



RENEWABLE ENERGY & RENEWABLE ENERGY PROJECT INVESTMENT

A PRIMER

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EXECUTIVE SUMMARY

Global Energy Investors, LLC (GEI) was founded to bring funding to the renewable energy market. We believe the time is right to invest significant financial resources in the development of renewable energy projects. Ever-increasing global demand for electricity, serious concerns about fossil fuels' role in climate change and the imposition of federal and state renewable energy standards have combined to create huge investment demand with excellent opportunities for future growth. At the same time, investors are seeking new investments that provide competitive returns yet are not dependent on asset valuation bubbles, trading arbitrage, or opaque quantitative methodologies. Renewable energy project investments can meet these objectives.

This paper considers the growing demand for energy and the limitations imposed upon us by our current fossil fuel dependency. It then briefly summarizes the various types of renewable energy resources that are available to lead us out of a state of energy dependency and toward a position of greater energy security. We then conclude by describing the financial and non-financial advantages of renewable energy project investing. Throughout, we strive to maintain objectivity, common sense, and intellectual credibility. We recognize that for some, these topics raise sensitive geo-political issues; however, as investors, we focus on the numbers, the markets, and the underlying question: does this investment make economic sense? We conclude that it does.¹

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¹ Although we do not address the issue of grid parity in this paper, it is worth mentioning that renewable energy is fast approaching pricing parity with traditional sources of energy. In terms of equivalency measures, according to HSBC, geothermal energy is roughly comparable to oil pricing of \$57/barrel, onshore wind energy is comparable to oil pricing at \$90/barrel, and offshore wind compares to oil at \$189/barrel. Solar tends to be more expensive and is expected to reach retail grid parity within the year and wholesale grid parity within five years. (See Keith Johnson, Solar Power: Finally, A Reason to Invest Says HSBC, in WSJ Blogs: Environmental Capital at http://blogs.wsj.com/environmentalcapital/2009/09/24/solar-power-finally-a-reason-to-invest-says-hsbc/?mod=yahoo_hs, last viewed September 30, 2009). However, it is worth noting that none of these measures take into account the very real pricing effects of diminishing oil reserves, wars fought to preserve access to oil, and rising costs associated with environmental damage due to fossil fuel dependency.



The Fossil Fuel Dilemma:

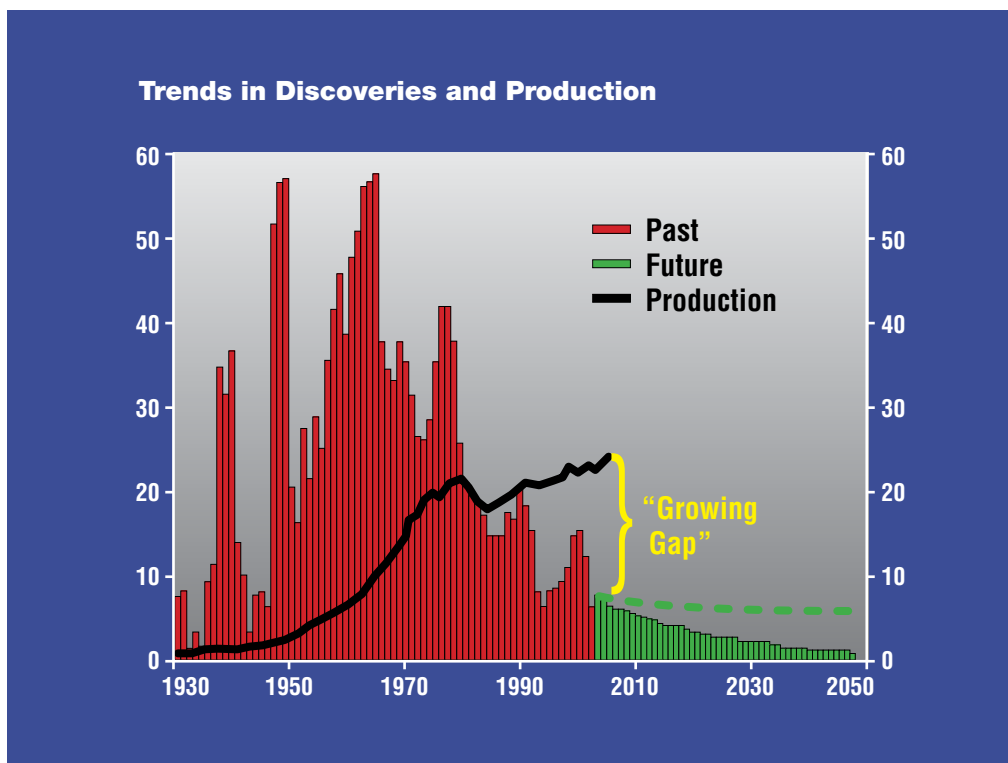
Since the industrial revolution, our primary source of energy has been the combustion of fossil fuels. These fossil fuels, ancient substances including oil, coal and natural gas were created through the natural decay of organic matter and are non-renewable resources. Once we extract them and put them to use, their material composition is forever altered, making them unusable for further energy creation. While the use of fossil fuels has helped catapult us into an unprecedented era of economic growth, it has also created significant economic, political, and environmental problems.

