



Risk Mitigation Reference Guide for New Energy Financing

© 2012 Energi Inc.

Table of Contents

<i>About the Author</i>	<i>3</i>
<i>Disclaimer</i>	<i>4</i>
<i>Executive Summary.....</i>	<i>5</i>
<i>Document Purpose and Role in Green Lending</i>	<i>6</i>
<i>Energy Efficiency</i>	<i>8</i>
Market Potential.....	8
Industry Report.....	10
<i>Renewable Energy</i>	<i>11</i>
Market Potential.....	11
Industry Reports	12
<i>Industry Risk Matrixes</i>	<i>15</i>
Energy Efficiency Project	16
Solar PV Project.....	17
Wind Project	18
Hydro Project.....	19
Cogeneration Project	20
Fuel Cell Project.....	21
<i>Conclusion.....</i>	<i>22</i>
<i>Appendix.....</i>	<i>23</i>
<i>Resources</i>	<i>30</i>

Risk Mitigation Reference Guide for New Energy Financing

About the Author

Energi Inc. is a Massachusetts based Industrial Reinsurance Company providing innovative risk management and insurance programs to the energy industry. In partnership with Hannover Re, the third largest reinsurer in the world, Energi has designed a series of warranty programs for the alternative energy and energy efficiency industries that aim to support market growth via risk mitigation.

Disclaimer

The information contained in the **Risk Mitigation Reference Guide for New Energy Financing** is intended for use solely in connection with educating lenders interested in participating in the development of Green Energy Projects.

The facts and information contained herein are presented in a manner that Energi believes to be accurate. Other than historical data, all statements which involve risk and uncertainties are based on facts and assumptions available to Energi at the time they are made and are subject to change.

This guide is not intended as providing specific insurance coverage advice. For specific insurance or coverage questions, please contact a qualified insurance professional.

Executive Summary

The markets for clean energy, electricity produced from renewable generation techniques, are expected to grow rapidly in upcoming years though are constrained by a gap between financing mechanisms available and project funding needs. Recent economic analysis indicates a large buildup of untapped energy efficiency projects within the commercial building sector and multiple billions of dollars in unfunded renewable energy projects.¹ In order to flourish, these markets require broader participation from financial institutions.

This **Risk Mitigation Reference Guide for New Energy Financing** is intended to give the lending community a clear understanding of clean energy and energy efficiency projects, including common risk exposures that arise during the construction and operational phases. The objective is to give banks various risk mitigation tools as they look to develop underwriting guidelines for green lending projects. The critical types of insurance for the majority of clean energy and energy efficiency projects fall under the Construction Phase Risk Mitigation, Production Phase Risk Mitigation and Warranty and Performance Risk Mitigation.

Ultimately, this document will serve as a reference guide for all risk and insurance issues pertaining to alternative energy generation and energy efficiency projects.



¹Hannah Choi Granade, Jon Creyts, Anton Derkach, Philip Farese, Scott Nyquist, Ken Ostrowski, "Unlocking Energy Efficiency in the U.S. Economy", McKinsey

Document Purpose and Role in Green Lending

Stakeholder interest in clean energy and sustainability has risen over the past 20 years, though access to capital remains a hurdle to unlocking the market's full potential. A recent study by Deutsche Bank and Living Cities concluded that lenders tend to "view projections as unnecessarily risky for the purposes of establishing a viable loan". A lack of "commonly accepted datasets, data standards, or third party verification practices to measure and confirm energy savings" means that lenders need adequate risk protection and technical resources to facilitate investment and develop thorough underwriting guidelines.²

This **Reference Guide on Risk Mitigation for New Energy Financing** provides an overview of green energy and energy industry sub-sectors, the main risk exposures threatening projects, and the products available to mitigate these risks. Specifically, the main objectives of this document are to:

- **Outline common types of green energy projects:**
Projects vary greatly in technology, size, complexity and cost. This document presents an overview of the most common types of alternative energy and energy efficiency projects seeking financing, including a discussion of the different technologies and project economics.
- **Summarize risk exposures associated with projects:**
Technology, construction, and operational processes are unique to each different renewable energy projects. This document will discuss the main risks within each project type that may lead to problems affecting financing, including weather related events, theft and also often overlooked system risks that include faulty system design and ongoing performance.
- **Examine new and conventional risk mitigation products available:**
Risk mitigation products are available today to adequately protect against common risk exposures that arise during the construction and operational phases of renewable energy and energy efficiency projects. This document details common insurance coverage such as workers compensation, property and general liability, and also discusses innovative risk mitigation products designed to fill traditional coverage "gaps".
- **Serve as a reference on project risk for banks establishing loan underwriting guidelines:**
Banks interested in funding renewable and energy efficiency projects must develop standardized underwriting guidelines. In order to do this, they need a previously unpublished reference guide for specific project risks and necessary risk mitigation coverage. This document will give banks the understanding of risk exposures and insurance options they need to further efforts to lend into green energy markets.

²The Deutsche Bank Americas Foundation and Living Cities. "Recognizing the Benefits of Energy Efficiency in Multifamily Underwriting." 12 Jan. 2012. p.2

Reference Guide for All Risk and Insurance Issues

This document is intended to serve as a reference guide for all risk and insurance issues pertaining to alternative energy generation and energy efficiency projects. In considering financing for a project, a lender should first read the Industry Report contained for that project's sub-particular sub-sector. Next, a lender should refer to the appropriate Industry Risk Matrix to review the risk exposures the project will face, the recommended risk mitigation tools, the phase in which each risk exists, and which party is responsible for purchasing the insurance or bond mitigation product.

