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Risk transfer via energy-savings insurance

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Abstract

Among the key barriers to investment in energy efficiency are uncertainties about attaining projected energy savings and potential disputes over stipulated savings. The fields of energy management and risk management are thus intertwined. While many technical methods have emerged to manage performance risks (e.g. building diagnostics and commissioning), financial methods are less developed in the energy management arena than in other segments of the economy. Energy-savings insurance (ESI)—formal insurance of predicted energy savings—transfers and spreads both types of risk over a larger pool of energy efficiency projects and reduces barriers to market entry of smaller energy service firms who lack sufficiently strong balance sheets to self-insure the savings. ESI encourages those implementing energy-saving projects to go beyond standard measures and thereby achieve more significant levels of energy savings. Insurance providers are proponents of improved savings measurement and verification techniques, as well as maintenance, thereby contributing to national energy-saving objectives. If properly applied, ESI can potentially reduce the net cost of energy-saving projects by reducing the interest rates charged by lenders, and by increasing the level of savings through quality control. Governmental agencies have been pioneers in the use of ESI and could continue to play a role. Published by Elsevier Science Ltd.

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1. Risk-management techniques for energy-efficiency projects

A growing body of literature suggests that efforts to measure energy savings in commercial buildings reveal that intended efficiency targets are not always met (Diamond et al., 1992; Vine, 1993; Piette, 1994). Perceived risk of underperformance can pose various kinds of barriers to efficiency projects, or dissuade project teams from pursuing high levels of savings requiring new technologies or techniques. In cases where external financing is required, this perceived risk of underperformance can have a particularly adverse effect on a project's viability. From a building owner's perspective, the prospect of disputes with sophisticated energy management companies are often seen as a losing proposition and can contribute to considerable reluctance to initiate projects.

Technical strategies are increasingly used to reduce the risk of underperformance in energy saving projects. These include a host of diagnostics and commissioning processes that can detect potential causes of underperformance and remedy them early on. The inclusion of commissioning in the ENERGY STAR Buildings process, and basing their Building Label on actual (measured) energy use are prominent examples of this trend (see www.energystar.gov). The international performance measurement and verification protocol (IPMVP) is another technical strategy to reduce performance risk (Kats et al., 1997).

In other sectors of the economy, financial risk-transfer mechanisms have been developed to facilitate investment (e.g. FDIC insurance or debt securitization). This has, to date, been much less apparent in the energy management arena, although some strategies are now beginning to be used to reduce the risk of underperformance. These include Savings Guarantees, Performance Bonds (also known as 'Surety Bonds'), and energy-savings insurance (ESI). These risk-transfer tools are increasingly applied to water conservation projects.

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Energy-savings insurance is a formal insurance contract between an insurer and either the building owner or third-party provider of energy services. In exchange for a premium, the insurer agrees to pay any shortfall in energy savings below a pre-agreed baseline, less a deductible. ESI has traditionally been used for existing buildings that are retrofitted to achieve savings, but several insurers are now investigating applications to new buildings where a logical baseline (e.g. existing energy codes) can be defined. Pricing is typically expressed as a percentage of energy savings over the life of the contract; e.g. 2.5 percent with a 10 percent deductible is a representative price level, although it is sometimes expressed as a percentage of project cost. The premium is paid once in the first year of operation. Such policies are non-cancelable, so the owner is guaranteed to have access to the insurance for the originally agreed contract term. ESI typically insures annual savings expectations (a 'volumetric' approach), although we encountered one example where a payback time was insured. This is a less desirable way to articulate the product, because the insurer would have no stake in the ongoing performance of the project once the payback is attained. ESI appears to be most widely practiced in Canada and the US, with examples also in Brazil and Malaysia.

