GROWING THE ENERGY EFFICIENCY MARKET THROUGH THIRD-PARTY FINANCING

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Synopsis: This article explores mechanisms for growing the energy efficiency market through third-party financing. First, to evaluate the opportunity for third-party investors, the article outlines the size of the energy efficiency market and highlights certain relevant sectors. The energy efficiency implications of recent and pending legislative stimuli to energy efficiency investing, such as the American Recovery and Reinvestment Act of 2009 are discussed, as well as the hazards of over-reliance on government funding. Structural challenges to the growth of the market are reviewed as well as promising solutions and current deal structures. Lastly, of particular interest to those seeking financing, a comparison of the appropriate cost of capital for energy efficiency projects is compared to the potential returns available to investors showcasing a significant investment opportunity.

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I. INTRODUCTION

Multiple factors are converging to focus private citizens and policymakers on energy efficiency. First, proposed legislation calls for a reduction of greenhouse gas emissions,[1] about forty percent of which can be achieved through energy efficiency at a negative marginal cost.[2] Second, energy efficiency offers a $170 billion per year investment opportunity that some experts predict can provide an average seventeen percent internal rate of return.[3] Third, both the American Recovery and Reinvestment Act of 2009 (ARRA)[4] and pending House[5] and Senate[6] legislation provide significant funds and incentives for energy efficiency investments. Lastly, the recent spike in energy prices, combined with concerns about the political trajectory of many energy producing countries (e.g., Russia, Iran, Iraq, Saudi Arabia), has raised concerns about energy security. Energy efficiency could reduce these concerns by slowing the flow of funds to these potentially volatile countries.[7]

Given these developments, it is not surprising that President Barack Obama calls energy efficiency "the cheapest, cleanest, fastest energy source[,]"[8] while World Bank economists declare that "[w]henever energy-efficiency rises, individual and societal welfare is increased."[9] Despite these trends and pronouncements, however, there are still multiple barriers to increasing energy efficiency, such as principal-agent,[10] informational, measurement and

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1. *See, e.g.*, The American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (2009) [hereinafter, *ACES*].

2. *See* THE CONFERENCE BOARD AND MCKINSEY & CO., REDUCING U.S. GREENHOUSE GAS EMISSIONS: HOW MUCH AT WHAT COST? XII (2007), *available at* http://www.mckinsey.com/clientservice/ccsi/pdf/Greenhouse_Gas_Emissions_Executive_Summary.pdf; ROBERT P. TAYLOR, CHANDRSEKAR GOVINDARAJALU, JEREMY LEVIN, ANKE S. MEYER & WILLIAM A. WARD, FINANCING ENERGY EFFICIENCY: LESSONS FROM BRAZIL, CHINA, INDIA, AND BEYOND 28 (The World Bank 2008), *available at* http://wwwds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2008/02/18/000333037_20080218015226/Rendered/PDF/425290PUB0ISBN11OFFICIAL0USE0ONLY10.pdf.

3. Diana Farrell & Jaana K. Remes, How the World Should Invest in Energy Efficiency, at 1, THE MCKINSEY QUARTERLY, July 2008.

4. H.R. 1, 111th Cong. (2009).

5. *ACES*, *supra* note 2.

6. The American Clean Energy Leadership Act (ACELA), S.1462, 111th Cong. (as reported by S. Energy & Natural Res. Comm., June 17, 2009).

7. *See, e.g.,* AMERICAN PHYSICAL SOCIETY, ENERGY FUTURE: THINK EFFICIENCY 6 (Sept. 2008), *available at* http://www.aps.org/energyefficiencyreport/report/aps-energyreport.pdf.

8. Michael Grunwald, *America's Untapped Energy Resource: Boosting* Efficiency, TIME, December 31, 2008, at 2, *available at* http://www.time.com/time/magazine/article/0,9171,1869224,00.html.

9. Lee Schipper, Energy Efficiency: Lessons from the Past and Strategies for the Future, Proceedings of the World Bank Annual Conference on Development Economics, at 400 (1993).

10. DIANA FARRELL & JAANA K. REEMES, THE ENERGY-EFFICIENCY OPPORTUNITY 2 (The McKinsey Global Inst. 2008).

verification, and transaction cost issues. Financing is one key to solving these problems: the market is most likely to break down these barriers if it can turn a profit.

After reviewing the potential size of the energy efficiency market and challenges to its growth, this article explores whether energy efficiency investments are likely to yield a sufficient return on investment, relative to traditional investments stocks and bonds to motivate investors and financial intermediaries to drive the market forward.

II. THE SIZE OF THE ENERGY EFFICIENCY MARKET

A. *Market Size*

The demand for energy efficiency grows in conjunction with the energy market. Global energy demand is forecast to increase by 2.2 percent per year until 2020; however energy efficiency could cut this demand growth down to 0.7 percent per annum: a savings of 18 quadrillion BTUs per year in the United States according to McKinsey & Company.[11] To support its calculations, McKinsey has identified specific energy efficiency savings that have an Internal Rate of Return (IRR) of at least ten percent and "avoid compromising the comfort or convenience valued by consumers."[12] These energy efficiency savings, all of which are predicated solely on technological rather than behavioral evolution, are projected to be worth about $35 billion per year by 2030.[13] Moreover, twenty to twenty-four percent of total energy demand in 2020 could be met by deploying existing energy efficiency technologies in lieu of new generation capacity.[14]

In the United States, experts estimate that energy efficiency investments can save between $170 billion[15] and $932 billion per year in energy expenses right now, [16] rising to a savings of $900 billion by 2020[17] and $3.9 trillion by 2030.[18] By 2020, energy efficiency savings could total $1.2 trillion based on an investment of $520 billion through 2020.[19] This would effectively eliminate

11. *Id*. at 3.

12. *Id.*

13. MCKINSEY & CO., UNLOCKING THE FULL POTENTIAL OF ENERGY EFFICIENCY IN THE UNITED STATES: INITIATIVE OVERVIEW 3-4, 18 (MCKINSEY & COMPANY July 28, 2008).

14. MCKINSEY & CO., CURBING GLOBAL ENERGY DEMAND GROWTH: THE ENERGY PRODUCTIVITY OPPORTUNITY 32 (MCKINSEY GLOBAL INST. May 2007), *available at* http://www.mckinsey.com/mgi/publications/Curbing_Global_Energy/ index.asp (about 125 to 145 quadrillion BTUs).

15. KAREN EHRHARDT-MARTINEZ & JOHN "SKIP" LAITNER, THE SIZE OF THE U.S. ENERGY EFFICIENCY MARKET: GENERATING A MORE COMPLETE PICTURE 27 (American Council for an Energy-Efficient Economy May 15, 2008).

16. ROGER BEZDEK, RENEWABLE ENERGY AND ENERGY EFFICIENCY: ECONOMIC DRIVERS FOR THE 21ST CENTURY 39 (American Solar Energy Society 2007); *see also* MCKINSEY & CO., THE CASE FOR INVESTING IN ENERGY PRODUCTIVITY 8 (McKinsey Global Institute February 2008) (predicting saving up to $900 billion per year in energy expenses by 2020).

17. Diana Farrell & Jaana K. Remes, *supra* note 3.

18. Bezdek, *supra* note 16, at 39.

19. HANNAH CHOI GRANADE, JON CREYTS, ANTON DERKACH, PHILIP FARESE, SCOTT NYQUIST, & KEN OSTROWSKI, UNLOCKING ENERGY EFFICIENCY IN THE U.S. ECONOMY (McKinsey & Company July 2009), *available at* http://www.mckinsey.com/USenergyefficiency.

about twenty-three percent of projected energy consumption as compared to a Business As Usual scenario.[20]

The American Council for an Energy-Efficient Economy (ACEEE) estimated that in 2004, "[e]nergy bill savings . . . from previous year gains in energy productivity exceed[ed] $700 billion."[21] Further spurring the growth of energy efficiency is its beneficial side effect of reducing greenhouse gas emissions.[22]

Energy efficiency requires upfront investment. Worldwide, it is estimated that annual investments of $170 billion per year are needed to capture available profitable energy efficiency opportunities.[23] Of this amount, $83 billion would be invested in the industrial sector, $40 billion in the residential sector, and $22 and $25 billion in the commercial and transportation sectors respectively.[24] Meanwhile, the potential market for energy efficient technologies in developing countries may be greater than $100 billion per year "once innovative financing mechanisms" are put in place.[25]

Not to be outdone by the McKinsey & Company estimates, the United States Department of Energy calculated a $300 billion market for energy-efficient technologies in 2004.[26] And the ACEEE forecasts energy efficiency investments to rise to $700 billion per year by 2030.[27]

Executive attitudes are consonant with these market forecasts. A 2007 survey of 1249 North American executives responsible for energy management decisions revealed that fifty-seven percent expected to make an energy efficiency investment over the next year.[28] Of these, at least twenty percent are expecting to seek outside financing of their investment.[29]

B. Sector Analysis

From a process standpoint, the largest energy efficiency market segments appear to be recycling, nondurable manufacturing, miscellaneous durable manufacturing, computers and copies, and vehicle manufacturing.[30] From an end-user perspective, the market is segmented as follows: [31]

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20. *Id.*

21. John A. Laitner, Presentation at The 2nd Annual Energy Efficiency Forum: The Next Generation in Financing Clean Energy, American Council for an Energy-Efficient Economy (April 10-11, 2008) (transcript on file with author).

