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THE ROLE OF UMBRELLA AGREEMENTS IN ACHIEVING SUSTAINABILITY GOALS: ENERGY EFFICIENCY AT THE EMPIRE STATE BUILDING

Frederik Dahlmann[1] and Gareth Veal[2]

ABSTRACT

In this paper we investigate whether innovative and flexible contractual arrangements can support the process of achieving ambitious sustainability goals. We explore this question through an analysis of the role of umbrella agreements in driving energy savings in the building sector. Drawing on a case study of the iconic Empire State building, we examine the typical challenges faced by clients and contractors in devising suitable agreements that facilitate managing contractual and performance risks, as well as the sharing of responsibilities and cooperation between multiple project stakeholders. We find that the project arrangements appear to exhibit the adoption of the key characteristics commonly found in umbrella agreements which incorporate sustainability measures that maximize income through efficient delivery of outcomes. Specifically, this means that they need to enable stakeholders to manage repeated review cycles, complex perceptions and expectations, and different tacit assumptions and codes of behaviour, as well as managing and communicating in networks and obtaining agreement also from non-contractual parties. Moreover, we demonstrate that umbrella agreements can facilitate a network perspective of business relationships by emphasizing value co-creation and the embeddedness of firms within a network of interactions.

KEYWORDS

umbrella agreements, contractual arrangements and sustainability goals, energy service companies, Empire State Building, managing contractual performance risks, energy efficiency and management

1. INTRODUCTION AND HYPOTHESIS

There is widespread recognition that the cheapest, most secure and most sustainable form of energy is that which is not consumed in the first place. In fact, energy management is an increasingly important issue for firms due to volatile energy costs, tightening regulations, security of supply issues and environmental concerns (Lucio et al., 2013). Estimates by the International Energy Agency suggest that global investment in energy efficiency in 2011 stood at $300 billion. Implementing all economically viable energy efficiency measures and

1. Warwick Business School, University of Warwick, Scarman Road, Coventry, CV4 7AL, +44 (0)24 7652 2311, frederik.dahlmann@wbs.ac.uk (corresponding author)

2. Royal United Hospital Bath, Combe Park Bath, Somerset BA1 3NG, +44 (0) 1225 428331, Gareth.veal@gmail.com

removing barriers to energy efficiency investments could further avoid the consumption of an amount of fuel worth up to $17.5 trillion to 2035 (IEA, 2013b) and inexorably lead to lower greenhouse gas emissions as well (Nishant et al., 2014).

With 35% a large proportion of global final energy demand comes from buildings (IEA, 2013b). Within the U.S. alone it is estimated that the total value of potential energy efficiency retrofit projects represents a $279 billion investment opportunity which could unlock energy savings worth more than $1 trillion over ten years (Fulton and Grady, 2012). Yet despite the apparent commercial opportunities, greater uptake of energy efficiency improvements often appears to be hampered by a whole range of factors including behavioral reasons and market failures (Frankel and Tai, 2013, IEA, 2013a). Particularly the building sector faces a unique set of challenges caused by, for example, the split incentives between landlords and tenants, the relatively dispersed and small scale nature of each individual investment and the lack of knowledge on the part of building owners who tend to outsource building management (Beddington, 2008, Egging, 2013, IEA, 2013a, Xu et al., 2011, Xu and Chan, 2013, Xu et al., 2013).

Increasingly, 'Energy Service Companies', or 'ESCos', attempt to capitalize on these energy efficiency opportunities. ESCos provide energy efficiency products and solutions with the aim of achieving significant and predictable technological and operational improvements to the running costs of their clients' premises or facilities. Broadly, ESCos are responsible for the selection, financing, installation and operation of new or replacement equipment and take 'payment by results' as a proportion of the energy savings that they achieve (Davies and Chan, 2001).

A key issue with respect to achieving many sustainability goals generally, and energy efficiencies in particular, however, is the fact that the necessary resources and know-how are often widely dispersed within and among other companies required for achieving these targets (Valente, 2012, Montiel and Delgado-Ceballos, 2014). In a world of rapid technological changes, shifting economic conditions and global competition this can create significant uncertainties and unpredictability for managers and investors (Mouzas and Ford, 2006). Coupled with the need to engage with a much wider circle of stakeholders the resulting interdependencies can lead to dysfunctional relationships, locked-in solutions and managerial complexities, especially when standard business practices and contract agreements are applied (Marshall and Brown, 2003, Schleich and Gruber, 2008, DeCanio, 1998).

In this paper we investigate whether innovative and flexible contractual arrangements can support the process of achieving ambitious sustainability goals. We explore this question through an analysis of the role of umbrella agreements in driving energy savings in the building sector. Drawing on an energy efficiency retrofit project case study of the iconic Empire State building in New York, we examine the typical challenges faced by clients and contractors in devising suitable agreements that facilitate managing contractual and performance risks, as well as the sharing of responsibilities and cooperation between multiple project stakeholders.

In doing so, our research aims to make two key contributions. First, we complement and extend existing literature concerning the design and management of innovative contract agreements by applying their specific dimensions to energy efficiency improvements. This allows us to determine the extent to which more flexible contractual relationships support the achievement of sustainability goals. Through our research, we therefore respond to calls for empirical work which pays specific attention to the development of commercial agreements, and new forms such as umbrella agreements in particular (Mouzas and Blois, 2013, Poppo and Zenger, 2002, Reuer and Ariño, 2007).

Second, by exploring the challenges involved in serving a network of direct and indirect customers and stakeholders, this research also contributes to our general understanding of achieving sustainability goals through interdisciplinary and inter-organisational collaborations (Sarkis et al., 2013). We therefore examine to what degree innovative ways of defining, agreeing and managing commercial relationships might be a fundamental pre-condition for, and integral part of, developing "sustaincentric" commercial propositions (Valente, 2012, Gladwin et al., 1995). By focusing on the intersection of the building and energy sectors, we also hope to respond to calls for the development of significant additional work addressing sustainability in the context of engineering management (Sarkis et al., 2013).