Surety Bonds offer another method of risk transfer. Surety bonds can be applied to the construction phase of an energy-savings project as well as to the ongoing savings stream. Surety bonds are three-party contracts among insurer, contractor, and property owner. If the contractor does not perform (e.g. energy savings are not achieved), the contractor has to reimburse the insurer. In the case of construction, the bond is a bet that the project can be completed for a particular price, and the bond will pay for completion of the project if necessary. Many projects in state-owned facilities require surety bonds. Pricing is typically 1 percent of project cost or stipulated savings, with a wide range (0.1–1.5 percent) depending on the caliber of the bond purchaser. In one example we identified, bond costs for a $200,000/year energy-savings guaranty ($1.8 M cap cost project) were $3000–4000 annually (1.5–2 percent of the project's lifetime savings). In practice, surety bonds have extremely limited application. Given their potential liability, very few contractors have strong enough balance sheets to qualify. Meanwhile, insurers (being able to recover losses from the contractor) have limited motivation to prevent claims. Thus, performance bonds are not true risk transfer for the contractor in that, unlike ESI, they remain liable for any shortfall. Surety companies also prefer not to take liability for periods exceeding 3 years. Providers of surety bonds are interested solely in the solvency of the insured (contractor), and thus have little interest in technical risk management such as that provided by building commissioning or M&V activities.

Savings Guarantees are offered by providers of energy management services, who effectively 'self-insure' the energy savings, i.e., retain the risk internally rather than selling the risk to a formal provider of insurance or bonds. Disadvantages of savings guarantees include the non-transparency of costs, given that they're bundled in with the broader performance contract, and the potential conflict of interest arising from the fact that those liable for underperformance are also typically those performing the savings measurement. Savings guarantees can also have an effective 'deductible', wherein the provider negotiates a lower project cost if the owner is willing to assume a fraction of the performance risk (i.e. accept something less than a 100 percent savings guarantee). Historically there has been a competitive tension between providers of savings guarantees (ESCOs) and providers of ESI, with ESCOs feeling that their credibility was undermined by the perceived need for ESI and loss of profits from their own 'guarantee premium'. The situation has improved somewhat as the ESI product has been positioned in a fashion that better-supports (essentially as 'reinsurance') and complements the guarantees offered by ESCOs.

Hybrid systems have been discussed, e.g. formulating ESI as backup insurance (reinsurance) for ESCO guarantees, or combinations of surety bonds (e.g. to guarantee completion of a job) and ESI (to guarantee performance).

We identified one comparative analysis of energy-saving guarantees and ESI (BCBC, 2001). The study found that in British Columbia, the cost of savings guarantees has historically equaled 4–13 percent of project costs (the range is a function of project risk, competition, deductible, profit). Participants in the BC Retrofit Program have offered guarantee prices from 3 to 5 percent with no deductible (BCBC, 2001). In contrast, the study found that ESI has historically equaled 3.5–6 percent of project costs, with deductibles ranging from 5 to 10 percent (range is a function of project risk, competition, deductible, risk), and insurers have offered 3.5 percent pricing under the BC Retrofit Program (5 percent deductible). Rates as low as 2.5 percent have been offered by Canadian energy-saving insurers. Costs have clearly declined over time.

As shown in Table 1, the choice of risk-transfer method can affect the borrowing rate and hence the overall profitability of the project.

In the remainder of this article, we focus on ESI as a technique for transferring performance risk. To explore this area in more depth, we conducted interviews with various players in the energy-savings marketplace. These include customers (building owners), service providers (e.g. ESCOs), lenders, insurers, agents, and brokers.

Table 1
Cost comparisons of self-financing, third-party financing with saving guarantees, and third-party financing with energy-savings insurance. Canadian conditions, late 1990s (NRCb n/d)

	Client-arranged financing: No risk transfer	Third-party financing: Traditional savings guarantee	Third-party financing: Energy-savings insurance
Project cost	$1,000,000	$1,000,000	$1,000,000
Annual energy savings	$250,000	$250,000	$250,000
Cost of debt	6.0–7.0%	8.5–9.0%	7.0–8.0%
Interest cost	$132,000 to $160, 250	$289,000 to $292,000	$185,400 to $219,000
Payback time	5.1–5.2 years	6.1–8.2 years	5.5–5.7 years
Cost of guarantee	On balance sheet	10–14% of project cost (including interest)	4–6% of project cost (including interest)

Note: interest cost is over life of project.

2. The mechanics of energy-savings insurance

ESI provides insurance for stipulated energy savings. One provider uses the more descriptive term 'Energy Conservation Savings Contractual Liability Insurance' to describe the product. We identified 12 insurance companies who now or in the past have provided this product, as well as 4 brokers or agents who serve as intermediaries between customers and insurers (Box 1).