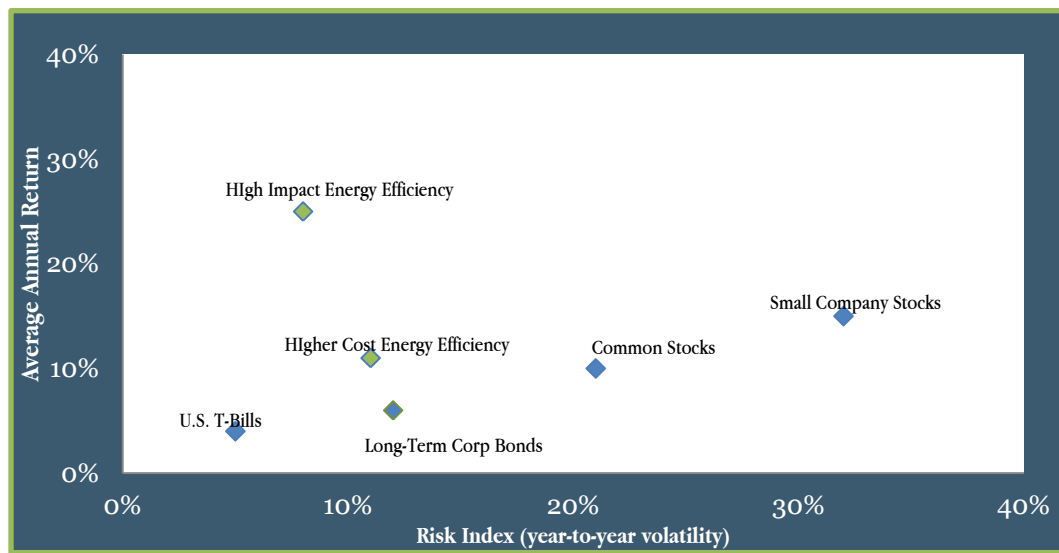
Further detail on each type of insurance or bond risk mitigation product is available in the Appendix section. For example, in assessing and underwriting an energy efficiency retrofit project, a lender would first gain a broad understanding of energy efficiency projects and the qualitative nature of specific risks by reading the Energy Efficiency Industry report. They next would refer to the Energy Efficiency Industry Risk Matrix to see, for example, that the risk of theft or vandalism present during the construction phase can be offset by requiring the contractor to purchase an "all-risk" or builders risk insurance policy. Detailed explanations and information on builders risk insurance is available in the Appendix Section under the Insurance Risk Mitigation Tools.

Energy Efficiency

Market Potential

Energy efficiency, or the practice of using less energy to provide the same service, is an often loosely defined yet powerful concept that has gained tremendous traction over the last several years.³ Energy efficiency addresses the following: sustainable sites, water consumption, power generation, waste reduction, and usage of materials and resources. An energy retrofit is designed to reduce the energy demand of a facility through more efficient energy utilization. Retrofit projects often include the addition of efficient boilers, chillers, HVAC & refrigeration equipment, appliances, efficient lighting, and building automation control systems.

In the 2009 study entitled “Unlocking Efficiency in the U.S. Economy”, McKinsey Global Energy and Materials reported that the United States has the potential to reduce energy consumption by roughly 23 percent by 2020, eliminating more than \$1.2 trillion in waste. The study also reported that an investment of approximately \$520 billion dollars was necessary to unlock the full potential in the market.⁴ The promising aspect of this finding is that investments in energy efficiency measures often provide a higher annual return than many widely used investment tools, as shown by the chart below.



Source: ACEEE Report “The Long-Term Energy Efficiency Potential”⁵

³ “What Is Energy Efficiency?” *What’s Energy Efficiency?* Lawrence Berkeley National Laboratory, n.d. <<http://eetd.lbl.gov/ee/ee-1.html>>.

⁴ Hannah Choi Granade, Jon Creyts, Anton Derkach, Philip Farese, Scott Nyquist, Ken Ostrowski, “Unlocking Energy Efficiency in the U.S. Economy”, McKinsey Global Energy and Materials, July 2009, pg. iii.

⁵ John A. “Skip Laitner, Steven Nadel, R. Neal Elliott, Harvey Sachs, and A. Siddiq Khan, “The Long-Term Energy Efficiency Potential: What the Evidence Suggests”, ACEEE, 2012, p. 9.

Despite the potential for high rates of return, financiers and property owners have been unable to take advantage of this tremendous opportunity. A recent study published by Deutsche Bank and Living Cities concluded that the current lending climate is conservative due to uncertainty and disbelief of energy efficiency retrofit projections.⁶ The study noted that “conventional lenders treat energy savings projections skeptically and virtually never incorporate them in the underwriting models that determine the sizing of loans”, favoring instead the historic energy performance of a building.⁷ Lenders cite a lack of historical data necessary to evaluate and “reliably assess the risk associated with lending against energy savings projections”.⁸ Project financiers must be sure that cash flows from future savings will be realized and will be sufficient to service the debt, since project owners rely on such savings to re-pay the initial investment.

Game-Changing Growth

Energy efficiency projects are common in the MUSH (Municipalities, Universities, Schools and Hospitals) market and have been typically completed by several large Energy Service Companies including Honeywell, Johnson Controls, Siemens, Eaton, Schneider Electric, Trane and AMERESCO. Energy Services Companies traditionally offer contractual guarantees or energy savings performance contracts (ESPCs) that guarantee that energy cost savings will meet or exceed an agreed upon amount. If the guaranteed savings value is not met due to errors in the contractors’ design or installation work, the ESPC requires the ESCO to pay.⁹

In recent years, game-changing financial structures have developed to generate greater investment in Energy Efficiency. These models are through various mechanisms such as Property Assessed Clean Energy (PACE) Financing, On-Bill Financing and Energy Service Agreements. Emerging small to mid-sized energy efficiency contractors are utilizing these financial mechanisms to focus on the largely untapped commercial market. In addition, various protocols and products have been developed to increase the confidence and activity in the energy efficiency market. The process of conducting energy audits and collecting project data has become streamlined and standardized to deliver highly accurate reporting and modeling.

Another recent development has been the reemergence of Energy Savings Insurance (ESI), which backstops energy savings guarantees and increases the “bankability” of a project. In the event guaranteed energy savings are not achieved, ESI will reimburse a contractor for shortfall payments that result from errors in the design or installation of the system. Insurance is beneficial, as it mitigates the risk of system underperformance and adds security on payback and ROI for financiers.¹⁰

⁶ The Deutsche Bank Americas Foundation and Living Cities. “Recognizing the Benefits of Energy Efficiency in Multifamily Underwriting.” 12 Jan. 2012. p.2

⁷ Ibid.

⁸ Ibid.

⁹ Anthony Buonicore, “Energy Savings Insurance and the NEW ASTM BEPA Standard”, *Green Building and Sustainable Development in the Commercial Real Estate Industry: Critical Issues Series*, Building Energy Performance Assessment News, 2011, pgs. 2-3

¹⁰ Ibid.

Industry Report

Energy efficiency conservation measures consist of building control systems, boilers & chillers, HVAC equipment and more efficient lighting. Simple changes to a building can produce large savings on energy costs. Investment paybacks for efficiency retrofit projects can range from 1-3 years for lighting upgrade projects, to 5-9 years for more complex retrofit projects.¹¹ Energy retrofit projects are often structured such that the cost of the project is less than or equal to the project energy savings, resulting in a win-win situation for the project owner or building manager.