We start our paper by examining prior research into sustainability practices and introducing the concept of umbrella agreements, before explaining how our research was undertaken and providing details of our case study. We close by analyzing and discussing the insights gained from this case study and the value of umbrella agreements for achieving sustainability goals more generally.

I. SUSTAINABILITY GOALS & PERFORMANCE-BASED CONTRACTING

Against the backdrop of mounting evidence indicating that efforts towards improving environmental conditions remain wholly insufficient (Whiteman et al., 2013, UNEP, 2012), there are increasing calls for firms to incorporate sustainability into their business plans and strategies (Schaltegger et al., 2012, Zollo et al., 2013, Rusinko, 2007, Seshadri, 2013). A key imperative of such approaches is the organisational capability of developing a greater focus on generating income by delivering sustainable outcomes, rather than by purely charging for products and services without any consideration for their environmental and social impacts (Ford et al., 2003). This argument suggests that integrating sustainability performance targets into the product or service delivery effectively removes the linear incentive to provide more goods or services in order to increase income. Instead, the aim is to create prosperity by either radically reducing negative or creating positive external effects for the natural environment and society (Schaltegger et al., 2012, Stubbs and Cocklin, 2008).

Elsewhere, more generic outcome-focused business practices are receiving increasing attention and are known as 'solution business models' (Storbacka, 2011, 2013), 'outcome-based contracts' (Ng et al., 2013, Ng and Nudurupati, 2010), 'result-orientated product-service systems' (Barquet et al., 2013), 'performance-based contracts' or 'servitization' (Vandermerwe and Rada, 1988). Examples of such commercial arrangements include Rolls Royce's 'Power By the Hour ©' service or printing equipment manufacturers that provide their printers to customers for free and then charge per printed sheet (Barquet et al., 2013, Ng et al., 2013).

In this paper we argue that these outcome-focused contracting approaches offer the potential to support the wider implementation of sustainability goals such as energy efficiency improvements and carbon emissions reductions. In traditional relationships that are based on payment for providing a product or service, a customer will want to buy the minimum required amount, while a provider will want to sell as much as possible. The provider's incentive of selling as much as possible introduces sales approaches which encourage increased consumption of resources and are therefore at odds with sustainability objectives. In outcome-based business models, by contrast, these clashing incentives are realigned, as both the customer and the provider are agreed on achieving a particular outcome, rather than managing the inputs required to achieve this outcome. This has implications for sustainability (Tukker, 2004). For example, Ng et al. (2013) suggest that outcome-based contracting provides a means of supporting corporate sustainability efforts by creating long-term customer value of service rather than transactional relationships based on goods.

The challenge in developing these types of sustainable arrangements arises from the fact that a new type of business relationship needs to be created where both the provider and the customer focus on the delivery of an outcome. Research suggests that the development of outcome-focused approaches is dependent on embedding and integrating the performance targets within the customer's operations. This demands increased flexibility as well as a switch to a network perspective of the firm's relationship and interactions with the customer (Storbacka et al., 2013). Consequently, customer interaction must be managed very differently due to the introduction of new incentives, the transfer of risk from the customer to the provider and the shared responsibility for achieving the outcome (Ng et al., 2013, Ng and Nudurupati, 2010). Such challenges are particularly important in the context of delivering sustainability goals which tend to revolve around temporal and spatial trade-offs between social, ecological and economic ends (Valente, 2012).

This link with sustainability performance targets is further strengthened by suggestions that sustainability requires firms 'operating as networks' rather than as self-centered, purely economically-focused organizations (Stubbs and Cocklin, 2008, Sarkis et al., 2013). In fact, research around outcome-based contract arrangements emphasizes the value of co-creation and the embeddedness of firms within a network of interactions and relationships (Leek and Mason, 2009, Mason and Spring, 2011, Mouzas et al., 2008); it is therefore well placed to offer insights into the implementation of sustainability goals. In particular, we build on academic research which argues that 'umbrella agreements' can facilitate the management of relationships within business networks (Mouzas, 2006). In this paper we explore whether umbrella agreements present a potentially promising solution for managing the diverse sets of interdependent stakeholders that are invariably involved when firms seek to address sustainability issues (Seshadri, 2013).

II. UMBRELLA AGREEMENTS

Umbrella agreements are also known as 'framework agreements', 'umbrella contracts' or 'framework contracts' and "*describe a joint consent that explicitly articulates a framework of rules and principles that guide future agreements*." (Mouzas, 2006). In other words, umbrella agreements explicitly anticipate and integrate the need for change and renegotiation during a contractual partnership and as such enable the negotiating parties to balance the need for certainty and calculability with the desire to remain sufficiently flexible in the face of changing conditions. They could also be usefully described as a negotiation platform on which all future contractual interactions will be based. Broadly, five key dimensions have been identified as being typical for umbrella agreements: 'manifold reality', 'recursive time', 'multilateral connectivity', 'diversity of norms', and 'joint consent' (Mouzas and Ford, 2006).

Recursive time acknowledges that an ongoing business relationship is typically more valuable than any individual transaction (Ford et al., 2003). Furthermore, particularly within a long-term business relationship, there is a need to continuously update agreements in response to the evolution of the relationship and the network within which it exists (Mouzas et al., 2008). This might include, for instance, periodic business and task reviews or annual negotiations (Mouzas and Ford, 2009). *Manifold reality* describes the need for dealing with the divergent perspectives of different actors within a network (Colville and Pye, 2010). When developing umbrella agreements, it is important to understand actors' divergent perspectives and to take these into account, as these views of reality often influence the interpretations that guide their behaviors (Gadde et al., 2003). Business relationships are also influenced by a *diversity of norms* which determine how different parties act (Feldman, 1984) according to the expectations of their social groupings and communities (Nee, 1998). Therefore, agreements must be able to deal with this variety of norms which often remain hidden from formal negotiations. The dimension of *multilateral connectivity* acknowledges that within any given business relationship there will be multiple points of contact between different parties. Managing business relationships over an extended period of time requires 'give and take' between the parties that are directly engaged as well as an ability to deal with third parties not formally included in the negotiations (Mouzas and Ford, 2009). Umbrella agreements therefore explicitly expect network type relationships, as opposed to the dyadic focus of traditional contracts (Barnes et al., 2007). Finally, due to the multiple connection points and exchanges discussed above, *consent* is neither linear, nor dyadic. The types of arrangement managed by umbrella agreements require consent from a number of parties which are interdependent and which must all take account of each other's interests and other options (Bazerman and Malhotra, 2006). In fact, consent for decision making may be evolving over time among the different stakeholders (Mouzas and Blois, 2013).