The likelihood of losses is reduced through various technical strategies, including the completion of an engineering design review and metering plan prior to construction (and the issuing of insurance), and of 'Acceptance Tests' and verifications of efficiencies specified in the design document, conducted under a commissioning protocol. In addition, insurers can conduct site inspections (often annually) during the life of the contract. The pre-retrofit baseline consumption benchmark is reviewed regularly, and adjusted to reflect changes in operating conditions, etc. Quoting from one sample policy, factors used in defining and adjusting baselines can include 'type, frequency, intensity of use of the building, seasonal temperature averages, fuel costs, costs of outside services, wage and salary rates and cost-escalation factors upon which calculated energy costs are based.' Some insurers also retain the option to make investments in the facility that can avoid potential claims.

Pricing is highly variable, being a function of the size of the project, quality of the project, and the parties involved. Two major types of pricing are used. The first is structured like typical insurance, with the purchaser retaining a portion of the risk via a deductible. Typical deductibles are in the range 5–10 percent of a given loss. Losses are typically capped at some upper number. The alternative formulation is what is referred to as 'co-insurance', wherein the insurer pays a certain percentage of each dollar of loss (e.g. 10 percent). Because the insurer pays parts of even small claims under co-insurance, the premiums tend to be slightly higher. Premiums ranging from 0.5 to 6 percent of energy savings have been cited, and in some cases a one-time fee (e.g. 0.75 percent) for engineering/underwriting review. ESI terms rarely exceed 10 years, and are more typically in the 5-year range.

While there is a cost premium for ESI, the cost can be offset by lower financing rates (as illustrated in Table 1) as well as improved project performance resulting from engineering review and ongoing inspections by the insurer.

In the US, state governments have been highly instrumental in the evolution of ESI, dating back to the mid-1980s. Similarly, in Canada provincial governments have helped to build the market for ESI (Box 2).

For example, among the goals of the Iowa Energy Bank program for public schools was to provide assistance in obtaining ESI (Iowa Department of Natural Resources ND). The state of Illinois has required ESI in its requests for proposals (RFPs) for energy management services in state-owned facilities (Illinois Department of Commerce and Community Affairs, Bureau of Energy and Recycling, 1999). Mississippi's process of selecting firms to provide energy services requires demonstration of ESI (Mississippi Development Authority, 1998). The State of Maryland often uses ESI, and has required it in the past (State of Maryland Department of Public Works, 1998). ESI was the single-most popular form of savings guarantee in their last round of RFP responses; ESCOs who propose projects must identify ESI providers and terms. In one example, a $3-million capital-cost project had a $15,000 ESI cost (0.5 percent of the project cost) over 15 years.

We found at least one example of ESI being used in public housing: a $1.7 million retrofit project at North Carolina housing authority in which projected savings of $374,784 annually are guaranteed by an insurance company over a period of 12 years (NCAT n/d).

A general rule of thumb is that large providers of energy services do not need ESI, as they can self-insure. In fact, these large firms may see ESI as a threat because

Box 1
Selected insurance companies and brokers/agents previously or currently offering energy-savings insurance

Insurance Companies
- AIG (US)
- Hartford Steam Boiler (US) and affiliate Boiler Inspection & Insurance (Canada). Both firms now owned by AIG
- CGU (UK, Canadian Subsidiary)
- Chubb (US)
- Employers Re (US)
- Lloyds of London (UK)
- New Hampshire Insurance Co. (US subsidiary of AIG)
- North America Capacity Insurance Co. (US, owned by Swiss Re)
- Safeco Insurance Company of America (US)—surety bond
- Sorema Re (Canada—Now owned by Scor Reinsurance; reinsures BI&I's policies)
- US Fidelity and Guarantee Co. (US)—surety bonds
- Zurich American/Steadfast Insurance Co. (US)

Agents/Brokers
- Aon Risk Services (US)—broker
- Morris & Mackenzie (Canada, broker)
- NRG Savings Assurance (US—sole agent representing NACICo)
- Willis Canada (Broker—US headquarters)

Box 2
Case study: the British Columbia Buildings Corporation experience

This British Columbia initiative was established to improve the operating efficiency of provincially funded buildings and, in the process, reduce their environmental impact and foster the growth of BCs environmental industry. It targets both new and existing facilities. The British Columbia Buildings Corporation is the implementing agent.

The Retrofit Program encourages provincially funded school districts, universities, colleges and health care institutions to retrofit their facilities to improve their energy and water efficiency, and reduce their greenhouse gas emissions and waste generation. The total cost of facility retrofits is repaid by the utility savings that result.