Provided below is an example of a comprehensive energy efficiency project completed on a commercial building:

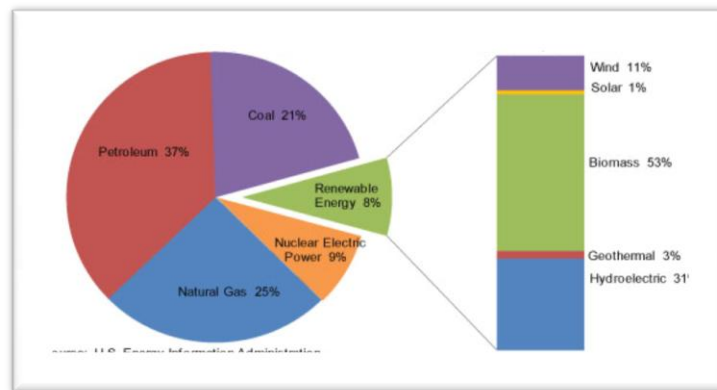


¹¹ The Rockefeller Foundation, and DB Climate Change Advisors. "United States Building Energy Efficiency Retrofits: Market Sizing and Financing Models." 5 Mar. 2012.

Renewable Energy

Market Potential

Common sources of renewable energy include biomass, hydropower, geothermal, wind, solar, and biofuel. In 2010, 8% of domestically produced electricity was generated by renewable sources. Forty-six states have incentive programs in the United States that promote the growth and use of renewable energy. Recent projections from the U.S. Energy Information Administration indicate that electricity generated from renewable sources will account for 17% of total electricity generation by 2035.¹²



United States Energy Consumption, 2010

Renewable energy has historically been more expensive to produce than conventional sources of electricity, as it is often located in remote areas that lack access to the existing grid distribution system. In order to transport the electricity produced from renewable sources to the cities and towns that require it, additional power lines and infrastructure must be built, which can be extremely expensive and add to the total cost of the power produced. Despite this, renewable energy generation still remains an attractive option in light of the rising costs and instability of fossil fuels. Significant federal and state government incentive programs also continue to drive down the cost of renewable energy.

Globally, the United States Energy Information Administration expects that renewable energy will be the fastest growing electricity generation source from the forecast period to 2035.¹³ This growth has been driven in part by technological advancements that allow for greater power producing ability and data collection tools necessary to analyze and maintain proper system performance. In addition, the recent introduction of specialized insurance products that mitigate risk during the construction and operational stage of a project have contributed to the growing demand for renewable energy.¹⁴

¹² "How Much of Our Electricity is Generated From Renewable Sources", *Energy in Brief—What Everyone Should Know About Energy*, U.S. Energy Information Administration, 2010.

¹³ Ibid.

¹⁴ Ibid.

Industry Reports

Solar

Solar panels use Photovoltaic (PV) cells to convert energy received via sunlight, into electricity. PV technology has been in existence since the 19th century and is currently the fastest growing power-generation technology source in the world. Photovoltaic panel arrays are comprised of a thin layer of crystalline or amorphous silicon protected with a layer of glass.¹⁵ Because the electricity produced per cell is generally low, the cells are bundled together into larger panels with a typical power output of 225 to 250 Watts.¹⁶ Solar panel frames are either stagnant or adjustable machines that are orientated in the direction of the sun. Panels vary in size from a surface area of two square feet to twelve square feet, and may be connected in a frame of two to twelve panels.¹⁷ The number of panel frames (also called an array) can vary from one to hundreds. Solar panels degrade over time due to continual exposure to the sun and have an average life span of 25 years. Solar panels can be expensive and are at risk of both physical damage and being stolen.



Wind

Wind energy is plentiful, renewable, widely distributed, and does not release greenhouse gasses during production. Wind Turbines operate by converting wind energy into useful forms of electricity as the blades spin and turn a motor. This electricity can be used on-site or pumped into a nearby electrical grid and in many cases, excess electricity can be sold to the local utility company.¹⁸



¹⁵ SEIA. "Photovoltaic Solar Technology: Creating Electricity from Sunlight." *Solar Energy Industries Association*. *Www.seia.org*. 15 Mar. 2010.

¹⁶ "Solar Technology and Products." *Solar Energy Industries Association*. 26 Mar. 2012.

<http://www.seia.org/cs/solar_technology_and_products/solar_electric_photovoltaic>.

¹⁷ Ibid.

¹⁸ "A Brief Guide to Wind Generators", *Earth-Friendly Resources for Home and Office*, <http://faryal.net/wpb_5-0.html>.



Cogeneration

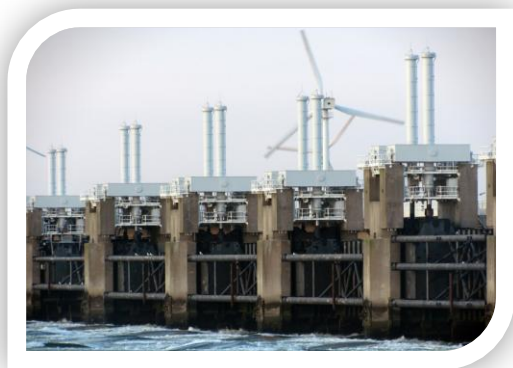
Cogeneration is a more efficient process of generating power by capturing and utilizing latent heat produced from the operation of a traditional combustion fired engine. On-site cogeneration systems are among the most cost efficient methods of reducing the carbon emissions of heating in cold climates. When equipped with sufficient redundancy, such as standby grid connection and uninterruptible power systems, cogeneration can far exceed the reliability of some local utilities. The most common way to apply cogeneration is

by using a gas turbine as the prime mover and a heat recovery steam generator. Due to the complexity of the systems, maintenance for cogeneration systems can also be sizeable. Energy savings are eventually realized, but the projects generally require sizeable upfront investments.¹⁹

Hydro Electric Power

Hydroelectric power comes from flowing water, winter and spring runoff from mountain streams and lakes. The force of gravity from falling water can be used to power turbines and generators that produce electricity. There are two types of turbines, reaction turbines and impulse turbines. Reaction turbines consist of horizontal or vertical wheels that operate fully submerged in order to reduce turbulence and stress on the wheel. Water is under pressure at a central point and escapes from the

end of the blades causing rotation. Impulse turbines consist of covered horizontal or vertical wheels that utilize the kinetic energy of water hitting the buckets or blades to cause rotation.²⁰ The efficiency of hydroelectric plants is currently about 90%. The U.S. Department of Energy has identified 5,677 sites in the United States with acceptable undeveloped hydropower potential.²¹