For our analysis, we draw on a case study which explores the role of umbrella agreement characteristics during an energy efficiency refit of the Empire State Building. Our aim is to investigate to what extent the main contractor is purposefully drawing on innovative commercial arrangements designed to deliver specific sustainability performance goals.

III. RESEARCH METHODOLOGY

Our research methods are guided by an ambition to develop a rich description of the application of an umbrella agreement in the case of a company seeking to integrate sustainability goals. We employ the case study research method as it offers the opportunity to investigate contemporary phenomena where the borders between the phenomena and context are blurred (Ford et al., 2003, Wenyu et al., 2013). It allows us developing rich, empirically grounded observations which we then confront with theoretical ideas and upon which we can base our explanations (Gibbert et al., 2008, Sitoh et al., 2014).

A. Data collection

The case study described in this paper is informed by an extended period of participant observation from 2008 to 2010, during which the second author worked with a FTSE100 building services company as a strategic consultant to define an 'End to End Energy Service'. The participant observation role was informed by the researcher's background as a mechanical engineer which enabled a better understanding of the technical aspects of energy services. The strategy role involved consultations with managers from all departments that were engaged with the development of the energy services as well as advisory meetings with the firm's main clients. It also included consultation with energy and climate regulators, further discussions with third party providers of energy reporting software as well as competition monitoring through industry reports on energy service market trends (BSRIA, 2014).

This participant observer role provided a comprehensive understanding of the energy services market and the dynamics which influence the development of umbrella agreements within it (Woodside, 2010). Due to the confidential nature of specific umbrella agreements studied, public sources of data have been used for the development of our case study. Yet participant observation played an essential part in the research: First, it facilitated the identification of salient sources of data that are not easily accessed by industry outsiders. Second, it provided the background knowledge of the energy services market necessary to interpret the secondary sources of data of this case study, all of which are summarized in Table 1.

TABLE 1. Public data sources used in developing case study.

Energy Efficiency Market Report 2013- Market Trends and Medium-Term Prospects: International Energy Agency (IEA, 2013a)
Energy Services Market Study: Building Services Research and Information Association (BSRIA, 2014)
Guidance for the management of contract risks, shared responsibilities and ESCo performance risks: United States Department of Energy, Energy Efficiency and Renewable Energy' (DOE-EERE, 2007).
Sustainability & Energy Efficiency policy: (ESB, 2013c)
Energy services performance contract for the Empire State Building retrofit project (redacted version): (ESB, 2013b)
White paper: "A Landmark Sustainability Program for the Empire State Building": (ESB, 2009)
2011 Annual Savings Report for Empire State Building: Energy Performance Contract: (ESB, 2013a)
International Performance Measurement & Verification Protocol: Concepts and Options for Determining Energy and Water Savings (Volume I): Organization (EVO, 2002)
Degree day statistics: States and Cities: National Oceanic and Atmospheric Administration (NOAA, 2013)

For our case study we chose the 'Empire State Building ESCo' because of the iconic nature of the building and its flagship role for energy efficiency projects. The Empire State Building is a 103-story skyscraper located in midtown Manhattan, New York City. More importantly, the project makes its plans, energy management data and legal paperwork publicly available (with some redactions), thus overcoming concerns of confidentiality (ESB, 2013c). We were also able to incorporate guidance from government agencies, such as the U.S. Department of Energy, Energy Efficiency and Renewable Energy (DOE-EERE, 2007) and from important third parties whose input underpinned delivery of the Empire State Building's ESCo business model, for example, the Efficiency Valuation Organization (EVO, 2002) and the National Oceanic and Atmospheric Administration (NOAA, 2013)

B. Data analysis

Our aim was to explore the role of umbrella agreements in facilitating the implementation of sustainable goals. We therefore prioritized explanatory modes of data analysis over statistical methods and took a realist stance that encourages explanation via the identification of causal explanations (Delbridge and Edwards, 2013, Miller and Tsang, 2011). For the development of the case study, we sought to provide a detailed description of the role an umbrella agreement played in the ESCo's service delivery. Consequently, our analysis was undertaken by confronting research data with theoretical concepts (Ragin and Becker, 1992, Yin, 2014). Specifically, we used a model from prior research into umbrella agreements to analyze and categorize the data from our case study. This conceptual framework enabled us structuring and developing an understanding consistent with what could be called an 'explanatory typology' (Yin, 2014, Elman, 2005). Explanatory typologies are multidimensional conceptual classifications based on explicitly stated theory (Elman, 2005). To do so, we identified empirical evidence from the ESCo case study and matched this with the five key characteristics of umbrella agreements (Mouzas and Blois, 2013).