A key and innovative element of the Program is the use of financial mechanisms to transfer performance risk (i.e. underachievement of energy savings) from the participating educational and health care institutions to the energy services provider or to a third-party insurer. The Program promotes the concept of energy-savings insurance through an agent (representing several insurers) identified through a competitive request for proposals. Premiums have been pre-negotiated by BCBC at rates considerably lower (3.5 percent of the overall project cost [first cost and interest], with a 5 percent deductible) than those prevailing in Canada previously. Insurers have the option of investing in capital improvements to mitigate problems with the retrofit systems that could otherwise precipitate a (costlier) loss.

Unless funded within existing facility budgets, projects must utilize either energy savings insurance or performance guarantees. Of the $26 million (Canadian dollars) in capital investment planned or completed since the launch of the Program in 2000 and for which a performance risk mechanism has been selected, 27 percent (CD$7 million) has been done with energy-savings insurance and the balance with performance guarantees (Maslany, 2001).

BCBC is also considering the application of similar risk-transfer concepts to their New Buildings program.

For more information, see http://www.greenbuildingsbc.com/

they are otherwise able to pass their self-insurance cost on to customers and stand to earn a margin on that cost. Similarly, externally procured insurance eats into bottom-line profits. However, one large firm pointed out that although they could easily self-insure, the presence of externally provided insurance would facilitate investment decision-making within the company by reducing the perceived complexity and risk of projects.

Some question the need for ESI, given how much is known today about energy-saving technologies. This view probably holds for those who are relatively unambitious and stick to the same techniques from project to project without 'pushing the envelope' or working in non-traditional settings. Many of those interviewed stated that ESI can be a valuable countervailing factor in such situations. Projects aiming at 'cream-skimming' have little need for ESI or other forms of savings guarantees.

We spoke with one firm that finances energy-saving projects, and at times serves as an intermediary between the ESCO and ESI provider. They noted that one of the major barriers to obtaining financing is the risk of customer disputes about savings. Hence ESI is a risk-reducing tool from the perspective of those providing financing. About 3–6 percent of their projects developed in the year 2001 utilized ESI.

Iowa's in-house ESCO (Iowa Facilities Improvement Corp) was formed with $12 million in bonds for energy-saving projects, and self-insured their energy savings (based on a small fee for each project). In their experience, savings guarantees rarely cover more than 80 percent of the predicted savings, typically 75 percent, thus leaving part of the risk with the building owner. (These terms are negotiable; lower coverages translate into lower costs. One-hundred-percent performance guarantees are offered by ESCOs under the Green Buildings BC program; see Box 2.) Their M&V efforts are very intensive and the need for their in-house insurance is minimal. However, they estimate that their achieved savings would be about 60 percent of expectations without M&V. They noted that ESI provides an opportunity for a greater diversity of firms to provide energy services, not just traditional ESCOs.

ESI has had a particularly notable level of support in Canada, including endorsement by the Parliament (Canadian Parliament, 1997). Canada's Federal Buildings Initiative made an effort to promote ESI, but reportedly without much success. According to the FBI, an engineer's stamp, a firm's reputation, built-in savings safety margins, and pre-qualification of vendors can accomplish much of the same goals. They note that energy-saving insurers often avoid soft measures (e.g. training) that hinge on human factors. British Columbia Buildings Corporation, on the other hand, has found ESI to be a valuable component in their provincial retrofit program (BCBC, 2001).

ESI, properly applied, can yield retrofit projects of high quality. Insurers are motivated to promote care in design and construction, as well as post-construction measurement and verification. Meanwhile, ESI reduces financial risks for various parties. The benefits include:

