, in particular wind energy and energy efficiency, are attracting investors, including venture capital and private equity funds.

We will begin by examining current state legislation and pending federal legislation, arguing that such texts provide legal predictability for investors in clean technology. We will perform a comparative cost analysis of several types of renewable energy and traditional sources of energy. This overview will focus on production and financial costs and will show that even though costs may be high for certain types of energy like solar, production cost of wind energy already competes with traditional sources of energy like coal.

We will next study the fiscal provisions applicable to renewable energy, particularly with regard to investment tax credits. We will advocate that these fiscal incentives are attractive for investors, particularly project finance institutional investors. Venture capital funds and private equity funds also benefit from these tax incentives and we will conclude that these types of investors should focus investments on wind and energy efficiency today.
I) A FAVORABLE LEGAL AND ECONOMIC LANDSCAPE FOR RENEWABLE ENERGY

In light of the legal and economic evolution in recent years, renewable energy is likely to become a bigger player in the overall energy mix and is still attracting leveraged investors, in spite of the persisting illiquidity on markets. State legislatures and the U.S. Congress are offering greater legal predictability for investors, and the increasing cost of traditional sources of energy versus the decrease in production cost of renewable energy allows certain renewable technologies to compete efficiently on the market.

A) Greater Legal Predictability and Visibility for Investment in Renewable Energy

i. A Legislative Push for Renewables

35 states have adopted RPS programs requiring that sellers or generators of electricity generate between 9.5% to 33% of renewable energy by 2013, at the earliest, and 2025 at the latest.13 States having adopted an RPS are very diverse and range from Texas to Massachusetts. Yet, few states were in compliance with their RPS in 2008,14 which foreshadows greater investment in renewable technology and projects in order to meet upcoming deadlines in RPS requirements.

The RPS requirement imposed on generators and sellers of electricity is flexible because it would be impractical and inefficient to compel all retail sellers of electricity in states with RPSs to purchase renewable energy up to a minimum standard. Instead RPS programs offer an alternative way of complying with the requirements. They allow

---

14 See id. at 103-04.
producers of renewable electricity to obtain renewable energy credits (RECs), tradable financial instruments worth 1 megawatt-hour (MWh) of renewable generated electricity. Utilities and generators of electricity unwilling to produce or buy renewable electricity can buy RECs from renewable electricity producers to meet the minimum requirements of the RPS.\textsuperscript{15}

Either way, complying with RPS by producing renewable electricity or by purchasing RECs on financial markets both require greater renewable energy production and investment.

Certain states exempt some forms of renewable energy from paying penalties if it cannot generate scheduled power, which puts that source at an advantage over other traditional sources of energy.\textsuperscript{16} This is the case of Texas and other Midwestern states ranging from Ohio to Montana.

Beyond state legislation, federal bill H.R. 2454, 111\textsuperscript{th} Cong. Sec. 601(d), passed in the House of Representatives, provides for a national RPS with 20% renewable electricity by 2020.\textsuperscript{17} The bill sets yearly targets starting from 2012 with a 6% required annual percentage of renewable electricity. Just like the state RPSs, section 601(e) of the bill provides for Federal Renewable Electricity Credits tradable on markets.\textsuperscript{18} Federal bill H.R. 1337, 111\textsuperscript{th} Cong. Sec. 2, creates a tax on carbon dioxide from coal, petroleum and

\begin{itemize}
\item \textsuperscript{15} See Michael Gillenwater, \textit{Redefining RECs, Part 2: Untangling certificates and emission markets}, 36 Energy Policy 2120, 2120 (2008).
\item \textsuperscript{17} American Clean Energy and Security Act, H.R. 2454, 111\textsuperscript{th} Cong. § 610(d) (as passed by House of Representatives, June 26, 2009).
\item \textsuperscript{18} See id. § 610(e).
\end{itemize}
natural gas extracted, manufactured, or produced in the United States, or entered into the United States for consumption, use, or warehousing.\(^1^9\)

Even though these bills are not law in the United States, they are a sign that the federal legislature is willing to place additional burden on traditional sources of energy and favor renewable energy. This observation has not remained unnoticed to investors. A greater proportion of investment from private equity funds and venture capital funds was placed in clean technology portfolio companies in 2009.\(^2^0\) It has become fairly predictable that U.S. Congress is pushing in favor of renewable energy, even though the legal texts are still at the bill stage. Given that the average investment period for venture capital and private equity funds is 10 years, investors are taking little risk in assuming that these bills, or similar types of texts, will likely become enforceable in the next decade.