22. PHILIPPINE DE T'SERCLAES, FINANCING ENERGY EFFICIENT HOMES: EXISTING POLICY RESPONSES TO FINANCIAL BARRIERS 7 (International Energy Agency February 2007), *available at* http://www.iea.org/textbase/papers/2008/cd_energy_efficiency_policy/2-Buildings/2-FinancialBarrierBuilding.pdf.

23. Bezdek, *supra* note 16, at 7.

24. *Id.*

25. Catherine Strickland & Russell Sturm, *Energy Efficiency in World Bank Power Sector Policy and Lending New Opportunities*, 26 ENERGY POL'Y 873, 874 (1998).

26. Laitner, *supra* note 21; Ehrhardt-Martinez & Laitner, *supra* note 15, at 13.

27. Laitner, *supra* note 21; Ehrhardt-Martinez & Laitner, *supra* note 15, at vii, 28.

28. Clay Nesler, Johnson Controls, Inc. , Presentation at The 2nd Annual Energy Efficiency Forum: The Next Generation in Financing Clean Energy (April 10-11, 2008) (transcript on file with author).

29. *Id.* (noting that only 80 percent believe they can cover the investment cost through operating funds).

30. Bezdek, *supra* note 16, at 30.

31. Granade, *et al.*, *supra* note 19, at iv.

SECTOR	**PERCENT OF TOTAL ENERGY EFFICIENCY OPPORTUNITY**
Residential	35%
Commercial	25%
Industrial	40%

The construction and operation of residential and commercial buildings account for thirty percent of non-transportation energy use and seventy-two percent of electricity use in the U.S.[32] Within buildings, solid state lighting (e.g. Light Emitting Diodes: LEDs) provides an opportunity for $280 billion in cumulative energy savings by 2025.[33] Meanwhile, windows are an "untapped efficiency market" worth $13 billion per year according to the ACEEE.[34]

Residential buildings, responsible for twenty-five percent of the world's energy's use,[35] are "the single largest energy consumer worldwide, and also the one where the largest uncaptured energy productivity improvement opportunities lie."[36] The ACEEE estimates that the residential sector received $39 billion in energy efficiency investments in 2004,[37] while McKinsey & Company calculates that the sector uses about 3,160 trillion BTUs of primary energy per year.[38]

Further residential energy efficiency investments are particularly warranted in the United States because American households are responsible for 4.5 percent of the entire world's energy consumption.[39] Familiar residential energy efficiency technologies include higher efficiency building shells and water heaters, compact fluorescent lighting, and small appliances that require less standby-power.[40]

As discussed further below, the residential market may also be the hardest to penetrate due to market imperfections that cause consumers to apply an overly high discount rate to any prospective energy efficiency investment.[41] Meanwhile, the seemingly more sophisticated operators of government buildings may be subject to these same imperfections as well, as demonstrated by its less than twenty percent penetration by energy efficiency investments.[42]

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32. MERRIAN FULLER, ENABLING INVESTMENTS IN ENERGY EFFICIENCY: A STUDY OF PROGRAMS THAT ELIMINATE FIRST COST BARRIERS FOR THE RESIDENTIAL SECTOR 9(Efficiency Vermont Report August 2008); de T'Serclaes, *supra* note 22, at 5 ("Existing buildings require over 40% of the world's total final energy consumption.").

33. James R. Brodrick, U.S. Department of Energy, Presentation at The 2nd Annual Energy Efficiency Forum: The Next Generation in Financing Clean Energy (April 10-11, 2008).

34. Laitner, *supra* note 22.

35. *Id*.

36. *Id.* at 56.

37. Ehrhardt-Martinez & Laitner, *supra* note 15, at 15.

38. Granade, *et al.*, *supra* note 19, at vii.

39. McKinsey Global Inst., *supra* note 14, at 19.

40. *Id.* at 33, 58; *see* ENERGY EFFICIENCY: THE FIRST FUEL FOR A CLEAN ENERGY FUTURE: RESOURCES FOR MEETING MARYLAND'S ELECTRICITY NEEDS Appendix C (American Council for an Energy-Efficient Economy February 2008).

41. McKinsey Global Inst., *supra* note 14, at 57.

42. RANJIT BHARVIRKAR, CHARLES GOLDMAN, ET AL., PERFORMANCE CONTRACTING AND ENERGY EFFICIENCY IN THE STATE GOVERNMENT MARKET xviii (Ernest Orlando Lawrence Berkley National Laboratory November 2008).

Not unexpectedly, power generation systems and transportation also remain prime markets for energy efficiency investments. Systems that utilize the excess heat generated by power plants (called combined heat and power systems) promise an annual potential market size greater than $50 billion per year, while the potential for recycled energy development exceeds $100 billion per year.[43] It is widely acknowledged that there are multiple opportunities to improve power plant efficiency.[44] The International Energy Agency estimates that "the application of proven technologies and best practices on a global scale could save between 25 E[xaJoules][45] and 37 E[xaJoules] per year, which represents between 18% and 26% of current primary energy use in industry."[46] Finally, while beyond the scope of this article, it is worth noting that road transport in the United States consumes 5.4 percent of the entire world's energy.[47]

C. Legislative Stimuli

Despite a downturn in construction and many other industries, the ARRA, promises to accelerate growth of the energy efficiency technology and applications. The bill provides $16.8 billion for Energy Efficiency and Renewable Energy programs,[48] including $3.2 billion for Energy Efficiency and Conservation Block Grants; $5 billion for Weatherization Assistance under part A of title IV of the Energy Conservation and Production Act[49]; $3.1 billion for State Energy Programs;[50] and $2 billion for manufacturing advanced batteries and components. Additionally, $4.5 billion is allocated for "Electricity Delivery and Energy Reliability" programs, including $100 million for worker training; and $80 million to assess future demand and transmission requirements.[51] Other significant energy efficiency investments to be funded by ARRA include[52]:

43. Laitner, *supra* note 22.

44. *See, e.g.*, NATIONAL PETROLEUM COUNCIL, ELECTRIC GENERATION EFFICIENCY, WORKING DOCUMENT OF THE NPC GLOBAL OIL & GAS STUDY (National Petroleum Council July 18, 2007), *available at* http://www.npc.org/Study_Topic_Papers/4-DTG-ElectricEfficiency.pdf.

45. An exajoule is equivalent to 10^{18} joules of energy; and a joule is the SI (International System of Units) measurement of the energy exerted by a force of one Newton acting to move an object one meter. One exajoule is roughly equivalent to a Quadrillion (10^{15}) British Thermal Units (BTUs).

46. International Energy Agency, *Worldwide Trends in Energy Use and Efficiency*, at 10 (2008) , *available at* http://www.iea.org/Textbase/Papers/2008/indicators_2008.pdf .

47. McKinsey Global Inst., *supra* note 14, at 19.

48. H.R. 1-24, 111th Cong. (2009) (enacted).

49. 42 U.S.C. 6861 et seq. (2008).

50. *See, e.g.*, Press Release, U.S. Department of Energy, Obama Administration Announces $3.2 Billion in Funding for Local Energy Efficiency Improvements (Mar. 26, 2009), *available at* http://www.energy.gov/news2009/7101.htm. ("The funding will support energy audits and energy efficiency retrofits in residential and commercial buildings, the development and implementation of advanced building codes and inspections, and the creation of financial incentive programs for energy efficiency improvements."); Jeff Genzer, Counsel, National Association of State Energy Officials, *American Recovery and Reinvestment Act of 2009 Energy Efficiency Opportunities* (March 16, 2009), *available at* http://www.naseo.org/news/arra/Energy_Efficiency_Opportunities_in_ARRA.pdf ("ARRA waived a 20% cost share for the states and also waived a regulatory provision that limited capital investments to 50% SEP funds.").

51. *Id.*

52. *See generally* Alliance to Save Energy, *Energy Efficiency in the Economic Recovery Bill* (February 25, 2009), http://ase.org/content/article/detail/5388.

Amount	**Purpose**
$300 million	Energy efficiency appliance rebates.
$6 billion	Innovative Technology and Loan Guarantee Program to develop technologies that reduce pollutants.
$400 million	Advanced Research Projects Agency-Energy.
$2.5 billion	Applied energy efficiency research and development.
$3.6 billion	Department of Defense energy efficiency projects facilities improvement.
$4.5 billion	General Services Administration conversion of government facilities to High-Performance Green Buildings.
$400 million	State and local government projects to encourage the use of plug-in electric drive vehicles.
$300 million	State and local government acquisition of efficient alternative fuel vehicles.

It is estimated that ARRA's energy efficiency investments will save government, businesses and consumers a total of $24.5 billion and 3,800 trillion BTUs per year.[53]

Pending legislation promises to further accelerate energy efficiency investments. Under American Clean Energy and Security Act of 2009 (ACES)[54] bill approved by the House of Representatives, many retail electricity suppliers will be required to meet a Renewable Electricity Standard (RES) by ensuring that a percentage of their electricity generation is drawn from certain renewable energy sources. States may specify that up to forty percent of a utility's RES requirement may be met by reducing customer electricity demand through qualified energy-efficiency projects.[55] Additionally, the Congressional Budget Office estimates that direct spending would increase by about $693 billion, which the states, natural gas, distributors, and federal agencies would use fund energy efficiency and other types of programs.[56] Of this amount, between 2010 and 2019 the monies to be spent include $3.1 billion for improving lighting efficiency; $2.1 billion for improving the energy efficiency of federal and nonfederal buildings; and $1.5 billion for energy-efficiency programs aimed at industry.[57] The legislation would also provide vouchers for the purchase or lease of fuel-efficient vehicles[58] similar to the currently popular "Cash for Clunkers" Program.[59] Overall, the Natural Resources Defense Council forecasts an average

53. Gil Sperling, Program Manager, U.S. Department of Energy, *Recovery Act Implementation* (March 16, 2009), *available at* http://ase.org/uploaded_files/5478/stimulus_webinar_gs.pdf.

