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Getting the incentives right. Energy performance contracts as a tool for property management by local government

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ABSTRACT

Energy conservation is a challenging and difficult task because disincentives in the building sector inhibit innovation. The municipality of Rotterdam experimented with an energy performance contract that aimed to avoid disincentives and replace them with a stimulus for innovation. *This article investigates whether the design requirements for performance management found in the management literature were fulfilled during the development of the contract and its implementation.* The outcomes of the experiment show substantial energy conservation – around 30 percent. *The existing incentive structure was changed through the use of a performance management contract, and perverse effects that are mentioned in the literature were limited.* The incentives established between the commissioning party and the contractor triggered better performance and innovation, although balancing the responsibilities between the principal and the agent was demanding and time consuming. Energy performance contracts are a useful piece of the sustainability puzzle, but tailor-made refinements are necessary.

1. Introduction

A fundamental transition is taking place within the energy production and consumption system because fossil-fuel energy resources currently being used will soon be exhausted. More and more renewable energy is being produced, and available energy resources are being treated with increasing frugality (BPIE, 2011; BPIE, 2012). This transition is not so much a technical challenge as a governance issue. In certain sectors, the actors involved have strong disincentives to shift to renewables or to a more frugal use of energy (Rizzi et al., 2014). This raises the question of how the transition to renewable energy and better energy conservation can be achieved within such an incentive structure.

The Netherlands is not a leader in energy conservation and sustainable energy, and it lacks effective instruments to promote them (Eurostat, 2014; Energy Research Centre of the Netherlands, 2009; Build Desk, 2011). Societal support for energy conservation and the relatively favourable innovation potential have yet to be translated into a resolute and effective approach (UNU/Merit, 2012; SER, 2013). In this article, we consider an ambitious experiment within the Dutch municipality of Rotterdam that developed and implemented a maintenance and performance contract (MPC) for nine swimming pools. In this experiment, energy usage was reduced by 30 percent. We investigate how Rotterdam was able to achieve this and how well-known obstacles were managed by using performance indicators.

We consider the dearth of energy conservation measures and renewable energy to be the result of disincentives in the building sector. If a strategy or instrument in this sector is to succeed in reducing energy use or encouraging renewable energy, it must avoid the impact of these disincentives. Furthermore, the performance contract should establish new and stimulating incentives for procurers and private contractors (Section 2). In Section 3, we describe the emergence, operation and effects of the performance contract developed jointly by the municipality and private contractors in Rotterdam. Section 4 contains an analysis based on the theoretical notions presented in Section 2, and in Section 5 we present our conclusions.

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2. Theoretical background

2.1. Energy conservation in the building sector: inhibitive incentive structure

A significant amount of energy is used in non-residential buildings (e.g. in swimming pools), which implies that there is considerable potential for energy conservation (Taskforce Energietransitie, 2006). About 38 Mt of CO_2-eq emissions are attributed to this sector, which is 19% of Dutch greenhouse emissions (MNC, 2010). Decisions to invest or not to invest in energy conservation in the built environment are taken by different actors including building owners, property managers, facility managers or tenants, and building and installation firms. The fragmentation of the building sector is an important obstacle to innovation. Furthermore, true drivers of innovation and renewal seem to be lacking. Within this market, neither new construction nor the renovation of buildings is driven by societal trends or the needs of consumers (RB, 2005; EIB, 2005; Al-Saleh and Mahroum, 2014). Innovations come largely from the construction sector, which does not have a good track record in this area (Eindrapport Parlementaire Enquêtecommissie Bouwnijverheid, 2002; RB, 2005; EIB, 2005).

The obstacles to energy conservation in the existing incentive structure include:

- *Weak incentives.* For many organisations, the costs of energy usage in non-residential buildings constitute only a small proportion of their total costs of business operation. For this reason, there is little 'sense of urgency' with regard to energy conservation (Doelen, 1989; Hoppe, 2009).
- *Split incentives.* In many cases, the costs of investing in energy conservation are paid by one actor, such as the owner, the manager or the tenant, while the benefits are realised by another actor — for example, the tenant (Hoppe, 2009; Bueren, 2009; Al-Saleh and Mahroum, 2014).
- *Split incentives in time.* The time needed to recoup investments is often lengthy. It is unclear whether the business case for energy conservation is still valid given this long payback period, particularly given the fluctuations in energy prices and technological developments (Heijden, 2015).
- *Tax exemptions.* The payback periods for large-scale users are relatively long, given the low energy prices resulting from tax exemptions (Vollebergh, 2014; Krozer, 2014).
- *Prospective innovations make it attractive to wait and see.* The technological development of some energy-saving products, such as lighting or solar panels, makes it attractive to delay investments in anticipation of solutions that are even less expensive (Hoppe, 2009).

Although efficiency norms for swimming facilities have been established in national and European legislation, the existing incentive structure in the building sector appears to be standing in the way of energy conservation. Solutions that enhance energy conservation or introduce renewable energy, such as in the Rotterdam experiment, have to address this problematic incentive structure. Thus, the first question that this article deals with is whether the municipality of Rotterdam was able to counteract the incentive structure that inhibits innovation.

2.2. Performance contracts: critical factors

The municipality of Rotterdam chose to use a performance contract in a green public procurement procedure, which offers a new way to enhance energy conservation. Green public procurement is a market-based instrument that can be used to provide new incentives for both procurers and private contractors (Rizzi et al., 2014; Uttam and Le Lann Ross, 2015). It is a new and increasingly popular instrument to improve environmental performance by creating a market for environmental products and services (Rietbergen et al., 2014; Uttam and Le Lann Ross, 2015). Because of the large budgets of governments, the potential impact on private contractors is substantial. The European Commission and the national governments of Member States have great ambitions for this instrument (Bratt et al., 2013).

Documented examples of green government procurement have occurred in different sectors, including water, waste, infrastructure and energy (Rietbergen and Blok, 2013; Faith-Ell et al., 2006). These examples testifies to the interest in this new instrument as well as the quest for best practices and the need for more knowledge. In empirical research, several factors critical to success have become evident, including a good procurement process (e.g. a competitive dialogue), the quality of communication with stakeholders, the institutional context of the procurement, a clear definition of environmental impacts, helpful tools, the involvement of the market at an early stage, and flexibility on the part of both the principal and the private contractors (Uttam and Le Lann Roos, 2015; Rizzi et al., 2014; Bratt et al., 2013; Rietbergen et al., 2014).

Organisational and management sciences have a track record in the use of performance indicators as tools. In addition to the abovementioned literature, they can provide an interesting and comprehensive reference for the study of the use of performance indicators and contracts in public procurement. In the literature on performance contracts, the fundamental conception is as simple as it is powerful: the objectives of public organisations are realised through the formulation of performance indicators (Osborne and Gaebler, 1992; Bouckaert and Peters, 2002; Bruijn, 2007). These indicators emerge through negotiations between the principal (e.g. a governmental body) and the agent (e.g. an agency). In these negotiations, the indicators are defined, along with the performance to be delivered by the agent as measured according to the indicators.

In addition, the contract specifies the corresponding rewards to be provided by the principal for meeting certain targets. The contract may, for example, contain agreements concerning bonuses for achieving the level of performance agreed and penalties for not achieving them. One strength of this approach is that it offers clear, simple targets for addressing the complex problems faced by governments. Performance management reduces complex and multicriteria challenges to a limited, uniform and measurable set of indicators (for the basic philosophy of performance management, see Osborne and Gaebler, 1992).

There are many examples that demonstrate the positive effects of performance management. In most cases, performance management offers an incentive for achieving the desired performance. It also promotes transparency, provides a de-bureaucratisation incentive and can offer an incentive for learning processes. Research has also revealed that performance management can generate many perverse effects. It can provide an incentive for strategic behaviour, lead to myopia or tunnel vision, reduce transparency and obstruct innovation (Smith, 1995; Johnsen, 2005; Bruijn, 2007; Teelken, 2008; Moynihan et al., 2012; Hammerschmid et al., 2013; Kelman and Friedman, 2009 and Hufen, 2013; on the perspective of the users of performance management, see Pollitt, 2013).