Separate from pending legislation, recently enacted federal statutes also support clean technology investment and renewable energy production. Both the Emergency Economic Stabilization Act of 2008\(^2^1\) (2008 Stimulus Bill) and the American Recovery and Reinvestment Act of 2009\(^2^2\) (2009 Stimulus Bill) provide tax incentives and government loans or financial guarantees.

The 2008 Stimulus Bill encourages developers to maintain clean and renewable energy technology by providing financial liquidity after the financial meltdown. Congress’ intention was to protect vulnerable emerging technologies from a lack of credit availability on financial markets. The Troubled Assets Relief Program (TARP) part of the

\(^{19}\) America's Energy Security Trust Fund Act, H.R. 1337, 111\(^{th}\) Cong. §2 (referred to the House Subcommittee on Ways and Means, and the House Subcommittee for Foreign Affairs).

\(^{20}\) See Prequin Report, supra note 9, at 2.


bill injected $700 billion into failing banks. The Energy Improvement and Extension Act of 2008, attached to the 2008 Stimulus Bill, provided for tax incentives. This was particularly important because research, development and application of clean or renewable technology are capital intensive and highly dependent on venture capital, private equity and bank funding.

The 2009 Stimulus Bill has a wider scope as its primary objective is to help the economy recover by creating jobs, investing in transportation, environmental protection and infrastructure.

ii. Current State of Investment in Clean Technology

In spite of the recent economic downturn and fall in clean technology investments in 2009 compared to 2008, clean energy investments declined less than other sectors. In 2009, in the U.S., investment totaled $2.6 billion in 193 deals.\textsuperscript{23} Deal activity decreased by 16% compared to 2008 but was close to 2007 levels. 2008 was a record year for clean technology investment and comparing 2009 to 2008 might offer a darker representation of investment trends in clean technology than should be. While global venture capital investment declined to 2003 levels in 2009, cleantech venture capital only backed up to 2007 levels.\textsuperscript{24}

Eventhough wind and solar were still top investment areas in cleantech venture capital in 2009, U.S. investors shifted to energy efficiency. Utilities highly invested in


wind energy and solar thermal and photovoltaic (PV).\textsuperscript{25} Utilities played a key role in 2009 to strengthen the clean technology market. The number of Power Purchase Agreement (PPA) announcements with Solar Thermal and Solar PV computed to 80% of total PPAs.\textsuperscript{26} PPAs are a relevant indicator of investment because no project finance investor takes the risk of financing a power plant without securing a power purchase agreement between the plant operator and power purchaser. This also means utilities have been in negotiation with investors to finance solar energy. Wind power utilities made increased capacity announcements during the last part of 2009, revealing an improvement in use of technology.

Corporations among the Fortune Global 500 companies also invested significantly in clean technology over 2009. Financing secured from the corporate world through direct investments in clean tech increased by 14% in the second part of 2009 compared to the same period in 2008.

2009 was also marked by a noteworthy shift towards energy efficiency investment. On the U.S. market, energy efficiency rose to number one in clean tech deal activity.\textsuperscript{27} The Energy Efficiency category accounted for $593.3 million over 2009. In the last quarter of 2009 (Q409), investments increased from $133.7 million at the end of Q309 to $252.8 million.\textsuperscript{28} The largest deal in 2009 was the investment in Silver Spring Networks Inc., involved in smart grids and network infrastructure, for $105.0 million. This shift from solar to energy efficiency on the U.S. market is the result of a shift from capital-intensive clean technology to lower financing technology. The Energy/Electricity

\textsuperscript{25} See id.
\textsuperscript{26} See id.
\textsuperscript{27} See E&Y Release, supra note 20.
\textsuperscript{28} Id.
Generation category, a more capital-intensive component of Energy Efficiency is a good example of that. The Energy/Electricity Generation category declined by 12% in 2009.\textsuperscript{29} Not only was the shift caused by illiquidity and cuts on the amount of financing offered but it was also driven by the nature of energy efficiency technology. Energy efficiency is faster to commercialize and, because it is close to information technology, it also falls perfectly in venture capital funds transferable skill sets.

