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Catalysing the energy service market: The role of intermediaries

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HIGHLIGHTS

- Intermediary organisations are playing a growing role in the energy service market.
- Intermediaries lower transaction costs for both clients and contractors.
- Intermediaries should be encouraged by public policy.

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ABSTRACT

The UK market for energy service contracts is expanding, owing in part to the emergence of intermediaries for those contracts in different parts of the public sector. These intermediaries combine a legal framework for establishing contracts with an organisational framework that facilitates contract negotiation and execution. This paper examines the nature and operation of these intermediaries in more detail, including their achievements to date and their similarities and differences. It uses ideas from transaction cost economics to develop a theoretical model of the contracting decision and shows how intermediary organisations can lower the transaction costs incurred by both clients and contractors, thereby increasing the viability of contracting. The paper argues that intermediaries can play an important role in expanding the market for energy service contracts, and hence in delivering cost-effective energy efficiency improvements throughout the public sector.

1. Introduction

Energy service contracts (ESCs) involve the outsourcing one or more energy-related services to a third party, or contractor – commonly termed an energy service company (ESCO) (Fawkes, 2007; Marino et al., 2011; Sorrell, 2005, 2007). Typically, an energy service contract guarantees a specified level of energy savings over a period of several years, with the capital investment being financed from the associated energy cost savings. By unlocking the potential for cost-effective energy efficiency improvements, ESCs can enable clients to reduce operating costs, transfer risk, upgrade assets, improved comfort, increase employee productivity and concentrate attention on core activities (Sorrell, 2007). By specifying outputs (e.g. energy savings) rather than inputs (e.g. specific technologies), energy service contracts can encourage flexibility and provide the contractor with ongoing incentives to optimise equipment performance. And by cost-effectively reducing energy demand and associated emissions, ESC's can contribute towards public policy objectives in the area of energy security and sustainability (Marino et al., 2011; Steinberger et al., 2009; Vine, 2005).

The UK market for energy service contracts is relatively large by European standards, but is concentrated a limited number of sectors and types of sites and is primarily focused upon well-established energy efficient technologies with high rates of return (Bertoldi et al., 2014; Nolden and Sorrell, 2016). Split incentives between landlords and tenants provide a major obstacle to market growth in the commercial sector, but the public sector market is expanding, owing to the emergence of ***public procurement frameworks for energy service contracts*** (***PPFs***). This term is used here to refer to both the *legal frameworks* for establishing energy service contracts in particular parts of the public sector and the *organisations* that have been established to implement those frameworks. The latter act as ***intermediaries*** between individual clients and contractors, facilitating the tendering process and the subsequent negotiation and execution of contracts (Bleyl et al., 2013). These intermediaries are playing an increasingly important

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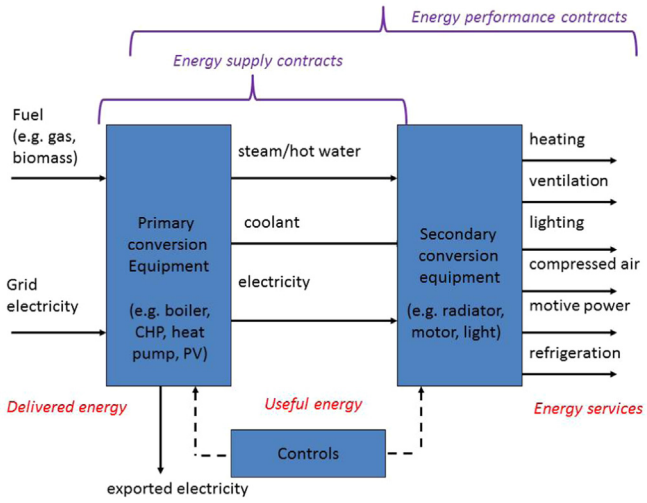

Fig. 1. Energy supply versus energy performance contracts.

role in the UK and there are a range of similar organisations in other EU Member States (Bleyl et al., 2013; Polzin et al., 2016a). But to date, the role of intermediaries in this market has received relatively little attention from researchers.

This paper therefore examines the nature and operation of the UK PPFs in more detail, including their influence on the economics of energy service contracting, their achievements to date and their implications for energy and climate policy. The analysis is based upon archival documents and 23 semi-structured interviews with key stakeholders in the UK energy service market.

The paper is structured as follows. Section 2 introduces energy service contracts, summarises the steps required to establish such a contract and uses concepts from transaction cost economics to explain the contracting decision. Section 3 briefly summarises the empirical methodology. Section 4 reports the findings, including the processes through which intermediaries can lower the transaction costs of contracting and the experience to date with the intermediaries operating in the UK. Section 5 concludes by drawing lessons for public policy and the future development of the energy service market.

2. Background

2.1. Energy service contracts

An energy service contract involves the outsourcing of one or more energy-related activities at a site or group of sites under the terms and conditions of a long-term contract. The contract may encompass the delivery of one or more 'useful energy streams' such as steam, hot water and electricity, and/or the provision of one or more 'final energy services' such as thermal comfort and illumination (Fig. 1) (Sorrell, 2005). Contracts that focus primarily on the former are commonly termed energy supply contracts while those that focus primarily on the latter are commonly termed energy performance contracts - although this terminology is not standardised and many contracts encompass both (Bertoldi et al., 2006; Nolden and Sorrell, 2016; Sorrell, 2007).[1] Payments are normally linked to the energy and cost savings achieved relative to an agreed baseline, thereby providing the contractor with an incentive to maintain and improve equipment performance over time. The contract may also guarantee the delivery of particular levels of energy or cost savings, thereby transferring much of the technical and financial risk of the associated investment to the contractor.

Energy service contracts vary in terms of *what* technologies and systems they include (e.g. boilers, CHP, lighting, cooling, building controls, motors, building fabric etc.), *how* they include them (e.g. who has responsibility for design, engineering, financing, purchasing, installation, commissioning, operation, maintenance, monitoring, verification etc.), and how they *finance* the required investment (e.g. working capital from the client or contractor, loans from financial institutions, equity from risk investors or a combination of these) (Fawkes, 2007; Hansen et al., 2009; Sorrell, 2005, 2007; Vine, 2005). Of particular importance is whether the investment is financed through debt taken on by the client and hence appears on the client's balance sheet, or whether the investment is financed by the contractor. With larger projects, lender security may be confined to the assets of the project rather than those of the client or contractor.