Theories concerning performance management and the empirical research based on these theories can be used to derive the design requirements that are crucial for the effective use of performance management (Bruijn, 2007; Haas and Kleingeld, 1999; Teelken, 2008; Vakkuri, 2010). Below, we provide a summary of

the most important requirements. We would note that they are often ambiguous or create dilemmas. Moreover, they may conflict with each other or generate undesirable effects.

1. *Simplicity.* The benefit of a Maintenance and Performance Contract (MPC) is that it reduces a complex performance to a small set of indicators (Osborne and Gaebler, 1992). If simplicity results in an overreduction of complexity, however, an incentive might emerge for both the principal and the agent to add indicators to the system or to design very detailed contracts, making the performance management system more complex. The dilemma here is that these indicators can never do complete justice to the complexity of the real world (Busse et al., 2013; Kerpershoek, 2015).
2. *Predictability.* A performance management contract should result in a predictable environment for both the principal and the agent. However, predictability for one party can create uncertainty for the other. Again, the parties will attempt to resolve these problems by defining additional indicators or by making additional agreements. This 'mushrooming' makes performance management systems increasingly complex, with the result that they lose their simplicity (Bruijn, 2007; Bouckaert and Halligan, 2007).
3. *Measurability.* Performance contracts call for clear, uniform and measurable indicators. However, an indicator that is clear to one party may be unclear to another. The measurement and calculation of energy conservation involves much more than simply reading a metre at two different points in time. It is, for example, necessary to define an objective reference period and to identify correction factors (Bouckaert, 1993).
4. *Limited impact of performance indicators.* Performance contracts can generate perverse effects. This is more likely when the fulfillment of the performance indicators has a high impact on the agent. If the agent is likely to achieve a low score on a performance indicator, an incentive for perverse behaviour might arise. The greater the negative financial consequences of failing to achieve the required performance level, the stronger the incentive for the agent to resort to perverse behaviour. At the same time, however, the financial consequences should be high enough to induce the desired performance (Bruijn, 2007).
5. *Room for trade-offs.* In many cases, performance is characterised by multiple criteria: work is expected to meet multiple — and in some cases conflicting —criteria. In such cases, agents need to be given room to make their own trade-offs. However, such room can also be used strategically: high scores on one performance indicator can be used to compensate for low scores on another. This may lead to suboptimal results in some areas (Schoenmaker, 2011; Slack and Robert Johnston, 2010).
6. *Room for other relationships.* An MPC is based upon a simple assumption: one principal directs one agent. In many cases, however, the context involves multiple actors who often have different interests. Multi-actor contexts usually involve multiple agents and, frequently, multiple principals as well. In such cases, each participant is responsible for a limited part of the performance and bears no responsibility for the outcome as a whole. Again, this creates an ambiguous situation: agents should serve the interests of their principals but should also work with other partners, who might have other interests (Turner, 2004; Schoenmaker, 2011).
7. *Flexibility.* The ability to handle unforeseen circumstances requires leeway on the part of the contract partners. All actors involved must be able to respond to changes, especially in cases of contracts of long duration such as the performance contract of the municipality of Rotterdam (Walker et al., 2010). The contract partners' need for flexibility can come at the expense of simplicity and certainty.

The second question that this article addresses is whether the municipality of Rotterdam was able to create a new and stimulating incentive structure through effective performance management. Did the new incentives in the performance contract improve the relationship between the principal and the private contractor and also trigger better performance reflected in energy conservation and innovation?

3. Method

The experiment conducted by the municipality of Rotterdam was examined through a case study of the tendering procedure for an MPC for nine swimming facilities and the results achieved during its implementation in the first year. The case study focused particularly on the involvement of the municipality of Rotterdam (the property management department), the three companies that entered bids, their financers, the consortium that implemented the contract and other organisations involved in the development or implementation of the performance contract.

The case study of the performance contract is important because good instruments to reduce energy consumption in non-residential buildings are missing, despite the fact that many effective energy conservation measures exist. If Rotterdam succeeds in developing and implementing an effective performance contract, other public authorities interested in green public procurement could be inspired by its experiences and lessons. Because of the large budgets of municipalities to invest in immovable properties, the potential effect of a successful new instrument is significant.

The case study describes what the effects of the performance contract were and analyses whether Rotterdam was able to avoid problems concerning performance contracts. What was particularly interesting was the municipality's interaction with construction firms and the impact of the wider environment. The case study endeavoured to find the mechanisms that explain the success or failure of performance contracts and to interpret the results in terms of the design requirements for effective performance management (second research question). The analysis of the characteristics of the MPC and the underlying mechanisms was necessary to find out if the factors that inhibit innovation in the building sector were overcome (first research question).

The first step in the case study involved reconstructing the tender procedure, starting from the preparation and development of the contract which occurred in a process of interaction between the municipality and the market parties. The reconstruction focused on establishing the actual course of the process by consulting the extensive documentation and archival records kept by the municipality of Rotterdam and conducting interviews with the chief actors involved in the process. The reconstruction of the tender procedure was crucial for the second step, which involved determining the extent to which the design requirements for effective performance management were met. In the second step, we analysed the design requirements and conducted interviews with several direct stakeholders, including the directors of the swimming facilities and organisations collaborating with the operators, as well as with several experts in the field of energy and performance contracts.

Two data collection methods in the case study were used for the purposes of the case study: qualitative content analysis and interviews. The combination of the qualitative content analysis and the interviews proved to be useful for the case in hand. The documents were useful during the preparation of interviews as well as valuable for the interpretation of the interviews.

The content analysis involved analysing the tender documents, the contracts that were formulated, the appendices to the contracts, memorandums, newspapers, policy briefs, journal articles, trade publications and relevant background literature (see Table 1) (GR1, 2012; GR2, 2012; GR3, 2012). Because of the status of the procurement process and the MPC as "experiment" and the desire of the municipality to communicate the results, many documents about the course of events during the procurement process, the contract itself and the appendices were made available for the researchers.

A total of 25 interviews were conducted with 19 people (see Table 2). Of these interviews, 10 were face-to-face and 15 were conducted by telephone. We interviewed the following: the commissioning authority and swimming pool directors (6), the operators (5), market parties in the tender (2), financers (4) and experts on energy and performance contracts (2). A protocol of clustered items were used to conduct the interviews. The interviews focussed on the parts that the respondents were involved in. Several individuals who were crucial to the study were consulted multiple times. The interviews were used to describe the elements of the procurement process and the outcomes in more detail as well as to evaluate the interactions between the actors involved and to evaluate if the design requirements for effective performance management had been met.

The clusters in the interview protocol were: professional and organisational background; MPC-concept and goals; experiences during the procurement process; specific topics in the procurement (such as definition of the scope of the contract, calculation of the baseline); evaluation of the procurement process in terms of outcomes, the process and the design requirements; monitoring, communication and payment; lessons learned; potential and future of the MPC.

4. The maintenance and performance contract

4.1. Development of the MPC

Inspired by the Clinton Climate Initiative (Building Retrofit Concept), the municipality of Rotterdam specified the following conditions for the sustainability of its immovable properties (see GR1, 2012):

1) guaranteed energy conservation
2) budget neutrality (financing through cost reduction)
3) optimisation of maintenance
4) improvements in comfort
5) contract flexibility
6) improved quality of the property

The municipality tried to avoid the disadvantages of the traditional way of procurement such as an elaborated prescription of the work at hand and the price as the most important factor in the selection of a private contractor. The aforementioned conditions were to be achieved through a public-private partnership (MF, 2011). The new tendering process was expected to elicit a response from a private party that would realise the sustainability objectives within the scope of the specified conditions. To this end, Rotterdam would enter into an MPC with the chosen party.

The municipality selected nine public swimming facilities from its immovable property portfolio of 3500 buildings: Schuttersveld, Bad West, Overschie, Wilgenring, Alexander, Afrikaanderplein, IJsselmonde, Charlois and Hoogvliet. These swimming facilities varied widely in age and state of maintenance. All of the swimming facilities were in need of improvements to their existing buildings, but the municipality of Rotterdam had made no budget allocations for this. The MPC for the swimming facilities was intended to provide a complete renovation and an improved maintenance programme of the facilities as well as a programme for energy conservation.