Prequin, a New York based research and consultancy firm covering private equity, hedge funds, real estate and infrastructure, recently published a report on clean technology investment by private equity and venture capital funds.\textsuperscript{30} The report concludes that clean technology is a booming sector for private equity and venture capital funds. We have not been able to access this document but have obtained the executive summary.

According to Prequin, 29 funds raised $6 billion in 2008, despite the economic crisis.\textsuperscript{31} This was very similar to 2007 figures. 2004 was the first important year where funds making some cleantech investments started investing in those types of portfolio companies. Since 2004, investments in those funds quadrupled with 117 new funds in 2008.\textsuperscript{32} The number of funds making investments solely in clean technology also increased over the past 5 years with 39 new funds created in 2008.

Cleantech funds are attracting a diverse panel of investors. Funds of funds and pension funds are the most prominent investors in clean technology funds.\textsuperscript{33} Funds of

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{29} See id.
\item \textsuperscript{31} Id. at 4.
\item \textsuperscript{32} Id. at 2.
\item \textsuperscript{33} See id. at 3.
\end{itemize}
\end{footnotesize}
funds invest in private equity funds, instead of investing directly in portfolio companies. This group of investors constituted 19% of cleantech fund investors. Public pension funds accounted for 15% of total investments in clean technology funds.\textsuperscript{34}

Most of the funds active in the clean technology area are venture capital funds and they represent approximately two thirds of cleantech investment. Unlike private equity firms, which are still suffering from lack of credit, venture capital funds seem to have remained steady through the economic crisis.

Projections for 2010 are hopeful, with Cleantech Group forecasting that private equity and venture capital investments in cleantech will exceed 2009 levels by a “high margin”.\textsuperscript{35} This overview of the state of investment in clean technology, particularly with regard to venture capital is encouraging for clean technology development. Even in difficult economic times, clean technology funds were maintained and some new funds were even created. As the economy recovers, investment in this area is likely to be important.

Investment and fund creation in the clean tech field maintained because of underlying economic realities. Private equity and venture capital are driven by high level of growth and potentially high returns involved in clean technology. Wind technology and energy efficiency were the most successful investment areas. We will assess the economic potential of clean technology in the following part.

\textsuperscript{34} See id.
B) A Comparative Analysis of Costs in Alternative and Traditional Energy

i. Levelized Cost Comparison

When comparing the levelized cost of various energy sources, we came to the conclusion that some sources of renewable electricity are already cost-competitive with traditional sources of energy. These types of alternative energy technologies are complementary to traditional generation technologies and will likely become less expensive because of RPSs and other legislation, innovation in efficient technologies and increase in production volumes.

Levelized cost of energy is an economic evaluation of the present value of the cost of building and operating a generating plant.\(^{36}\) It includes the costs over the plant’s entire lifetime, including initial investment, cost of operation and maintenance, cost of supply, and cost of capital. The levelized cost is usually calculated on a $/MWh basis and is calculated in the following way:

\[
LEC = \frac{\sum_{t=1}^{n} I_{t} + M_{t} + F_{t}}{\sum_{t=1}^{n} E_{t}}
\]

LEC = Average lifetime levelized electricity generation cost

\(I_{t}\) = Investment cost in year \(t\)

\(M_{t}\) = Operation and maintenance cost in year \(t\)

\(F_{t}\) = Fuel cost in year \(t\)

r = Discount rate\(^{37}\)

n = Lifetime of the plant

According to a paper published by Lazard Ltd., a financial advisory and asset management firm, in partnership with Power & Energy Industry, an engineer firm, the levelized cost of coal is between $74/MWh and $135 MWh.\(^{38}\) On the other hand, the levelized cost of technologies such as biomass co-firing or energy efficiency are between 0$/MWh and $50/MWh.\(^{39}\) Energy efficiency is not a generating source of electricity but allows generating plants to work more efficiently to reduce operating cost and fuel costs of other generating sources of electricity.

The levelized cost of gas peaking, integrated gas-combined cycle (IGCC) and nuclear is higher than the levelized cost of wind or geothermal.\(^{40}\) The levelized cost of wind and geothermal is between $42/MWh and $94/MWh. Among conventional technologies and energy, only coal, gas combined cycle and landfill gas have a levelized cost close to that of wind or geothermal, between $50/MWh and $135/MWh.\(^{41}\)

This comparison reveals that certain clean technologies, wind and geothermic for example, are already cost-competitive with conventional generation technologies. All renewable energies are cost-competitive with gas peaking as of today. The levelized cost of gas peaking is between $221/MWh and $334/MWh.\(^{42}\) Only solar technology,

\(^{37}\) The discount rate is the annual interest rate deducted in advance.