- Lower cost than traditional savings guarantees.
- Careful measurement of actual energy use and savings.
- Impetus for maintaining energy-saving equipment and systems.
- Owner's peace of mind stemming from pre-approved project documents, independent engineering review, and performance verification protocols provided by the insurer and their engineering consultants.
- Involvement of insurers sends a signal to other trades that performance projections and measured data will be independently scrutinized, and underperformance could result in real costs or even litigation.
- Transparent and explicit criteria for defining baseline energy use levels and savings, which remove uncertainties for the owner and can simplify contract negotiation.
- 'Cream-skimming' is discouraged by removing the downside risk of more ambitious savings measures. More aggressive projects (deeper savings) are sought thanks to availability of risk-transfer mechanisms.
- Removal of risk that project underperformance will jeopardize the solvency of the energy service provider or lender (Natural Resources Canada n/d-a).
- Enhances competition by enabling smaller firms to bid on projects, where it would otherwise be impossible due to the inability to self-guarantee savings and performance.
- Lower costs of financing thanks to transfer of performance risk off of the project balance sheet of borrower, be it building owner or contractor. Off-balance-sheet (non-recourse) financing enables the facility owner to enlarge the budget for EEMs (Natural Resources Canada n/d-a and n/d-b) or borrow for other purposes.
- Debt service can be ensured by matching loan payments to projected energy savings while designing the insurance mechanism so that payments are made by the insurer (and from set-aside account holding the deductible amount) in the event of a savings shortfall, as is done in British Columbia.
- Improved credit-worthiness of ESCOs (Adelaar et al., 1997).
- Financial regulation of insurers reduces the likelihood of their insolvency, whereas no such regulation exists for ESCOs or other providers of savings guarantees.

Taken together, these benefits considerably mitigate the two previously mentioned barriers to energy efficiency projects: risk of under-attainment of savings and aversion to disputes over savings.

3. Insurer perspectives

Insurers are continually looking for new product ideas. ESI is one such product, which is offered by relatively few companies as yet (Box 1). While ESI has significant untapped upside potential for the insurance industry, it will always be a niche product, given the relatively small potential premium volume.

Data on the total market size of ESI are not readily available. One Canadian insurer with current policies representing approximately CD$20 million in energy savings estimated their market share at 25 percent; another insurer placed the savings of their current projects in the CD$45 million range. This implies that roughly CD$80 million in savings are currently insured in Canada. No total-market data have been found for the US. The ESI industry is clearly in its infancy, yet has considerable upside potential.

Table 2
Scoping estimate of US energy-savings insurance market potential

Annual commercial buildings energy cost	\$107 billion/year
Annual energy-savings potential (33%)	\$35 billion/year
Annualized insurance premium (3% of savings)	\$1.059 billion/year

Note that lifetime premiums for any given contract are paid in first year; amount shown above is annualized. Industrial buildings not included in above estimates.

To estimate the potential US market size, one can assume that the \$107-billion US commercial buildings annual energy bill (DOE, 2001) could be reduced by one-third. With a premium equal to 3 percent of energy savings, this would correspond to annual premiums of \$1 billion (Table 2). While this is a significant amount of revenue, it is small compared to the several hundred billion dollars collected in overall US property/casualty insurance premiums each year. However, there are other well-established specialty insurance products with comparable levels of premium income.

One relatively novel benefit of ESI (from an insurer's perspective) is that the first 24 months or so can be expected to be free of claims, i.e., while the consumption history is accumulating and the building is being commissioned. Another benefit is that, while a project may have, say \$10 million in projected energy savings over a 10-year period, the loss potential in any single year is only \$1 million.

Risk management (loss control) is of central importance for insurers. However, conventional insurers do not possess expertise about energy use and energy management in buildings. Insurers understandably tend to shy away from the unfamiliar. When they do insure the unfamiliar, the terms reflect the uncertainties—which means that insureds find themselves faced with exclusions that dilute the value of the product. ESI insurers, however, are more sophisticated when it comes to energy management. Rigorous engineering review is typically required before placing the insurance, followed by periodic site visits, and sub-metering. One insurer utilizes the IPMVP developed by the US Department of Energy (see http://www.ipmvp.org).

At least one insurer allows the property owners to purchase the insurance directly (known as 'first party' coverage in insurance parlance). This eliminates the risk of ESCO viability from the equation, e.g., if there is a loss and the ESCO is no longer in business, the building owner can still obtain payment for the lost savings. The risk of customers filing dubious claims (a problem known as 'moral hazard' in insurance parlance) is mitigated by up-front engineering review by the insurer, quarterly reporting, annual on-site visits, choosing reputable ESCOs and contractors, and the availability of funds from the insurer to proactively remedy problems that may otherwise lead to claims.

A complicating factor for energy-saving insurers is that the likelihood of claims is relatively high (compared to standard types of insurance), while the severity of losses is generally low. This elevates purchaser sensitivity to pricing and size of deductibles. Meanwhile, loss-control costs can be high in relation to premium income.