To determine whether there was sufficient interest in accepting these challenges, the municipality invited market parties to submit rough drafts of proposals through TenderNed. The interest expressed by eleven companies or consortiums provided an indication that the market was willing. The municipality of Rotterdam selected three parties. Due to unfamiliarity with the main points contained in the performance contracts, the municipality decided to elaborate the contract further through open dialogue with the market parties in accordance with the procurement formula of competitive dialogue.

Since the performance contract would be based on a bonus/malus formula, it was important for the market parties to be well informed about the characteristics of the buildings, including information on energy usage This would provide the market parties with the information required to assess whether the commissioning party's formula would be feasible and if so, which conservation percentages would be realistic. To this end, extensive information was collected about the swimming facilities with regard to the pools, the dressing rooms, the reception areas, the gyms and the canteens. Access was provided to all available information concerning long-term maintenance plans and energy use, and missing information was added where necessary. A part of this information is described in Table 3 to give an idea of the swimming pools and the other facilities. The older accommodations proved to be swimming pools only, whereas most of the younger swimming pools also included other sporting facilities. The last renovations were carried out in 2000 (Schuttersveld, Overschie), the overall picture of the pools shows a backlog in maintenance. Some of the

Table 1
Documents and materials.

Municipality's framework for the development and implementation of the performance contract
Documents on the process of consultation of the construction sector
Documents on the calculation of energy use and energy conservation in a building
Identification of the baseline energy consumption in a building
Documents on the various steps in the procurement procedure
Documents on the implementation of the performance contract
Description of the output specification of the performance contract (performance indicators, measurement of performance indicators)
Procedure for paying the contractor
Procedure to accept the performance calculated by the contractor
Inventory of the risks of the performance contract at different stages of the development and implementation process
Documents on the methodology concerning the condition assessment of buildings (NEN2767-1)
Documents of the Chamber of Commerce concerning the legal structure and financial performance of ESCo Invest BV
Press reports of the local government of Rotterdam
Press reports and PR material concerning public-private partnerships (Strukton)
Reports by consultancy firms on the management of performance contracts (compiled on behalf of the Ministry of Government of the Netherlands)

Table 2
Interviewees and dates on which interviews took place.

	Position	Organisation	Date
1	Project manager of performance contracts	Real estate department, municipality of Rotterdam	8/10/2012, 30/1/2013, 23/4/2013, 9/7/2013, 3/9/2013, 26/2/2014.
2	Director of Schuttersveld	Local swimming pool Schuttersveld	11/7/2013
3	Director of Afrikaanderplein	Local swimming pool Afrikaander plein	16-7-2013
4	Director of Charlois	Local swimming pool Charlois	15/7/2013
5	Director of Wilgenring	Local swimming pool Wilgenring	9/7 2013
6	Director of West	Local swimming pool West	10/7/2013
7	Project manager of integrative projects	Strukton (construction firm)	31/10/2012
8	Project manager of energy service company	Strukton (construction firm)	27/6/2012, 9/7/2013
9	Project manager	Hellebrekers (construction firm)	17/7/2012
10	Project manager of maintenance	Hellebrekers (construction firm)	9/7/2013
11	Project manager of monitoring	Hellebrekers (construction firm)	4/3/2014
12	Director of sustainable development	Unica (construction firm)	11/10/2013
13	Manager of Business Development – Energy Solutions	Honeywell (firm in construction/technology sector)	21/4/2012
14	Consultant of sustainable built environment	AgentschapNL (professionals commissioned to implement government programmes concerning energy conservation)	22/11/2012
15	Relationship manager	ASN (financial sector)	26/7/2012
16	Manager of project development	ASN (financial sector)	14/9/2012
17	Manager of infrastructure/public-private partnerships	BNG (financial sector)	14/11/2012
18	Manager of sustainable development	ABN AMRO (financial sector)	21/5/2013
19	Consultant of performance contracts	AHB Consultancy	1/6/2012

accommodations were going to be shut down before the end of the performance contract. The market parties visited the nine swimming facility locations in order to complete their overviews of the accommodation.

Questions and answers were exchanged during the open dialogue. Most of the questions had to do with financing, organisation and technology. In its contacts with the three bidding parties — Strukton/Hellebrekers, Honeywell Building Systems, Dura Vermeer/Unica — the municipality of Rotterdam played the role of a sounding board. To this end, the municipality engaged specialised task groups to ensure that the market parties could perfect their proposals based on clear answers. As part of this method, performance indicators were specified following consultations on each of the spaces in the swimming pool complexes.

The conservation performance would not be a simple one-off measurement but rather the outcome of a calculation. Energy usage was to be measured annually during the contract period. In addition, energy usage would be corrected for the following:

Table 3
Characteristics and energy use of the nine swimming accommodations in Rotterdam.

Accommodation/allocation		Construction year, year last renovation and end contract (month/year)			Energy use base line year (2009)		
Accommo-dation	Allocation of space	Construction year	Last re-novation	End contract	Electricity (kWh)	Gas (m^3)	Heating (GJ)
1. Schuttersveld	• pool • office • dressing room • sports hall	1980	2000	21/21	498,704	224,700	–
2. Wilgenring	• pool • office • dressing room • sports hall	1996	–	12/21	697,770	255,560	–
3. West	• pool • office • dressing room • sports hall	1993	–	12/21	516,167	219,427	–
4. Hoogvliet	• pool • office • dressing room	2002	–	12/21	325,640	109,614	–
5.IJsselmonde	• pool • office • dressing room	2007	–	12/21	296,624	151,048	–
6. Overschie	• pool • office • dressing room	1979	2000	12/20	137,520	91,048	–
7. Alexander	• pool • office • dressing room	1970	1995	12/20	192,373	150,261	–
8. Charlois	• pool • office • dressing room	1962	1992	12/16	979,713		9385
9. Afrikaander-plein	• pool • office • dressing room	1974	1991	12/15	196,929	1399,409	–

Legenda: no-ren = no renovation carried out since year of construction Source: GR2, 2012 and interviews.

degree days, opening hours, and visitors per year. The correction factors were used as an objective method to calculate the "real energy use", i.e. the use of energy that is not influenced by temperature, opening hours and the number of visitors. The calculation of savings used energy usage figures from 2009 as a reference for baseline energy use. The correction factors of the base line year (2009) are presented in Table 4 as well as the corrected energy use. This calculation demonstrated the use of the formula and provided insight into the specifics of an important part of revenue model in het MPC. The energy components in the calculation were electricity, gas, heat and water. The calculation of energy costs in the base line year and the manner in which each of the performance indicators would be measured and/or calculated during implementation was put down in writing (Table 5).

The municipality of Rotterdam and the three competing market parties all reported that the tendering procedure was time-consuming and difficult. One of the three construction consortiums withdrew in the middle of the tender process due to the high costs and its low expected chance of winning the tender. One of the two winning construction parties estimated the recruitment costs at approximately EUR 400,000. The two market parties that completed their proposals considered the procedural costs high but acceptable due to the expectation that this form of tender would become standard practice in the future, also in other industries.

The banks collaborating in the tenders also regarded the tenders as time-consuming and demanding. The Dutch banks adopted a reticent attitude during the procedure, with the exception of ASN bank, which is a green bank. This reticence was mainly due to the unfavourable relationship between the investment of time and the scope of the project as a whole. To optimise the likelihood of the success of the experiment, the municipality engaged the services of a specialised agency to provide the necessary personnel and expertise. The municipality of Rotterdam estimated the support costs for the tender at approximately EUR 1 million (GR, 2012).

The municipality selected the most economically advantageous tender, which was submitted by the consortium of Strukton and Hellebrekers. In addition to the qualitative criteria, the following quantitative selection criteria were applied: the level of energy conservation (40 points), the investment costs (10 points) and the maintenance costs (20 points). The winning proposal distinguished itself from its competitors largely due to its high score on energy conservation. After the project was awarded to Strukton, Bank Nederlandse Gemeenten (BNG) expressed its willingness to finance the project.

4.2. Outcome of the tender: contract and organisation

The outcome of the tendering procedure in mid-2011 was an energy performance contract between the municipality of Rotterdam and ESCo Invest BV (ESCo = energy service company) covering the period 2012–2021. Strukton is the sole shareholder of ESCo Invest BV. The construction and installation activities were performed by a professional partnership consisting of Strukton Bouw, Strukton Worksphere, Strukton Systems and Hellebrekers (see: Fig. 1). The performance contract was based on the assumption that the investment costs would be paid through cost reductions in energy of at least 34 percent and a reduction in maintenance costs of at least 15 percent.