54. H.R. 2454, 111th Cong. (2009).

55. CONG. BUDGET OFFICE, COST ESTIMATE, AMERICAN CLEAN ENERGY AND SECURITY ACT OF 2009 at 8 (Cong. Budget Office June 5, 2009), *available at* http://www.cbo.gov/ftpdocs/102xx/doc10262/hr2454.pdf.

56. *Id.* at 26.

57. *Id.* at 33.

58. *Id.*

59. *See, e.g.*, Car Allowance Rebate System, http://www.cars.gov (last visited Sept. 16, 2009); Richard Verrier, *'Cash for Clunkers' Program Still Powering Sales*, L.A. TIMES, Aug. 10, 2009 ("So far, more than 220,000 vehicles have been sold through the program, giving a welcome boost to the struggling auto industry").

household savings of about $5.99 per month due to energy efficiency measures inherent in ACES.[60]

The American Clean Energy Leadership Act (ACELA),[61] approved by the Senate Energy and Natural Resources Committee, requires new energy efficiency standards for fluorescent, incandescent, and LED lamps, appliances, electric motors, and commercial furnaces;[62] and modifies building codes to improve energy efficiency by thirty percent now, increasing to a fifty percent improvement by 2015, and an additional five percent efficiency increase every three years thereafter until 2030.[63] Additionally, the legislation provides $50 million per year to academic institutions to create Building Assessment Centers to identify and evaluate new energy efficiency practices,[64] and establishes a Retrofit for Energy and Environmental Performance (REEP) Program to offer financial assistance to state and local governments to conduct energy audits of existing buildings retrofit them with new energy efficiency technologies.[65] Building on the success of the Energy Star program,[66] ACELA allocates $60 million to create a building energy performance labeling program for new residential and commercial construction.[67] The American Council for an Energy Efficient Economy estimates that the energy efficiency provisions of ACELA will save consumers $15 billion per year by 2020 and $36 billion by 2030, net of costs.[68]

D. The Danger of Relying on Government Funding

Government spending, while capable of stimulating interest in energy efficiency, may be insufficient to sustain the sector due to its limited duration. The renewable energy sector provides a harbinger of this conundrum. "Plotted on a graph, the history of clean-energy production in the United States resembles the blade of a saw, rising and falling each time subsidies came and went."[69] By contrast, "Japan, Germany, Spain, and Denmark show smooth, upward-sloping yield curves, a reflection of consistent government policy."[70] Government funding often leads to fits-and-starts in progress because, "once funding is depleted, potential participants may hold off on purchasing PV systems in anticipation of renewed funding."[71]

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60. *See* NATURAL RESOURCES DEFENSE COUNCIL, CLIMATE BILL CUTS ELECTRICITY BILLS (NRDC 2009), *available at* http://switchboard.nrdc.org/blogs/paltman/media/HR%202454%20Average%20Household%20Savings%20by%20State.pdf.

61. S. REP. No. 111-48 (2009).

62. *Id.* at tit. I, § 161, and tit. II, §§ 211-14.

63. *Id.* at tit. II, §§ 201-07.

64. *Id.* at tit. I, § 173.

65. *Id.* at tit. II, §§ 201-07.

66. Kate Galbraith, *Governments Can Promote Energy Efficiency*, N.Y. TIMES, Aug. 2, 2009.

67. S. REP. No. 111-48, *supra* note 64.

68. AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY, SAVINGS ESTIMATES FOR AMERICAN CLEAN ENERGY LEADERSHIP ACT OF 2009 DISCUSSION DRAFT (ACEEE June 23, 2009), *available at* http://www.aceee.org/energy/ national/ACELA%20Savings%20Estimates%200618.pdf.

69. Joshua Green, *The Elusive Green Economy*, THE ATLANTIC, July/August 2009.

70. *Id.*

71. S. GOUCHOE, V. EVERETTE & R. HAYNES, CASE STUDIES ON THE EFFECTIVENESS OF STATE FINANCIAL INCENTIVES FOR RENEWABLE ENERGY viii (National Renewable Energy Laboratory Sept. 2002).

In addition to creating consumer hesitation, over-reliance on government incentives often reduces investment in industrial capacity. In particular, incentives subject to annual appropriations "creat[e] an uncertainty that prohibited sustained growth. This uncertainty can dissuade investments in larger projects in particular, due to longer planning and construction time frames."[72] This uncertainty tends to "increases the cost of capital due to the risk of meeting a deadline [created by the end of an incentive] and leads to a boom and bust cycle" for capital equipment, for which pricing is driven by government funding, rather than supply constraints.[73]

For these reasons, energy prices that better reflect higher external costs, such as the emission of greenhouse gases, may spur longer-term energy efficiency growth than more extravagant, but shorter-term incentives. Nonetheless, incentives that create a demand bubble may also have an important role to play: at least one Internet pioneer has argued that bubbles are "accelerators to technology innovation."[74]

III. CHALLENGES TO GROWTH OF THE MARKET

Impediments to growth of the energy efficiency market are multifold and complex, ranging from market issues to political and regulatory obstacles to cultural, behavioral, and aesthetic/environmental challenges.[75] Researchers describe these obstacles collectively as "the energy conservation paradox": when "consumers appear to under invest in energy-efficiency technology."[76] The paradox becomes evident when consumers apply implicit discount rates of twenty-five to seventy-five percent to a potential energy efficiency investment, rather than the standard five to eight percent applied to other types of investments.[77] For example, former World Bank Chief Economist Lord Stern predicts homeowners want a thirty percent return on energy efficiency investments to compensate for market failures that discourage investment, such as high transaction costs and imperfect knowledge of options.[78] The result is an "efficiency gap", which is "the difference between what appears to be optimal

72. *Id.* at 3.

73. Joe Kastner, Vice President, MMA Renewable Ventures, Utility Scale Solar Power: Opportunities and Obstacles, Statement to U.S. House of Representatives Comm. on Sci. and Tech. Subcomm. on Energy and the Env't (Mar. 17, 2008).

74. Martin LaMonica, *Bob Metcalfe's EnerNet Embraces 'Global Warming Bubble'*, CNET, Apr. 9, 2008, *available at* http://news.cnet.com/8301-11128_3-9915135-54.html.

75. Benjamin K. Sovacool, *The Importance of Comprehensiveness in Renewable Electricity and Energy-Efficiency Policy*, 37 ENERGY POL'Y 1529, 1530 (2009); KENNETH GILLINGHAM, RICHARD G. NEWELL & KAREN PALMER, ENERGY EFFICIENCY ECONOMICS AND POLICY 9 (Resources for the Future Apr. 2009) (summarizing market failures related to energy efficiency); Taylor, *et. al*, *supra* note 2, at 50; *see* Ciprian Ghetau, Finance Manager, UNDP/GEF, Obstacles and Barriers In Energy Efficiency Project Financing and Twelve Lessons Learned, Presentation on Climate Technology and Energy Efficiency (Oct. 2-25, 2006), *available at* http://ecologic-events.eu/cti/documents/11_ghetau.pdf (explaining the additional challenges in smaller, less developed countries.).

76. Schipper, *supra* note 9.

77. Fuller, *supra* note 32, 9; *see also* Gillingham, Newell & Palmer, *supra* note 78, at 7 (citing implicit discount rates of 25 to 100 percent).

78. Economist.com, Opinion Section, *The Elusive Negawatt,* THE ECONOMIST (May 8, 2008).

and what consumers actually purchase."[79] This section breaks down the components of this gap.

A. Principal-Agent Issues

The real estate sector, a prime target for energy efficiency investment, is often plagued by contradictory goals of principals (owner-occupants and tenants) and agents (builders and landlords), stemming from "fragmentation within sections of the value chain and non-integration between them."[80] This split-incentive problem is driven, in part, by the rise of real estate as a class of investment asset, like stocks and bonds, which encourages absentee ownership of buildings.[81] The current economic downturn, which increases the class of renters, exacerbates the problem.[82]

A traditional Owner-Occupant of a building would stand to benefit directly from energy savings and thus be more inclined to make energy efficiency investments.[83] Real estate investors, on the other hand, sell buildings more frequently than owner-occupiers and, thus, have a shorter investment horizon.[84] Further, as "[l]andlords [they] make the investment decisions, while tenants shoulder financial responsibility. Consequently, both are discouraged from investing in energy efficiency."[85] The Principal-Agent problem is estimated to afflict "25 percent of refrigerator energy use, 66 percent of water heating energy use, 48 percent of space heating energy use, and 2 percent of lighting energy use." [86] Because lighting investments general have a faster payback, they are appealing even to temporary tenants. Further, most lights are purchased by the same party that pays for the energy to operate the lights. Additionally, lighting is generally less expensive than water heaters and refrigerators, which reduces the barrier to investing in lighting energy efficiency.

While local utility companies sometimes offer energy efficiency investment programs to building occupants, such programs are often unavailable to rental properties.[87] This was compounded by utilities "scal[ing] back their efforts to promote energy efficiency during the l1990s when states began deregulating the industry."[88]

One potential solution for utilities companies and tenants is the use of a Tariffed Installation Program (TIP), which "use[s] a utility's billing system to collect a charge that has been attached to the meter as a special tariff to repay the

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79. Schipper, *supra* note 10; Philip B. Thompson, *Evaluating Energy Efficiency Investments: Accounting for Risk in the Discounting Process*, 25 ENERGY POL'Y 989, 991-92 (1997) (reviewing the "efficiency gap" literature).