For insurers, an added strategic benefit of providing ESI is that certain energy efficiency strategies also stand to reduce ordinary insurance losses (e.g. those from fires caused by inefficient halogen torchiere light fixtures) (Mills and Rosenfeld, 1996; Mills, 1997; Vine et al., 1998; Vine et al., 1999).

4. Loss control

Loss control is central to the business of insurance. If insurers and insureds are able to limit the frequency and/or intensity of losses, the cost of insurance can be lowered. Measures can range from requiring fire sprinklers in buildings to computer ergonomics training in workplaces. There are two primary approaches for implementing insurance loss control: contractual and technical.

Contractual methods include exclusions on the policy, or the ability to shift the loss cost to others (as is done in performance surety bonds wherein the insurer can make claims on the contractor in the event of a loss). Insurance providers also limit claims through the use of deductibles and exclusions.

Technical methods for loss control include a host of quality-assurance techniques used during design, construction, and startup of a project. Most of these are captured within the set of tools known as building commissioning. Using measurement and diagnostics to track actual performance, and make corrections before claims materialize is also important.

Energy-saving insurers may become proponents of more rigorous measurement and diagnostics procedures. An acute case for the need is in the design of semiconductor fabrication facilities, where degradation of rated chiller efficiencies can amount to large losses in savings. In one example, a central plant designed for a COP of 7.8 is achieving 30 percent poorer performance, i.e. a COP of 5.5 (Lock, 2001). This will translate into a \$375,000 shortfall in annual energy savings compared to the design intent. Commonly used sensors and COP measurement techniques are accurate to only within ± 15 percent. Providers of ESI would have an incentive to promote better design and measurement techniques, which are currently available but are often dismissed as un-necessary. The barrier here is the incremental cost of more precise measurement instruments.

5. Exclusions

In the process of defining the insurance coverage afforded by a given policy, insurers typically identify closely related areas or causes of losses that are not covered. These are known as exclusions. One purpose for exclusions is to avoid double insurance, i.e. charging twice for coverage already provided by insurance policies (e.g. property insurance policies) already in place. Risk, and thus pricing and availability, are thus closely tied to the exclusions used. Some cite the exclusions used in ESI contracts as unreasonable. In fact, all insurance policies have (and must have) exclusions, although, if exclusions become excessive, customers can indeed be expected to demand lower insurance prices or forego coverage altogether.

In the case of ESI, it is important to note that exclusions are flexible. ESI is a 'surplus lines' type of coverage, which means that contract terms (including exclusions) are negotiated on a case-by-case basis (also known as 'manuscripted' policies). Many familiar types of insurance (e.g. auto or life) are generic, and buyers typically have no opportunity to negotiate the terms.

Common ESI policy exclusions, and their rationale, are noted below:

- *Inadequate maintenance*: Maintenance requirements should be stipulated in the underlying energy-services contract. The responsibility for maintenance should reside with the insured (or the energy performance contractor).
- *Physical damages to energy-efficient equipment, including wear and tear*: Physical damage is an insurance risk covered under the standard property damage policy of the property owner. Wear and tear is a matter of lack of maintenance (see above). The wear-and-tear policy terms are in fact quite valuable, where the goal is to ensure the persistence of savings via a responsible maintenance program. Good policies will require replacement of non-durable items during the term of coverage. Lost energy savings due to physical damage may be covered in a property owner's business interruption insurance or by the ESCO—again, there is no merit to doubling up on such coverage.
- *Financial default of the purchaser*: The exclusion pertains to the default of the property owner. Again, this in a case where the underlying contract typically stipulates the exclusion. This exclusion can be waived where it does not apply. Moreover, financial default is typically the result of default on the loan used to finance the project: ESI is not financial-guarantee insurance.
- *Sabotage/misuse/vandalism of equipment*: This exclusion is focused on intentional acts and is covered in other types of insurance typically carried by the insured.
- *Changes of laws or codes*: This is a typical language in most types of insurance policies, due to the horrendous losses incurred in the past (notably, asbestos claims). Performance contractors typically do not sign contracts with this type of language. If a contract with the Property Owner offers this clause, then the ESCO can negotiate the deletion of such language.
- *New end uses that increase energy use*: This exclusion simply prevents the creation of a claim as a result of the addition of end uses. ESI contracts normally allow for the baseline to be adjusted if end uses are added to or subtracted from the site. Policies typically state that the reconciliation will allow for adjustments of baseline.
- *Changes in energy prices*: ESI policies are not market-risk coverages. ESCOs typically freeze the values of the energy prices in their performance contract language. Again, the energy-savings insurer is accepting the technical performance risks of energy-saving equipment, but not market conditions, i.e. energy savings not energy cost savings.
- *Environmentally unsafe materials released during construction or operation*: Other types of insurance, e.g. Environmental Liability, cover this risk.
- *Failure or malfunction of data acquisition systems*: This exclusion stands to enhance project quality, by promoting the proper selection and maintenance of metering equipment.