Table 1 summarises some of the activities required for a client to establish an energy service contract (DECC, 2015b). The process typically requires the client to invest considerable staff time and resources; to employ a range of different skills (e.g. technical, project management, financial, legal) that may not be readily available in-house; and to coordinate the activities of a number of departments that may have competing interests (Bleyl et al., 2013; Polzin et al., 2016a). Many potential clients will lack the resources and expertise to conduct such a process, while others will consider that the costs involved are likely to outweigh the associated benefits. In the public sector, the obligations imposed by public procurement legislation may create an additional obstacle to contracting (OGC, 2008). Potential clients may also consider that their lack of expertise, coupled with the difficulties of monitoring contract performance, leaves them vulnerable to a 'bad deal'. As a consequence, the (anticipated) 'transaction costs' of establishing energy service contracts may frequently preclude their use (Polzin et al., 2016b; Sorrell, 2005).

2.2. The economics of energy service contracts

Concepts from transaction cost economics (Furubotn and Richter, 1997; Rindfleisch and Heide, 1997; Shelanski and Klein, 1995; Williamson, 1985) can help explain the conditions under which an energy service contract is likely to succeed. The following summarises the model developed by Sorrell (2005, 2007),[2] and suggests that the inclusion of intermediaries in this model may improve its explanatory power. Section 4 investigates the impact of intermediaries on transaction costs in more detail.

It is assumed that the client's primary motive for entering into an energy service contract is to reduce the (anticipated) total cost of supplying the relevant useful energy streams and/or final energy services. This cost is the sum of the *production costs* of providing these streams/services and the *transaction costs* associated with organising or 'governing' their provision (Globerman and

[1] According to the EU Energy Efficiency Directive (Council of the European Union, 2012): "… Energy performance contracting means a contractual arrangement between the beneficiary and the provider of an energy efficiency improvement measure, verified and monitored during the whole term of the contract, where investments….in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement or other agreed energy performance criterion, such as financial savings…" In the UK, energy supply contracts (known as 'contract energy management') have historically been more common than energy performance contracts, but this is changing (Nolden and Sorrell, 2016).

[2] This in turn builds upon This in turn builds upon Globerman and Vining (1996) and Vining and Globerman (1999) the *transaction costs* associated with organising or 'governing' their provision (Globerman and Vining, 1996; Williamson, 1985).

Table 1
Client responsibilities during the contracting process.

Phase	Tasks
Project development	• Identify options for project goals and scope (e.g. buildings and services covered) • Assess the technical, economic, legal and organisational feasibility of different project options • Obtain buy-in from relevant parties • Explore financing options and associated risks • Collect and analyse relevant data on energy consumption and costs • Estimate potential project value and anticipated rate of return
Procurement	• Draft tender document • Organise tendering process • Ensure compliance with national and EU procurement legislation • Decide selection criteria • Evaluate bids and negotiate with contractors • Select preferred supplier • Develop, negotiate and finalise details of energy service contract
Installation	• Liaise with contractor to ensure delivery on time and to specification • Co-operate with contractor to resolve unanticipated difficulties
Operation	• Oversee monitoring, verification and reporting of energy savings, together with overall contract performance • Negotiate changes and modifications to contract if and when required • Resolve any disputes with contractor

Vining, 1996; Williamson, 1985).

The *production* costs include: the capital costs of any replacement energy conversion, distribution and control equipment (including financing costs); the staff costs associated with audits and project design; the staff and material costs associated with equipment operation and maintenance; and the purchase cost of energy commodities. Prior to signing the contract these costs are borne directly by the client, while subsequent to signing the contract these costs are largely borne by the contractor and recovered through the contract fees.

There are two main reasons why contracting can lower the production costs of energy services. First, contractors benefit from *economies of scale, scope and specialisation*, in that they have greater technical, commercial, legal and managerial expertise in the provision of energy services than their clients; their staff can simultaneously manage a number of client sites; and they can frequently access finance, equipment and energy commodities at lower cost. Second, the process of outsourcing involves *market competition* which gives contractors a strong incentive to bid close to the marginal cost of energy service supply - unlike in-house provision where inefficiencies and monopolistic pricing may prevail. The scope for *ex-post* inefficiencies is constrained by performance incentives within the contract and the threat of switching contractors (although the latter may not always be feasible).

Any savings in production costs will be offset by the *transaction costs* incurred by both client and contractor in preparing, negotiating, establishing, executing, monitoring and enforcing the contract (Globerman and Vining, 1996; Sorrell, 2005, 2007; Vining and Globerman, 1999). These contracts will necessarily be 'incomplete' in that they will not specify the actions to be taken in all circumstances and since it is not possible to fully monitor the behaviour of the other party, there is a risk that one party will act opportunistically to the detriment of the other (Williamson, 1985). Transaction costs will also be incurred for in-house provision of energy services, but these are typically smaller and often more hidden.

The transaction costs incurred by both client and contractor may be usefully subdivided into:

- the *search costs* associated with tendering, identifying a potential client or contractor, verifying their suitability, preparing and evaluating bids and selecting a preferred contracting partner;
- the *bargaining costs* associated with negotiating and preparing the contract, monitoring contract performance, enforcing compliance, negotiating changes to the contract when unforeseen circumstances arise and resolving disputes; and
- the *opportunism costs* associated with either party acting in bad faith - for example by claiming that cost reductions derive from performance improvements when their real origin lies elsewhere (Vining and Globerman, 1999).

Contracting will be viable for the client when the saving in production costs outweighs the increase in transaction costs. Similarly, it will be viable for the contractor when contract revenues exceed the production and transaction costs incurred while also allowing for an appropriate rate of return. For both conditions to hold, the overall saving in production costs must exceed the overall increase in transaction costs for both parties combined (Sorrell, 2005, 2007).

Both the potential for reducing production costs and the associated transaction costs will vary between different contexts, clients and energy services. However, this complexity can be reduced to a limited number of variables that are summarised in Annex A (Sorrell, 2005, 2007). This model suggests that contracting may be more viable for 'medium-sized' sites where the potential for energy cost saving is reasonably large, but contractors still have scale, scope and specialisation advantages over in-house provision (Sorrell, 2005, 2007).

This theoretical model appears incomplete, however, as it neglects contextual factors that could help explain why similar organisations in different sectors have different probabilities of contract adoption. While a number of factors may be relevant, the availability or otherwise of *intermediation services*, such as those provided by the PPFs, appears to be of particular importance.