\(^{38}\) Lazard, Levelized Cost of Energy Analysis – Version 2.0 (2008) [hereinafter Lazard Analysis], available at www.narucmeetings.org/.../2008%20EMP%20Levelized%20Cost%20of%20Energy%20-

\(^{39}\) Id. at 2.

\(^{40}\) Id.

\(^{41}\) See id.

\(^{42}\) Id.
including solar PV – crystalline and fuel cells are more expensive than traditional sources of energy on a levelized cost basis.\textsuperscript{43} Some solar technologies, like solar thermal or thin film could compete with coal or gas combined cycle in the years to come.\textsuperscript{44}

Despite the lower cost linked to the generation of renewable energy, renewable technology has yet to improve its generation capacity to compete effectively with conventional sources like coal or gas combined cycle. Some sources of renewable energy have become complementary to conventional sources of energy and will likely become increasingly widespread over the next decade.

On one side, conventional sources of energy are sensitive to higher carbon emission costs resulting from a hypothetical carbon tax for example. They are also highly sensitive to fuel prices, both in a positive and negative way. This is because conventional technology, unlike renewable technology, uses another source of energy to generate electricity. For example, the levelized cost of coal in the case of varying fuel prices is between $67/MWh and $144/MWh: it amounts to an increase of $9/MWh compared to the standard levelized cost of coal and a decrease of $7/MWh compared to the standard levelized cost of coal.\textsuperscript{45}

On the other side, renewable energy is highly sensitive to U.S. federal tax incentives. Without any tax incentive, the levelized cost of wind doubles, reaching a cost between $89/MWh and $150/MWh.\textsuperscript{46} Solar thermal triples with a levelized cost between $210/MWh and $349/MWh. Without any tax incentive, wind and geothermal would not be able to compete with coal or gas combined cycle.

\textsuperscript{43} See id.
\textsuperscript{44} See id.
\textsuperscript{45} Id. at 3.
\textsuperscript{46} Id. at 5.
ii. Financing Cost Comparison

The gap is closing between the capital cost of conventional technology and certain alternative technologies. Only biomass co-firing is less capital-intensive than gas peaking. The capital cost of gas peaking is between $650/kW and $1,500/kW when capital cost for wind is between $1,900/kW and $2,500/kW. Solar is the most expensive technology in renewable energy: its cost can reach $6,300/kW for solar thermal.47

Financial data for specific renewable energy projects is confidential and therefore not accessible. These types of projects are not financed through public bonds but usually through private equity firms, privately held banks or institutional investors.

Edward Kahn, from the Energy and Environment Division of the Lawrence Berkley Laboratory, analyzed several wind projects and renewable energy projects and measured the financing cost on the basis of the information available at the time.48 Any data not available was assumed.

Financing cost is measured by analyzing several components in the financial structure of a project. This includes the interest rate on debt, debt maturity, the debt/equity ratio, and the cost of equity capital. The capital recovery factor (CRF) encapsulates the impact of credit maturity on the cost of financing and will be the basis for our comparison of financing costs between wind projects and fossil fuel power plants. The CRF is calculated in the following way:

\[
CRF = \frac{r(1+r)^n}{(1+r)^n-1}
\]

\[r = \text{the rate of return on capital}\]

47 Id. at 7.
\( n \) = the amortization period

After reviewing several wind projects, on one side, and fossil fuel power plants, on the other, Kahn realized that wind turbine cases usually had 12-year debt maturity with a 10% interest rate.\(^{49}\) The cost of equity is the rate of return on investment for shareholders, including dividend and capital gain. Kahn assumed the cost of equity in wind project was 18%. It is usually admitted that wind turbine projects with only 20% equity do not take in available tax credits.\(^{50}\) Therefore, we assume 35% equity and 75% debt.

Fossil power plants usually have a longer loan maturity date, closer to 15 years than 10 years.\(^{51}\) After comparing fossil energy projects, we will assume a 10% interest rate and a cost of equity of 12%. Conventional power project is less risky and less return is thus expected from shareholders than in wind turbine projects. The classical debt/equity structure for conventional technology is 20% equity and 80% debt.