In 2011, the market parties (Strukton, Hellebrekers) proposed the following measures:

- covering the swimming pools
- installing energy-saving lighting
- using heat/power co-generation
- optimising boilers

The investment budget for these measures amounted to EUR 2.6 million.

As mentioned, the financing of ESCo Invest BV was provided by Bank Nederlandse Gemeenten. BNG covered its risks through a financial guarantee from Strukton for the energy service company. The municipality of Rotterdam was also prepared to cover a portion of the financial risk. Rotterdam was a guarantor for the increase in the value of the swimming facilities resulting from the investment. The contract stipulated the rights and obligations of the contract parties, in addition to 14 appendices. The core of the business agreements specified that the contractor would be paid for the performance delivered in terms of: a) energy conservation, b) comfort and c) maintenance.

a) Energy conservation performance

Strukton/Hellebrekers agreed to ensure annual energy savings of 34 percent over a period of 10 years. The 34 percent pertained to the average savings across all swimming facilities during the runtime of the contract. If the level of performance agreed upon was achieved, the commissioning party (the principal) would pay a basic fee to ESCo. If the cost savings exceeded the level agreed upon, the savings would be shared (50%/50%) between the principal and ESCo (bonus), while lower cost savings would be deducted in their entirety from the basic fee (malus).

b) Comfort performance

The contractor is responsible for achieving a good level of comfort. For each of the swimming facilities, performance requirements were specified for the different type of spaces, day and time. These requirements concerned the temperature of the air, the

Table 4
Correction factors for calculation of energy costs in base line year 2009 for the swimming pools.

Accommodation	Correction factors for calculation of energy costs in baseline year 2009 (before contract start)			Calculated energy costs base line year (2009)
	Degree days	Visitors	Hours accessible	(in euros)
1. Schuttersveld	2790	83,319	4316	180,236
2. Wilgenring	2790	193,113	3380	236,781
3. West	2790	117,333	4316	188,326
4. Hoogvliet	2790	144,883	3983	125,170
5. IJsselmonde	2790	155,256	4732	132,399
6. Overschie	2790	59,943	3839	73,591
7. Alexander	2790	101,425	3516	117,928
8. Charlois	2790	253,051	3756	296,440
9. Afrikaanderplein	2790	104,814	3030	128,821

Source: GR2, 2012.

Table 5
Results of the implementation as indicated by the score on the performance indicators for energy conservation, comfort and maintenance.

Outcomes	Performance	Norms performance indicator (score and permitted deviation)[a]	Performance 2012[a]
Energy	Energy saving	34%, 0%	30%
Comfort level	Temperature air		Realized or corrected within acceptable time
	• swimming pool	• 26 °C; ±0.5 °C	
	• office	• 20–23 °C; ±0.5 °C	
	• dressing room	• 19–28 °C; ±0.5 °C	
	• sports hall	• 18.5–19.5 °C; ±1.0 °C	
	Water quality	• 0.3 mg/l; 0.1 mg/l	Realized or corrected in time
	Air quality		Realized or corrected in time
	• swimming pool	• 55%; ±10%	
	• sports hall	• 40%; ±10%	
	Water temperature	• Fixed score between 27–32 °C, ±0.5%	Realized or corrected in time
Maintenance level	Condition measurement (1–6)	• ≥3 (full runtime contract)	Realized or corrected in time
		• ≥5 (not full runtime)	
		• Realization of building and installation measures	Realized
		• meet standard in the legal norms and regulation	Realized

[a] The norms of the performance indicators are in most spaces applicable as indicated in the table, however some exceptions exist. The qualification of the performance counts for all spaces.

water quality, the humidity of the air and the water temperature in each of the spaces in the swimming pool complex. Some of the comfort levels were specified using bandwidths. The standard air temperatures were in most allocations: 1) swimming pool rooms: 26 °C with a permitted deviation of ±0.5 °C; 2) office: 20–23 °C, permitted deviation ±0.5 °C, 3); 3) dressing room: 19–28 °C, permitted deviation 0.5 °C; 4), sports hall 18.5–19.5 °C permitted deviation 1.0 °C. The requirements of the water quality was measured by a standard value of 0.3 mg/l with an permitted deviation of 0.1 mg/l. The requirement of air quality was measured by a standard for the air humidity of 55% in the swimming pool with an accepted deviation of ±10% and of 40% for a sports hall 40% with an accepted deviation of ±10%. The requirement for water temperature was different for every type of pool with a standard day average temperature between 29 and 34 °C (for example: competition pool), 32 °C (for example children's pool) with a permitted deviation of ±0.5 °C.

The contract included a fee or achieving the desired maintenance and comfort values. If the level of performance agreed upon was not delivered, or if a deficiency was not corrected quickly enough, the commissioning party was entitled to apply a discount to the fee.

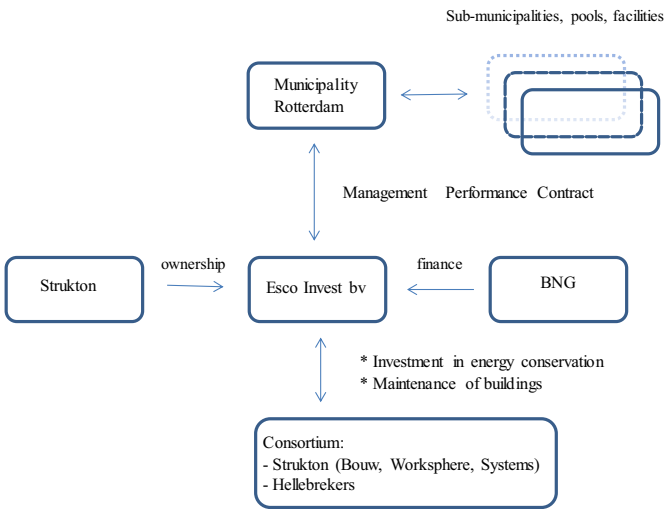

Fig. 1. Principle and contractor in Management Performance Contract, and some other partners involved.

c) Maintenance performance

Minimum requirements for the level of maintenance of the buildings were defined in terms of the classification of the condition measurement. 'Condition measurements' for the various complexes in the various buildings described and classified the actual state of the buildings (NEN2767). The minimum condition for maintenance was Condition 3 (on a scale of 1 (poor) to 6 (optimal) for swimming pools that are participating until 31 December 2021 and Condition 5 for the swimming pools that are due to be closed before 31 December 2021. Existing legislation and regulations concerning functionality, safety and sanity were included in the description of the minimum level of maintenance that had to be met. A table with standards in legislation and regulation that clarified whether the commissioning party, the private party or both were responsible is integrated in the performance contract. Responsibility concerning building and installation measures was defined and integrated in the annexes of the performance contract. Furthermore, requirements with regard to the opening of swimming facilities during maintenance activities were also included. In this way, a set of minimum conditions was defined for each of the swimming pool complexes.

The structure of the maintenance and performance contract for the nine swimming facilities in Rotterdam was simple, as the organisation and technical management and maintenance was placed in the hands of two parties. In the past, each of the nine swimming facilities had contracted its own operators. The new contract assigned maintenance and management to a single commissioning party and a single operator for all nine swimming facilities. It was agreed that there would be bi-weekly contact between the managers of the swimming facilities and the operators. The municipality of Rotterdam would maintain monthly contact with the contractor (ESCo) and the swimming facility manager. Reports on the performance delivered had to be prepared by ESCo and discussed with the commissioning party (the municipality). The commissioning party would use the outcomes to pay the commissioned party. The financial compensation included the basic fee, the bonus/malus adjustment and the maintenance compensation.

4.3. Results of the implementation of the MPC in the first year (2012)

The following results were delivered in the 2012 calendar year:

- Energy savings of 30 percent

An energy saving of 30% was published and was confirmed in the interviews with the manager of the performance contract of the municipality and the project managers of Strukton and Hellebrekers (Cobouw, 2013). In 2011, ESCo invested in carefully selected renovation measures and the monitoring of their consequences, in addition to undertaking several supplementary measures. The operators approached the choice of measures conscientiously, thereby achieving the greatest possible cost reduction per euro and selecting measures expected to yield the most profits. Less investment was made in the older swimming facilities that were slated for closure during the course of the contract, as such investment would yield fewer returns. The greatest potential for cost reductions was found in the swimming facilities with high levels of energy usage and which were to remain open until 2021. The swimming pools directors were satisfied with the energy savings that were realized as director of the swimming pool the Wilgenring stated: "We are very satisfied with the performance contract because the investments that are realized in the swimming pools could never have been realized by the municipality as the necessary budgets were not available."