The term intermediation services is used rather loosely in the literature, but may be defined as activities by third parties that help buyers and sellers meet and transact. Intermediaries can facilitate and coordinate transactions, reduce information asymmetries between buyers and sellers, reduce risk and provide guarantees of product quality. As Spulber (1996) notes, intermediaries "provide the underlying microstructure of most markets" and include organisations such as retailers, wholesalers, financial brokers, credit agencies, real estate agents and insurance agents. For a product as complex as an energy service contract, intermediaries

are necessarily highly specialised and have only emerged relatively recently.

Despite their important contribution to market functioning, intermediaries remain relatively neglected in the economics literature (Spulber, 1996). Notable exceptions include Biglaiser (1993), who shows how introducing 'middlemen' in a market with adverse selection can improve efficiency, Biglaiser and Friedman (1994) who show how intermediaries can guarantee product quality and reduce moral hazard, and Li (1998) who shows how the contribution of intermediaries depends on the degree of asymmetric information between producer and consumer, as well as the cost of verifying product quality. These theoretical models are complemented by a number of empirical studies of particular commodity markets (e.g. Wang, 1999) and a growing literature on electronic intermediaries (e.g. Barnes and Hinton, 2007; Brousseau, 2002). But little attention has been paid to intermediaries within the energy policy literature and the only study of intermediaries for energy service contracts is by Bleyl et al. (2013), who show how 'facilitators' can overcome a variety of obstacles to contracting within the client organisation. Give the growing importance of intermediaries for energy service contracts it seems useful to explore their nature and contribution in more detail and to reflect this within the theoretical model.

3. Methods and data

The empirical study is based upon information compiled during 2014–15 from primary and secondary literature and semi-structured interviews with 23 sector representatives. The choice of elite interviews is justified for this topic, since there are only a small number of energy service contractors in the UK and an equally small number of informed market observers (Nolden and Sorrell, 2016). The interviews sought to establish the current status of the UK energy service market, the drivers and barriers to market growth, the factors explaining the relative success of energy service contracts for different types of client, the contribution of policy initiatives to this success and the future prospects for the market. The interviews were used to corroborate evidence derived from documentary sources and to contribute to the development of explanations for the empirical patterns observed.

The interviewees had a variety of overlapping expertise, and included monitoring and verification (M&V) experts (2), finance experts (2), ESCO representatives (8), market analysts (3), procurement framework representatives (4), public procurement experts (2), trade body representatives (1), local authority representatives (2) and policy makers (2). Most interviewees were asked how the PPFs were operating, what successes they had achieved and what factors explained that success. Interviews were conducted face-to-face or via telephone and lasted between 30 and 90 min. Interviews were recorded and transcribed, except in cases where topics were commercially sensitive.

4. Findings and discussion

The section summarises the main findings and uses quotes from the interviews to illustrate those findings. Section 4.1 identifies the need for intermediaries and describes how the UK public procurement frameworks are meeting that need. Section 4.2 summarises the experience with these frameworks up to 2015, including their achievements, similarities and differences. Section 4.2 explores the economics of intermediation in more detail, drawing upon the theoretical ideas summarised in Section 2.2. The focus throughout is on the public sector, since intermediation services have yet to extend to the private sector.

4.1. Public procurement frameworks for energy service contracts

Comprehensive energy service contracts are complex (e.g. DECC, 2015a), and their use requires the client to engage significant technical, legal, project management, financial and administrative expertise. This means that the transaction costs of establishing a contract can be high:

> "…. [energy service contracting] is tough to do. It is really hard work. It's transaction costs. It's resources. It's time. You need staff with time. You need to make sure when the ESCO supplies you with the M&V report that you understand the baseline. Some clients look at it and say 'it's fine' but they really have no idea. I know they are saving because I check everything. But they have no time…."[3]
>
> "…. The problem is that energy performance contracts are complicated. We need to ensure that somebody understands the M&V, how you measure the guarantee, how you do reconciliation, how you establish a baseline….. We realised that [public sector clients] didn't have the resources internally to do this type of project…."[4]

For a variety of reasons, there has been little progress towards standardising energy service contracts in the UK:

> "… There is no single dominant energy performance contract in the UK. It varies very much in terms of size, type of building, type of client, length.… Because the market is expanding there isn't enough standardisation…. We are literally seeing every single type of contract…"[5]

Bespoke contracts provide diversity and adaptability, but are time-consuming to negotiate and establish and require the client to engage significant legal expertise. Standardised contracts offer the potential to reduce transaction costs, while standardised methods for monitoring and verification can reassure clients and reduce risk for lenders. European and national policy measures to encourage contracting have therefore focused upon encouraging standardisation and disseminating best practice, with the aim of increasing confidence in the contracting model and reducing transaction costs for inexperienced clients (DECC, 2015a; 2015b; Shonder et al., 2010; Staničić et al., 2014).[6] But such top-down initiatives have proved relatively ineffective, perhaps because they lack the specificity to be useful for individual clients. As one interviewee observed:

> "…..[national guidelines] are not doing anything as far as I can see. They sit in ivory towers saying this is how it should be done. But how many contracts have you done? Show me your method. Explain why you are doing it that way. Every time you stick a bunch of engineers in the room, they will come up with a different set of guidelines…."[7]

Clients can obtain more specific and targeted assistance from private consultancy companies, but these services can be expensive and consultants often lack expertise in the public sector. Public procurement frameworks for energy service contracts (PPFs) help to overcome these challenges by combining three separate but interlinked functions:

First, they provide a recognised *legal framework* for procuring energy service contracts in specific parts of the public sector that complies with the relevant UK and EU procurement legislation and

[3] Interview with procurement framework representative, 2014.
[4] Interview with procurement framework representative, 2014.
[5] Interview with monitoring and verification expert, 2014.
[6] See for example: http://www.european-energy-service-initiative.net/eu/project.html.
[7] Interview with energy service company representative, 2014.

allows a number of pre-qualified contractors to bid for each contract. These 'framework agreements' set out the terms and conditions under which clients can establish energy service contracts with the qualifying contractors throughout the period of the agreement (typically four years). The agreement is advertised in the Official Journal of the European Union (OJEU), but the individual tenders are not - thereby avoiding the associated delays and costs.

Second, they establish organisations that act as *intermediaries* between clients and contractors and provide dedicated, professional and informed assistance to clients at each stage of the contracting process - including the organisation of tendering and the selection of preferred bidders. In this role, the intermediaries can encourage learning from one contract to another, increase trust between the relevant parties and reduce the costs faced by both client and contractor in establishing and executing the contract.