80. WORLD BUSINESS COUNCIL FOR SUSTAINABLE DEVELOPMENT, ENERGY EFFICIENCY IN BUILDINGS: BUSINESS REALITIES AND OPPORTUNITIES 14 (World Business Council for Sustainable Development 2007).

81. *Id.* at 30.

82. Nick Timiraos, *Renters Lose Edge on Homeowners*: *Cost Gap Returns to Historical Norms in Some Markets as House Prices Drop,* WALL ST. J., Feb. 25, 2009, at A3.

83. *Id.*

84. *Id.*

85. de T'Serclaes, *supra* note 22, at 4.

86. Gillingham, Newell & Palmer, *supra* note 78, at 12-13.

87. Fuller, *supra* note 32, at 5.

88. Edward H. Comer, *Transforming the Role of Energy Efficiency*, 23 NATURAL RES. & ENV'T, Summer 2008, at 34.

cost of energy improvements."[89] Another approach is to create "Clean Energy Tax District Financing", which uses a special municipal tax to repay energy efficiency investments.[90] Both of these techniques require that the charges for an energy efficiency upgrade are assumed by subsequent tenants if the first one departs, thus providing greater security to the utility or municipality that is asked to pay upfront for the efficiency investment. These methods of energy efficiency do, however, have certain challenges: some utilities cannot easily reconfigure their billing systems to accommodate energy efficiency repayments; consumers may get confused by a non-utility charge on their bill; and utilities who earn higher profits when their volume of power sales increases will not be motivated to assist efficiency efforts.[91]

Another means of reducing the problem is to incorporate more energy efficiency measures into building codes, thereby forcing prospective buyers of a property to place an explicit value on a property's energy efficiency and the cost of complying with the code. This would incentivize property owners to invest more in building energy efficiency, even if they do no reside in the property themselves.

B. Measurement and Knowledge Problems

A major obstacle to the growth of energy efficiency investing is imperfect information.[92] Often those who do have knowledge about energy efficiency "want to use it opportunistically" and "are not prepared to give it away[.]"[93] Meanwhile "[m]any customers do not know how to implement energy efficiency measures, or understand and have confidence in the benefits of a project."[94] Even if average energy savings is known, the exact savings for an individual might not be known yet.[95]

While accurate estimation tools (and qualified auditors or contractors) could help to ensure that the repayment period of an energy efficiency investment is long enough to exceed all potential savings,[96] standardized measurement and verification protocols are often still lacking.[97] Even with solid measurement techniques and a pre-approved contractor network with specific subject matter knowledge,[98] efficiency technology is a moving target due to continuing technological improvements in the marketplace.[99]

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89. Fuller, *supra* note 32, at 6.

90. *Id.*

91. *Id.* at 44-45; MATTHEW BROWN, STATE ENERGY EFFICIENCY POLICIES OPTIONS AND LESSONS LEARNED: BRIEF #3, PAYING FOR ENERGY UPGRADES THROUGH UTILITY BILLS (ALLIANCE TO SAVE ENERGY 2009), *available at* http://ase.org/uploaded_files/5476/On-Bill%20Loans%20-%20Final.pdf.

92. de T'Serclaes, *supra* note 22, at 15.

93. *Id.*

94. Fuller, *supra* note 32, at 4, 10; Comer, *supra* note 91.

95. *Id.* at 4, 10, 42-43.

96. *Id.* at 42-43.

97. de T'Serclaes, *supra* note 22, at 15.

98. *Id.* at 45.

99. Piet G.M. Boonekamp, *Evaluation of Methods Used to Determine Realized Energy Savings*, 34 ENERGY POL'Y 3977 (2006).

Akin to Akerlof's classic lemons problem,[100] "[t]he sellers of every product would have an incentive to suggest that the energy efficiency of the product is high, but because the buyers cannot observe the energy efficiency, they may ignore it in their decision."[101] Further, "consumers almost never see a [full] choice of energy technologies" before they need to make a decision.[102] Unlike automobile fuel efficiency, which is required by law to be posted on the window of each new car,[103] there is no requirement to label the energy efficiency of building materials. And because few building materials are sold in the consumer after-market, they are less likely to be profiled in publication like *Consumer Reports*.

These knowledge problems apply not just to individual consumers, but also to professionals and firms.[104] For example, a survey of over 1,400 experienced real estate professionals[105] demonstrated systematic underestimates of buildings' contribution to greenhouse gas emissions, and overestimates of the cost premium to build a more efficient building.[106] And a lack of "personal know-how" about "how to improve a building's environmental performance and where to go for good advice" was seen as the most significant obstacle to creating more efficient buildings. [107]

C. Transaction Costs

The so-called "Warren Buffet problem", an "inclin[ation] to do one large deal rather than lots of small deals"[108], plagues the energy efficiency market. Energy efficiency is inherently dispersed, often requiring scattered investments over time. Renewable energy investments, by contrast, are more attractive than energy efficiency projects because the former are higher dollar value and have assets to serve as collateral.[109] Likewise, power plants have more "charisma" as an investment because they provide a "large, tangible, and highly visible" demonstration of economic progress.[110] Energy efficiency investments, by contrast, require more end user consumer involvement than energy supply investments, and often require regulatory support to become successful.[111]

100. George A. Akerlof, *The Market for 'Lemons': Quality Uncertainty and the Market Mechanism*, 84 Q. J. OF ECON. 488 (1970).

101. Gillingham, Newell & Palmer, *supra* note 78, at 12; Schipper, *supra* note 9.

102. Schipper, *supra* note 9.

103. 49 U.S.C. § 32908 (2008) (directing the EPA to place a label on each new car stating the vehicle's fuel economy and how it compares to similar cars made by other manufacturers).

104. Gillingham, Newell & Palmer, *supra* note 78, at 11-12.

105. Those surveyed included "Specifiers and developers –including architects, engineers, builders and contractors[;] Agents and professional landlords, including corporate building owners[; and,] Corporate tenants."

106. World Business Council for Sustainable Development, *supra* note 83, at 18.

107. *Id.* at 20.

108. American Council for an Energy-Efficient Economy, *supra* note 40, at 3.

109. Jeffrey Eckel, Hannon Armstrong, Presentation at The 2nd Annual Energy Efficiency Forum: The Next Generation in Financing Clean Energy (Apr. 10-11, 2008); de T'Serclaes, *supra* note 22, at 4 ("[M]ost financiers believe that energy efficient investments have a higher risk exposure than most traditional financing, and debate on the adequate discount rate.").

110. Strickland & Sturm, *supra* note 25, at 877.

111. *Id.*

Because energy efficiency investments have a far higher yield than renewable energy projects,[112] there remains an incentive to overcome their "heterogeneity and hidden costs[.]"[113] As such projects are replicated across a broader base of society, they should become more standardized. Meeting this aggregation challenge is "key to profitable and scalable investments" in energy efficiency.[114]

D. Lack of Price Signals

It is well-established in the economic literature that "inaccurate price signals distort true economics[.]"[115] Thus, it is not surprising that a survey of 181 electricity industry experts around the world revealed that the single most recommended policy change to foster greater energy inefficiency is "eliminate subsidies" and "create accurate electricity prices and encourage feedback."[116] These subsidies cause "[m]arket conditions [. . . to] depart from efficiency if there are market failures, such as environmental externalities"[117] like greenhouse gases.[118]

By failing to include the cost of these externalities, consumers may consider energy to be too cheap to be worth saving,[119] and, thus, not worthy of an energy efficiency investment.[120] In countries where energy is more expensive, on the other hand, energy efficiency investment tends to be higher as well.[121]

More accurate price signals are essential for consumers to properly assess the costs and benefits of energy efficiency investments.[122] Because energy bills are not broken out by appliance, for example, consumers have no idea which appliance should be the focus of their efficiency investing.[123] Owners of certain household appliances may have been told at the time of purchase about the typical energy consumption of the product, pursuant to the Appliance Labeling Rule contained within the Energy Policy and Conservation Act of 1975,[124] however they may have no knowledge of how often a particular appliance is in use, or the extent of standby (aka "vampire") power[125] that it draws. Further, the use of average, rather than time-of-day or real-time, pricing for consumer electricity use fails to signal to consumers when their power usage might

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112. Eckel, *supra* note 112.