- First, the burning of fossil fuels has negatively impacted the environment. The unchecked release of the

greenhouse gases associated with the burning of fossil fuels has accelerated potentially irreversible climate change which will undoubtedly have negative social and economic implications as we scramble to adapt to a world of rising sea levels and temperatures.

- Second, the depletion of fossil fuel resources will lead to rising oil prices. As demand for energy increases and fossil fuel supplies are depleted, simple economics dictates that prices will increase, leaving us all in an untenable situation wherein we pay ever higher prices for increasingly limited resources. Real oil prices are, in fact, expected to rise over the long term due to growing demand and efforts by other countries to limit access to their oil resources.²

Figure 1: New Oil Discoveries Lag Demand



This graph demonstrates the 'growing gap' between oil reserves discovered, and the demands we place on those reserves. While the graph is isolated to the oil markets, graphs for all fossil fuel resources demonstrate a similar trend: that our reserves are quickly diminishing while the demand we place on those reserves continually increases.³

Reliance upon one energy source, particularly a non-renewable, non-native source, limits a nation's ability to supply the needs of its citizens and compromises its economic flexibility.

² U.S. Department of Energy, Annual Energy Outlook 2009 (AEO2009), with projections to 2030, www.eis.doe.gov, Release date: March 2009.

³ Source: Speech by former Secretary of Defense James Schlesinger before the U.S. Senate in 2005.



Ultimately, this will continue to concentrate power in the oil-rich nations and undermine the economic viability of oil-dependent nations, such as the U.S. (see Figure 1, previous page).

- Third, reliance upon one energy source, particularly a non-renewable, non-native source, limits a nation’s ability to supply the needs of its citizens, compromises its economic flexibility by creating a non-diversified dependent state, and puts the nation at the mercy of resource-rich nations. In 2008, for example, the world was held hostage to wildly gyrating swings in oil prices, which ultimately exceeded \$150 per barrel, a 500% increase over 2003 prices.

Rising Global Demand for Energy

Over the last twenty years energy demand has increased exponentially with no tapering in sight; the global population—estimated to reach 7 billion in 2010—is consuming resources faster than ever. The U.S. Energy Information Administration (EIA) posits that energy demand will increase 2.3% per year from 2010 to 2020.⁴ While the majority of growth will occur in developing nations, every nation will likely experience some increase in

energy demand.⁵ In its Annual Energy Outlook 2007, the EIA estimated that U.S. electricity demand will grow by 39% from 2005 to 2030, reaching 5.8 billion megawatt-hours by 2030.⁶ Developing countries in the third world, as well as emerging powerhouses such as China and India, are adding to the quandary, placing new demand on quickly diminishing fuel reserves. (See Figure 2)