We calculate the CRF using the various debt maturities for each type of project. The CRF for wind projects is 0.150, whereas the CRF for conventional fossil power plants is approximately 0.111. Hence, the financing cost for wind turbine projects is approximately 34% higher than that of conventional fossil power plants.

Despite the higher cost of wind projects over conventional technology projects, these types of project are still attractive to investors. This is both because of the expectation of a higher rate of return on investment and because of investment tax

\(^{49}\) Id. at 17.
\(^{51}\) See Kahn, supra note 46, at 17.
credits, interesting to institutional or private equity investors with taxable income in the United States.

We will study investment tax credits and fiscal structuring in the context of renewable energy projects in the next part.

II) INVESTING IN RENEWABLE ENERGY: A PERFECT DEAL FOR VENTURE CAPITAL AND PRIVATE EQUITY

It is currently the right period for private equity funds, and venture capital funds to a greater extent, to invest in renewable energy because of the investment tax credits provided by the 2008 Stimulus Bill. Moreover, certain renewable technologies like wind or energy efficiency are particularly promising areas of investment because of likely high return and important development potential.

A) Tax Credits and Fiscal Structuring

i. Investment Tax Credit and Alternatives

Renewable energy legislation mentioned in part I) A) provides for two types of tax credits: production tax credits (PTCs) and investment tax credits (ITCs). It also offers a cash grant instead of ITCs. The ITC is an additional reason for banks, private equity funds, and venture capital funds to invest in renewable energy.

Section 45 of the Internal Revenue Code provides a ten year production tax credit where the installation deadline was extended to 2012 for wind and 2013 for geothermal, biomass, landfill gas, municipal solid waste, qualified hydroelectric and marine and
hydrokinetic facilities.\textsuperscript{52} The production tax credit goes up to 1.5 cents/kWh subject to modification in case of inflation.\textsuperscript{53} The PTC for the project is reduced by government grants or government low-interest loans. There are two major conditions to receive the PTC. First, the owner of the project must also operate the project.\textsuperscript{54} Second, power must be sold to a third party.\textsuperscript{55} The PTC could not apply to private equity investors or venture capital funds. Only the owner of the project can benefit from the PTC.

Hence, sections 104 and 105 of the Internal Revenue Code provides for an Investment Tax Credit for commercial energy projects linked to solar, fuel cells, wind, geothermal, micro turbines, combined heat and power.\textsuperscript{56} Section 104 of the act creates a 30\% ITC for small wind projects, fuel cells and solar. A 10\% ITC applies to geothermal micro turbines, and combined heat and power.\textsuperscript{57} The credit is awarded for a period of 5 years pursuant to the installation of the project. The ITC allows tax equity investors to benefit from tax credits when financing such projects. The deadline for the installation of wind, fuel cells, micro turbines, and combined heat and power projects is 2016. Geothermal has no deadline and solar will not expire in 2016 but the credit percentage will decrease. There are several advantages to the ITC for investors. The credit is reduced only by government grants and not loans. The owner of the project does not have to be the operator. This allows the creation of special purpose vehicles or intermediary corporations, satisfactory to investors. Moreover, the ITC does not impose any power

\textsuperscript{52} I.R.C. § 45 (2010).
\textsuperscript{54} I.R.C. § 45 (2010).
\textsuperscript{55} Id.
\textsuperscript{56} I.R.C. § 104-05 (2010).
\textsuperscript{57} See Mark Bolinger et al., PTC, ITC, or Cash Grant? An Analysis of the Choice Facing Renewable Power Projects in the United States, National Renewable Energy Laboratory (2009) [hereinafter PTC, ITC, or Cash Grant?].
sale requirement. However, if the project owner sells the project prior to the fifth year of operation, the remaining portion of the ITC reverts to the IRS.

Unlike the PTCs, where underperformance in the generation of electricity reduces profits and the amount of credits, ITCs are not affected by the performance of the plant and only cash revenue may suffer from less production. With ITCs, investments in small-wind projects, solar and fuel cells become highly attractive to institutional investors and private equity and venture capital funds, with sufficient taxable income in the United States.