Third, the same organisations may also *promote* energy service contracts to potential clients. For example, they may disseminate case studies,[8] organise seminars with relevant parties, organise site visits to successful contracts, facilitate access to specific funding sources, develop model contracts targeted at particular subsectors, promote or operate standardised monitoring and verification (M&V) schemes, engage with key stakeholders and liaise with central government on relevant legislation and guidance.

Framework agreements are a common feature of public sector procurement and generally set out terms and conditions under which specific purchases or contracts ('call offs') can be made (OGC, 2008).[9] The agreements are not contracts, but the process of establishing them is subject to EU procurement rules. In the UK, the use of framework agreements for complex, non-standard energy service contracts is relatively novel, as is the establishment of associated organisations for facilitating those contracts. But there are a number of precedents in other member states including the Energy Saving Partnership in Berlin and the Federal Contracting Campaign in Austria (Bleyl et al., 2013).

Both the UK PPFs and other intermediaries are established by public authorities and employ staff with procurement expertise in relevant parts of the public sector - a combination that makes them attractive to clients in that sector. The cost of intermediation is recouped from the client and/or contractor - for example through a fixed fee or a percentage of annual cost savings. These costs vary with the size and nature of the contract, the range of services offered and the commercial orientation of the relevant intermediaries. Our research suggested that fees in the UK range from 2% to 10% of project capital costs, while a survey of 34 facilitated contracts in different Member States suggested a mean figure of 3% (Bleyl et al., 2013).

The value of intermediation to clients is illustrated by the following quote from the Carbon and Energy Fund (CEF) - a PPF operating primarily in the UK public health sector:

> "….. CEF was born out of frustration……to halt the excessive expenditure by Trusts in procuring energy performance contracts. Traditionally, public sector bodies would complete stand-alone procurements so contracts had to be purchased, consultants employed and contractors procured and once it was complete all the knowledge was lost. Then after construction the schemes typically started to underperform due to a lack of finance, contractual awareness and knowledge if things didn't go as well as expected. The CEF was created as a place to capture knowledge and to simplify the process so it could be repeated time and time again…."[10]

Box 1–The contracting process facilitated by the Carbon and Energy Fund

1. A client expresses interest in the CEF and shares the scope of its proposed scheme with CEF staff, supported by relevant documentation such as their estates strategy and an outline business case.
2. CEF staff visit the client, meet with their estates, finance and procurement teams and explain the CEF process.
3. CEF staff assist the client in outlining the feasibility of the scheme, including the anticipated capital investment, annual payments and guaranteed savings.
4. The client joins the CEF, and the latter commits to support the client through the life of the contract.
5. The CEF organises a mini competition, asking its member contractors to express their interest in the project.
6. The interested contractors are invited to an open day at which the client and the CEF explain the project.
7. Interviews are held, at which the contractors present their initial ideas, together with their record, approach and financial model.
8. The client selects up to four contractors that it would like to work with, and holds one-to-one discussions with each.
9. The CEF assists the client in issuing an invitation to tender to the four contractors. Each contractor provides a bid.
10. The CEF works with client to evaluate the bids and choose the one that offers best value for money.
11. The winning contractor is given three months to complete the design and technical schedules. If the contract meets the original price and guaranteed savings, the client will sign. If not, the client will cover the costs incurred by the contractor in preparing the design.
12. The installation phase begins and may last up to a year. The CEF chairs monthly technical and project board meetings to help the client manage the installation and works with the client to assess the technical and financial performance of the project.
13. Once the project is approved, the client starts payments to the contractor. The CEF monitors the project performance and verifies the energy and cost savings. The contractor reimburses the client if savings are less than those guaranteed in the contract.
14. The CEF charges no fees to the client, but recovers its costs by taking a portion of the guaranteed savings in the contract.

The nature and level of support that is provided to clients varies from one PPF to another and also from one contract to another. The CEF can afford to provide substantial support (Box 1), since the majority of its contracts relate to large-scale, energy infrastructure investments with a typical capital investment of ~£5 million. Lower levels of support are found for smaller scale projects, but many of the principles are common all PPFs.

[8] See for example: https://www.london.gov.uk/what-we-do/environment/energy/energy-buildings/refit/refit-london-case-studies.

[9] Defined in the EU Public Sector Procurement Directive (2004/18/EEC) as "… An agreement or other arrangement between one or more contracting authorities and one or more economic operators which establishes the terms… under which the economic operator will enter into one or more contracts with the contracting authority in the period during which the framework agreement applies….".

[10] CEF website (http://www.carbonandenergyfund.net/).

Table 2
Key features of UK public procurement frameworks for energy service contracts.

	RE: FIT	CEF	Essentia	Ecovate	P-EPC
Originator	Greater London Authority	Countess of Chester Hospital NHS Foundation Trust	Guy's and St Thomas' NHS Foundation Trust	King's College Hospital NHS Foundation Trust	Peterborough City Council
Established	2008	2011	2012	2013	2013
Title	RE: FIT framework (public buildings retrofit programme)	National Framework Agreement to supply carbon and energy infrastructure upgrades	Strategic Sustainability Transformation Framework RE: FIT framework (public buildings retrofit programme)	National Framework for Energy, Carbon and Backlog Maintenance Management Services – Performance Contract	Blue Sky Peterborough: Energy Performance Contracting Programme
No. of approved contractors	12	16	8	8	1
Main clients	Public sector organisations in London (2008) and England (2014)	NHS trusts and universities	NHS trusts and public sector organisations	NHS trusts	Local authorities premises
Achievements	200 public sector organisations in London and over 500 buildings. £93 m of investment with typical savings of 15–20% (up to 47%) and payback of 5–7 years	50 NHS hospitals to date. Target of upgrading 240 hospitals over 16 years. Current contracts amount to ~£250 m in capital value, £50 m in annual cost savings and ~20% in annual energy savings	12 NHS Trusts have established EPCs using the framework with typical energy savings of 15–25% and an average saving of 17%. Total capital investment to end 2015 was ~£65 million, delivering annual savings of ~£8 million.	Kings College NHS Trust has established an EPC reducing energy consumption by 9% with 11 years payback, removing £3.1 m of backlog investment	First two phases with 10 buildings in total completed with £4.4 m investment. Phase 3–5 includes 42 schools. Guaranteed energy savings of 20% with a 15 year payback

Table 3
Contractors participating in UK public procurement frameworks for energy service contracts.