The Solution is Simple

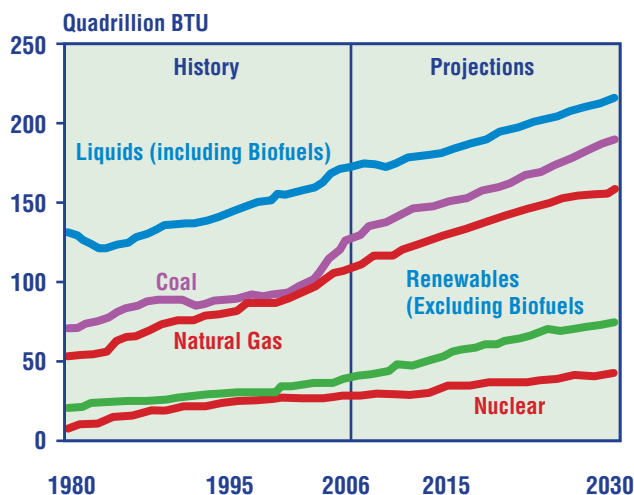
The solution is simple: renewable energy resources. By marrying natural environmental processes and 21st century technological ingenuity, we can safely harvest enough energy to meet our increasing demand without imposing additional burdens on the environment and without further compromising our energy security.

Renewable resources are natural resources which are constantly replenished at a rate equal to or faster than the rate of consumption. Renewable energy involves the harvesting of these resources to generate electricity or to fuel other processes requiring external energy input. Since renewable resources are not dependent on the availability of a finite quantity of fuel, they are not subject to the same supply limitations that have plagued fossil fuel resources, such as oil, coal, natural gas, and shale. The implications are profound: by employing a greater percentage of renewable energy resources to satisfy a portion of its demand for electrical energy, the U.S. can free itself from dependence both on limited reserves and on the political vagaries of foreign oil suppliers.

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Figure 2: Growth in Energy Usage Will Continue

World Marketed Energy Use by Fuel Type, 1980-2030



Sources: 2006: Energy Information Administration (EIA) *International Energy Annual 2006* (June-December 2008), web site www.eia.doe.gov/iea. Projections: EIA, *World Energy Projections Plus* (2009).

⁴ U.S. Department of Energy, “International Energy Outlook 2006”, www.eia.doe.gov, August 2006

⁵ Rosenfeld, J. and Nyquist, S. ‘Why Energy Demand Will Rebound’, *McKinsey Quarterly*, May 2009

⁶ U.S. Department of Energy, “Wind Report: 20% in 2030”, at <http://www.20percentwind.org/default.aspx>, 2006.



Global Energy Investors, LLC focuses on six principal sources of renewable energy: Wind, Solar, Hydropower, Ocean/Tidal, Geothermal, and Bioenergy.⁶

Wind Energy

Wind energy is one of the most prominent sources of renewable energy. Large turbines harness the natural kinetic energy of moving air and then use the energy to supply immediate electrical demand, transmit the energy to an electrical grid, or store it for future use. The costs of developing wind energy are limited to production, installation, and maintenance of turbines as no additional fuels or facilities are required to assist in the energy production process. Wind turbines can be sited almost anywhere that the wind blows relatively consistently, and great strides have been made over the past 10 years in improving the efficiency, productivity, and reliability of large, utility scale machines.

As a result of these improvements, recent government incentives, and the increasing awareness of the need to increase our energy independence, the installed capacity of wind energy projects has grown dramatically. (See Figure 3 below)