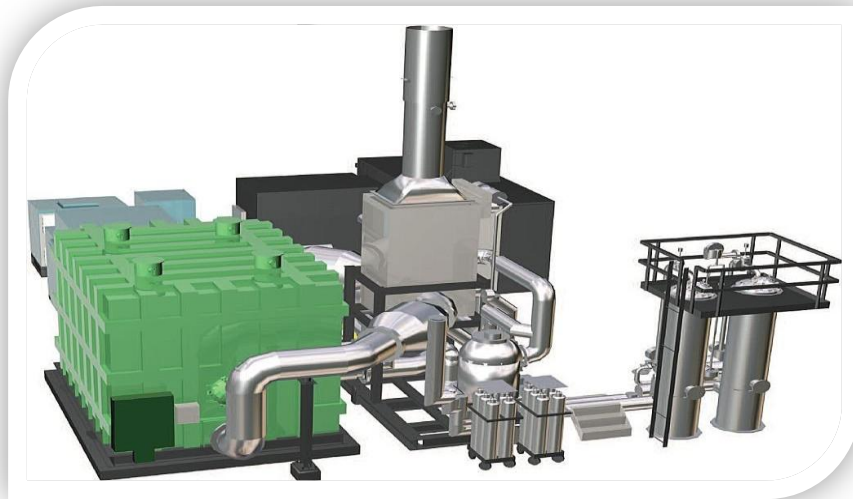
¹⁹ Tim Baur, "Cogeneration can help be a long-term energy-producing alternative", *PlantServices.com*, <<http://www.plantservices.com/articles/2003/107.html?page=full>>.

²⁰ U.S. Department of Energy: Energy Efficiency and Renewable Energy Division. "Hydropower Basics." *Water Power Program*. 19 Sept. 2011. <http://www1.eere.energy.gov/water/hydropower_resources.html>.

²¹ "Water Energy Resources of the United States with Emphasis on Low Head/Low Power Resources", *United States Department of Energy*, April 2004, pg. 1.

Fuel Cell Energy

Fuel cells are electrochemical devices that combine fuels such as hydrogen, natural gas, or alcohol with oxygen in order to produce electricity and heat. Much like a battery, they consist of an anode and a cathode with a fluid electrolyte in between. Because the process does not include combustion, the process is much cleaner and more efficient than conventional combustion engines. Fuel cells can be used for power, cogeneration, off-grid power supply, distributed generation, emergency power systems, electric and hybrid vehicles, and many other applications. Fuel cells have a 95% power availability and electric power generation efficiency of 47%. As of January 2011, stationary fuel cells generated power at approximately \$724 to \$775 per kilowatt installed.²²



²² U.S. Department of Energy: Energy Efficiency and Renewable Energy Division. "Types of Fuel Cells." *FCT Fuel Cells*.
<http://www1.eere.energy.gov/hydrogenandfuelcells/fuelcells/fc_types.html>.

Industry Risk Matrixes

Energy Efficiency Project

Notable Exposures	Risk Financing Tools	Construction Phase	Production Phase	Provided By
Tangible Property/Fixed Assets				
"All Risk" Causes of Loss/Construction Including:	Builder's Risk or "All Risk" Property Policy	X		Contractor or Project Owner
Theft		X		
Vandalism		X		
Fire		X		
Materials In Transit Including Loading & Unloading		X		
Materials Stored Off Premise		X		
Loss or Delay of Business Income (relevant if income generating assets are affected)	Property Policy	X	X	Project Owner
"All Risk" Causes of Loss Including			X	
Fire			X	
Windstorm			X	
Vandalism			X	
Lightning			X	
Earthquake			X	
Sudden and Accidental Equipment Breakdown	Machinery & Equipment Breakdown		X	Project Owner
Business Income/Equipment Breakdown			X	
Flooding/Selected Locations	Flood Insurance		X	Project Owner
Liability/Third Party - Injury to Workers and Bodily Injury and Property Damage (BI & PD) to Others				
Site & Operations BI & PD Injuries to Others	Commercial General & Excess/Umbrella Liability	X		Contractor & Project Owner
			X	Project Owner
Vehicle Related BI & PD Injuries to Others	Automobile & Excess/Umbrella Liability	X	X	Contractor & Project Owner
			X	Project Owner
Injuries to Employees	Workers' Compensation	X	X	Contractor & Project Owner
			X	Project Owner
Performance				
Contractor Insolvency	Bid & Performance Bonds	X		Contractor
Inability to Complete Construction		X		
Failure to Deliver Material	Supply Bond	X		Contractor and/or Manufacturer
Defect in Means & Methods of Construction	Contractors Errors & Omissions*	X		Contractor
Negligent Supervision of Subcontractors		X		
Non-Payment due to Credit Risks such as Default, Insolvency or Bankruptcy	Trade Credit Insurance/Contract Frustration		X	Financier
Equipment Design/Manufacturing Defect	Product Warranty		X	Manufacturer
Equipment Output Deficiency	Performance Warranty		X	
Shortfall In Projected Energy Savings	Energy Saving Warranty		X	Contractor and/or Manufacturer
"Notable" Exposures are those expected to be material for the Construction and Operation of this type of facility. Each Project should be analyzed to identify and evaluate Project specific risks of loss.	Insurance Policies suggested for Tangible Property Damage and Liability Losses will typically provide protections for exposures common to most enterprises and broader than those identified as Notable. *The Risk Financing tools suggested(Property & Casualty Insurance, Surety Bonds, Warranties and Hedging) may not be available in all cases.			