Company	CEF	RE: FIT	Essentia	P-EPC
Ameresco	*			
Bilfinger	*			
Bouygues	*	*		
Breathe Energy (MCW)	*	*	*	
British Gas		*	*	
Cofely	*	*	*	
Cynergin	*		*	
Doosan Babcok	*			
EDF	*	*		
ENER-G	*		*	
E.On	*	*	*	
Honeywell		*		*
Imtech	*	*	*	
Kier	*			
Mitie	*	*		
Norland		*		
Schneider Electric[a]				
Skanska		*	*	
SSE	*			
Veolia (previously Dalkia)	*			
Vital Energi	*			
Willmott Dixon		*		

Note: CEF has procured three frameworks with a different mix of ESCOs in each.

[a] Schneider Electric appears in the list as it has it was contracted through Ecovate to undertake an EPC at King's College Hospital in 2013.

4.2. *The experience with public procurement frameworks in the UK*

There were five PPFs operating in the UK in 2015: two developed by local authorities (*RE:FIT* and Peterborough's EPC framework, henceforth *P-EPC*) and three developed for the National Health Service (NHS) (*Carbon and Energy Fund*, *Essentia* and *Ecovate*). Table 2 summarises these frameworks while Table 3 lists the contractors participating within each. Although we do not have reliable estimates of the share of UK contracts facilitated by these PPFs, nearly all our interviewees emphasised their importance in stimulating recent market growth – with RE: FIT and the CEF playing the biggest role. The success of RE: FIT in London has led to a similar model being developed for all of England and Wales and has also provided the basis for model contracts and guidance notes published by the UK government (DECC, 2015a; 2015b).

Below we summarise the main features of each PPF, their achievements up to the end of 2015 and their key similarities and differences.

4.2.1. *Carbon and energy fund*

The Carbon and Energy Fund (CEF) is the oldest and largest PPF in the UK and primarily operates in the National Health Service (NHS) – which has an annual energy bill of more than £750 million across 12000 sites (2300 hospitals), ageing infrastructure, diverse loads, 24-h operation on many sites, and significant backlog maintenance (GIB, 2014).[11] The CEF was created in 2011 to support NHS Trusts in meeting their cost and carbon reduction targets and it funds, facilitates, manages and monitors complex energy infrastructure upgrades. Whilst focusing primarily on the health sector, the CEF is now expanding its activities to large sites in other parts of the public sector, including universities and local authorities.

Most CEF projects involve large scale investment in CHP, boiler

[11] The Green Investment Bank estimates that the NHS could reduce energy costs by £150million/year through investments with paybacks of less than 10 years, requiring capital investment of up to £1.5 billion.

replacement, heat distribution networks, building management systems, lighting and a variety of energy efficiency measures. Projects have a minimum size of £1 million and a typical size of £6 million, with the largest being a £36 million project at Addenbrookes Hospital, Cambridge. Developing such projects requires close corporation between contractors and clients and typically involves 7–9 CEF staff (Box 1). Unlike the other PPFs, the CEF also takes responsibility for monitoring and verifying energy savings throughout the life of the project. Since most NHS clients have limited scope for borrowing (especially for large, capital-intensive projects), the CEF combines a framework agreement and intermediation services with the provision of off-balance sheet financing from a variety of sources. On average, 4–6 of the CEF's 16 pre-approved contractors bid for individual projects, typically guaranteeing either unit price or energy cost savings of 20% or more over periods of 15–25 years. By the end of 2015, the CEF had facilitated or was developing more than 50 projects amounting to over £250 m in capital value, and was planning to substantially increase investment over the next few years.

4.2.2. RE:FIT

RE: FIT was launched by the Greater London Authority (GLA) in 2008 and was partly modelled on US experience, including the retrofit of the Empire State Building. It began with a pilot phase covering 42 buildings which has since been followed by two further phases of increasing size and ambition. The current target is to retrofit 40% of London's public sector floor-space by 2025 (GLA, 2015).

In contrast to CEF, most RE: FIT projects are financed by clients who have access to low-cost loans from sources such as Salix[12] and the London Energy Efficiency Fund (LEEF).[13] There are twelve approved contractors in the current phase (Table 3), of which 4–6 typically bid for a contract. Capital expenditures range from £150k to £6 million, with an average of £1 million, and projects typically deliver 15–20% energy savings with a payback period of 5–7 years. Phasing of projects is common, through including additional buildings over time. Contractors are responsible for monitoring and verification but are required to use a standard protocol (Bertoldi and Kromer, 2006).[14] Contractors are also required to employ more than one energy-saving measure,[15] but most projects focus on measures with high rates of return.

RE: FIT's intermediary organisation – the Programme Development Unit (PDU) - was established with the help of a £2.7 million grant from the European Investment Bank and has proved critical for the scheme's success. By end 2015, over 50 contracts had been signed involving over 200 public sector bodies including the majority of London boroughs, 26 NHS organisations, central government offices, libraries and museums. The total capital investment of ~£93 million is estimated to have saved around ~£6 million/year in energy costs.[16] RE: FIT is also extending the approach to schools via bundled, multi-site contracts supported by interest-free loans from Salix. This is the first time energy service contracts have been used for UK schools, and the target is to retrofit over 200 schools in three years.

The GLA is now collaborating with Local Partnerships[17] to extend the RE: FIT model to all public sector organisations in England and Wales. Launched in 2016, RE: FIT Local Partnerships involves a larger number of contractors (16), includes more extensive marketing activities and promises an increased focus on more innovative energy efficient technologies. Early clients include Cambridgeshire County Council, Hull City Council and the University of Kent.

4.2.3. Essentia

Established in 2012, Essentia developed out of the capital projects and estates functions of Guys and St Thomas NHS Foundation Trust - which includes one of the largest and busiest teaching hospitals in London. Essentia takes an integrated approach to managing the Trust's infrastructure, including activities such as energy, waste, IT and transport, and has expanded its activities to support clients in other parts of the public sector. Essentia's development of a procurement framework for energy service contracts is therefore linked to this broader and rapidly expanding set of business activities. Essentia's target market is similar to CEF's, and by end 2015 it had facilitated twelve energy service contracts involving capital investment of £65 million (an average project size of £5.4 million). These were delivering an average of 17% energy savings and cost savings of approximately ~£8 million/year. There are eight approved contractors under the framework, of which typically half bid for each project. Monitoring and verification is undertaken by the contractors themselves.