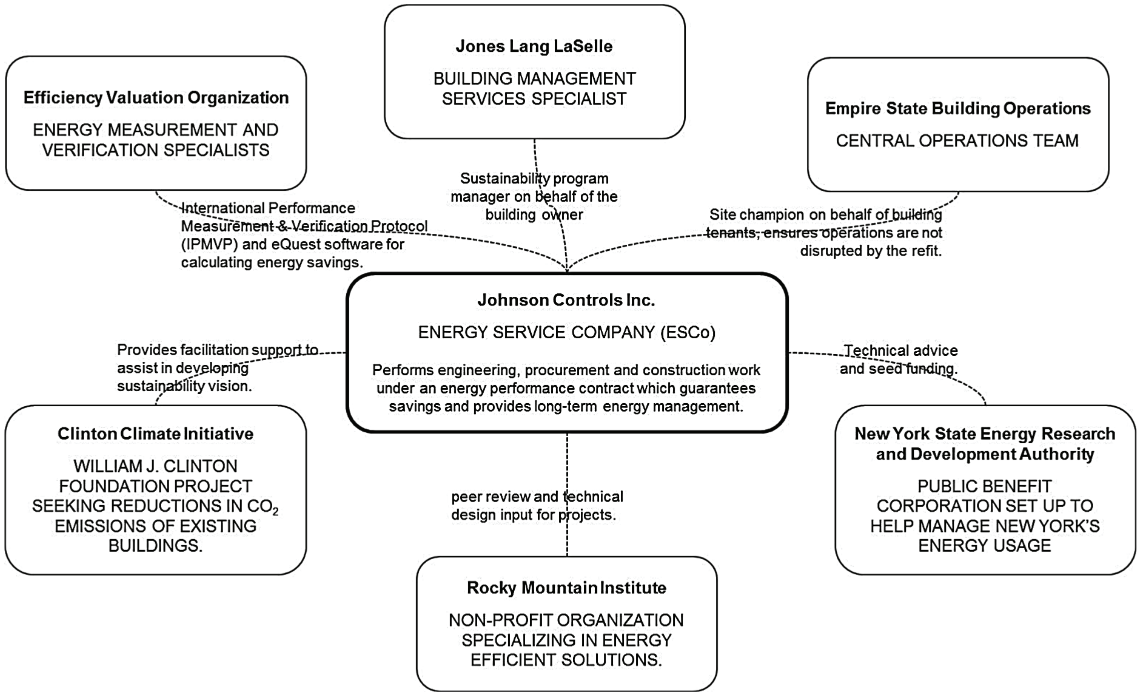
IV. CASE DESCRIPTION

We begin our analysis by presenting a case study to illustrate the use of an umbrella agreement in support of the delivery of integrated sustainability goals. In particular, we investigate how an umbrella agreement facilitated the collaboration of a network of organizations involved in the operation of an ESCo, which itself was part of a larger energy efficiency refit project of the world-famous skyscraper. We start by outlining the general purpose of an ESCo, before detailing how the ESCo involved in our case study was set up and highlighting the targeted energy savings outcomes.

An ESCo is a company which "develops, installs, and funds projects designed to improve energy efficiency and reduce operation and maintenance costs in their customers' facilities. ESCOs generally act as project developers for a wide range of tasks and assume the technical and performance risk associated with the project. […]When an ESCO undertakes a project, the company's compensation is directly linked to the cost savings from energy actually saved." (DOE-EERE, 2015). As such, the empirical setting of our case study provides an example of an industry sector operating with performance-oriented targets, which have the potential to significantly reduce global carbon emissions. The ESCo business model therefore stands in contrast to traditional energy suppliers that tend to be rewarded for selling more, rather than less, energy.

In 2009, the owners of the Empire State Building announced a major sustainability program to reduce the building's carbon footprint, improve energy efficiency and showcase the project as a global model for energy efficiency retrofit projects (ESB, 2013c). The Empire State Building ESCo, run by Johnson Controls Inc., was contracted to manage a key part of this project; all further parties involved in this project are shown in Figure 1 below. As the ESCo, Johnson Controls is responsible for the engineering, procurement and construction works that deliver the energy savings. The ESCo guarantees these savings under a long-term energy performance contract which it needs to achieve by managing a number of important stakeholders.

FIGURE 1: Parties involved in Empire State Building ESCo.*



*NB: Details given by 2011 ESCo report (ESB, 2013a)

Jones Lang LaSalle acts as the building management service specialists on behalf of the building owner. It specializes in wider facilities management services, for example, in activities such as letting units, managing rental contracts, organizing the cleaning of shared space and providing building maintenance. In our case study, their role was to act as the overall sustainability program manager for the building on behalf of the building owner. The ESCo set up by Johnson Controls had to coordinate with Jones Lang LaSalle to ensure that all proposed energy management projects fitted with the wider energy refit that was underway. The second important stakeholder was 'Empire State Building Operations', a central operations team responsible for day to day management of the building. It acted as Johnson Controls' interface with the building's tenants and was tasked with ensuring that the ESCo's activities did not disrupt the tenants and their activities.

The remaining stakeholders were external to the Empire State building, but played important roles in developing the vision and viability of the wider energy refit of the building and of Johnson Controls' corresponding ESCo activities. First, the New York State Energy Research and Development Authority (NYSERDA), a public benefit corporation tasked with supporting energy efficiency initiatives in New York, provided technical advice and seed funding to help incentivize energy savings on the project. From the publicly reported data, it is not clear whether the seed funding directly contributed to Johnson Controls' ESCo activities, or more generally to the wider energy refit. However, in either case, NYSERDA was a key stakeholder in terms of helping to plan, and subsequently validate, Johnson Controls' energy saving proposals. Two other stakeholders were involved in providing independent review and technical advice to the project's energy refit. Although the issue is not specifically discussed in the public documentation, it is likely that they were also seen as playing a role in boosting wider credibility of the energy saving initiatives through third party endorsement. The Clinton Climate Initiative is a project of the Clinton Foundation and provided a wider perspective to inform the overall refit program's sustainability vision. The Rocky Mountain Institute is a niche not-for-profit organization specializing in energy efficiency which offered independent peer review and technical advice to the project. One final important external stakeholder was the 'Efficiency Valuation Organization' which conducted energy measurement and verification. The parties involved with the Empire State Building ESCo agreed to measure and verify energy savings achieved through the ESCo using the 'International Performance Measurement and Verification Protocol' (IPMVP) and corresponding eQuest software offered by the Efficiency Valuation Organization.

Next, we detail the commercial arrangements and specific energy efficiency projects that Johnson Controls implemented within its ESCo offering for the Empire State Building. The ESCo started in 2007 and over a period of 15 years, Johnson Controls guaranteed 90% of the targeted energy savings, valued at $2,240,728. They represent around half of the total energy savings sought through the wider energy refit project which in aggregate targets a 38% reduction in energy usage, translating into a $4.4 million reduction in annual utility costs (JLL, 2009). Moreover, following all modeling and analysis activities the team decided to pursue a program that would ultimately result in saving 105,000 metric tons of carbon dioxide over the next 15 years (ESB, 2009). The specific efficiency measures targeted by Johnson Controls via the Empire State Buildings' ESCo are detailed in Table 2.