Solar PV Project

Notable Exposures	Risk Financing Tools	Construction Phase	Production Phase	Provided By
Tangible Property/Fixed Assets				
"All Risk" Causes of Loss/Construction Including: Theft	Builder's Risk	X		Contractor or Project Owner
Vandalism		X		
Fire		X		
Windstorm				
Materials In Transit Including Loading & Unloading		X		
Materials Stored Off Premise		X		
Loss or Delay of Business Income	Property Policy	X	X	Project Owner
"All Risk" Causes of Loss Including:			X	
Hail			X	
Windstorm			X	
Lightning			X	
Fire			X	
Earthquake			X	
Theft			X	
Sudden and Accidental Equipment Breakdown	Machinery & Equipment Breakdown		X	Project Owner
Business Income/Equipment Breakdown			X	
Flooding/Selected Locations	Flood Insurance		X	Project Owner
Liability/Third Party - Injury to Workers and Bodily Injury and Property Damage (BI & PD) to Others				
Site & Operations BI & PD Injuries to Others	Commercial General & Excess/Umbrella Liability	X	X	Contractor & Project Owner
			X	
Vehicle Related BI & PD Injuries to Others	Automobile & Excess/Umbrella Liability	X	X	Contractor & Project Owner
			X	Project Owner
Injuries to Employees	Workers' Compensation	X	X	Contractor & Project Owner
			X	
Performance				
Contractor Insolvency	Bid & Performance Bonds	X		Contractor
Inability to Complete Construction		X		
Failure to Deliver Material	Supply Bond	X		Contractor and/or Manufacturer
Defect in Means & Methods of Construction	Contractors Errors & Omissions*	X		Contractor
Negligent Supervision of Subcontractors		X		
Non-Payment due to Credit Risks such as Default, Insolvency or Bankruptcy	Trade Credit Insurance/Contract Frustration		X	Financier
Equipment Design/Manufacturing Defect	Product Warranty		X	Manufacturer
Equipment Output Deficiency	Solar Installation Performance Warranty		X	
Lack of Sun	Heating Degree Day (HDD)/Climate Hedge*		X	Project Owner
"Notable" Exposures are those expected to be material for the Construction and Operation of this type of facility. Each Project should be analyzed to identify and evaluate Project specific risks of loss.	Insurance Policies suggested for Tangible Property Damage and Liability Losses will typically provide protections for exposures common to most enterprises and broader than those identified as Notable. *The Risk Financing tools suggested(Property & Casualty Insurance, Surety Bonds, Warranties and Hedging) may not be available in all cases.			

Wind Project

Notable Exposures	Risk Financing Tools	Construction Phase	Production Phase	Provided By
Tangible Property/Fixed Assets				
"All Risk" Causes of Loss/Construction Including:	Builder's Risk	X		Contractor or Project Owner
Theft		X		
Vandalism		X		
Windstorm		X		
Fire				
Materials In Transit Including Loading & Unloading		X		
Materials Stored Off Premise		X		
Loss or Delay of Business Income	Property Policy	X	X	Project Owner
"All Risk" Causes of Loss Including:			X	
Vandalism			X	
Windstorm			X	
Lightning			X	
Earthquake			X	
Sudden and Accidental Equipment Breakdown	Machinery & Equipment Breakdown		X	Project Owner
Business Income/Equipment Breakdown			X	
Liability/Third Party - Injury to Workers and Bodily Injury and Property Damage (BI & PD) to Others				
Site & Operations BI & PD Injuries to Others	Commercial General & Excess/Umbrella Liability	X	X	Contractor & Project Owner
			X	Project Owner
Vehicle Related BI & PD Injuries to Others	Automobile & Excess/Umbrella Liability	X	X	Contractor & Project Owner
			X	Project Owner
Injuries to Employees	Workers' Compensation	X	X	Contractor & Project Owner
			X	Project Owner
Performance				
Contractor Insolvency	Bid & Performance Bonds	X		Contractor
Inability to Complete Construction		X		
Failure to Deliver Material	Supply Bond	X		Contractor and/or Manufacturer
Defect in Means & Methods of Construction	Contractors Errors & Omissions*	X		Contractor
Negligent Supervision of Subcontractors		X		
Non-Payment due to Credit Risks such as Default, Insolvency or Bankruptcy	Trade Credit Insurance/Contract Frustration		X	Financier
Equipment Design/Manufacturing Defect	Product Warranty		X	Manufacturer
Equipment Output Deficiency	Performance Warranty		X	
Lack of Wind	Weather/Climate Hedge*		X	Contractor and/or Manufacturer
"Notable" Exposures are those expected to be material for the Construction and Operation of this type of facility. Each Project should be analyzed to identify and evaluate Project specific risks of loss.	Insurance Policies suggested for Tangible Property Damage and Liability Losses will typically provide protections for exposures common to most enterprises and broader than those identified as Notable. *The Risk Financing tools suggested(Property & Casualty Insurance, Surety Bonds, Warranties and Hedging) may not be available in all cases.			

Hydro Project

Notable Exposures	Risk Financing Tools	Construction Phase	Production Phase	Provided By
Tangible Property/Fixed Assets				
"All Risk" Causes of Loss/Construction Including:	Builder's Risk	X		Contractor or Project Owner
Theft		X		
Vandalism		X		
Fire		X		
Materials In Transit Including Loading & Unloading		X		
Materials Stored Off Premise		X		
Loss or Delay of Business Income	Property Policy	X	X	Project Owner
"All Risk" Causes of Loss Including:			X	
Hail			X	
Windstorm			X	
Vandalism			X	
Lightning			X	
Earthquake			X	
Sudden and Accidental Equipment Breakdown	Machinery & Equipment Breakdown		X	Project Owner
Business Income/Equipment Breakdown			X	
Flooding/Selected Locations	Flood Insurance		X	Project Owner
Liability/Third Party - Injury to Workers and Bodily Injury and Property Damage (BI & PD) to Others				
Site & Operations BI & PD Injuries to Others	Commercial General & Excess/Umbrella Liability	X	X	Contractor & Project Owner
			X	Contractor
Downstream Flooding/Dam Operations		X	X	
Vehicle Related BI & PD Injuries to Others	Automobile & Excess/Umbrella Liability	X	X	Contractor & Project Owner
			X	Contractor
Injuries to Employees	Workers' Compensation	X	X	Contractor & Project Owner
			X	Contractor
Performance				
Contractor Insolvency	Bid & Performance Bonds	X		Contractor
Inability to Complete Construction		X		
Failure to Deliver Material	Supply Bond	X		Contractor and/or Manufacturer
Negligent Supervision of Subcontractors	Contractors Errors & Ommissions*	X		Contractor
Non-Payment due to Credit Risks such as Default, Insolvency or Bankruptcy	Trade Credit Insurance/Contract Frustration		X	Financier
"Notable" Exposures are those expected to be material for the Construction and Operation of this type of facility. Each Project should be analyzed to identify and evaluate Project specific risks of loss.	Insurance Policies suggested for Tangible Property Damage and Liability Losses will typically provide protections for exposures common to most enterprises and broader than those identified as Notable. *The Risk Financing tools suggested(Property & Casualty Insurance, Surety Bonds, Warranties and Hedging) may not be available in all cases.			