113. Gillingham, Newell & Palmer, *supra* note 78, at 8.

114. Eckel, *supra* note 112.

115. McKinsey & Co., *supra* note 14, at 6.

116. Sovacool, *supra* note 78, at 1530.

117. Gillingham, Newell & Palmer, *supra* note 75, at 2

118. McKinsey Global Inst., *supra* note 14, at 51.

119. The Economist, *supra* note 81.

120. Jack M. Hollander & Thomas R. Schneider, *Energy-Efficiency: Issues for the Decade*, 21 ENERGY 273, 277 (1996).

121. The Economist, *supra* note 81.

122. McKinsey & Co., *supra* note 14, at 6.

123. McKinsey Global Inst., *supra* note 14, at 41.

124. Implemented by the FTC at 16 CFR §§ 305.1 *et seq.* (2009).

125. *See, e.g.*, PAOLO BERTOLDI, BERNARD AEBISCHER, ET AL., STANDBY POWER USE: HOW BIG IS THE PROBLEM? WHAT POLICIES AND TECHNICAL SOLUTIONS CAN ADDRESS IT? (Lawrence Berkeley National Laboratory June 5, 2002) *available at* http://repositories.cdlib.org/lbnl/LBNL-50567/ (estimating that standby power accounts for 3 to 10 percent of home and office electricity use).

coincide with peak systemic demand, thus, requiring the use of higher marginal cost backup power.[126]

E. Perceived Lack of Collateral

One hesitation of potential energy efficiency financiers is the perceived lack of collateral for their investment. Several professionals in the field have reported that the owners and mortgagees of buildings in which energy efficiency investments are to be installed refuse to permit the placement of additional liens on the property. At first glance, this would seem to hinder efforts to collateralize energy efficiency financing because any equipment purchased to increase efficiency (e.g., new boilers, light fixtures, chillers,[127] etc.) would be considered a "fixture that merges with the underlying real estate subject to the secured lender's lien."[128]

Careful application of the Uniform Commercial Code (U.C.C.) by the energy efficiency financiers may be able to circumvent this problem. Specifically, the U.C.C. provides that, excluding two irrelevant exceptions, the holder of a purchase money security interest in property who files a financing statement within twenty days "takes priority over the rights of a . . . lien creditor which arise between the time the security interest attaches and the time of the filing."[129] In other words, the purchase money security holder's lien on the equipment it financed is automatically senior to any lien on the equipment that accrues to a lienholder on the real property to which the equipment will be attached. This interpretation of the U.C.C. has been upheld by multiple courts.[130]

By utilizing the purchase money security interest designation, financiers of energy efficiency equipment could perfect a security interest in equipment before it is installed in a building and, thus, classified as a fixture. No permission of the existing real property lienholder would be necessary and the energy efficiency pioneer would retain the ability to foreclose upon energy efficiency upgrades in the event if unpaid.

At first blush, this may provide limited satisfaction to the financier because repossessing a used boiler or air conditioner may be an expensive proposition relative to the salvage value of the equipment. Accelerating the depreciation schedule of the equipment should help somewhat with this. Giving the financier the ability to remotely disable the energy efficiency equipment, rather than

126. 16 CFR §§ 305.1 *et seq.* (2009).

127. *See* In re Cooperstein, 7 B.R. 618, 623 (Bankr. S.D.N.Y. 1980) (holding that an air-conditioning compressor and lighting fixtures are legally "fixtures", and thus, part of the underlying real estate).

128. *See, e.g.*, Certain Underwriters at Lloyds London v. Law, 570 F.3d 574, 581 (5th Cir. 2009) (a "fixture" is something securely, and usually permanently, attached or appended, as to a house, apartment, building, etc." or "[p]ersonal property that is attached to land or a building and that is regarded as an irremovable part of the real property.").

129. U.C.C. § 9-317(e) (2001).

130. *See, e.g.,* Evans v. Green Tree Servicing, L.L.C., 370 B.R. 138, 142 (Bankr. S.D. Ohio 2007) (holding that "A perfected security interest in fixtures has priority over the conflicting interest of encumbrancer or owner of the real estate where: (a) The security interest is a purchase money security interest, the interest of the encumbrancer or owner arises before the goods become fixtures, [and] the security interest is perfected by a fixture filing before the goods become fixtures or within [the requisite number of] days thereafter"); and United States v. Baptist Golden Age Home, 226 F. Supp. 892, 903 (W.D. Ark. 1964) (noting that, despite being construed a fixture, a properly perfected purchase money security interest in such carpeting would "take priority over prior encumbrances of the real estate.").

repossess, may prove to be a more potent form of security to lenders. For example, the threat of shutting off a business' air conditioning or lighting system for non-payment of one's energy efficiency financing bill would, no doubt, produce a certain degree of compliance by borrowers.

F. Motivating the Search for Solutions by Creating Financial Instruments

Outside capital is necessary for the energy efficiency market to reach its potential. A review of eighteen energy efficiency assistance programs, for example, revealed that potential consumers without access to capital upfront may decline a project, even if the project would yield a greater than fifteen percent payback.[131]

Creating financial instruments tied to energy efficiency investments may provide several benefits. First, increased sources of funding should lower the cost of capital, as supply of funds increases relative to demand. Second, outside expertise typically accompanies outside financing sources. These experts are incentivized to create opportunities for investors, and that can best be accomplished by closing the aforementioned "energy efficiency gap." If energy efficiency investments offer a sufficiently attractive return on investment, this will create a new class of intermediaries who package and verify energy efficiency investments in various sectors of the economy. At present, the prototypical intermediary is the Energy Service Company (ESCO), to which we now turn.

IV. ACCESS TO MONEY AND EXPERTISE

While utilities might be well-positioned in terms of expertise, capital, and customer base to offer energy efficiency investments, such activities often do not fit their culture or incentive structure.[132] Furthermore, the unbundling of the utility industry structure means no one single part of the value chain (e.g. distribution, pipelines, generation) can capture all of the benefits of an energy efficiency investment.[133]

A. The ESCOs

This opens up a role for third parties with energy efficiency expertise. One such entity is the ESCO, which "align[] the interests of both the utility and the customer."[134] ESCOs "provide comprehensive technical services and focus on reducing facility energy usage and costs utilizing a broad array of strategies that involve end use efficiency and/or onsite generation technologies."[135]

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131. Fuller, *supra* note 32, at 11.

132. NATIONAL ACTION PLAN FOR ENERGY EFFICIENCY, ALIGNING UTILITY INCENTIVES WITH INVESTMENT IN ENERGY EFFICIENCY at ES-8 (Nat'l Action Plan for Energy Efficiency Nov. 2007); *see also* Timothy J. Brennan, *"Night of the Living Dead" or "Back to the Future"? Electric Utility Decoupling, Reviving Rate-of-Return Regulation, and Energy Efficiency*, RESOURCES FOR THE FUTURE DISCUSSION PAPER 08-27 (Aug. 2008).

133. National Action Plan for Energy Efficiency, *supra* note 135, at 1-4.

134. Diane Munns, *Modeling New Approaches for Electric Energy Efficiency*, 21 ELEC. J. 20, 24 (Mar. 2008).

135. Bharvirkar *et al.*, *supra* note 42, at 3.

ESCOs "typically provide turnkey design, installation, and maintenance services and also help arrange project financing."[136] Between 1990 and 2006, it is estimated that ESCOs completed about $28 billion in projects, with about seventy-five to eighty percent in the institutional market. In 2006, ESCO energy revenues were estimated at $3.6 billion, with $2.5 billion coming from energy efficiency projects.[137] These revenues grew more than twenty percent per year between 2004 and 2006.[138]

The majority of ESCOs' revenue comes from the institutional sector, which accounts for twenty-five percent of commercial energy demand.[139] The biggest component (about fifty-eight percent of total revenues) of the institutional sector is the MUSH market: <u>M</u>unicipal and state governments, <u>U</u>niversities, <u>S</u>chools, and <u>H</u>ospitals.[140] It is these entities that are eligible for tax-free lease financing. The federal market provides twenty-two percent of ESCO revenues.[141] So far, ESCOs have completed over 460 federal energy efficiency projects, valued at $2.3 billion (average value of $5 million each), for nineteen federal agencies. [142] These projects resulted in $7.1 billion in cost savings, of which $5.7 billion was allocated to finance project investments and $1.4 billion accrued to the federal government as net savings.[143]

Unfortunately, the institutional market is often capital-constrained and unable to afford even high-return efficiency investments,[144] let alone basic capital improvements. It is these entities, who lack their own capital equipment budget, that particularly need outside financing. Federal government agencies are advised to "exhaust private financing opportunities before using scarce appropriated funds",[145] and many state governments have very tight budgets. ESCOs try to work around this difficulty, as well as the aforementioned "Warren Buffet problem", by bundling multiple projects in a region together.[146]

B. Typical ESCO Deal Structure

A survey of 1,642 energy efficiency projects completed between 1990 and 2000 reveals that the median ESCO project size was $0.7 million and the average was $1.8 million, suggesting that some projects were much larger than the median.[147] Institutional sector projects tended to be up to three times larger than private sector projects.[148]

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136. *Id.*

137. NICOLE HOPPER, CHARLES GOLDMAN, *ET AL.*, A SURVEY OF THE U.S. ESCO INDUSTRY: MARKET GROWTH AND DEVELOPMENT FROM 2000 TO 2006 v (Lawrence Berkeley National Laboratory May 2007).

138. Bharvirkar *et al.*, *supra* note 42, at 3.

139. McKinsey Global Inst., *supra* note 15, at 30.

140. Hopper *et al.*, *supra* note 140, at 13; Bharvirkar *et al.*, *supra* note 42, at xiii.

141. Hopper *et al.*, *supra* note 140, at 13.

142. U.S. Dep't of Energy, *Federal Energy Management Programs*, http://www1.eere.energy.gov/femp/financing/espcs.html (last visited Sept. 14, 2009).

143. *Id.*

144. McKinsey Global Inst., *supra* note 14, at 42.

145. Tom Hattery, ENERGY EFFICIENCY AND RENEWABLE ENERGY, SUPER ESPC: ENERGY SAVINGS PERFORMANCE CONTRACTING 10 (U.S. DEP'T OF ENERGY March 2009), *available at* http://www1.eere.energy.gov/femp/pdfs/escoforum0309hattery.pdf.

146. de T'Serclaes, *supra* note 22, at 41.