In sum, we do not find the kinds of exclusions listed above as unreasonable or in any way departing with the purpose or spirit of ESI. It is important to remember that ESI operates in consort with other forms of insurance. Insureds should avoid situations in which they are paying twice (i.e. through different policies) for the same coverage.

6. Conclusions & next steps

ESI provides a new method to enhance demand-side market transformation in the energy sector, and it has considerable untapped potential to spread risk and increase market confidence in energy savings claims. ESI offers a number of significant advantages to other forms of risk transfer (savings guarantees or performance bonds). However, hybrid approaches should be explored (surety bonds to guarantee completion of the project and ESI to guarantee the subsequent stream of energy savings).

ESI offers the potential for enhancing existing energy policy initiatives. For example, most people we interviewed believed that the US Environmental Protection Agency's ENERGY STAR message would be considerably strengthened if linked to ESI. From a brand-quality perspective, the trust and endorsement evidenced by insurers who potentially adopted the Label and ENERGY STAR in general as a risk-management tool would bolster ENERGY STAR's credibility. By partnering with ESI providers, the Program could tailor its benchmarking tools and commissioning processes to support lower premiums by reducing the risk of under-achievement of savings. Ongoing operations and maintenance procedures would also diminish the risk of claims.

We found that the two most common criticisms of ESI—excessive pricing and onerous exclusions—are not born out in practice. The exclusions typically found in policies have largely to do with avoiding double-coverage for risks already insured under other types of policies (e.g. property damage) or promote customer-side vigilance over the persistence of savings. ESI pricing seems quite reasonable, at approximately 3 percent of total lifetime energy savings, given that the risk of under-attainment of savings is considerably higher than this in many projects and that offsetting financing cost savings can be captured when ESI policies are used.

From a policy perspective, it is worth noting that smaller energy-savings firms are especially benefited by ESI, as they lack the financial resources to self-insure or purchase performance bonds. The same holds for relatively small financing firms. Thus, ESI stands to level the playing field between large and small firms engaged in the energy services marketplace. Another important dimension for policymakers is that the presence of ESI encourages the parties to go beyond standard, tried-and-true measures (e.g. simple lighting retrofits) and thereby achieve more significant levels of energy savings. Similarly, energy-saving insurers stand to be proponents of improved savings measurement and verification techniques, thereby contributing to national energy-saving objectives and perhaps improving the quality of information available for program evaluation. Interestingly, ESI has also been promoted by developers of new energy-efficient technologies, to help reduce barriers to market entry.

ESI offers an important macro-level benefit of spreading aggregate risk over a larger pool of energy-efficiency projects than most individual purveyors are likely to have. This is a natural benefit of establishing financial markets for previously unmonetized externalities.

Thus far, we have found no evidence of efforts to track and evaluate the real-world experience of ESI agreements, or to conduct detailed financial analysis of the added project costs versus savings (e.g. lower financing costs). This void should be filled by future research. Research should also be conducted which better quantifies the benefits of building commissioning, diagnostics, and the maintenance of energy-efficiency systems. Parallel progress is needed to reduce the costs of data acquisition equipment and procedures required to track savings.

Opportunities for expanding the scope and appeal of ESI include developing applications for new buildings, products that can be purchased directly by building owners who do their own retrofit work, improved harmonization with the ESCO industry, and securing lower premiums through initiatives to reduce the risk of losses and the cost of measurement and verification. These avenues are best approaches through collaborations between ESI providers and the energy research community. Local and national governments could play a key role in market transformation by demonstrating the optimal use of ESI in their own facilities.