4.2.4. Ecovate

Ecovate Innovations Ltd manages a procurement framework on behalf of Kings College NHS Foundation Trust - another large London teaching hospital. This was created in 2013 as a national framework for 'Energy, carbon, and backlog maintenance management services'[18] throughout the public sector in England and Wales. The initial project at Kings involved capital investment of £8 million, leading to a 9% reduction in annual energy expenditure, a major reduction in backlog maintenance and improved working environment for patients and staff. Ecovate chooses contractors from a maximum of eight of the UK's 'most accomplished ESCOs', and uses a collaborative approach where contractors work in partnership with clients to develop the most appropriate project scope.

4.2.5. P-EPC

Peterborough City Council has established a wholly-owned subsidiary (Blue Sky Peterborough) to develop a range of energy and carbon saving initiatives, including partnering with British Gas to deliver energy efficiency improvements to households and setting up a scheme to negotiate energy supply contracts for groups of consumers. Established in 2013, the procurement framework forms part of these activities and - unlike the other frameworks - involves only a single contractor (Honeywell Building Solutions). The framework is of a 'partnering nature' where the two parties are "… required to work together in a spirit of good faith and cooperation…". (Peterborough City Council, 2013) The framework facilitated the negotiation of a 15-year contract for Peterborough Council buildings (including the town hall, swimming pool, leisure centre and library) which aims to achieve 15–

[12] Funded by the UK government, Salix is a not-for-profit organisation offering interest-free loans to UK public sector organisations for energy efficiency projects that meet certain criteria. Since 2004, Salix has invested £420 million in over 13,000 projects, leading to annual energy cost savings in excess of £108 million.

[13] LEEF has £100 m from the European Regional Development Fund and the London Green Fund to lend to public or private sector projects that promote energy efficiency.

[14] The International Performance Monitoring and Verification Protocol (IPMVP).

[15] "…. Part of the framework is that you cannot do just one measure. It has to be a bundle of measures because we don't want everybody to just do lighting because otherwise they wouldnot consider the big stuff……" (Interview with procurement framework representative, 2014).

[16] https://www.london.gov.uk/what-we-do/environment/energy/energy-buildings/refit.

[17] Local Partnerships is jointly owned by the Local Government Association and the UK Treasury and specialises in the delivery of a wide range of public services and infrastructure. Its activities are funded by fees from local authorities and central government.

[18] http://www.publictenders.net/node/2321460.

30% guaranteed energy savings from a £5.3 million investment. The framework is open to other local authorities and educational establishments within the East, South-East and Midlands, but only a few contracts have been facilitated to date. As with RE: FIT, P-EPC is targeting schools through multi-site contracts that aim to deliver an average 20% reduction in energy consumption.

4.2.6. Comparing the frameworks

The frameworks currently operating in the UK fall into two groups: RE: FIT and P-EPC primarily target local authority buildings, leading to smaller projects with shorter contract lengths and higher rates of return; while CEF, Essentia and Ecovate primarily target hospitals, leading to larger projects with longer contract lengths and lower rates of return. All the frameworks offer energy performance contracts, but the larger, hospital-based projects frequently include the upgrade and replacement of large-scale energy supply infrastructure. All of the frameworks remain primarily focused upon their core markets, although they are attempting to expand into other parts of the public sector.

The type of services offered varies from one framework to another, together with the associated fees – with Essentia and Ecovate operating a more commercial model. The CEF offers the most extensive services, reflecting their comparatively large projects. Overall, the scale of projects range from straightforward lighting upgrades at schools with an energy bill of less than £5k/year, to the development of the £36 million Energy Centre at Addenbrookes. Although the cost of intermediation makes it less viable for smaller projects, the frameworks have overcome this constraint to some degree by developing bundled, multisite contracts and facilitating simplified, 'off-the-shelf' solutions.

The process of establishing contracts also varies from one framework to another, including the relative emphasis on prescriptive energy-savings targets, versus a more open, flexible and negotiated approach. While the latter can encourage innovation, it is also more resource intensive and hence better suited to larger projects (Box 1).

While four of the frameworks allow prequalified contractors to compete for each contract, P-EPC is unique in creating a partnership arrangement between the local authority and a single contractor. This sacrifices the benefits of competition, but may offer compensating benefits through encouraging long-term, trust-based relationships that could reduce the need for formal contractual provisions (Bradach and Eccles, 1989; Chiles and McMackin, 1996; Poppo and Zenger, 2002).

The frameworks also differ in their sources of finance, reflecting the different characteristics of their target markets. Larger projects often use off-balance-sheet finance from a range of sources such as commercial banks and the UK's Green Investment Bank, while smaller projects may be financed from revenue and maintenance budgets. The health service faces greater borrowing constraints than local authorities, and the latter have benefited from low-cost sources such as the Public Works Loan Boards. Most interviewees considered that the availability of finance was not a major obstacle to energy service contracts in the UK:

> "…. Finance is not an issue. No problem. If you want finance there is RBS, there is Siemens, there is LEEF, there are pots everywhere..…"[19]
>
> "…if you have a viable business plan with robust M&V, you should not have any trouble accessing finance…"[20]
>
> "…. When people tell you that finance is problem - it is not a problem…"[21]

While each of the frameworks have been successful in exploiting 'low hanging fruit', the inclusion of innovative technologies and measures with longer paybacks is comparatively rare.[22] This is partly because there are many low-cost opportunities still available ("….we are tackling the buildings that have had nothing done over the last 50 years…."[23]), and partly because of the costs and risks associated with innovative measures:

> "….we go for things that have been tried and tested, and which the supplier can guarantee with a massive margin because, let's be honest, if you want them to guarantee something they are not sure about you are going to put a co-efficient of risk on top which will cost you a fortune.…When you have innovation, it's for people who have already done a lot, who have a team inside who already know….. These people will say 'you will have to come up with something new - that's why I'm coming to you.' That's where we're driving innovation, but it represents a very small amount of our projects…." [24]

Overall, the frameworks represent a diversity of approaches that appear well-matched to their target markets and are experiencing growing success. The CEF and RE: FIT in particular have opened up to range of market opportunities over the last five years.

4.3. The economics of intermediation for energy service contracts

The success of the intermediaries can be understood with reference to the theoretical model developed in Section 2.2. Specifically, the intermediaries make contracting more attractive by reducing the associated transaction costs - to a degree that more than offsets the associated fees.