Cogeneration Project

Notable Exposures	Risk Financing Tools	Construction Phase	Production Phase	Provided By
Tangible Property/Fixed Assets				
"All Risk" Causes of Loss/Construction Including:	Builder's Risk	X		Contractor or Project Owner
Theft		X		
Vandalism		X		
Windstorm		X		
Fire		X		
Materials In Transit Including Loading & Unloading		X		
Materials Stored Off Premise		X		
Loss or Delay of Business Income	Property Policy	X	X	Project Owner
"All Risk" Causes of Loss/Production Including:			X	
Hail			X	
Windstorm			X	
Vandalism			X	
Lightning			X	
Falling Objects, e.g. Trees, Utility Poles			X	
Earthquake			X	
Sudden and Accidental Equipment Breakdown	Machinery & Equipment Breakdown		X	Project Owner
Business Income/Equipment Breakdown			X	
Flooding/Selected Locations	Flood Insurance		X	Project Owner
Liability/Third Party - Injury to Workers and Bodily Injury and Property Damage (BI & PD) to Others				
Site & Operations BI & PD Injuries to Others	Commercial General & Excess/Umbrella Liability	X	X	Contractor & Project Owner
			X	Project Owner
Vehicle Related BI & PD Injuries to Others	Automobile & Excess/Umbrella Liability	X	X	Contractor & Project Owner
			X	Project Owner
Injuries to Employees	Workers' Compensation	X	X	Contractor & Project Owner
			X	Project Owner
Performance				
Contractor Insolvency	Bid & Performance Bonds	X		Contractor
Inability to Complete Construction		X		
Failure to Deliver Material	Supply Bond	X		Contractor and/or Manufacturer
Defect in Means & Methods of Construction	Contractors Errors & Omissions*	X		Contractor
Negligent Supervision of Subcontractors		X		
Non-Payment due to Credit Risks such as Default, Insolvency or Bankruptcy	Trade Credit Insurance/Contract Frustration		X	Financier
Equipment Design/Manufacturing Defect	Product Warranty		X	Manufacturer
Equipment Output Deficiency	Performance Warranty		X	
Electrical Price Fluctuations/Green Energy Tax Incentive Uncertainty	Appropriate Hedging Tool*		X	Project Owner
"Notable" Exposures are those expected to be material for the Construction and Operation of this type of facility. Each Project should be analyzed to identify and evaluate Project specific risks of loss.	Insurance Policies suggested for Tangible Property Damage and Liability Losses will typically provide protections for exposures common to most enterprises and broader than those identified as Notable. *The Risk Financing tools suggested(Property & Casualty Insurance, Surety Bonds, Warranties and Hedging) may not be available in all cases.			

Fuel Cell Project

Notable Exposures	Risk Financing Tools	Construction Phase	Production Phase	Provided By
Tangible Property/Fixed Assets				
"All Risk" Causes of Loss/Construction Including:	Builder's Risk	X		Contractor or Project Owner
Theft		X		
Vandalism		X		
Windstorm		X		
Fire		X		
Materials In Transit Including Loading & Unloading		X		
Materials Stored Off Premise		X		
Loss or Delay of Business Income	Property Policy	X	X	Project Owner
"All Risk" Causes of Loss/Production Including			X	
Hail			X	
Windstorm			X	
Vandalism			X	
Lightning			X	
Falling Objects, e.g. Trees, Utility Poles			X	
Earthquake			X	
Sudden and Accidental Equipment Breakdown	Machinery & Equipment Breakdown		X	Project Owner
Business Income/Equipment Breakdown			X	
Flooding/Selected Locations	Flood Insurance		X	Project Owner
Liability/Third Party - Injury to Workers and Bodily Injury and Property Damage (BI & PD) to Others				
Site & Operations BI & PD Injuries to Others	Commercial General & Excess/Umbrella Liability	X	X	Contractor & Project Owner
			X	Project Owner
Vehicle Related BI & PD Injuries to Others	Automobile & Excess/Umbrella Liability	X	X	Contractor & Project Owner
			X	Project Owner
Injuries to Employees	Workers' Compensation	X	X	Contractor & Project Owner
			X	Project Owner
Performance				
Contractor Insolvency	Bid & Performance Bonds	X		Contractor
Inability to Complete Construction		X		
Failure to Deliver Material	Supply Bond	X		Contractor and/or Manufacturer
Defect in Means & Methods of Construction/Installation	Contractors Errors & Omissions*	X		Contractor
Negligent Supervision of Subcontractors		X		
Non-Payment due to Credit Risks such as Default, Insolvency or Bankruptcy	Trade Credit Insurance/Contract Frustration		X	Financier
Equipment Design/Manufacturing Defect	Product Warranty		X	Manufacturer
Equipment Output Deficiency	Performance Warranty		X	
Electrical Price Fluctuations/Green Energy Tax Incentive Uncertainty	Appropriate Hedging Tool*		X	Project Owner
"Notable" Exposures are those expected to be material for the Construction and Operation of this type of facility. Each Project should be analyzed to identify and evaluate Project specific risks of loss.	Insurance Policies suggested for Tangible Property Damage and Liability Losses will typically provide protections for exposures common to most enterprises and broader than those identified as Notable. *The Risk Financing tools suggested(Property & Casualty Insurance, Surety Bonds, Warranties and Hedging) may not be available in all cases.			

Conclusion

Next Steps Moving Forward

The intent of the **Risk Mitigation Reference Guide for New Energy Financing** is to help educate the lending community about green energy projects and associated risk exposures. Uncertainties exist for alternative energy and energy efficiency around the performance of technologies and the security of future energy savings or production, leading to a conservative lending environment. Further education is necessary to overcome the barriers that prevent wide-scale lending and project development. The market has shown that for these technologies and industries to reach scale, banks require enhanced underwriting practices where future project performance can be analyzed. In order to fully capitalize on industry opportunities, lenders must develop standardized underwriting guidelines that incorporate the projected future energy savings or production. To do this they must understand risk exposures that may affect project economics.

Insurance and Risk Management

A key component of new and advanced underwriting is the value of insurance in mitigating project risks and inherent uncertainties. Insurance plays a critical role by providing financial protection to various project types throughout construction and operational phases. Similar to other construction or energy markets, adequate insurance protection is crucial to guard against risk exposures, ensure proper project performance and protect the financial interests of all parties involved. Application of adequate risk protections through insurance will further encourage the continued success and growth of the clean energy and energy efficiency markets.

Appendix:
Insurance Risk Mitigation Tools

Risk Mitigation in Construction Phase

Builder's Risk

- Builder's Risk Insurance is a property damage policy that protects the construction project from beginning through completion. This coverage is rated reflecting the changing value of the project from initial value of the equipment and supplies to the value of the project upon completion.
- Builder's Risk is common property coverage for construction projects and can be purchased by either the contractor or project owner. It is important to coordinate the project completion date with permanent coverage. Once construction is completed the equipment should be covered within a property policy of the Project Owner or other party required by contract to provide insurance.
- Perils that are typically covered under Builder's Risk policy include theft, vandalism, fire, lightning and windstorm. Coverage is provided for materials in transit (including loading and unloading) and collision and other transportation perils are included. Materials stored off premise are also covered.