147. Charles A. Goldman, Nicole C. Hopper & Julie G. Osborn, *Review of U.S. ESCO Industry Market Trends: An Empirical Analysis of Project Data*, 33 ENERGY POL'Y 387, 391 (2005); JULIE OSBORN, CHUCK

For most projects, the ESCO's role is to "act as a project developer[] for a wide range of tasks and assume the technical and performance risks associated with the project" including development, installation, financing of an agreement "to provide energy at a contracted level and cost, usually over 7-10 years."[149]

The ESCO's compensation is often "linked directly to the amount of energy that is actually saved,"[150] by structuring the agreement to divide up a stipulated amount of energy cost savings between the ESCO and end user.[151] Most ESCOs do not finance projects themselves, however they do guarantee performance of the energy efficiency systems they install, albeit not up to 100 percent.[152] Because most energy efficiency equipment is installed at the end-user site, ESCOs have few assets of their own that can be used as collateral for a loan.[153] Deals are typically leveraged up to eighty percent, at capital leasing rates.[154]

In order to repay third party financing for an energy efficiency project, the ESCO usually seeks to capture at least ninety percent of the savings on a six year deal, and seventy-five to eighty percent of the savings for an eight year deal.[155] The key benefit to the end user is protection against future energy price increases,[156] and several non-energy advantages.[157] For example, the installation of high performance lighting enhances productivity 6.7 percent, while a more energy efficient building can also lower water and waste costs.[158]

MMA Renewable Ventures, one of the leading financiers in the field of energy efficiency financing in recent years,[159] typically pays ESCOs for "all design, engineering, equipment, and installation costs," as well as long-term operating expenses.[160] In exchange, MMA takes title to all property and end-users pay MMA directly based on the savings generated by the project.[161]

GOLDMAN, NICOLE HOPPER, & TERRY SINGER, ASSESSING U.S. ESCO INDUSTRY: RESULTS FROM THE NAESCO PROJECT 6 (Lawrence Berkeley National Laboratory August 2002); *Cf.* Telephone Interview with Robert Hinkle, Former Head of Energy Efficiency Finance, MMA Renewable Ventures (Mar. 31, 2009) (Averaging $1 to 4 million for energy efficiency projects.).

148. Osborn, Goldman, Hopper & Singer *supra* note 150, at 7.

149. World Business Council for Sustainable Development, *supra* note 83, at 31.

150. *Id.*

151. Hinkle, *supra* note 150.

152. DOUG CULBRETH, ENERGY EFFICIENCY AND RENEWABLE ENERGY, FEDERAL ENERGY MANAGEMENT PROGRAM AGENCY ESCO FORUM, FINAL PROPOSAL 6 (U.S. Department of Energy March 11, 2009); Hinkle, *supra* note 150; Hattery, *supra* note 145, at 4.

153. Strickland & Sturm, *supra* note 25, at 881.

154. Hinkle, *supra* note 150.

155. *Id.*

156. *Id.*

157. DAVE BIRR & TERRY E. SINGER, NAESCO ANALYSIS OF NON-ENERGY BENEFITS OF EFFICIENCY RETROFITS FOR ESCOS AND ESCO CUSTOMERS (Nat'l Assoc. of Energy Serv. Cos. December 16, 2008), *available at* http://www.naesco.org/resources/industry/documents/NAESCO%20NEB%20Report%2012-11-08.pdf.

158. Robert Hinkle, Former Head of Energy Efficiency Finance, MMA Renewable Ventures, Presentation at the 2nd Annual Energy Efficiency Forum: The Next Generation in Financing Clean Energy (Apr. 10-11, 2008).

159. It appears that MMA may soon focus its efforts solely on solar finance, having been acquired by Fotowatio, a Spanish solar power developer. *See, e.g.,* Lindsay Riddell, *MMA Solar, Wind Company Gets Bought*, SAN FRANCISCO BUS. TIMES, March 2, 2009, *available at* http://www.bizjournals.com/sanfrancisco/stories/2009/03/02/daily11.html.

160. Hinkle, *supra* note 150.

161. *Id.*

MMA, in turn, retains the project equity and brings in lenders to provide debt for the project.[162] Investment sizes range from $2 to $10 million and projects last between seven and fifteen years.[163] One of MMA's peers, Hannon Armstrong, already has a portfolio of over $1.5 billion of energy efficiency assets.[164]

For federal government projects, lower cost financing is available if the end-user borrows the project funds, rather than the ESCO.[165] For this reason, on some federal government energy efficiency projects, the ESCO arranges the loan, but the loan relationship consists of direct contractual privity between the lender and the government end user.[166] The result of such an arrangement is that the risk of end-user default is negated. The remaining risk for such projects is that the energy efficiency technology installed by the ESCO does not work and the ESCO itself is insufficiently creditworthy to honor its guarantee of the technology. In short, the ESCO becomes the weakest (aka riskiest) link in the financing. For commercial entities, by contrast, the cost of financing can be significant, ranging from eight to twelve percent interest rates,[167] depending on the entity's credit-worthiness.

C. Evolving the ESCO Business Model

In addition to the more vertically-integrated ESCOs are the Energy Efficiency Service Providers (EESPs), companies that offer energy efficiency products and services, but do not usually guarantee a particular savings from its installation.[168] As compared to ESCO, many EESPs are more narrowly focused on particular technologies and efficiency methodologies. While EESPs are less likely to be owned by utilities, some are owned by equipment producers, such as The Trane Company, an air conditioner manufacturer.[169] EESPs can both leverage utility company financing programs, as well as offer their own financing packages.

EESPs have a significant expansion opportunity if utilities are willing to offer billing services by adding EESP charges to customer energy bills. Obstacles to this occurring include efforts by consumer advocates to ensure that basic utility service is not terminated if a customer is willing to pay his/her/its monthly utility bill, but not the monthly energy efficiency financing charges.[170] It is this threat of having one's power cut off that reduce the credit risk of financing energy efficiency improvements for smaller customers. Another

162. *Id.*

163. *Id.*

164. Eckel, *supra* note 112.

165. Gillingham, Newell & Palmer, *supra* note 78, at 13-14.

166. Taylor *et al*., *supra* note 3, at 227.

167. Tel. Interview with Charles Goldman, Lawrence Berkeley National Laboratories (July 28, 2009).

168. The Texas Code defines EESPs as "A person who installs energy efficiency measures or performs other energy efficiency services. An energy efficiency service provider may be a retail electric provider or large commercial customer, if the person has executed a standard offer contract." 16 TEX. ADMIN. CODE § 25.5 (2009).

169. *See, e.g.,* the list of EESPs in the territory covered by San Diego Gas and Electric, *available at* http://www2.sdge.com/EIC/forms/eesplist.cfm.

170. *See, e.g.,* Brown, *supra* note 94, at 11. ("Advocates in Vermont and New York have expressed concern that the utility commission did not have the authority to allow utilities to disconnect a customer's service for non-payment of the tariff. Consumer advocates in Kansas objected to the disconnection component of the tariff in that state as well[.]")

challenge for on-bill financing is that the billing system used by many utilities is not easily re-configurable to accommodate third party services.

EESPs also offer financing programs offered by equipment manufacturer. These are influenced heavily by the ease of repossessing the manufacturer's equipment upon default. An air conditioner connected to many ducts may be significantly hard to reclaim than an energy management console connected via Ethernet to the customer's local area network. Credit enhancement techniques, such as the creation of an escrow account or sinking fund, can also be used to lower the cost of financing.

A key window for selling energy efficiency services and equipment opens when a potential end-user is planning a major renovation or is forced to replace existing equipment. At such time, the customer is already preparing to spend a significant sum on infrastructure and the challenge for EESPs is to influence the customer to spend slightly more for a more efficient solution.[171] Thus, the energy efficiency expenditure is only a small incremental step above the already planned expenditure. Focusing on such moments in time, can dramatically reduce the amount of financing required specifically for energy efficiency investments by piggybacking on the consumer's owned planned investment.

V. ENERGY EFFICIENCY FINANCING PAYBACK PERIODS AND INVESTMENT YIELDS

ACEEE estimates that energy efficiency investments in the current market have a typical payback period of three years,[172] although this will increase to five years by 2030.[173] Meanwhile, a 2007 survey of 1249 North American Energy Management Executives revealed that more than half planned to make an energy efficiency investment over the next year, with an average payback period of less than 4.3 years.[174]

Meanwhile, McKinsey & Company has identified $170 billion per year[175] of energy efficiency investment opportunities that will yielding an average seventeen percent IRR.[176] Specifically, within the Commercial/Industrial sector, McKinsey identified the following investment opportunities[177]:

Industry	**Technology**	**Capital Requirement**	**Projected IRR**
All	Combined Heat and Power Generation	$43 billion	36%
All	Optimization of Electric Motors	$23 billion	35%
Pulp & Paper	Increased use of recycled paper	$4.1 billion	19.1%
Iron & Steel	Thin slab casting	$8.4 billion	10.5%

171. Tel. Interview with Corey Stone, BWB Solution (Aug. 4, 2009).
172. Ehrhardt-Martinez & Laitner, *supra* note 15, at vii.
173. *Id.*
174. Nesler, *supra* note 28.
175. Farrell & Remes, *supra* note 3, at 1.
176. McKinsey Global Inst., *supra* note 17.
177. *Id.* at 14.