Intermediaries provide a standardised contracting process facilitated by independent and experienced organisations with sector-specific expertise that can be expected to act in the client's interest. Compared to individual clients, intermediaries benefit from; *specialisation economies*, since their primary focus is energy service contracts; *scale economies* since they deal with multiple contractors and clients; and *learning economies* since they carry forward lessons from one contract to another. The services they provide can lower search, bargaining and opportunism costs for both clients and contractors (Brousseau, 2002; Spulber, 1996).

By having an established agreement with a prequalified group of contractors, together with a standardised tendering process, intermediaries lower the ***search costs*** for the client in finding a suitable contractor, together with the search costs for the contractor in finding a suitable client. They also reduce the risk that a suitable match will not be found and that resources will be wasted. By providing a single point of contact linking multiple clients and contractors, and by compiling, filtering and verifying relevant information, intermediaries simplify the contractor's problem of acquiring information about the demand for energy service contracts by different clients, as well as the client's problem of acquiring information about the opportunities and risks of different types of contract. Comparing multiple bids simultaneously, using a standardised format with the help of experienced advice lowers the cost to clients of appraising offers and increases the incentive

[19] Interview with energy service company representative, 2014.
[20] Interview with energy service company representative, 2014.
[21] Interview with monitoring and verification expert, 2014.
[22] Examples include the contract at Tower Hamlets College which includes atrium roof replacement and boiler replacement (15 year payback) and the contract at Goldsmiths College which includes wall cladding, double glazing and a district heating scheme for 90 buildings that reduces energy consumption by 47% (12 year payback).
[23] Interview with procurement framework representative, 2015.
[24] Interview with procurement framework representative, 2014.

to contractors to price fairly and competitively. For example, a PPF representative made the following observation about the bidding strategies of UK contractors:

> "…..what [the contractors] will try and do ……is come up with different names for things so you never really understand what you are buying.…It's just doing the numbers in a different way so that you can't understand them.….. A lot of schemes stall at that point because [clients] don't know what on earth they are buying…….*We* know, however, because we have simplified the whole thing. When they bid in this format there is no way to hide. You put a capital price in, you put an end price in and it gives you the level of savings and we can compare numbers……" [25]

By working with a pre-approved list of contractors with experience in the relevant client sector, an intermediary provides assurance about the quality of the contractors, together with reliable information about the success of similar contracts with comparable organisations in that sector. In some cases intermediaries organise visits to those organisations, so that potential clients can gain first-hand experience of successful contracts and talk directly to the people involved. As a result, clients gain confidence in the contracting model ("…We chose RE: FIT because it was tried and tested…"[26]) and can afford to spend less time and effort appraising individual contractors since they can rely on the reputation of the intermediary instead. Hence, clients become more willing to both establish a contract and to pay more for higher quality contracts.

Intermediaries also lower the ***bargaining costs*** for the client by providing standardised tendering and procurement procedures, along with standardised (where applicable) and legally-compliant model contracts and sector-specific energy performance benchmarks. These significantly shorten the time required to negotiate a contract, while also simplifying the negotiation process and reducing the associated risks:

> "……Attached to the framework…..is a call-off contract….with the providers. They are all preapproved. If you are an organisation you don't have to negotiate with the suppliers, it's all preapproved, it's all standard. From the moment you start your mini competition to getting your contract takes about 8 weeks, really fast, because they are all preapproved contracts…." [27]
>
> "…. We've got a standard form of contract, a standardised process, a standardised framework, a standardised contract. We've got a standard way of doing it and it all conforms with OJEU and the banks feel comfortable…." [28]
>
> "…. It's bundling and simplifying the process. It's productising the process. It's sort of market evolution. Some contractors don't like it. They say there's less chance to innovate. But in reality there is less chance to get away with stuff…"[29]

Intermediaries further lower bargaining costs by providing clients with expert assistance in establishing baseline data, comparing with sector benchmarks, defining contract scope, assessing bids, negotiating with contractors, accessing finance, monitoring and verifying energy savings and so on. In all these cases, the experience and independence of intermediaries leads to a better outcome for the client. Since intermediaries facilitate multiple contracts with each contractor they are better placed to assess the latter's quality and reliability. Intermediaries also have a strong incentive to avoid contractual problems and disputes, since this would negatively affect their reputation and hence the potential for future contracts. The use of an intermediary therefore reduces risk for clients, allowing them to spend fewer resources assessing specific contract terms.

Intermediaries also reduce the ***opportunism costs*** for both parties by reducing the information asymmetry between client and contractor, thereby reducing the scope for opportunistic behaviour. Opportunism may be further discouraged by the development of trust-based relationships between contractors and intermediaries, together with the strong incentives the latter have in maintaining and building their reputation. The intermediaries role as a 'gatekeeper' and enabler of future market opportunities in priority sectors helps to reinforce the incentives on contractors to maintain their own reputation and hence to deliver high quality contracts that benefit clients.

Intermediaries also help extend the contracting model to smaller clients by facilitating the negotiation of multi-site contracts involving several different clients - such as a group of schools or area-based collaborations. Such arrangements aggregate the production cost savings from multiple sites whilst spreading the transaction costs between those sites, thereby improving contract viability (Fig. 2). This approach potentially opens up major market opportunities, but the feasibility depends upon both the degree of similarity in investment opportunities between the relevant sites and the degree of cooperation between the relevant clients.

In sum, the intermediaries improve the viability of energy service contracting by reducing transaction costs for both client and contractor. Fig. 2 in Annex A reflects this by including the availability of intermediation within the theoretical model outlined in Section 2. While the nature and degree of intermediation varies between different organisations and contracts, the availability of any of the above services is beneficial for clients. The use of an intermediary should be preferred to bilateral contracting when the (anticipated) saving in transaction costs outweighs the associated intermediation fees for both client and contractor. But given that many potential clients known relatively little about energy service contracting, the more common choice is between using an intermediary to establish a contract and continuing to provide energy services in-house. Hence, in addition to facilitating individual contracts, intermediaries also play a critically important role in raising awareness of contracting opportunities more generally among different client groups. For many clients, contracting would never have been considered without the marketing and free advice provided by the intermediary.

5. Conclusions and policy implications

Recent UK experience suggests that the establishment of intermediaries to facilitate energy service contracts can be an important driver of the future growth of this market. To date, the biggest constraint on growth has been the high transaction costs associated with establishing individual contracts. By effectively reducing these costs, the UK intermediaries are opening up much wider range of opportunities throughout the public sector.