TABLE 2. Energy Efficiency Measures within Johnson Controls' ESCo*.

Energy Conservation Measure	Guaranteed savings
Windows Retrofit	**$338,508**
Radiator Insulation & Steam Traps	**$491,191**
Building Automation System Retrofit	**$774,388**
Chiller Plant Retrofit	**$611,641**
Tenant Energy Management	**$25,000** (of $386,709 targeted)
	$2,240,728

*NB: Details taken from (ESB, 2013a), numbers unadjusted, from 2007 contract.

The ESCo primarily targets engineering-based energy efficiency improvements to the heating and ventilation systems in the building and include: retrofitting windows; installing reflective insulation; updating steam traps; improving the building automation system; and upgrading the chiller plant. These energy efficiency projects involve technical challenges, but are relatively 'self-contained' in terms of the level of influence of third parties on their operational success. Accordingly, Johnson Controls could guarantee the projected savings of these projects. By contrast, the final measure included within the scope of the project was the facilitation of tenant energy management where the ESCo only guaranteed $25,000 of the total targeted savings.

V. ANALYSIS

We now take closer look at some of the typical contractual concerns faced by Energy Service Companies. Table 3 summarizes our discussion using the risk, responsibility, and performance matrix developed by the Department of Energy (DoE) for the development of ESCo agreements (DOE-EERE, 2007). Where appropriate, we adjusted and supplemented this table with examples from the redacted versions of the Johnson Controls' ESCo contracts (ESB, 2013c).

TABLE 3. Typical contractual concerns for Energy Service Companies (ESCos) and respective mitigation efforts in the case study*.

Issue	Summary
FINANCIAL	
Construction Costs	• Design and corresponding costs of energy efficiency investments to be borne by the ESCo must be realistic at the outset in order to prevent failure of the ESCo or the need for later bailout payments. • 3rd party design input and peer review of plans can mitigate this risk. • *Empire State Building ESCo worked with the Clinton Climate Initiative, the Rocky Mountain Institute, and the New York State Energy Research and Development Authority to manage this risk.*
Energy Related Cost Savings	• Improve energy management can result in other savings, e.g. reductions in maintenance budgets, or reduced water usage. • Parties to an ESCo arrangement must agree upfront how any non-energy based savings will be measured, verified and accounted for. • *In the Empire State Building example, fluctuations in operational costs such as maintenance were the responsibility of the ESCo for the duraction of the 15 year agreement. Only electricity, gas and steam savings were included in the ESCo savings and payment calculations.*
Interest Rates	• Interest rates fluctuate independently of the ESCo operations. • All parties should attempt to enable the ESCo agreement to be signed at a time when interest rates are favorable and therefore offer reduced project financing costs. • *Publicly available data on the Empire State Building ESCo do not disclose whether this consideration was taken into account.*

TABLE 3. Continued

Issue	Summary
FINANCIAL	
Measurement & Verification	• A robust methodology is required in order to measure and verify energy savings and manage the payment by results elements of an ESCo. • Independent standards and tools can help to facilitate accurate and mutually acceptable measurement and verification methods. • *The Empire State Building ESCo calculated energy savings using the 'International Performance Measurement and Verification Protocol' (IPMVP), option D which provides a third party software tool called 'eQuest' to simulate building energy performance.*
OPERATIONAL	
Operating Hours & Load	• Over the duration of an ESCo agreement, changes in the operating hours of a building, changes to the loading of existing equipment, or changes to equipment held within the building with all influence energy consumption. • Energy savings data should be 'normalized' to remove the influence of operating hours and loading. E.g. shorter operating hours shouldn't count as savings or, longer ones as waste. • *To take account of operating hours, the Empire State Building ESCo inputs the building's operating schedule and vacancy rates during calibration of the eQuest energy modelling software. Power loading data is also included in the eQuest energy model, for example data on: tenant energy use; consumption by lighting, eleators, office equipment; and energy use by radio broadcasting equipment on the roof.*
Weather	• Weather conditions will make a significant difference to energy use in the building, for example via fluctuations in heating or air conditioning demand. • Energy measurement and verification tools must take account of this and normalize energy performance data accordingly. • *eQuest building energy management software takes New York weather data from National Oceanic and Atmospheric Administration (NOAA).*

TABLE 3. Continued

Issue	Summary
OPERATIONAL	
User Participation	• Many energy saving measures require user participation for successful implementation. • ESCo agreement should define what level of user participation is necessary and attribute responsibility for this upfront. • *The Empire State Building ESCo guaranteed technical savings that required little third party interface. However, due to the difficulty of influencing, measuring and verifying the behavior of tenants the ESCo only guaranteed $25,000 of the targeted $386,709 savings sought from influencing tenant energy usage.*
PERFORMANCE	
Equipment Performance	• Equipment selection, design, installation, maintenance, repair and replacement all impact upon energy performance and are typically the responsibility of the ESCo. • It is important to clarify the timeframes and level of responsibility of the ESCo with regard to equipment performance agreeing how any shortfalls will be compensated. • *The Empire State ESCo contract is set to span 15 years. All aspects of equipment performance are the responsibility of the ESCo. In the case of any shortfall in energy savings, the ESCo is legally bound to pay the difference between actual performance and the guaranteed savings.*
Continual Review and Improvement	• ESCos typically operate over an extended period and during this time new opportunities to save energy, or to optimize existing arrangements, will arise. • ESCo agreements should include clauses that allow for new potential improvements to be appraised and which specify how decisions to invest, or otherwise, will be taken. • *Empire State ESCo includes a contractual clause to allow for continuous review of new opportunities to save energy within the scope of ESCo service.*

* Table structure based upon the risk, responsibility, and performance matrix developed by the Department of Energy for the development of ESCo agreements (DOE-EERE, 2007), examples from Johnson Controls' Empire State Building ESCo contracts in italics which are available at the Empire State Building's website (ESB, 2013c).