In order to give more flexibility to project developers during the economic crisis, the 2009 Stimulus Bill also allowed projects eligible under the PTC to opt for the ITC instead. This provision favors outside investment, instead of using the credit for the project itself. The program provides grants up to 30% of the cost basis of the project. The ITC is still capped to a dollar amount for many types of projects. However, commercial small wind projects, eligible under the 30% ITC are no longer capped to a maximum dollar amounts. This makes investment in qualifying wind projects even more attractive to investors. The ITC is a way for investors to obtain additional benefit from a project, separate from return on investment. Hence, obtaining a 30% tax credit reduces part of the risk of the overall investment because the investor is sure to have at least a 30% ITC even if the project fails. This is particularly true for small wind projects, where the ITC is 30% and the amount is not capped.

Less favorable to investors, the project developer may also decide to receive a cash grant instead of the ITC for a reduced period of time. This additional option allows project developers to receive cash if they cannot or do not want to find outside
investors. This means that some project developers will decide not to call on banks, private equity or venture capital funds.

However, several considerations will determine which of the PTC, ITC or cash grant is the best option for a given project. For example, for wind technology, the PTC provides greater value when the total installed cost of the project is lower than $1,500/kW and the production capacity is greater than 25%. On the other hand, when the total installed project cost is $2,500/kW and production capacity is lower than 39%, the ITC is more interesting than the PTC. Beyond quantitative considerations, qualitative factors are also taken into account when deciding to choose the PTC, the ITC, or the cash grant.

Among the most important qualitative factors to consider is the tax credit absorption potential. If the project cannot absorb the PTC over the ten-year period because it is still uncertain whether the tax base will be sufficient, the ITC might be more adequate. However, while the ITC offers more visibility, the full credit has to be realized in the project’s first year. Hence, the tax base has to be larger in the first year in order for the ITC to become economically interesting.

ITCs and PTCs do not include energy efficiency projects. Energy efficiency is economically efficient without the support of credits because its cost is low and profit potential high. Unlike other forms of renewable energy supported by PTCs and ITCs, wind energy, also covered by such credits, competes efficiently with traditional sources of energy on a levelized cost basis. Wind is thus an interesting investment choice, along with energy efficiency, in the renewable energy sector.

58 See id. at 1.
59 See id. at 6.
60 See id.
ii. Investing Structure

The legal structure varies depending on whether the credit chosen is the PTC or ITC. Tax equity investors are looking for a structure reducing taxation and allowing the credit to benefit their own entity.

For the PTC, section 45 of the Internal Revenue Code provides that the owner has to be the operator.\(^{61}\) The text also requires that the production must be attributable to the taxpayer.\(^{62}\) Hence, the taxpayer has to be both the owner and operator of the plant. A narrow reading of this section would mean that no investor could benefit from the PTC. However, section 45(e)(3) explicitly refers to divided ownership interests in the owner and operator of the plant generating renewable energy. Lawyers structuring the project will rely on this specific provision of the Internal Revenue Code to allow tax equity investors to benefit from the PTC.

The special purpose vehicle used in most PTC structures is a disproportionate allocation partnership.\(^{63}\) The partnership is for tax purposes but under state law, the entity may be a partnership or limited liability company. The financing vehicle allows other entities to own an interest in the partnership. Hence, the tax equity investor becomes a partner in the special purpose vehicle (SPV) in order to benefit from the PTC. However, the tax equity investor is the biggest shareholder and is thus a disproportionate partner. The largest part of the income and loss is attributed to that partner at the early stage.

Once the tax equity investor has obtained the agreed return, the partner becomes a minority shareholder. This allows the investor to benefit from the PTC in exchange for

---


investments in the SPV and the project. The structure is called a Partnership Flip Structure\textsuperscript{64} because the tax equity investor is first a majority partner and then becomes a minority shareholder in the SPV.

To prevent the tax equity investor partner from taking advantage of the project developer, several conditions are required for the disproportionate allocation partnership structure to benefit from the PTC. Concerning the shareholder allocation, the developer of the project must have at least a 1\% interest in the SPV.\textsuperscript{65} There are also several requirements as to the investor’s capital contributions in the SPV. The investor must make a minimum investment equal to at least 20\% of the sum of the fixed capital contributions plus reasonably anticipated contingent capital contributions required to be made by the investor under the partnership agreement.\textsuperscript{66} At least 75\% of the sum of the fixed capital contributions, plus reasonably anticipated contingent capital contributions must be fixed and determinable obligations.\textsuperscript{67} Neither the developer nor the investor can purchase the project interests before the first 5 years of operation and after 5 years of commercial operation, the purchase price cannot be less than the fair market value of the project.\textsuperscript{68} Concerning guarantees, no person may guarantee or otherwise insure the investor the right to any allocation of the credit under section 45 of the Internal Revenue Code.\textsuperscript{69}