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References

Adelaar, M., Day, T.F., Fraser, M., 1997. The Canadian Energy Performance Contracting Experience. Presented to the International Seminar on Energy Service Companies. International Energy Agency, 27–28 October. http://www.globalmvo.com/speech.html

BC Buildings Corporation (BCBC), 2001. Comparative Framework for Procurement and Risk Transfer under the BC Retrofit Program. Prepared by Grant Thornton, 20pp.

Canadian Parliament, 1997. http://www.parl.gc.ca/36/1/parlbus/chambus/house/debates/038_1997-11-26/han038_2215-e.htm

Diamond, R.C., Piette, M.A., Nordman, B., de Buen, O., Harris, J., 1992. The performance of the energy edge buildings: energy use and savings. Proceedings of ACEEE 1992 Summer Study on Energy Efficiency in Buildings, Vol. 3. Berkeley, CA, ACEEE, Washington, DC, pp. 3.47–3.60.

DOE, 2001. 2001 BTS Core Databook. US Department of Energy, Office of Building Technology, State and Community Programs, Washington, DC.

Illinois Department of Commerce and Community Affairs, Bureau of Energy and Recycling, 1999. Request for Proposals for Energy Services http://www.rebuild.org/sourcebook/pdfs/illinois_rfp.pdf

Iowa Department of Natural Resources. Energy Bureau, Energy and Geological Resources Division Iowa Department of Natural Resources http://www.state.ia.us/dnr/energy/programs/bem/ebank/leg.htm

Kats, G., Kumar, S., Rosenfeld, A.H., 1997. The role for an international measurement & verification standard in reducing pollution. Proceedings of the 1997 ECEEE Summer Study. European Council for an Energy-Efficient Economy, Copenhagen, see also http://www.ipmvp.org

Lock, L.E., 2001. Supersymmetry. Personal Communication, September 23.

Maslany, O., 2001. British Columbia Buildings Corporation. Personal communication, September 20.

Mills, E., 1997. Going green reduces losses. Reinsurance, London (March), p. 24 http://eetd.lbl.gov/insurance/GoingGreen.html

Mills, E., Rosenfeld, A., 1994. Consumer non-energy benefits as a motivation for making energy-efficiency improvements. Proceedings of the 1994 ACEEE Summer Study of Energy Efficiency in Buildings, pp. 4.201–4.213 (Also in Energy—The International Journal 21 (7/8) 707–720).

Mississippi Development Authority, 1998. Request for qualifications (RFQ) for energy performance contracting services. http://www.decd.state.ms.us/main/energy/rfq.pdf

Natural Resources Canada (N/da). Federal buildings initiative: an executive overview. http://oee.nrcan.gc.ca/fbi/pdfs/policycont.pdf

Natural Resources Canada (N/db). Implementing energy efficiency projects. http://dsp-psd.pwgsc.gc.ca/Collection/NH18-23-29E.pdf

NCAT (N/d). National Center for appropriate technology description of project at the Kinstha Housing Authority http://www.ncat.org/reh/kinstha.html

Piette, M.A., 1994. Early Energy Use in New Commercial Buildings. Building Energy Analysis Group, Recent Research, Lawrence Berkeley National Laboratory http://eetd.lbl.gov/EA/Buildings/RResearch/Energy.Edge.html

State of Maryland Department of General Services, 1998. Request for proposal (RFP) for indefinite delivery contract (IDC) to provide project management, audit, engineering, construction, financing, and maintenance services to develop comprehensive energy efficiency and guaranteed savings programs at state facilities. I.D. NO: DGS-98-EPC-IDC http://www.energy.state.md.us/epcrfp.htm

Vine, E., 1992. Persistence of energy savings: what do we know and how can it be ensured? Energy 17 (11), 1073–1894.

Vine, E., Mills, E., Chen, A., 1998. Energy-efficiency and renewable energy options for risk management and insurance loss reduction: an inventory of technologies, research capabilities, and research facilities at the US Department of Energy's National Laboratories. Lawrence Berkeley National Laboratory Report No. 41432. (Technical Appendices bound separately.) (A briefer version is published in 2000 Energy 25, 131–147) http://eetd.lbl.gov/insurance/LBNL-41432.html

Vine, E., Mills, E., Chen, A., 1999. Tapping into energy: new technologies and procedures that use energy more efficiently or supply renewable energy offer a largely untapped path to achieving risk management objectives. Best's Review—Property/Casualty Edition May, pp. 83–85 http://eetd.lbl.gov/insurance/BestReview/bestreviewart.html.