A. Financial considerations

The first group of issues which influence contractual agreements surrounding an ESCo relate to financial considerations. It is important that the design and corresponding construction costs of energy efficiency investments to be borne by the ESCo must be realistic at the outset, in order to avoid future failure of the ESCo or the need to support it with unplanned payments. Such a scenario is extremely undesirable since the operations of an ESCo become so entwined with those of their customer which means that letting the ESCo fail is typically not an option; doing so would cause the interruption of essential utilities of the building services, such as lighting or heating. The DoE recommends engaging third party organizations to review the ESCo's investment plans upfront. In our case, the Empire State Building ESCo worked with the Clinton Climate Initiative, The Rocky Mountain Institute and the NYSERDA to manage this risk. By providing technical and project advice these organizations effectively supported the ESCo with independent evaluations on the design features and the proposed measures. Such objective inputs are invaluable for raising early warning on potential risk factors, particularly with regard to budgeting, forecasting and financing.

The next consideration is that improved energy management can result in supplementary savings, such as reductions in maintenance budgets and reduced water usage. The ESCo agreement must therefore define how such additional savings will be measured, verified and accounted for. In this case, fluctuation in operational costs, such as maintenance and the use of boiler water, were the responsibility of the ESCo for the duration of the 15 year contractual agreement. Although publicly available data do not confirm this, it is likely that any such anticipated ancillary savings were built into the original ESCo cost model. Only electricity, gas and steam savings were explicitly included in the ongoing savings and payment calculations of the ESCo offering.

Another financial consideration is the influence of interest rates on the ESCo operations. Because interest rates may fluctuate, the timing of the agreement to form an ESCo will influence the final costs of funding energy efficiency measures. The DoE recommends all parties work together to target signing the ESCo agreement at a time when interest rates are favorable. Unfortunately, in this case there is no publicly available data to confirm whether this consideration was taken into account by the ESCo.

Finally, the financial viability of the ESCo model is based on the requirement for a robust methodology which enables the measurement and verification of energy savings so as to manage the 'payment by results' elements of the contract. Independent standards and tools can help to facilitate accurate and mutually acceptable measurement and verification methods (Goldman et al., 2005, Sorrell, 2007). The Empire State Building and Johnson Controls calculated energy savings based on the 'International Performance Measurement and Verification Protocol' (IPMVP), Option D, which uses a software tool called 'eQuest' to simulate building energy performance (EVO, 2002).

B. Operational considerations

The second set of key contractual issues for ESCos concern the management of operational fluctuations which influence the energy performance of the asset in a manner which is independent of the efficiency measures implemented by the ESCo. For example, over the duration of an ESCo agreement, changes in the operating hours of a building could influence energy consumption. Likewise, the loading of existing equipment or changes to equipment held within the building will also impact on energy consumption. As a result, energy savings data should be 'normalized' to remove the influence of operating hours and equipment loading.

For example, shorter operating hours should not count as savings and an increase in the amount of equipment in the building should not indicate failure of the ESCo to save energy. To take account of operating hours, the ESCo included the building's operating schedule and vacancy rates as part of its calibration of the eQuest energy modelling software. Furthermore, data on power loads included input into the eQuest energy model on tenant energy use; sub meter data from equipment such as lighting systems, elevators and office equipment; and data on energy consumption by radio broadcasting equipment installed on the roof.

Similarly, weather conditions can make a significant difference to energy use in a building, for example, via fluctuations in heating or air conditioning demand. The energy saving measurement and verification tools must account for this and normalize energy performance data accordingly. In this case, the eQuest software normalizes for the impact of the weather, using data on New York City weather conditions that are collated by the NOAA (2013).

Finally, in terms of operational considerations, many energy saving measures require user participation for their successful implementation. An ESCo which guarantees energy savings will need to define the limits of their responsibility with regard to the level of user participation required for each planned energy conservation measure and agree responsibility for this upfront. In this case, the ESCo guaranteed the majority of savings for the technical projects which had little user input, but only guaranteed a small amount of financial savings in relation to efforts to engage tenants in energy saving changes of behavior. This was due to the difficulty of separately influencing, measuring and verifying tenants' behavior which would have caused subsequent contractual and financial ambiguities.

C. Performance considerations

The final set of contractual considerations for ESCos relate to how ongoing building performance and efficiency savings are maintained. The first important issue is that lasting energy efficiency improvements rely on suitable equipment selection, system design, installation, maintenance, repairs and replacement. These considerations all impact on energy performance and typically remain the responsibility of the ESCo. To support long-term equipment performance it was necessary to agree the specific timeframes and levels of responsibility for the ESCo and how any shortfalls would be compensated. In this case study, the contract is set to span 15 years of operation and all maintenance remains the ESCo's responsibility. As a result the ESCO is required to compensate for any shortfall in performance, as well as being legally bound to compensate for the difference between actual energy efficiency performance and the savings which the ESCo has guaranteed.

Finally, since ESCos typically operate over an extended period, during their lifetime, new opportunities to save energy or to optimize existing arrangements are likely to arise. As such, ESCo agreements should allow for potential improvements to be appraised and which specify how decisions to invest, or otherwise, will be taken. The Empire State Building ESCo contract specifically includes a statement[1] to cover changes to the 'energy conservation measures' (ESB, 2013b). This means that, subject to customer consent, there is an opportunity to continually review and improve the energy savings implemented by the ESCo.

The details of this particular case study demonstrate how the ESCo faces a variety of challenging circumstances in the delivery of sustainability-oriented goals and services and therefore requires careful consideration of the applicability of standard contractual arrangements such as achieving specific energy efficiency improvements. In the next section we analyze the extent to which characteristics commonly found in umbrella agreements helped with binding a network of project partners into a sufficiently flexible, yet mutually beneficial contractual framework.

VI. DISCUSSION

Based on the insights offered by our case study we discuss our analysis by using the five key characteristics of umbrella agreements introduced earlier and relating them to the Empire State Building ESCo's contractual terms and stakeholder considerations (Table 4).