If the investor follows these requirements, it will be allowed to benefit from the PTC as a separate entity, even though the tax credit is linked to the production of energy

\textsuperscript{64} See Bolinger, PTC, ITC, or Cash Grant?, supra note 54.
\textsuperscript{66} Id. § 4.03.
\textsuperscript{67} Id. § 4.04.
\textsuperscript{68} Id. § 4.05.
\textsuperscript{69} Id. § 4.07.
and the investor is not really involved in generating the electricity. Hence, the investor’s main activity can be of any type and does not have to be related to energy production. Banks and other institutional investors like insurance companies favor the Partnership Flip Structure because they lack management expertise and can give control back to the operator or developer. Private equity and venture capital funds, on the other hand, might have a larger interest in the management of the company and might not choose a flip structure but keep control over the company.

Section 48 of the Internal Revenue Code does not require that the taxpayer be the project owner and operator. For the ITC, tax equity investors can use a disproportionate allocation partnership, just like for the PTC. Most investors will prefer a lease structure where they can keep ownership of the facility or project.\(^70\) The asset is leased to the project developer or operator. The investor keeps all the benefits of the ITC and keeps control over the property. However, additional fiscal rules apply to lease structures. Specifically, the lease term should not exceed 80% of the economic life of the asset.\(^71\) More important, the residual interest cannot be less than 20% at the term of the lease.\(^72\) This makes a substantial difference with the disproportionate allocation partnership structure. Thus, some project operators might prefer the partnership structure to the lease structure.

PTCs and ITCs attract investors, including private equity and venture capital funds, because they offer a secure source of tax reduction. However, considering the current economic situation, investment in any type of renewable energy technology or projects is not the best and most specific advice one could give. Investment in some renewable

\(^{70}\) See Feo, What’s Hot in Renewable Energy Project Financing, supra note 60.

\(^{71}\) Id.

\(^{72}\) Id.
energy sectors looks much more promising than other sectors. In the next part, we will argue that wind energy and energy efficiency are likely to be a wise investment strategy for clean tech investors.

B) High Return Potential in Wind Technology and Energy Efficiency

i. Wind: A Mature Technology for Mid and Long-Term Return

Wind energy is flourishing everywhere around the United States. Wind farm projects are multiplying, both on and offshore. In October 2009, Irish Wind Capital Group closed a deal for $240 million for a 150 MW farm project in the DeKalb County, Mo. Four banks, Nord/LB, BayernLB, Rabobank, Banco Santander and Union Bank were financing the project. The project was the first to benefit from the ITC cash grant under the 2008 Stimulus Bill. Offshore wind energy projects are also under review along the North Eastern shore. The Delmarva Power & Light/Bluewater Wind project in Delaware features among these projects. The project would include 150 turbines for a total capacity production of 450 MW. The Delaware wind project would be the first U.S. offshore wind project to come online between 2012 and 2015. Approximately 10 other projects are also in the process of obtaining permit approval or still at the planning stage. However, several practical difficulties, regulatory issues and legal action have delayed these projects. Issues pertaining to the sale of the electricity produced from the Delmarva Power & Light/Bluewater Wind project have involved the Delaware courts and the Public

73 See Wind Capital Group, Missouri’s Native Son Building State’s Largest Wind Project, www.windcapitalgroup.com/.../missouri_s_native_son_building_state_s_largest_wind_project.aspx (last visited Apr. 3, 2010).
Service Commission of the State of Delaware. Another famous project, the Cape Wind Farm on the coast of Massachusetts was also delayed by over 9 years since the date the project was planned. The construction company is still waiting for final approval for the federal permit to build the wind farm.75

IPOs over corporations developing wind technologies were among the highest in terms of dollars in the clean tech sector in 2009. China Longyuan Electric Power was sold for $2.2 billion on the Honk Kong exchange last year, which makes it the largest IPO in the renewable energy sector before the $380 million offering by Boston-based A123 Systems, an electric car battery developer.76

The venture capital industry has also been very active in wind technology recently. Viryd Technologies, which develops drivetrain technology for wind turbines, recently raised over $5 million from a venture capital fund of existing and new investors.77 The corporation focuses on the improvement of wind turbine energy capture and better wind connectivity to the grid.