- Improvements in comfort at seven swimming facilities

The renovation measures resulted in improvements in comfort at seven of the nine swimming facilities. The contract included no comfort measures for two swimming facilities that were slated for closure in the near future. The commissioning parties (i.e. the municipality and the swimming facility directors) were satisfied with the improved comfort in the swimming facilities. The air temperature, water temperature, air humidity and chlorine percentage were managed well by the operators. The working conditions for the swimming facility staff were better than they had been prior to 2012. Any irregularities with regard to comfort values were corrected quickly. As a result, the entire fee allocated for maintenance and comfort was paid to the operators by the municipality of Rotterdam.

- Maintenance level achieved

The municipality of Rotterdam and the swimming facility managers were satisfied with the achievement of the desired level of maintenance. The operator worked according to a submanagement style of preventive maintenance, which improved the cost-efficiency of maintenance. The commissioning party paid the full project fee without any discount (malus). The organisation of technical management had been simplified, with a single commissioning party and a single operator. The contract partners agree that the change is an improvement because of the simplicity and practicality.

- Miscellaneous

Long-term unemployed people were engaged for the technical management of the swimming facilities (Cobouw, 2013). The project thus yielded new employment opportunities for a group of people with otherwise poor job prospects. This effect was confirmed in the interviews but more precise quantitative information about the number of people is not available.

In 2012, the commissioning party made payments consistent with the principle of budget neutrality that had been adopted at the start. The financing costs in 2012 were somewhat lower than expected due to the lower energy-cost reductions (Cobouw, 2013). The budget neutrality of the commissioning party was counterbalanced by the losses incurred by Strukton in the 2012 financial year. The operator was expected to break even in 2013 and reverse losses after that year.

The realisation of energy-cost savings, the desired comfort level and the desired level of maintenance required intensive cooperation between Strukton and the swimming facility managers. According to those involved, the communication between these two parties proceeded as desired. The building management system provided the operator with a good overview of the amount of energy being used in the buildings, in addition to indicating whether the swimming facility managers were performing their jobs well. Every two weeks, Hellebrekers consulted with the swimming facility managers with regard to operational aspects. The partnership between Strukton and Hellebrekers functioned well in practice. Doubts about whether it would be possible to collaborate as equals proved unfounded in 2012, and the partnership proceeded satisfactorily.

5. Analysis of the MPC in practice

The contractor and the commissioning party were generally positive about the partnership as well as the outcomes of the performance contract in the first full year of implementation. The stakeholders were of the opinion that the extensive consultation had paid off. The level of performance agreed upon for one of the main points was not achieved — the energy savings of 34 percent. The operators offered the following explanation:

- Not all of the investments had been completed by the beginning of 2012. For example, one of the measures required a permit, and the procedure and requirements for obtaining this permit delayed its implementation. The measures were completed over the course of 2012, and the energy-cost savings were expected to increase as a result.
- Another explanation is that the operator needed time to optimise energy management. According to Hellebrekers (installation firm): 'You actually need a full heating season before you can know for sure.' The installations must be perfectly coordinated with the building's energy usage, and this takes time. The energy management of buildings required a learning period, particularly for the Hellebrekers installation company.

One unexpected positive side effect for the contractor was that the operation of this prestigious project increased the likelihood of subsequent projects. Strukton and Hellebrekers have since submitted new proposals for performance contracts that are being prepared by other municipalities. In addition, the contractor stated that it had received supplementary contracts from the same commissioning party in connection with the performance contract that was arranged.

5.1. Problematic incentive structure mitigated?

The dynamics generated by the performance contract can be explained in part by the fact that it resolved various problems in the incentive structure for energy conservation as discussed in Section 2.

- *Weak incentives.* In the tender procedure, the municipality of Rotterdam imposed the requirement that the renovations must yield energy savings. This made it clear to contractors that they would not have a chance of winning the contract without offering considerable energy savings. The performance contract thus had strong incentives for market parties to take energy conservation seriously.

- *Split incentive.* The Rotterdam arrangement does not contain any split incentives, as the municipality is both the party initiating the renovations and the party benefiting from the lower costs for energy and maintenance. The cost reductions directly benefit the municipality of Rotterdam, which subsequently uses these to pay the contractor.
- *Split incentive in time.* Because the municipality requires the contractor to finance the costs of renovation, there is also no split incentive in time. The commissioning party does not pay for the investment in renovation, as the contractor bears responsibility for financing.
- *Tax exemptions.* In this case, the tax reduction for large-scale users did not impede the implementation of energy conservation. The financial incentives of the arrangements were so strong that they outweighed the tax advantages in the current situation.
- *Prospective innovations make it attractive to wait and see.* Prospective innovations may constitute a reason for adopting a wait-and-see attitude. The arrangement designed by Rotterdam produced an entirely different incentive: the benefits of investment were greatest at the start of the contract, as the cost reductions that they yield may continue to have an effect for 10 years.

An MPC circumvents structural problems in the building sector by including new arrangements, as developed in the tenders based on 'Design & Construct' (Ministry of Finance, 2012). Through these tenders, the effects of fragmentation in the building sector can be prevented by finding a single party to bear responsibility for the construction process. The responsibility for maintenance as well as design makes it advantageous for the operator to realise the investments in an efficient manner. The performance contract thus increases the need for integrated solutions and innovation.

5.2. Did the performance contract improve the incentive structure?

Performance management carries the risk that well-known problems of performance agreements will arise or, conversely, that the absence of these problems explains the relative success of the outcomes.

5.2.1. Simplicity

The dialogue that took place during the tendering procedure resulted in a performance contract that was far from simple. An extensive contract emerged, with 14 appendices arranging the relatively complex distribution of responsibilities and risks among the commissioning party, the contractor and the financers. None of the parties to the contract had had much experience with performance contracts, so all felt a need for certainty. Moreover, the possibilities for energy conservation differed for each of the various spaces within the swimming pool complexes, and this required extensive and detailed agreements.

Due to its limited experience with performance contracts, the municipality invested in drafting a very extensive contract which stipulated the rights and obligations of the contracting parties and the financer, and included guarantees for abiding by the contract. In the future, the commissioning party is likely to refrain from being extensively involved in the drafting of contracts and can avoid costs of hiring external experts.

The simplicity of the contract was severely affected, but the parties involved felt that it was necessary to extensively elaborate the contract. This allowed all parties to be committed to the outcomes. Thus, while the dialogue resulted in a complex contract, the outcome had an important added value. The dialogue between the parties was seen by contract partners as a learning process that defined the formula for calculating energy performance. It also provided a detailed description of the current state of maintenance as well as surety agreements in the financing.

Furthermore, the extensive contract provided clarity about the operationalisation of performance indicators, the investment budget and the current level of maintenance at the existing swimming facilities. An inventory was made of risks and unexpected circumstances, and solutions for these matters were sought. The contractor was asked to provide surety agreements, largely due to the external financing. Although the ultimate performance contract was more complex than had been expected, the complexity was negotiated, that is, it was acceptable to both parties.

Both the commissioning party and the contractor regarded the contract as feasible and not too complex. However, for one of the actors in the procurement, the intensity of the dialogue was too demanding and did not offer any flexibility. Another building consortium expressed a preference for more concise contracts in the future. The willingness of building consortia and financers to participate in this project does not necessarily mean that they will be willing to participate in other, similarly complex and demanding projects henceforth.

5.2.2. Predictability

While the contract created by the parties involved was not simple, it allowed them additional predictability. In other words, more detailed agreements create a more predictable environment.