TABLE 4. Elements of Energy Performance Contract.

Recursive time:	15 year contract with annual settlement against savings targets. ESCo measures are not fixed, instead open to ongoing review requiring input from all stakeholders and consent from the building owner.
Manifold reality:	**The empire state building is…..:** – **…. an investment from which we seek to maximize income.** (building owner) – **…. the site from which we operate our business.** (tenants) – **…. the site where we seek to maximize energy savings.** (Johnson Controls, New York State Energy Research and Development Authority, Rocky Mountain Institute) – **…. an opportunity to demonstrate climate change mitigation.** (Clinton Climate Initiative, Rocky Mountain Institute) – **….a customer for our energy monitoring and verification tool.** (Efficiency Valuation Organization)
Diversity of norms:	– **Minimize disruption to tenants** (tenants, building owner, Empire State Building Operations) – **Seek maximum energy savings.** (Johnson Controls, New York State Energy Research and Development Authority, the Rocky Mountain Institute) – **Maximize CO_2 emission reductions and wider sustainability impact** (Clinton Climate Initiative) – **Minimize CapEx and operational costs of energy saving measures** (Johnson Controls)
Multilateral connectivity:	An ESCo is not a contract between the provider and a building owner. For example, the Empire State ESCo involved the building owner, tenants, site operations team, external advisors and external measurement and verification experts.
Joint consent:	Any particular energy saving measure is subject to consent from the parties listed above

1. *"The mutual goal of the Parties is to maximize the Project Savings Amount. Therefore, the ESCO shall have the right, at all times during the Guarantee Term, subject to the Customer's written approval, to modify or replace any of the ECMs (energy conservation measures) or install additional ECMs and to revise any procedures for the operation of the ECMs or implement other procedures at the Site provided that: (i) such actions by the ESCO do not result in modifying the standards of comfort and service set forth in Schedule C without the express written approval of the Customer; (ii) such actions do not detrimentally impact Site operations or use and occupancy of tenant space; (iii) such actions are necessary to enable the ESCO to achieve or exceed the Guaranteed Annual Savings Amount; and (iv) any costs incurred including maintenance related charges, relative to such modifications, additions or replacements of the ECMs, or operational changes or new procedures shall be the sole responsibility of the ESCO."* ESB. 2013b. *Empire State Building: Schedule A: Project Description (redacted version of energy services performance contract for the Empire State Building retrofit project)* [Online]. New York: Jones Lang LaSelle. Available: http://www.esbnyc.com/documents/sustainability/Redacted_Schedules_for_Retrofit_project_2.doc [Accessed January 2014.

A. Recursive time – managing repeated review cycles

In our case study, the need for period review was particularly important. Although the ESCo was set up to run for 15 years in order to recoup the initial capital investments made in energy efficient equipment, it also involved a number of recurrent sub-cycles to manage performance and distribute savings over the duration of the agreement. These recursive cycles involved an annual savings review which required annual energy performance measurement and verification, followed by settlement of any shortfalls against the guaranteed saving amounts that the ESCo had promised as part of their contract. Furthermore, apart from this annual cycle there was also an open cycle of continuous review of the energy conservation measures employed by the ESCo. This was designed to ensure that new opportunities to further improve savings were realized, for example, through continuous improvement and learning, or the integration of new technologies. Identification and subsequent approval of these opportunities required input from all stakeholders and consent from the building owner on an ongoing basis. For these reasons, we argue that including clauses that provide opportunities for repeated contractual reviews as common in umbrella agreements is an important factor in driving long-term review processes and performance improvements necessary for the achievement of many sustainability goals.

B. Manifold reality – managing complex perceptions and expectations

The dimension of dealing with manifold reality proved equally relevant for supporting the work of this ESCo as it suggests that stakeholder have diverse interpretations of the same focal project. Specifically, we observed that the Empire State Building was perceived in very different ways by the different stakeholders involved in the ESCo's energy efficiency service. Namely, to the building owner, the Empire State Building is an investment asset from which they seek to maximize income. To the tenants, the building is the site from which they operate their businesses. To Johnson Controls, the NYSERDA and the Rocky Mountain Institute, the building was primarily a site where they sought to maximize energy savings. Similarly, but with a slightly different focus, the Clinton Climate Initiative and Rocky Mountain Institute also perceived the site as an opportunity to demonstrate climate change mitigation initiatives in existing buildings. Finally, the third party of the Efficiency Valuation Organization treated the Empire State Building as a customer for its energy measurement and verifications tool 'eQuest'. Taken together, these multiple views held by the numerous stakeholders involved in the project created a set of complex expectations which the ESCo had to manage in order to successfully deliver the energy savings it had contractually guaranteed.

C. Diversity of norms – managing tacit assumptions and codes of behaviour

In line with these diverse interpretations of what the ESCo was due to deliver, an examination of the different stakeholders affecting and affected by the energy savings at the Empire State Building suggests that the ESCo operated by Johnson Controls also had to manage a diverse set of norms. The most salient norm for the building's owners, tenants and their representative, 'Empire State Building Operations', was that of minimizing any disruption caused to tenants by the energy efficiency measures. Johnson Controls, on the other hand, as the ESCo provider was driven by the norm of maximizing energy savings. This norm was shared by the NYSERDA and the Rocky Mountain Institute. However, it is clear that the interface between these two norms required careful management, since the tenants were the primary source of income for the building owner. This norm therefore set hard and fast boundaries as to what types of measures would be acceptable means by which the ESCo could seek to reduce energy consumption: those which caused too much disruption to tenants would not be acceptable. Finally, the Clinton Climate Initiative worked to a slightly different norm, which was mainly driven by their goal of bringing about widespread action on climate change mitigation. As such, their norm was to maximize the CO_2 emission reductions and to showcase the wider sustainability impact of the retrofit project. Again, this norm has to be followed within limits caused by its confrontation with the other norms. The ESCo had guaranteed a certain level of energy savings and was working 'at risk'. It therefore worked towards a norm of minimizing the capital and operational costs of energy saving measures so as to maximize profitability. This meant that it was unwilling to explore some of the more expensive climate change mitigation options proposed by the Clinton Climate Initiative. Consequently, the ESCo agreement had to take into account and provide resolution mechanisms for a variety of norms in order to foster the long-term relationships necessary to pay back the initial capital investment and to incorporate the flexibility required to uphold and continuously improve energy performance.