Chemicals	Liquid membrane separation	$0.8 billion	109.2%
Refining	Increase furnace efficiency	$2.1 billion	37.5%
Refining	Improve stream efficiency	$2.2 billion	31.4%

The U.S. residential sector offers additional high-yielding investment opportunities[178]:

Type of Technology	**Projected IRR**
Lighting	500%
Heating & Cooling	15%
Water heating	20%

Studies of the ESCO market have provided insights into yields for energy efficiency investments in the institutional and commercial sectors. An analysis of 771 institutional sector projects suggested a 1.6 median benefit-to-cost ratio at a seven percent discount rate, and a 1.3 ratio at a ten percent discount rate,[179] with projects solely involving lighting paying back nearly three times faster than projects not involving lighting.[180] Overall, about seventy percent of institutional sector projects yielded a net present benefit-to-cost ratio of greater than one at a seven percent discount rate.[181] The median payback time for this sector was seven years.[182]

An analysis of 309 ESCO private sector projects suggested a 2.1 median benefit-to-cost ratio at a ten percent discount rate, and a 1.6 ratio at a fifteen percent discount rate, a notably higher return than institutional sector projects.[183] Overall, about eighty-seven percent of private sector projects yielded a benefit-to-cost ratio of greater than one at a ten percent discount rate,[184] with a median payback time of 3.9 years for projects involving a combination of lighting and non-lighting technologies.[185] MMA Renewable Ventures reports similar returns: a two to three year payback on lighting deals, and a three to five year payback on motor/pump deals.[186]

Some caution that payback period is an insufficient metric for analyzing investments because it takes into account neither benefits that occur after the payback period, nor the time-value of money. However, an analysis of 1,057 investment funds raised between 1983 to 1994 reveals that there is a significant relationship (R-squared of 0.5) between IRR and payback period.[187] The study reveals that

178. *Id.* at 19.

179. Hopper, Goldman, *et al*., *supra* note 140, at 396.

180. *Id.* at 397.

181. *Id.*

182. *Id.* at 396.

183. *Id.*

184. *Id.* at 397.

185. *Id*.

186. Hinkle, *supra* note 150.

187. ANDRE FREI & MICHAEL STUDER, PAYBACK TIME 2 (PARTNERS GROUP RESEARCH SERIES 2004), *available at* http://www.partnersgroup.com/docs/library/PERSPaybackperiod.pdf.

> short payback periods indicate a strong portfolio and/or favorable exit conditions. They raise the prospect of additional distributions later in a fund's life and hence high long-term IRRs. Conversely, long payback periods typically indicate a weak portfolio and/or an unfavorable exit environment, usually leading to low IRRs unless the fund can generate substantial exits [by selling investments for a large profit] at a later stage.[188]

VI. IS ENERGY EFFICIENCY AN ATTRACTIVE INVESTMENT FOR THE FINANCIAL COMMUNITY?

Despite the large potential size of the energy efficiency financing market, the aforementioned market barriers may mean that investors will demand a risk premium in order to enter the marketplace. In other words, energy efficiency investments need to yield a significantly higher return than other investment vehicles to incentivize investors to develop solutions to issues such as transaction costs, imperfect knowledge, and principal-agent misalignment.

Accordingly, the paper will next compare some of aforementioned energy efficiency payback periods and returns on investment (at various discount rates) to more common financial instruments, such as corporate bonds and equity. Given the lack of a robust securitization market for energy efficiency collateralized debt obligations, one of the first issues to be addressed is the relative illiquidity of energy efficiency financing instruments.

A. Comparison to Corporate Bonds

According to Peter Conklin, the head of Structured Finance for MMA Renewable Ventures, debt financing for energy efficiency investments sometimes require yields as high as those accorded more speculative bonds.[189] Standard & Poors rates bonds according to their likelihood of payment, nature of the obligation, and protection afforded to the bondholder in the event of bankruptcy.[190] A bond rated as BB- by Standard & Poors is "regarded as having significant speculative characteristics," because "it faces major ongoing uncertainties and exposure to adverse business, financial, or economic conditions, which could lead to the obligor's inadequate capacity to meet its financial commitments."[191]

The average yield of a corporate Standard & Poors BB- rated loans between 1997 and 2007 has been 8.675 percent per year, as shown here by Bloomberg.

Energy efficiency investments made through ESCOs compare favorably to the returns offered by BB- rated bonds. The simple payback period for BB- bonds is approximately 11.5 years, while the simple payback period for energy efficiency investments is seven years for institutional sector projects, and 3.9 years for private sector projects.[192] Likewise, energy efficiency investments offered a positive net present value (as measured by Benefit-to-Cost ratio), even when discounted at higher rates than the 8.675 percent yield required by BB-

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188. *Id.*

189. Telephone Interview with Peter Conklin, Head of Structured Finance, MMA Renewable Ventures (Mar. 24, 2009).

190. *Understanding Standard & Poor's Rating Definitions*, STANDARD & POOR'S, June 3, 2009, *available at* http://www2.standardandpoors.com/spf/pdf/fixedincome/Understanding_Rating_Definitions.pdf.

191. *Id.* at 10.

192. *Id.* at 17.

bonds. Specifically, institutional sector energy efficiency investments offered a 1.3 median Benefit-to-Cost ratio at a ten percent discount rate, while private sector offered 2.1 median ratio at a ten percent discount rate.[193]

Outside the ESCO marketplace, McKinsey's forecast of an average seventeen percent internal rates of return[194] also compares favorably to BB- rated bonds. In fact, efficiency technology investments such as combined heat and power generation, solid state lighting, and optimized electric motors promise[195] yields more than four times greater than BB- rated bonds.

In conclusion, energy efficiency projects promise a significantly higher return than speculative corporate bonds.

B. Comparison to Equity Securities

Peter Conklin of MMA Renewable Ventures, compares energy efficiency investments to project finance equity investment funds. In project finance, once projects are constructed, investors expect a return in the "low teens."[196] These returns are necessarily higher than that of corporate bonds for several reasons: 1) equity provide less security to investors in the event of bankruptcy; and 2) because companies are obligated to pay bondholders, while equity holders are only rewarded if the company either chooses to pays optional dividends or the market becomes enamored of that particularly equity.[197] It is for this reason that there is a risk premium paid to equity holders above the returns provided to bondholders.[198]

Several recently raised infrastructure project finance funds offer a case in point. Three funds focused on developed country markets are targeting returns in the ten to fifteen percent range, with an expected fund life of four to twelve years.[199] The typical ESCO energy efficiency project, which tends to last between seven and ten years,[200] fits readily within this profile.

Compared to average seventeen percent internal rates of return forecast by McKinsey for energy efficiency investments, equity investments in project finance are an inferior investment. While equity returns of thirteen percent do offer an analogous payback period to institutional sector energy efficiency investments,[201] they still pale in comparison to private sector energy efficiency investments, which yield a median payback of 3.9 years.[202] Analyses of other equity investment funds, such as a review of 1057 buyout and venture capital

193. *Id.*

194. *Id.* at 1.

195. *Id.* at 16.

196. Conklin, *supra* note 194.

197. BRADFORD CORNELL, THE EQUITY RISK PREMIUM: THE LONG-RUN FUTURE OF THE STOCK MARKET 183-84 (John Wiley & Sons 1999) (*Quoting* Michael Milken's explanation that high yield bonds are a better investment than equities because borrowers are forced to pay their bondholders, even if the company's equity is out of favor).

198. *Id.* at 34.

199. RYAN J. ORR, THE RISE OF INFRA FUNDS (PFI: Project Finance International June 13, 2007); *See also* Conklin, *supra* note 194 (describing 15% cash equity yield as the target return for MMA Renewable Venture's energy efficiency deals).

200. World Business Council for Sustainable Development, *supra* note 80, at 31.

201. Frei & Studer, *supra* note 192, at 3.

202. *Id*. at 17.

funds raised between 1983 to 1994, yield similar conclusions about funds' relative payback periods: "[f]or liquidated funds that did break even, . . . the average payback period is approximately seven years, whereas venture funds took more than eight years on average . . . ."[203]

Another means of calculating a benchmark equity price to use in comparison to energy efficiency investments is to apply "The Buildup Method," which adds various risk premia to the risk-free rate.[204] Using this methodology, the equity risk premia is adjusted to account for the industry sector of the investment and the size of the investment. As of year-end 2005, the risk-free rate was 4.6 percent and the general equity risk premia was 7.1 percent.[205] Because "energy efficiency [i]s an investment in producing energy services[,]"[206] the most appropriate industry premia to apply is that of the utility sector, which had a premium of 1.3, according to the Energy Information Administration.[207] Because most energy efficiency investments are less than $265 million, a size premium of 6.36 must also be applied to the cost of capital.[208] Combining the risk-free rate with the appropriate equity, industry, and size premia, the Buildup Method suggests that the total cost of equity for energy efficiency investments should be 19.4 percent:

Risk-free rate	4.60%
Long-term equity premium	7.10%
Industry premium for utility sector	1.30%
Size premium for investments of less than $265 million	6.36%
Total equity cost of capital	19.4%

The "cost of equity for the market is a synonym for expected return on the market[,]"[209] thus, the Buildup Method suggests that an investment in a small utility's equity could yield a 19.4 percent return. Clearly this slightly exceeds the average return on energy efficiency projects analyzed by McKinsey, however it is still significantly lower than the return available on many specific efficiency technologies.[210]

Unfortunately, at this time I am unable to directly compare the median and average IRR of the aforementioned ESCO energy efficiency projects to the

203. *Id*. at 16.

204. IBBOTSON & ASSOC., STOCKS, BONDS, BILLS, AND INFLATION, VALUATION EDITION 2006 YEARBOOK 37 (New York, NY: Ibbotson & Assoc., 2006); JAMES R. HITCHNER, FINANCIAL VALUATION: APPLICATIONS AND MODELS 139 (Hoboken, NJ: John Wiley & Sons, 2003).