Nevertheless, one important uncertainty remained, which strongly affected the contractor. A contract is optimal if it allows a win–win situation for the commissioning party and the contractor. This is not the case here, as the commissioning party established its original goals in the contract in terms of savings, comfort, maintenance and budget neutrality, apparently at the expense of the contractor. What is the mechanism here? If a commissioning party performs assessments in the tendering procedure based on the extent to which savings and sustainable energy will be achieved, this produces a powerful incentive for innovation. Tendering parties that do not include the latest innovations are less likely to win the project. At the same time however, contractors that submit bids with high levels of energy savings may risk not achieving such promised energy-saving levels because innovations have less predictable outcomes than conventional technologies.

The performance contract thus generates a dynamic that largely reduces the certainty offered to contractors in particular. It is a balancing act for the principal. On the one hand, the contract should contain a sufficiently strong incentive to innovate. On the other hand, these incentives should not be so strong that they create excessive uncertainty for the contractor with regard to the financial returns. This aspect also emphasises the importance of a constructive dialogue, which can be used by the commissioning party and contractor to work together to find the right equilibrium.

5.2.3. Measurability

During the implementation of the performance contract in the first year, it became apparent that the measurability of the performance indicators and the level of maintenance were sufficient. The performance indicator for the savings percentage was not completely satisfactory. The following issues emerged:

- Ambiguous reference year (ambiguous values in the past)

A period preceding the start of the contract was used as a reference point in the calculations of the energy use. In the Charlois and Schutterveld swimming pools, the energy use of the swimming pools in Charlois and Schuttersveld proved to be incorrect in the

baseline year. The contractor discovered that a sports canteen, a church and a recreational building were connected using energy on the same meter as the swimming pools. The contract partners of the MPC agreed that the baseline was not completely correct but decided after a discussion not to adapt the calculation of the energy use in the baseline year.

- Ambiguous correction factor: “number of visitors”

In practice, the correction factor for ‘number of visitors’ proved to be more complex than expected. In one of the swimming facilities (Schuttersveld), the number of visitors declined in 2012 due to the cancellation of school-based swimming lessons, while the energy savings after the realisation of the measures were lower than expected. The operator's efforts were therefore not rewarded with a higher fee because the correction factor for ‘number of visitors’ in the calculation formula produced a distortion.

For the contractor, the implications of these deficiencies in the formula were not purely theoretical. As a result of these errors in the formula, the contractor probably received less income, and the basic fee was lower due to the malus that was applied. Nevertheless, in the interviews, the commissioning party and the contractor told that their relationship was not affected by the deficiencies. One important reason for this was that the formula for calculating the performance delivered had been discussed extensively during the preparation of the contract. Both parties were therefore explicitly aware of the payment method, including the correction factors. A second reason is that after calculation, the errors in the formula will probably have only minor effects on the income earned. Third, the experience-based information was shared directly between the commissioning party and the contractor during their regular consultations.

5.2.4. Limited impact

The importance of high energy-savings percentages is evident in Rotterdam's maintenance and performance contract. The contractor would receive a basic fee for performance if energy savings of 34 percent were achieved. If the savings amounted to more than 34 percent, the contractor and the commissioning party would share the additional proceeds of the lower energy costs. If the savings amounted to less than 34 percent, the lower energy costs would be offset by a lower fee paid to the contractor. The bonus/malus system emphasised the importance of a high score on the savings percentage.

One of the design requirements of a performance contract is that the impact of the performance indicators should be limited. If this is not the case, it can lead to perverse effects. Although the system that was selected could thus be expected to produce perverse effects, no such effects arose in practice. This indicates that there were no loopholes that would allow the contractor to realise a high score. The contractor achieved the level of energy savings agreed upon out of a sense of enlightened self-interest. After comprehensive consultation during the preparatory period, the commissioning party and contractor agreed that the calculation method would produce a good reflection of ‘actual’ energy performance. The dialogue between the commissioning party and the contractor also led to a certain relationship and bond of trust between the two parties. Perverse conduct was less appropriate within the relationship of mutual trust that emerged.

One additional interest in achieving high scores has to do with the professional honour of the operators. Based on extensive experience, Hellebrekers knew that the intended energy savings of 34 percent was feasible. The inclusion of this level of savings — which was recognised through experience — as a commitment in the performance to be delivered provided the operator with an incentive to realise it. The level of 34 percent was not a non-committal recommendation: it was the standard that the operator was willing to endorse and commit to achieving through its work. It was also not imposed but agreed upon.

The effect that emerges with regard to the savings percentage concerns the operation of the market. The arrangement that was chosen stimulated the operators to seek the most cost-effective measures for the swimming facilities and to realise them within the shortest possible timeframe. Rather than encouraging the practice of waiting for technical problems to emerge, it spurred the replacement of components in order to prevent problems. This led to a reduction in the number of malfunctions relative to the period preceding the performance contract.

5.2.5. Room for trade-offs

The maintenance and performance contract was composed of a series of indicators concerning energy usage, along with indicators for the interior environment and comfort. The various parameters were elaborated for each of the various spaces within the swimming pool complexes. Minimum values were established for some indicators, and bandwidths were established for others. There was a risk of trade-offs that could have the effect of not offering the commissioning party the results that it had intended. The temptation that performance contracts raise — to use high scores to compensate for insufficient scores elsewhere — did not emerge in the case of Rotterdam's maintenance and performance contract. Why not? First, sanctions were formulated for each indicator and were to be imposed if the desired score on that performance indicator was not achieved. If energy savings of 34 percent were not achieved, the contractor had to pay a fine. If the comfort values were not achieved, the contractor had a brief period to address the complaint. If the problem could not be corrected quickly, the contractor had to pay another fine. The contract provided the contractor with a strong incentive to abide by and act according to the agreements that had been made. Second, the contract was embedded in a continuous dialogue, which also acted as a disincentive for making ‘wrong’ trade-offs.

5.2.6. Room for other relationships

Although the agreements between the municipality of Rotterdam as the principal and Strukton as the contractor played a central role in the performance contract, other actors were also involved.

The operation of the performance contracts was influenced by the involvement of the *swimming facility directors*. In the period leading up to the performance contract, the nine swimming facility directors decided that they would grant the renovation contract to a single construction party or consortium. They were also actively involved in the development of the performance contract. In addition, the market parties visited the swimming facilities. Active cooperation occurred in relation to the provision of objective information on the current situation in each swimming pool complex. Cooperation with the market parties occurred each day during implementation. In addition, frequent consultations were held during implementation with regard to energy management and comfort values at the swimming facilities. The active involvement of the directors from the start contributed to the delivery of the performance requested.

Due to the municipality's demand that the contractor provides financing, another important partner was added to the network: the financer. In the development of the contract, BNG ensured that the municipality explicitly accepts the appreciation in the value of the swimming facilities resulting from the renovations. This made it possible for the municipality to cover the financial risks if problems were to arise with the contract partner and to do so without suffering losses.

In practice, *local politicians* also proved to be relevant actors in the network. The performance contract included assumptions concerning the period during which the swimming facilities were open, but decisions regarding the closure of swimming facilities were the responsibility of local politicians. The performance contract mentioned that the old Afrikaanderplein swimming facility was slated for closure in 2014. However, partly due to the municipal elections, the swimming facility was not closed in 2014 and is now to remain open at least during the period 2016–2018. These effects did not lead to any problems during the period of study.

5.2.7. Flexibility

An extensive long-term contract requires a good contract that suits both contract partners. The main private contract partner (Strukton) was satisfied with the contract: "The performance contract contains a balance between the commissioning party and the private organisations that is suitable for a long term cooperation". However communication between the commissioning party and the contractor with regard to unforeseen circumstances is crucial for a successful implementation. The parties to the contract should consult each other on the application or adaptation of the existing contract. In this case study, the municipality and ESCo engaged in regular discussions on the status of the implementation. These discussions revealed several areas in which the contract was in need of adjustment:

- Delays in the closure of swimming facilities

Contrary to expectations, two swimming facilities (Afrikaanderplein and Charlois) will not be closed at the time specified. Additional agreements are thus needed in order to realise the maintenance of these swimming facilities.

- Ambiguous formula for calculating energy performance

The formula has proved to be useful in practice in supporting compensation, although several imperfections were revealed. The possible need for adjustments was discussed during the consultations.

- Profitability of the contractor

The contractor's profitability is juxtaposed with the budget neutrality of the municipality. Performance contracts in which commissioning parties incur losses within the specified conditions are not sustainable in the long term.