Commercial General Liability

- Commercial General Liability Insurance covers bodily injury and property damage to third parties and related defense costs. Coverage applies both on and off site for claims related to the project construction.
- During construction, it is necessary that both the contractor and project owner purchase these covers.

Commercial Automobile Liability

- Commercial Automobile Liability Insurance covers bodily injury and property damage to third parties as a result of an automobile accident.
- During construction, it is necessary that both the contractor and project owner purchase these covers.
- Coverage should be carried whether or not an entity owns vehicles to protect against allegations of negligence resulting from employee or other use of non-owned vehicles.

Worker's Compensation

- Worker's Compensation Insurance covers employers for their statutory responsibility for employees' work related injury or illness.
- Employers are responsible by law for medical expenses and statutory lost wages related to workplace injuries. If the Contractor does not insure their Worker's Compensation obligation, injuries to the Contractor's employees may become the responsibility of the Project Owner.
- During construction the contractor must, and the project owner should, purchase Workers' Compensation insurance.

Performance and Bid Bonds

- Performance Bonds guarantee to the Project Owner that the Contractor will complete the contracted work.
- Bid Bonds guarantee the Project Owner that a bidding Contractor's bonding company (Surety) will provide the Performance Bond if the Contractor's bid is successful.
- The Contractor arranges for the Performance and Bid Bond.
- The design and construction of renewable energy or energy efficiency projects require immense amounts of upfront capital. A substantial risk exposure for project financiers is that construction will not be completed. Bid and Performance Bonds mitigate the risk of incomplete construction.

Supply Bonds

- Supply Bonds guarantee the Project Owner that the Supplier will furnish supplies or materials as contracted.
- The Supplier arranges for the Supply Bond.
- The lack of alternative sources of technology or other specialty materials acceptable to the Project Owner may discourage Sureties from providing Supply Bonds.

Contractor's Errors & Omissions

- Contractor's Errors & Omissions (E&O) Insurance provides protection against losses sustained resulting from the contractor or subcontractors errors and oversights during construction.
- The coverage is purchased by the Contractor and the terms, conditions and breadth of coverage vary widely.

Excess/Umbrella

- An Excess or Umbrella Insurance policy provides higher limits over a Commercial General Liability or an Automobile Liability policy, or the Employer's Liability coverage part of a Workers' Compensation policy. Most often the Excess or Umbrella policy will extend coverage over all three of these primary policies.
- Excess/Umbrella policies can be purchased by Contractors in sufficient limits to satisfy their contractual responsibility to the Project Owner.
- Contractors and Project Owners can both arrange Excess/Umbrella policies with limits deemed sufficient to protect each party's assets.

Political Risk Insurance

- Political Risk Insurance protects assets located outside of the United States against Confiscation or Deprivation
- Assets can be protected for the period of construction or on a permanent basis with policy terms available up to 20 years on a non-cancellable basis
- Coverage is often required by financiers as a condition to providing project equipment finance.²³

Risk Mitigation in Production Phase

Property

- Property Insurance pays for sudden and accidental physical damage caused by common perils including fire, wind, hail, lightning, vandalism, theft, and other risks.
- Property coverage limits should be the replacement cost of equipment of similar capacity and productive life, and any other property such as protective barriers, fences, wind barriers, controls, transformers, transmission wiring and other ancillary equipment.
- Some green energy projects will require additional coverage, where available, to cover site specific perils such as wind, earthquakes and floods.
- Equipment Breakdown policies provide coverage for the repair or replacement of mechanical and electrical equipment that suffers sudden and accidental breakdown. Coverage may be included in a Property Insurance policy or purchased separately.
- Business Interruption insurance covers the revenue lost during repair or reconstruction of equipment. Business Interruption is a common endorsement to Property and Equipment Breakdown insurance. Coverage can be provided during the construction phase to ensure against delay in realized income or savings.
- The various forms of Property Insurance are purchased by the Project Owner.

Commercial General Liability

- Commercial General Liability Insurance covers bodily injury and property damage to third parties and related defense costs. Coverage applies both on and off site for claims related to the Project Owner's operations.
- The Project Owner should purchase this cover during production.

²³ Quirk III, James F., "Trade Credit and Political Risk Analysis", Wells Fargo Insurance, Boston MA. <<http://www.linkedin.com/in/jimquirk>>

Commercial Automobile

- Commercial Automobile Liability Insurance covers bodily injury and property damage to third parties as a result of an automobile accident.
- The Project Owner should carry Automobile Liability Insurance whether or not they own vehicles to protect against allegations of negligence resulting from employee or other use non-owned vehicles.

Worker's Compensation

- Worker's Compensation Insurance covers employers for their statutory responsibility for employees' work related injury or illness. Employers are responsible by law for medical expenses and statutory lost wages related to workplace injuries.
- Workers' Compensation coverage is recommended for the Project Owner during the production phase of a project and is mandatory if the Project Owner has employees subject to statutory coverage.

Weather Insurance

- Weather insurance is a hedge against weather conditions that vary negatively from predictions upon which a business is dependent and it is often considered when developing a solar array.
- The power output and production of a solar array is dependent upon the amount of sunshine received on a project site in a given year. Projected output values are calculated based on historical averages and current trends, yet it is possible for substantial deviations in average weather patterns to occur and significantly alter the output of a system.
- Weather Insurance can be purchased by a Project Owner to protect against below average sunshine in a given year and is comparable to insurance that a farmer purchases to protect crop production in the event of drought.
- Premiums are typically expensive, and because contractors often adjust and factor in these variations in seasonal weather patterns when making system projections, weather insurance is likely not a crucial or necessary protection.

Excess/Umbrella

- An Excess or Umbrella Insurance policy provides higher limits over a Commercial General Liability or an Automobile Liability policy, or the Employer's Liability coverage part of a Workers' Compensation policy. Most often the Excess or Umbrella policy will extend coverage over all three of these primary policies.
- Project Owners can arrange Excess/Umbrella policies with limits deemed sufficient to protect their assets.