Solar Energy

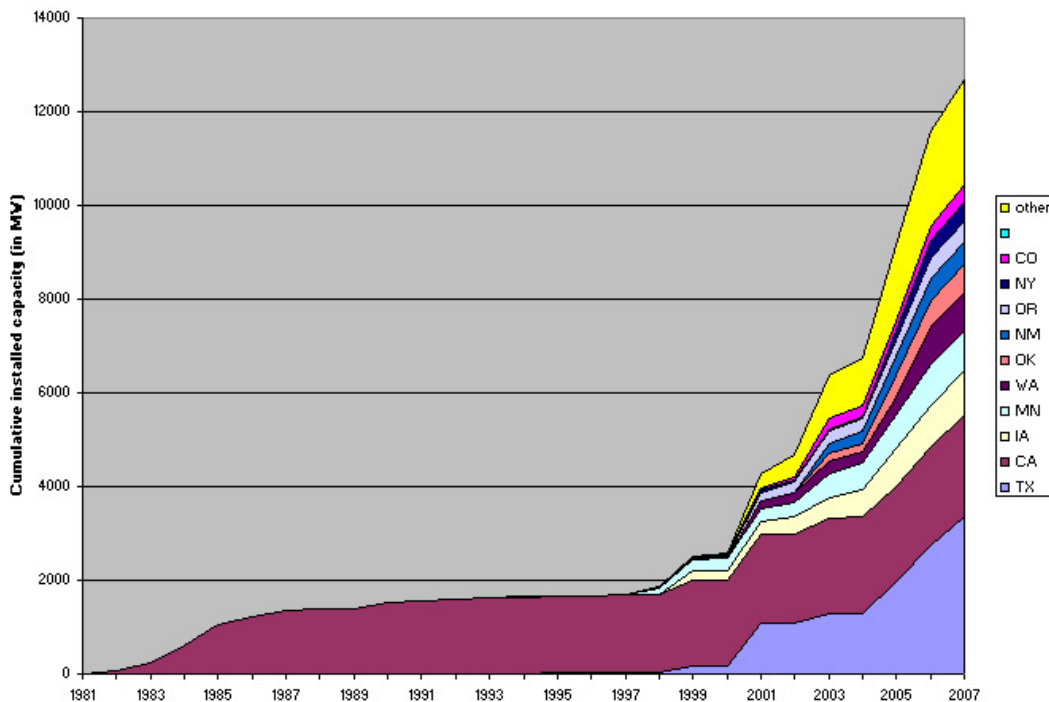
One of the most promising renewable energy sources is solar energy. Scientists have demonstrated that more solar energy reaches Earth annually than fossil fuels are capable of generating over hundreds of years. There are several different methods of harnessing solar energy to directly generate electricity:

- In Solar Photovoltaic or PV, a photovoltaic film or panel made from silicon wafers captures sunlight and directly converts it to electricity.
- In Solar Thermal systems, mirrors are used to reflect the sun at a central

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Figure 3: Increase in U.S. Installed Wind Energy Capacity

U.S. Installed Capacity (Megawatts) 1981-2007



Sources: U.S. Department of Energy Wind Energy Program & AWEA



receptor to heat a liquid (oil or water) to drive a steam turbine and generate electricity.

Solar plants perform optimally when situated in areas where sunlight is both more intense and more consistent, such as desert environments in the Southwestern U.S.

Hydroelectric

Hydroelectric plants use turbines to capture the kinetic energy of moving water to generate electricity. Traditionally, hydroelectric plants used large dams to store and drive water through turbines; today, newer “stream flow” turbine systems can be placed directly in rivers and streams without the need for dams. Currently, hydroelectric power generation is the most technologically developed and prevalent renewable resource; in 2006 about 6.3% of global energy production originated from hydroelectric facilities.⁸

Ocean Energy

Ocean energy involves harnessing the kinetic energy of waves and tides through a variety of mechanical means to generate electricity. Ocean energy technologies have advanced dramatically over the past decade. One promising technology uses wave motion flowing under a floating pyramid structure to create differences in air pressure to drive a wind turbine located at the top of the pyramid. Others systems capture the energy in tidal flows through submerged turbines. While still early in their development, an important benefit of many types of ocean energy systems is their consistency. The electrical energy generated by ocean and tidal technologies is relatively consistent throughout the day, season, and year and can generate electricity 24/7.

Geothermal

Geothermal is another highly potent renewable resource which can be

accessed through drilling or through hot springs that reach the surface of the earth. Geothermal plants pump water deep into the ground. Warmed by the natural heat of the earth, that water is then returned to the surface and used to generate electricity through steam turbines and other means. Like solar energy, geothermal processes bring great promise to our energy needs; with minimal scientific advances geothermal energy could theoretically sustain all of our current energy demands.