Wind should be attractive to clean tech investors for several reasons. Small wind projects benefit from the ITCs and PTCs, which provide the certainty for investors of benefiting at a minimum from a fiscal advantage. Most importantly, new technology is ready to be marketed on a national scale because there is currently a demand for greater generation capacity. Moreover, the price of producing wind energy has fallen to a level that is now competitive with other traditional sources of energy like coal or gas.

75 See http://www.capewind.org/.
Wind energy offers a great opportunity for private equity funds and for venture capital funds in the mid and long-term. Wind technology needs venture capital to develop even greater capacity production and more efficient turbines. Private equity funds will likely increase the number of buy-outs on wind energy corporation or wind farm projects in the years to come. Private equity management teams will create higher profitability by restructuring these corporations for better efficiency and increase the long-term development potential.

ii. Energy Efficiency: A Hot Sector for Short-Term Profit

Energy efficiency is particularly successful with investors because it is a less capital-intensive area, which is very convenient as markets are less liquid today than they were a couple of years ago. Energy efficiency also has a strong development potential, with likely high returns. Moreover, it offers quicker returns because start-ups in this area can produce revenue rapidly. Development of the product or device usually takes less time because it involves the improvement of existing technology. Moreover, the technological improvement can often apply to several different derived products. Thus, compared to other sectors of renewable energy, energy efficiency strikes the right balance between a safer investment than wind and a sufficiently risky bet to expect high return.

Wind energy is sufficiently mature for some private equity funds to be interested in the buyouts of wind corporations. Energy efficiency, on the other hand, attracts less private equity funds. Because energy efficiency involves technological products, venture capital funds are more active in this field.

Some start-ups obtained venture capital funding to develop and commercialize products ranging from more energy efficient windows to power-saving microchips and
software. Some corporations involved in energy efficiency listed on public markets quadrupled in value in 2009. For example, this was the case for EnerNOC Inc., a corporation specialized in energy management and reducing corporate power bills, and Cree Inc., a low-energy LED lighting corporation.\textsuperscript{78}

Taking existing products like laptops and making them less energy consuming is a great way to reduce energy needs and was a market little explored until now. The development potential of this market is huge because energy efficiency can apply to all electric goods, including commercial and household appliances.

**CONCLUSION**

Even though renewable energy is still a minor source of electricity in the United States, some renewable sources are gaining ground and offering a complementary source of electricity to U.S. production.

Investment trends and statistics in renewable energy and clean technology are reflecting greater interest of investors for this market. This observation is all the more interesting that global markets have undergone two difficult years following the financial meltdown. This is evidence of strong investor confidence in renewable energy.

This confidence is supported by tangible economics. Studies reveal that the cost of producing renewable electricity is steadily decreasing and now very close to matching production cost for other traditional sources of energy. ITCs and PTCs play a major role in this greater parity of levelized cost between traditional sources of energy and renewable sources. Financing cost is still higher for renewable energy and production

capacity is too small for renewable energy to produce as much electricity as coal or gas. Investors have seen the development potential in production capacity and are looking for the profits associated to market growth.

Investors are also driven by greater legal predictability and fiscal incentives in favor of clean technology and renewable energy production. Both the state legislatures and the federal government are supporting renewable energy and upcoming legislation is likely to increase the burden on traditional sources of energy.

One renewable source of energy looks particularly promising in the near future: wind. This technology has developed over the last five years, production cost has gone down, and production capacity has increased significantly. Another area of clean technology is also attracting investors: energy efficiency. Energy efficiency promises short-term returns with less cash involvement up front. These two areas of renewable energy and clean technology are definitely the two sectors investors should invest in the next few years.

Renewable energy is particularly relevant for venture capital funds because it usually involves high technology and application developments. Moreover, many corporations in this sector are still in the start-up phase and looking for funds. This is a perfect opportunity for venture capital funds to provide funding and management skills to increase productivity in the sector.

Although their investment capacity is still hindered by illiquid markets, private equity funds are also increasingly interested in buying out corporations involved in the renewable energy business. The increasing number of fund creation investing in renewable energy corporations in 2009 is a relevant indicator of this development.
Timing of investment is significant because venture capital funds invest for approximately ten years before selling the portfolio companies. In 2020, the energy market is likely to have evolved considerably and will possibly have created an increase in the value of portfolio companies.