Our research was unable to identify the full costs and benefits of facilitated contracts to individual clients. But the growing success of the frameworks in difficult economic conditions, together with the positive appraisals of the frameworks by the majority of our interviewees, strongly suggests that this is a viable and attractive approach to unlocking cost-effective energy efficiency improvements. These in turn can relieve the budgetary constraints on public sector organisations, as well as contributing towards national climate targets.

[25] Interview with procurement framework representative, 2015.
[26] https://www.london.gov.uk/sites/default/files/london_school_of_economic spolitical_scienceuol.pdf.
[27] Interview with procurement framework representative, 2014.
[28] Interview with procurement framework representative, 2014.
[29] Interview with procurement framework representative, 2014.

The research reported here has important implications for policy. The EU Energy Efficiency Directive (Council of the European Union, 2012) requires Member States to promote energy service contracts throughout the public sector through measures such as model contracts, guidelines and the dissemination of best practice. The UK government has followed these recommendations (DECC, 2015a; 2015b, 2015c), but to date, these top-down initiatives appear to have had little impact upon industry practice. A more effective approach may be to encourage the bottom-up development of intermediaries in relevant sectors - for example, through subsidising their start-up costs. The success of the UK frameworks may be attributed in part to their emergence from individual local authorities and NHS Trusts and their consequent, in-depth knowledge of those sectors. The same characteristics may also explain why the intermediaries have had relatively limited success to date outside of their core sectors - although this may be beginning to change.[30] This success of RE: FIT in particular has encouraged the UK Department of Energy and Climate Change to support the roll-out of a larger programme across England and Wales (RE: FIT Local Partnerships), and has encouraged the Welsh government to support the development of a similar programme in Wales (RE: FIT Cymru). Both initiatives look highly promising and could provide a model for other EU member states.

Despite this growing success, our research found little evidence that intermediaries had extended beyond the public sector to the industrial and commercial sectors. Since intermediaries should also be able to lower transaction costs in these sectors, their absence remains a puzzle. However, contracting is poorly suited to many industrial energy uses, since these often either specific to the sector or critical to production (Sorrell, 2005). Similarly, contracting faces major obstacles in the commercial office sector owing to the prevalence of split incentives between landlords and tenants. These problems may partly explain why industry and commerce account for only a small proportion of the global market for energy performance contracts: for example, they only account for 15% in the US, with commercial offices accounting for only 6% (Larsen et al., 2012). In this context, the potential for intermediaries to lower transaction costs may be insufficient to stimulate market growth since other barriers may be more significant. In addition, much of the expertise of the existing intermediaries is specific to the UK public sector (e.g. procurement legislation) and this expertise may be less useful in the private sector.

In a similar manner, our research found little evidence that energy service contracts have moved beyond well-established technologies to deliver innovative solutions with lower rates of return. Hence, if the goal is to significantly expand the market in the industrial and commercial sectors, to deliver deep retrofits of buildings or to accelerate the diffusion of innovative energy-efficient technologies, additional policies and business models are likely to be required.

In conclusion, intermediaries are playing an increasingly important role in expanding the market for energy service contracts, both in the UK and in other countries. They therefore deserve much greater attention from researchers, as well as specific encouragement from policymakers.

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[30] For example, CEF has a contract with the Victoria and Albert Museum and is expanding into the university and local authority market.

Annex A. - Key variables influencing the economics of energy service contracts

(Box 2, Box 3).

Box 2–Determinants of production costs

- *Asset specificity:* Contracting may be more viable for generic energy technologies such as boilers, chillers and lighting systems, but less so for technologies that are specific to particular sectors and clients such as specialised industrial processes.
- *Economic potential for energy cost saving*: Contracting may be more viable for clients with a large absolute potential for energy cost savings (in £).
- *Aggregate energy costs*: Contracting may be more viable for clients with smaller annual energy bills, since these are less likely to have dedicated and competent in-house energy management teams with comparable skills to the contractor.
- *Competitiveness of the energy service market*: Contracting may be more viable when there are multiple, competing contractors since this should provide stronger incentives for efficient pricing, as well as more benchmarks against which to evaluate bids.

Box 3–Determinants of transaction costs

- *Asset specificity:* Contracting may be less viable when contractors are required to invest in physical or human assets that are highly specific to the contract and of little value in alternative uses. This is because such investments make the contractor vulnerable to opportunistic behaviour by the client. To reduce the associated risks, the contractor will seek a longer contract duration, together with the inclusion of various protection clauses. Dependence upon the services provided by the relevant assets may also make the client vulnerable to opportunistic behaviour by the contractor, since it may be difficult to switch suppliers or to take energy service provision back in-house.
- *Task complexity*: Contracting may be less viable when the tasks associated with providing energy services are complex. This will make it more difficult and costly to specify and negotiate contract terms and to monitor compliance, as well as raising the scope for opportunistic behaviour by either party. Greater task complexity may also make the cost and quality of the service more vulnerable to changes in various internal and external conditions (e.g. building occupancy, weather conditions) which can be difficult to measure and control for.
- *Competitiveness of the energy service market*: Contracting may be less viable when there are fewer credible competitors, since this creates a stronger incentive for opportunistic behaviour during contract bidding and negotiation. Weak competition also increases the risk of opportunistic behaviour during contract execution, since it makes it harder to switch suppliers either prematurely or at the point of contract renewal.

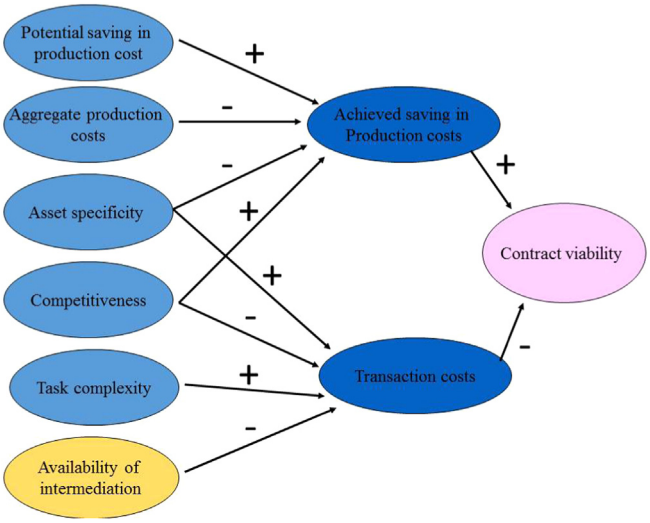

Fig. 2. Determinants of the viability of an energy service contract.

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