- Reduction in flexibility as contract period progresses

As the period of the performance contract progresses, the risk arises that innovation will not take place and that it will not be possible to keep pace with technological developments.

One year into the implementation, it became apparent that the contractor was particularly in need of some level of flexibility as regards implementation. To date, the contract has not been adjusted, but there is a chance that adjustments will be made during the contract period.

6. Conclusion

To date, the energy performance contract for the public swimming facilities has proven to be a useful property management tool for the municipality of Rotterdam. Given the contract's duration of 10 years, any final evaluation at this point in time would be premature. Nevertheless, we can conclude that the commissioning party was able to realise its stated goals within the boundary conditions set within the first year of the contract. The negative effects generally associated with performance contracts either did not arise or did not pose enough of an impediment to counteract the positive effects of the arrangement.

The MPC, the constitution of the public-private partnership and the competitive dialogue was a clear improvement compared to the traditional way of procurement that was used previously according to the municipality, the swimming pool directors and the private contract partners. Key point in the improvement is the responsibility of the private contractor to realize cost-effective technical solutions for energy conservation in the swimming pools and to organise preventive maintenance.

After the performance contract has been implemented for several years, it would be wise to analyse the effects on energy conservation as well as the collaboration between the commissioning parties and the market parties. In addition, an analysis of the actual effects on energy savings over the years could be a valuable supplement to this article. An in-depth analysis of the differences between the different swimming facilities could also further clarify under what circumstances the performance contracts have the strongest effects. In order to support this research, the performance contract partners should extend their willingness to share quantitative information on energy conservation in all their swimming pools.

One explanation for the effects of the contract thus far is that the Rotterdam arrangement eliminated important disincentives to energy conservation (Al-Saleh and Mahroum, 2014). A strong financial incentive was created in order to achieve energy savings. The incentive to delay energy conservation was eliminated — it became profitable to invest early and quickly in energy conservation. This also eliminated the split incentive in time. And the incentive to innovate was strengthened because the financial advantages for the agent could be realised only by utilising all possible innovations.

The results achieved can be partly explained by the attention paid to success mechanisms, such as competitive dialogue as a procurement mechanism, the concern for continuous communication, and the institutional context (Uttam and Le Lann Roos, 2015; Faith-Ell et al., 2006; Rizzi et al., 2014). Furthermore, the results can be attributed to the fact that the contract meets the design requirements for effective performance management. The requirement of *predictability* was largely fulfilled due to the extensive nature of the contract. The requirement of *measurability* was also met, although several components of the measurement procedure came under discussion. During implementation, sufficient space emerged for parties other than the commissioning party to be involved in the process of energy conservation (*room for other relationships*).

On other points, the performance contracts failed to meet some or all of the stated design requirements. The requirement for *simplicity* was not met because the need arose for a complex performance contract. The requirement of *limited impact* was also not met: fulfilling (or failing to fulfill) the performance indicators had major financial consequences for the agent. The performance contract also provided little *flexibility* or *room for trade-offs*. This did not, however, counteract the effects of the performance contract. This raises the question of how the good results achieved thus far occurred despite conflicts with some of the design requirements. In this respect, we should consider the following:

First, performance agreements are always surrounded by some degree of ambiguity. Although simplicity is necessary, it can yield excessive uncertainty. A high-impact system is an incentive for performance but can also generate perverse effects. A strong incentive to achieve savings in energy costs in the initial phase

could eliminate stimulus at the end of the contract period, and the existing incentive structure could impede further measures. Measurability is crucial, but it may become apparent during implementation that the measurement methods do not work in practice. Due to contradictions between design requirements, it is very difficult to develop a performance contract that scores positively on all criteria.

Second, the development of the contract as well as its implementation were embedded in a continuous process of interaction between the commissioning party, the market parties and, later, the operator (Uttam and Le Lann Roos, 2015). During this dialogue, questions and answers were extensively exchanged with regard to technology, organisation and financing. The involvement of the swimming facility directors in an early phase introduced a link to practice in the implementation phase. For each of the design requirements, problems that emerged or could emerge were mitigated through the process of interaction. Moreover, the above-mentioned trade-offs were able to emerge in this process and were therefore supported by both the principal and the agent.

Third, communication produced a 'negotiated order' between the commissioning party and the contractor. Agreements were made with regard to the uncertainty that is inherent in this type of contract (e.g. the content of the contract; the division of roles between the commissioning party and the contractor; risks associated with financing). The performance indicators for savings and comfort were extensively discussed, documented and included in a calculation formula. Although the contract was not simple, it was able to provide a set of useful rules of engagement for the primary stakeholders: the commissioning party, the contractors and the financer.

Inconsistencies in the design requirements did not counteract the effects of the performance contract, although they did pose a risk factor for the remaining years of the contract. It is also conceivable that the effects of other performance contracts will jeopardise the contract later on. These risks are largely related to factors that could have a negative influence on the quality of communication. At any rate, we have identified the following vulnerabilities:

- High procedural costs. The commissioning party, the contractor and the banks described the procedure as time-consuming and complex. It is conceivable that in other projects, market parties will not be willing to assume these recruitment costs due to better market conditions. If the results of communication among stakeholders is less effective, known problems associated with performance contracts may yet arise.
- Poor cooperation. The partnership between Strukton and Hellebrekers has proceeded smoothly. In the construction sector, fruitful cooperation between builders and installation companies is more often an exception than a rule. Given the necessity of good communication in performance contracts, this is a risk.
- High level of knowledge and skills. Engagement in performance contracts proved too complex for the municipality of Rotterdam to implement independently. The knowledge and skills needed in this regard were therefore largely imported. The necessary process knowledge and skills are also scarce among the market parties. Only a limited number of large companies are capable of realising this type of performance contract.
- Risk of asking too much. Partly due to its position of power in the tendering process, the commissioning party was able to impose heavy demands with regard to energy conservation and the price to be delivered, but this was accompanied by risks. The performance contract was awarded to an energy services company (ESCo) that was financed by a bank. This form of contract is less attractive to financers if the performance offered can only just be achieved. The contractor could also incur unacceptable risks, accompanied by all of the negative consequences for the contractor, the contractor's bank and the commissioning party.

For a commissioning party such as the municipality of Rotterdam, the high level of knowledge and the high procedural costs are interrelated. The question here is where new MPCs can relatively easily be developed using the experiences with the swimming pools. Also the risk of asking too much should be a major concern for the municipality. For the private contract partners such as Strukton and Hellebrekers, the high level of knowledge of the high procedural costs can become a serious problem. When the commissioning party use energy conservation as their most important selection criterion, the MPC can become less attractive since the revenue model comes under pressure. The inverse relation between effort to finance projects and the potential revenues is a concern for banks. In addition the identification and management of risks are not without concern for banks.

In any dialogue between a commissioning party and a contractor, the performance contract might look different to that which emerged in the context of the Rotterdam swimming facilities. For example, it would be conceivable to opt for: a bandwidth solution for the performance to be delivered, without imposing consequences on the fee; a gradual increase in the level of savings achieved throughout the duration of the contract; a different amount for the basic fee; a change in the relative distribution of the bonus/malus; agreements with the building managers specifying their efforts; or other agreements about the contribution of the commissioning party to the financing and the duration of the contract. Much depends on the manner in which commissioning parties, construction consortiums and financers make decisions throughout the process. Thus, performance contracts are apparently less of a ready-made solution than they are a formula that allows for tailor-made refinements.

Acronyms: MPC Management and Performance Contract

References

Al-Saleh, Y., Mahroum, S., 2014. A critical review of the interplay between policy instruments and business models: greening the built environment a case in point. J. Clean. Prod. http://dx.doi.org/10.1016/j.jclepro.2014.08.42.

Bouckaert, Geert, 1993. Measurement and meaningful management. Public Prod. Manag. Rev. 1, 31–43.

Bouckaert, Geert, Peters, B.G., 2002. Performance measurement and management: the Achilles' heel in administrative modernization. Public Perform. Manag. Rev. 4, 359–362.

Bouckaert, Geert, Halligan, J., 2007. Managing Performance: International Comparisons. Routledge, London.

Bruijn, Hans de, 2007. Managing Performance in the Public Sector. Routledge, London.