Trade Credit Insurance

- Credit Insurance also called Contract Frustration is offered to business entities wishing to protect their accounts receivable from loss due to credit risks such as default, insolvency or bankruptcy.
- Trade Credit insurance covers accounts receivable against nonpayment, typically chapter 7 or 11 filings of the United States Bankruptcy code within the United States or the equivalent bankruptcy filing outside the United States.
- It also insures payments for goods or services provided to foreign governments with Contract Frustration insurance.
- Trade Credit Insurance is purchased by financial institutions or lenders.²⁴

Political Risk Insurance

- Political Risk Insurance can be used to insure payment or protect against deprivation or seizure of owned equipment located outside of the United States. Coverage periods range from one to twenty years on a non cancelable basis and are available from private insurers and government sponsored insurers.
- It can insure against non-payment by sovereign obligors.
- It can insure contractually due payments for such things as service contracts and Power Purchase Agreements.²⁵

Product Warranty

- A Manufacturer of technologies commonly offers a Product Warranty which is issued to their customer and end-users.
- The warranty typically covers the repair and replacement costs in the event of design error or manufacturer's defect. In addition, the warranty may cover losses that result from the faster degradation of product performance than warranted by the Manufacturer.
- The length, coverages and exclusions are critical to ensuring that adequate protection is available in the event of a loss.
- The Manufacturer can in turn purchase a Contractual Liability policy that stands behind the Product Warranty issued by the Manufacturer.
- Various carriers offer unique insurance solutions that consist of a product warranty and performance output cover.
- The purchase of the Product Warranty cover is critical to protect both the Project Owner and Investor in the event that the purchased system component parts are defective and require replacement or repair. It is especially important to provide greater economic support and long-term certainty for the manufacturer's products.

²⁴ Quirk III, James F., "Trade Credit and Political Risk Analysis", Wells Fargo Insurance, Boston MA. <<http://www.linkedin.com/in/jimquirk>>.

²⁵ Ibid.

Performance Warranty

- Performance Warranty guarantees that the clean energy equipment will produce the power output guaranteed by the Contractor.
- If the guaranteed power level is not met and the source of shortfall is due to contractor design or installation errors, the contractor is responsible to reimburse the system owner in an amount equal to the value of the output deficiency.
- The length, coverages and exclusions are critical to ensuring that the project owner has adequate protection in the event of a loss.
- Since Project Owners are dependent on the power output of installed systems to repay loans or repay the debt service, a guarantee contract gives added security to both project owners and financiers.
- The contractor can in turn purchase a Contractual Liability Policy that directly backstops the Production Guarantee Contract, in which the Energy Procurement Contractor (EPC) guarantees the kWh power output of the installed system.
- The purchase of Performance Insurance strengthens the contractor's guarantee with the addition of a strongly established insurance company, who will pay for production shortfalls.

Energy Savings Insurance

- Energy Savings Insurance backstops the energy savings guarantee a Contractor makes on a retrofit project.
- Energy Savings Insurance covers the unanticipated cost of system underperformance that results from incorrect system design, incorrect system installation or product deficiencies.
- In the event of system underperformance, the insurance company will pay the Contractor, who is then contractually required to reimburse the Project Owner in the amount of savings shortfall.
- Energy Savings Insurance is critical to mitigate against the four primary causes of savings shortfall as concluded by the Deutsche Bank and Living Cities 2012 report. These causes include: inappropriate or inadequate retrofit scope, over projected energy savings potential by auditors, improper execution of the retrofit scope, and the incomplete execution of retrofit implementation.²⁶
- Energy Savings Insurance adds validity to the guaranteed future cash flow projections by assuring proper and adequate installation/implementation of the retrofit project. Insurance underwriters/ engineers inspect implemented system to make certain the commissioned project complies with approved design.

²⁶ The Deutsche Bank Americas Foundation, and Living Cities. "Recognizing the Benefits of Energy Efficiency in Multifamily Underwriting." 12 Jan. 2012.

Resources

"A Brief Guide to Wind Generators," *Earth-Friendly Resources for Home and Office*, <http://faryal.net/wpb_5-0.html>.

Anthony Buonicore, "Energy Savings Insurance and the NEW ASTM BEPA Standard", *Green Building and Sustainable Development in the Commercial Real Estate Industry: Critical Issues Series*, Building Energy Performance Assessment News, 2011, p. 2-3.

Hannah Choi Granade, Jon Creyts, Anton Derkach, Philip Farese, Scott Nyquist, Ken Ostrowski, "Unlocking Energy Efficiency in the U.S. Economy", McKinsey Global Energy and Materials, July 2009, p. iii.

"How Much of Our Electricity is Generated From Renewable Sources", *Energy in Brief—What Everyone Should Know About Energy*, U.S. Energy Information Administration, 2010, <http://www.eia.gov/cfapps/energy_in_brief/renewable_energy.cfm>.

John A. "Skip Laitner, Steven Nadel, R. Neal Elliott, Harvey Sachs, and A. Siddiq Khan, "The Long-Term Energy Efficiency Potential: What the Evidence Suggests", ACEEE, 2012, p. 9.

Quirk III, James F., "Trade Credit and Political Risk Analysis," Wells Fargo Insurance, Boston MA. <<http://www.linkedin.com/in/jimquirk>>.

SEIA. "Photovoltaic Solar Technology: Creating Electricity from Sunlight." *Solar Energy Industries Association*. <www.seia.org>.

"Solar Technology and Products." Solar Energy Industries Association. <http://www.seia.org/cs/solar_technology_and_products/solar_electric_photovoltaic>.

Tim Baur, "Cogeneration can help be a long-term energy-producing alternative", *PlantServices.com*, <<http://www.plantservices.com/articles/2003/107.html?page=full>>.

The Deutsche Bank Americas Foundation, and Living Cities. "Recognizing the Benefits of Energy Efficiency in Multifamily Underwriting." 12 Jan. 2012. p.2

The Rockefeller Foundation, and DB Climate Change Advisors. "United States Building Energy Efficiency Retrofits: Market Sizing and Financing Models." 5 Mar. 2012.

U.S. Department of Energy: Energy Efficiency and Renewable Energy Division. "Types of Fuel Cells." *FCT Fuel Cells*. 08 Jan. 2011. <http://www1.eere.energy.gov/hydrogenandfuelcells/fuelcells/fc_types.html>.

U.S. Department of Energy: Energy Efficiency and Renewable Energy Division. "Hydropower Basics." *Water Power Program*. 19 Sept. 2011. <http://www1.eere.energy.gov/water/hydropower_resources.html>.

"Water Energy Resources of the United States with Emphasis on Low Head/Low Power Resources", *United States Department of Energy*, April 2004, p. 1.

"What Is Energy Efficiency?" *What's Energy Efficiency?* Lawrence Berkeley National Laboratory, <<http://eetd.lbl.gov/ee/ee-1.html>>.

Energi Inc.

10 Centennial Drive, Peabody, MA 01960

978-531-1822

www.energi.com