D. Multilateral connectivity – managing and communicating in networks

The discussions above illustrate the importance of acknowledging the significant multilateral connectivity that was inherent in the delivery of the Empire State Building ESCo. Instead of viewing an ESCo as a contract between a provider and the building owner, our case study demonstrates that the delivery of an energy efficiency project also required engagement with a wider network that included tenants, the site operations team, external advisors and external measurement and verification experts. As a result, the contractual arrangements had to make allowances for reporting and communicating through a variety of channels, for the use of clear terminology and terms of references as well as the possibility of settling any disputes in a mutually acceptable manner.

E. Joint consent – obtaining agreement also from non-contractual parties

Finally, the ESCo had to acknowledge that this multilateral connectivity leads to the need to cultivate relationships with multiple stakeholders involved in the delivery of the project, in which case fostering consent in most cases can only be encouraged, rather than legally enforced. For example, changes to heating thermostat settings or lighting levels that might save even more energy required joint consent from several stakeholders. Although an ESCo may only have one primary fee-paying client, the success of the contractual arrangement depends on developing joint consent with a much wider group of stakeholders.

VIII. CONCLUSION

In this paper we have explored the role of innovative contractual arrangements during the implementation of sustainability goals. We provided a case study which examined the relevance of an umbrella agreement employed by an 'Energy Service Company' in the delivery of a major energy efficiency refit at the Empire State Building in New York.

Theoretically, our paper is among the first to link the concept of umbrella agreements to the implementation of sustainability goals. These links have been built via two related streams of management research. First, we have argued that 'outcome-based' contracting offers opportunities to incorporate sustainability measures that maximize income through efficient delivery of outcomes, as they provide an alternative to traditional 'input-orientated' business models which incentivize increased consumption (Ng et al., 2013, Ng and Nudurupati, 2010). Second, the network perspective of business relationships emphasizes value co-creation and the embeddedness of firms within a network of interactions (Mason and Spring, 2011, Ford et al., 2008). We suggest that this perspective is particularly relevant during the management of outcome-based sustainable performance goals and that drawing on umbrella agreements may be a promising approach for managing these particular types of relationships. For these reasons, we suggest that umbrella agreements offer new ways of defining, agreeing and managing the commercial relationships that typify 'sustaincentric' commercial propositions (Valente, 2012, Gladwin et al., 1995). The integration of sustainability goals requires innovative forms of multi-lateral arrangements that can coordinate and integrate a variety of demands beyond deterministic, dyadic and contractual relationships, and which move towards more network-oriented and trust-based relationships instead (Barnes et al., 2007, Stubbs and Cocklin, 2008, Colville and Pye, 2010, Holmes and Smart, 2009, Xu et al., 2011).

In our analysis, we discussed how aspects of umbrella agreements provide insights into ways of balancing the need for certainty and calculability with the desire to remain sufficiently flexible. As became apparent from our case study, this was an absolute necessity for the delivery of energy efficiency improvements in the multi-stakeholder, long-term service contracts exemplified by the ESCo offerings. We found that arrangements managed by the ESCo appear to exhibit adoption of characteristics commonly found in umbrella agreements and that the arrangements broadly covered the following five key dimensions (Mouzas and Ford, 2006) along which the ESCo had to operate:

- *Recursive time – managing repeated review cycles*
- *Manifold reality – managing complex perceptions and expectations*
- *Diversity of norms – managing different tacit assumptions and codes of behaviour*
- *Multilateral connectivity – managing and communicating in networks*
- *Joint consent – obtaining agreement also from non-contractual parties*

Through the use of umbrella agreements, the Empire State Building ESCo project has already exceeded guaranteed energy savings for the second year in a row, and has saved $2.3 million (ESB, 2013a). These energy savings are unlikely to have ever been achieved by tenants, landlords, or the building owner on their own and each one of the dimensions would appear to provide a vital contribution to the project's success.

Although the potential for umbrella agreements to support sustainability goals has received little attention in the management literature to date, we believe that the links demonstrated by our case study suggest that their potential interaction represents an exciting line of enquiry, which deserves further investigation. For instance, how can we rationalize the comparatively slow uptake of sustainability initiatives? Is it due to their highly complex nature which may lead to transaction costs that are either too high or too risky to predict (Sorrell, 2007)? We suggest that umbrella agreements may help to reduce and manage these transaction costs and therefore to increase the feasibility of previously difficult or unviable sustainability goals (Qian and Guo, 2014, Qian et al., 2012, Qian et al., 2015). Other potentially exciting areas of empirical research could include advanced waste reduction and recycling schemes; efficient supply chain, distribution and reverse logistics; and industry-wide efforts such as sustainable fishing, logging, or water sourcing.

Following on from our paper, we would argue that more empirical research is also needed to study to what extent umbrella agreements can be more widely employed in the development of sustainable business models more generally. The substitution of products for results-oriented services certainly appears to provide ample opportunities for reappraising customer value and thus avoid the need for selling ownership of goods. But for many types of products and goods, outcome-based arrangements may not be suitable. How would umbrella agreements apply in these circumstances? And where they do, how might outcome-oriented business models and innovative contractual arrangements drive the general development of a more 'circular economy' (Andersen, 2007)?

Finally, we also wonder whether the five characteristics of umbrella agreements explored in our case study are either exhaustive or relevant enough to be applied in other sustainability goals or business models. What type of modifications would organizations need to make in their cases? What are the specific conditions that determine the success or failure of such outcome-based approaches? At the same time, how can more companies exploit the potential benefits of employing umbrella agreements? What, if anything, is stopping them from doing so? We hope our paper serves as an insightful starting point and rallying call for greater (scholarly) engagement with outcome-based umbrella agreements in the context of integrating sustainability goals and business models.

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