Bioenergy

Bioenergy is yet another increasingly viable renewable resource. Broadly speaking, bioenergy is energy derived through the combustion, fermentation, or organic processes of different types of biomass—naturally replenishing crops such as corn and sugarcane, but also including animal waste and lumber scraps. Additionally, certain forms of algae can produce biofuels directly from photosynthesis and hold much promise. The versatility of biomass—usable as fuels, products, and sources of energy—has helped bioenergy become increasingly popular as a replacement for processes traditionally requiring fossil fuels.

Advantages of Investment in Renewable Energy Projects

- Renewable energy project investments are similar to investments in other infrastructure assets, such as toll roads, airports, and port facilities. The investor benefits from the ownership of tangible, revenue-generating assets whose steady income streams can be captured to provide predictable returns.
- Renewable energy project investments resemble many of the attractive aspects of fixed income investments. The income stream that renewable energy projects deliver is relatively consistent, based on a binding Power Purchase Agreement (PPA) between a power generating project and the purchasing electrical

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⁸ U.S. Department of Energy, “International Energy Outlook 2006”, www.eia.doe.gov, August 2006



utility or commercial user. Many utilities are now required to purchase a growing percentage of their electrical supply from renewable energy generation projects.

- Renewable energy project investments can provide higher returns than fixed income investments for a number of reasons. First, the return is not tied to low Treasury rates as are many fixed income investments. Rather, returns are driven by the sale of power at fixed prices or at prevailing market rates correlated with oil and natural gas prices. Second, the GEI model is a private equity model, which positions the investor as an equity partner, traditionally a more profitable position in the capitalization structure.
- Renewable energy projects are a growth industry, and U.S. capacity for renewable energy projects is enormous.⁹ By considering all six types of renewable energy resources as potential investment opportunities, GEI believes our investors will benefit from scalability in our investment model. Scalability is also enhanced by the fact that development is not restricted to the U.S.; Canada, Europe, South America, Asia, and Australia are attractive expansion markets for financing renewable energy projects. Finally, many older projects will need to replace their existing equipment over time, and these project upgrades will provide additional investment opportunities.


Global Energy Investors and Our Energy Future

Embracing a wide range of renewable energy resources is critical to ensuring our future energy supply, protecting our environment, and improving our economic condition. GEI recognizes this and has created an investment vehicle with the goals of maximizing investor returns while supporting our local and global communities for generations to come.

We believe that:

- Investments in renewable energy power generation will enhance our energy security by bringing us closer to energy independence.
- Increasing demand for electricity will require massive investment to replace older generating plants and to grow our electrical power infrastructure. These investments will enable us to safely confront the time when fossil fuel reserves near exhaustion and their prices soar.
- Replacing the use of carbon based fossil fuels with clean, renewable sources of energy will reduce the impact of global warming.
- Finally, designing, building and operating these facilities will create new jobs while protecting the environment.

Conclusion

The future of renewable energy is bright. Investors today have the opportunity to participate in this exciting future in myriad ways and in doing so, to benefit themselves, their local communities, and the global community at large. 

Global Energy Investors, LLC welcomes your thoughts and questions. We may be reached at info@globalenergyinvestors.com.

Risks Relating to Private Equity Investments:

Private equity investments are more illiquid than other types of investments and are intended for investors with longer time horizons. Returns are not guaranteed.

Identifying and structuring private equity investments involves a high degree of uncertainty.

Nothing in this document is intended to be an offer to sell or a solicitation of an offer to purchase any security or investment product.

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⁹ The Obama administration's goal of doubling renewable energy generation by 2011 could require up to \$134 billion in new capital investments. A total of \$217 billion will be needed to attain a 10 percent penetration of renewables in the nation's energy mix by 2012. Nathaniel Gronewold, "Stimulus seen sowing seeds for renewable energy's revival", <http://www.nytimes.com/gwire/2009/03/20/20greenwire-stimulus-seen-sowing-seeds-for-industry-rev-10227.html?pagewanted=1>, March 20, 2009.