205. Ibbotson, *supra* note 209, at 43.

206. Gillingham, Newell & Palmer, *supra* note 75, at 3.

207. ENERGY INFORMATION ADMINISTRATION, OFFICE OF INTEGRATED ANALYSIS AND FORECASTING, THE ELECTRICITY MARKET MODULE OF THE NATIONAL ENERGY MODELING SYSTEM: MODEL DOCUMENTATION REPORT 87 (DOE/EIA Mar. 2006) (calculating the utility industry beta based on airline and telecommunication industry betas because 1) historic utility industry betas are inappropriate for statistical inference due to industry restructuring; and 2) "the structure and size of the both airline and telecommunication industries are an appropriate guide to the current and future utility industries.").

208. Ibbotson, *supra* note 209, at 262.

209. Cornell, *supra* note 197, at 28.

210. Hitchner, *supra* note 209, at 156 *et seq.*

project finance equity returns because the ESCO project IRR data is unavailable, perhaps due to ESCO concerns about releasing trade secrets. A request to provide the IRR data in the aggregate, in order to alleviate concerns about the confidentiality of specific projects and companies, is still pending.

C. The Weighted Average Cost of Capital

As demonstrated above, energy efficiency investments tend to offer a significantly higher yield than speculative grade corporate debt and a slightly lower return with that of a small utility company's equity. Practically speaking, few projects will be financed entirely by debt or entirely by equity. Rather, most energy efficiency projects will be financed by a weighted average cost of capital (WACC): a combination of debt and equity.[211] In developing their WACC, investors generally wish to use debt as their source of financing to the greatest extent possible because: 1) bondholders require a lower return than equity holders; and 2) debt service payments are tax deductible.[212] However investors need to be careful not to use too much equity because it will increase a project's cost of financial distress.[213]

In developing countries, non-recourse project finance funds report twenty to thirty percent debt in their capital structure,[214] while developed country funds might employ fifty to eighty percent leverage through bank loans, securitization and bonds.[215] MMA Renewable Ventures has packaged energy efficiency investments with up to ninety percent debt before.[216] Thanks to significant amounts of debt in the capital structure, many infrastructure investments funds derive up to half of their returns from "financial structuring."[217]

Assuming a conservative 50-50 split between debt and equity and a thirty percent tax rate, the Weighted Average Cost of Capital for energy efficiency investments should be about 12.95 percent:

		Percentage of capital structure	Cost	Tax Shield	Weighted Cost of Capital Component
Equity		50%	19.4%		9.70%
Debt		50%	8.7%	2.2%	3.25%
Tax rate	25%				
Weighted Average Cost of Capital					**12.95%**

211. *Id*. at 17.

212. *See, e.g.*, Franco Modigliani & Merton H. Miller, *Corporate Income Taxes And The Cost Of Capital: A Correction*, 53 AM. ECON. REV. 433 (1963).

213. *See, e.g.*, Edward I. Altman, *A Further Empirical Investigation of the Bankruptcy Cost Question*, 39 J. OF FIN. 1067 (1984).

214. de T'Serclaes, *supra* note 22, at 21.

215. Orr, *supra* note 204.

216. Conklin, *supra* note 194.

217. Orr, *supra* note 204.

This cost of capital could be lowered further through greater leverage in the capital structure, however even with this conservative gearing of fifty percent equity, the cost of capital for energy efficiency investments is significantly lower than the seventeen percent return on energy efficiency investments forecast by McKinsey & Company. This means that the average energy efficiency project should provide a positive return, even after taking its cost of capital into account.

D. Discount for Lack of Liquidity/Marketability

It is well-established that the marketability of a security can have a significant impact on its value.[218] Liquid instruments are worth more because they give investors the flexibility to sell their holdings in case they need cash for some other reason, or because they believe the investment's prospects have soured.[219] Illiquid securities must provide a higher return to compensate for these risks.

In order to compare illiquid energy efficiency investments to publicly traded equities and bonds, the return of the energy efficiency investments must be discounted by the risk premium for the investments' illiquidity. Historical studies of restricted and unregistered stock are typically used to calculate this premium.[220] An older, seminal study by the Securities and Exchange Commission revealed that restricted stocks tended to trade for thirty to forty percent less than freely marketable shares.[221] More recent research on this topic by Emory suggests that a forty-seven percent discount for equity illiquidity is appropriate,[222] while the Liquistat Database reports that shares restricted for sale by, on average, 138 days, were marked down by a median discount of 32.8 percent.[223]

Corporate bonds are discounted for lack of liquidity as well.[224] On average, Chen *et al.* suggest that the "liquidity cost estimate for investment grade bonds is $0.30 per $100 value."[225] Wilson somewhat concurs, noting a liquidity premium of thirty to fifty basis points for illiquid debt.[226] For a BBB-grade bond, however, Chen *et al.* estimate that the yield spread (above Treasury bonds) must increase from 1.80 to 3.21 percent, an increase of 141 basis points.[227] Data from

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218. *See, e.g.,* Francis A. Longstaff, *How Much Can Marketability Affect Security Value?*, 50 J. OF FIN. 1767 (1995).

219. Colin Wilson, Barrie & Hibbert, Presentation to Open Forum, UK Faculty & Institute of Actuaries: (Il) Liquidity Premium Estimation, at 6 (Nov. 6, 2008), *available at* http://www.actuaries.org.uk/?a=140656.

220. SHANNON P. PRATT, BUSINESS VALUATION DISCOUNTS & PREMIUMS, 2D. ED., 88-89, 410-11 (Hoboken, NJ: John Wiley & Sons, 2009); *see also* William E. Holmer, How to Use Put Options to Determine Discounts for Lack of Marketability, Presentation at 23rd Annual Advanced Business Valuation Conference (Oct. 7-9, 2004) (describing the use of Put options to determine the appropriate lack of marketability discount).

221. DISCOUNTS INVOLVED IN PURCHASES OF COMMON STOCK, 5 INST. INVESTOR STUDY REPORT OF THE SECURITIES AND EXCHANGE COMMISSION 2444 (Wash., D.C.: U.S. Government Printing Office, 1971).

222. John D. Emory, Sr., & John D. Emory, Jr., *Discounts for Lack of Marketability, Emory Pre-IPO Discount Studies 1980-2000, as Adjusted October 10, 2002*, at 1, BUSINESS VALUATION REVIEW (Dec. 2002), *available at* http://www.emoryco.com/valuation-studies.shtml.

223. Pratt, *supra* note 225, at 429.

224. Long Chen, David A. Lesmond, & Jason Wei, Corporate Liquidity and its Effect on Bond Yield Spreads, 14th Annual Conference on Financial Economics and Accounting, at 2 (April 2005).

225. *Id.*

226. Wilson, *supra* note 224, at 4.

227. Chen *et. al*., *supra* note 229, at 27.

the Securities Industry and Financial Markets Association supports this conclusion as well, showing bid-ask spreads of about 280 basis points.[228] If one were to assume that half of the spread was attributable to the buyer and half to the seller,[229] this might suggest an illiquidity spread of 140 basis points.

Assuming, once again, that if an energy efficiency project was capitalized with thirty percent equity, then an illiquidity discount of forty percent should be applied to the equity, and a premium of about 140 basis points over publicly traded debt of an equivalent credit risk.[230] The result is a weighted average cost of capital of 12.77 percent:

	Share of Capital Structure	Weighted Cost of Capital Component	Illiquidity Discount	New Weighted Cost of Capital Component
Equity	30%	5.82%	40.0%	8.15%
Debt	70%	4.55%	1.4%	4.62%
Illiquidity Adjusted Weighted Average Cost of Capital				**12.77%**

Because the projected average return of energy efficiency projects (seventeen percent) still exceeds this weighted average cost of capital, despite a capital structure containing thirty percent equity, and application of a discount for illiquidity, this demonstrates that the economics of energy efficiency projects should be attractive to the financial marketplace.

VII. CONCLUSION

Energy efficiency investments offer a promising new financial market. The prospective returns available provide a significant incentive for market actors to overcome obstacles such as principal-agent misalignment, imperfect knowledge, and transaction costs through the applications of technology and new business models.

Of course, opportunities for further research remain. A review of the IRR data excluded from the Lawrence Berkeley Laboratory study of ESCO projects, for example, could provide additional validation of risk-adjusted return for particular types of technologies. Likewise, studying the reliability of projected efficiency project savings/returns would enable fine-tuning of project debt-to-equity ratios. Enhancing the creditworthiness of borrowers, through third-party guarantees or cross-collateralization could lower borrowing costs. And creating more easily detachable energy efficiency equipment, combined with greater use

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228. SIFMA, RESEARCH REPORT: SECURITIES INDUSTRY AND FINANCIAL MARKETS ASSOCIATION 16 (SIFMA Vol. III, No. 10 Nov. 2008).

229. *See, e.g.*, Vathana Ly Vath & Simone Scotti, *Bid-Ask Spread Modelling: A Perturbation Approach*, FINANCE INNOVATION, Nov. 29, 2008, at 1, *available at* www.finance-innovation.org/risk09/work/6481080.pdf) ("There are several approaches in modelling liquidity risk. . . . [including] to consider liquidity risk in terms of the difference between the bid and ask prices, i.e. the existence of a bid-ask spread.").

230. In the current tight credit environment this may not apply, according to Gershon Cohen, *The Future of PPPs*, PFI: PROJECT FINANCE INTERNATIONAL, December 16, 2008 ("at Triple B investment grade assets would need to be priced at around Libor plus 500bp, and that is just not economic.").

of the purchase money security interest mechanism could provide greater security for lenders.