Bratt, C., Hallstedt, S., Robert, K.-H., Bröman, G., Oldmark, J., 2013. Assessment of criteria development for public procurement from a strategic sustainability perspective. J. Clean. Prod. 52, 309–316. http://dx.doi.org/10.1016/jclepro.2013.02.007.

Bueren, E.M. van, 2009. Greening Governance. IOS Press.

Build Desk, 2011. Marktstudie CO_2-besparingspotentieel ESCo's in de Utiliteitsbouw, makkelijk besparen in een moeilijke markt (Market study: CO_2 savings potential in a difficult market?). Build Desk report nr. 1102, Delft.

Buildings Performance Institute Europe, 2011. Europe's Buildings under the Microscope: a Country-by-country Review of the Energy Performance of Buildings. BPIE, Brussels.

Buildings Performance Institute Europe, 2012. Energy Efficiency Policies in Buildings: the Use of Financial Instruments at Member State Level. BPIE, Brussels.

Busse, R., Geissler, A., Aaviksoo, A., Cots, F., Häkkinen, U., Kobel, C., Mateus, C., Or, Z., O'Reilly, J., Serdén, L., 2013. Diagnosis-related groups in Europe: moving towards transparency, efficiency, and quality in hospitals? BMJ Br. Med. J. 346.

Cobouw, 2013. Zwembaden verbruiken 30 procent minder energie dankzij mini-PPS [Swimming Facilities Use 30% Less Energy, Thanks to Mini PPP]. Cobouw, February 21, 2013.

Doelen, F.C.J. van der, 1989. Beleidsinstrumenten en energiebesparing [Policy instruments and energy conservation]. University of Twente, Enschede.

Economisch Instituut voor de Bouwnijverheid, 2005. Opdrachtgevers aan het woord [Commissioning Parties Speak]. EIB, Amsterdam.
Eindrapport Parlementaire Enquêtecommissie Bouwnijverheid, 2002. [Final Report of the Parliamentary Inquiry Commission on Construction], Handelingen Tweede Kamer 28.244, nr.6, Session Year 2002–2003. Staatsuitgeverij, The Hague.
Energy Research Centre of the Netherlands (ECN), 2009. Energy Efficiency Services, Market Development Energy and Energy Service Companies. ECN, Petten.
Eurostat Newsrelease, 2014. Renewable Energy in the EU28 (37/2014). Available via Eurostat Press Office. http://ec.europa.eu/eurostat/documents/2995521/5181358/8-10032014-AP-EN.PDF/91350d4a-4b57-4833-b9f0-32cfe0a6d360?version=1.0. Accessed: August 2015.
Faith-Ell, C., Balfors, B., Folkeson, L., 2006. The application of environmental requirements in Swedish road maintenance contracts. J. Clean. Prod. 14, 163–171.
GR1, Gemeente Rotterdam (Municipality of Rotterdam, 2011), Aanbestedingsprocedure van de gemeente Rotterdam [Tendering procedure of the municipality of Rotterdam], 2012 (accessed 16.07.15.) http://www.rotterdam.nl/Clusters/Stadsontwikkeling/Document%202013/vastgoed/groene%20gebouwen/Procesbeschrijving%20aanbestedingsprocedure%20Rotterdamse%20Groene%20gebouwen%20120419.pdf
GR2, Gemeente Rotterdam (Municipality of Rotterdam, 2011), Aanbestedingsdocumenten van de gemeente Rotterdam [Tendering documents of the municipality of Rotterdam], 2012 (accessed 16.07.15.) http://www.rotterdam.nl/aanbestedingsdocumenten
GR3, Gemeente Rotterdam (Municipality of Rotterdam, 2011), Procesbeschrijving aanbestedingsprocedure, formule Rotterdamse zwembaden [Process description of the tendering procedure: The Rotterdam swimming facility formula], 2012 Rotterdam. (accessed 16.07.15.) http://www.rotterdam.nl/Clusters/Stadsontwikkeling/Document%202013/vastgoed/groene%20gebouwen/Procesbeschrijving%20aanbestedingsprocedure%20Rotterdamse%20Groene%20gebouwen%20120419.pdf
Haas, Marco de, Kleingeld, A., 1999. Multilevel design of performance measurement systems: enhancing strategic dialogue throughout the organization. Manag. Account. Res. (3), 233–261.
Hammerschmid, G., Van de Walle, S., Stimac, V., 2013. Internal and external use of performance information in public organizations: results from an international survey. Public Money Manag. (4), 261–268.
Heijden, J. van der, 2015. Regulatory failures, split incentives, conflicting interests and a vicious circle of blame: the new environmental governance to the rescue? J. Environ. Plan. Manag. 58 (6), 1034–1057. http://dx.doi.org/10.1080/09640568.2014.907135.
Hoppe, T., 2009. CO_2 reductie in de bestaande woningbouw [CO2-reduction in non-residential buildings]. University of Twente.
Hufen, J.A.M., 2013. Werkt Energiebesparing via Aanbesteding? [Does energy conservation work through tendering?]. Tijdschrift Milieu J. Environ. 6, 33–37.
Johnsen, Å., 2005. What does 25 years of experience tell us about the state of performance measurement in public policy and management? Public Money Manag. (1), 9–17.
Kelman, S., Friedman, J.N., 2009. Performance improvement and performance dysfunction: an empirical examination of distortionary impacts of the emergency room wait-time target in the English National Health Service. J. Public Adm. Res. Theory (4), 917–946.
Kerpershoek, E., 2015. Medical Professionals' Responses to a DRG Performance Management System for Hospital Care in the Netherlands. Delft University of Technology, Delft.
Krozer, Y., 2014. Smart grid and EU 27 countries policy. In: Paper Presented at the ESEAI Conference at the University of Twente, Enschede, 24–25 April 2014.
Ministry of Finance, 2012. Rijksbrede modelovereenkomst DBFM(O) [Government-wide Model Agreement Design Build Finance Maintenance (Operate)]. Staatsuitgeverij, The Hague.
MNC, 2010. Milieu- en natuurcompendium [Environment and nature compendium]. http://www.milieuennatuurcompendium.nl. Accessed: August 2015.
Moynihan, D.P., Pandey, S.K., Wright, B.E., 2012. Prosocial values and performance management theory: linking perceived social impact and performance information use. Governance 25 (3), 463–483.
Osborne, D., Gaebler, T., 1992. Reinventing Government. Penguin, Reading.
Pollitt, C., 2013. The logics of performance management. Evaluation (4), 346–363.
Regieraad Bouw, 2005. Vernieuwingsoffensief Bouw, Werkprogramma 2005–2008 van de Regieraad Bouw [Innovation offensive in construction: 2005–2008 Working programme of the Regulatory Council for Construction]. Regieraad Bouw, Gouda.
Rietbergen, M.G., Blok, K., 2013. Assessing the potential impact of the CO_2 performance ladder on the reduction of carbon dioxide emissions in the Netherlands. J. Clean. Prod. 52 (2013), 33–45. http://dx.doi.org/10.1016/j.jclepro.2013.03.027.
Rietbergen, M.G., Rheede, A., van, Blok, K., 2014. The target-setting process in the CO_2 performance ladder: does it lead to ambitious goals for carbon dioxide emission reduction? J. Clean. Prod. http://dx.doi.org/10.1016/j.j.lepro.2014.09.046.
Rizzi, F., Frey, M., Testa, F., Appolloni, A., 2014. Environmental value chain in green SME-networks: the threat of the Abilene paradox. J. Clean. Prod. 85, 265–275.
Schoenmaker, Rob, 2011. De ingeslagen weg [The Chosen Way]. Delft University of Technology (in Dutch), Delft.
SER, 2013. Energieakkoord voor duurzame groei [Energy Agreement for Sustainable Growth]. Sociaal Economische Raad, Den Haag.
Slack, N., Johnston, R., 2010. Operations Management. Pearson Education, Harlow.
Smith, P., 1995. On the unintended consequences of publishing performance data in the public sector. Int. J. Public Adm. (2–3), 277–310.
Taskforce Energietransitie, 2006. Meer met Energie [More with Energy]. http://www.gezen.nl/archief/Meer-met-Energie-tcm24-187512-2.pdf. Accessed: September 2015.
Teelken, C., 2008. The intricate implementation of performance measurement systems: exploring developments in professional-service organizations in the Dutch non-profit sector. Int. Rev. Adm. Sci. (4), 615–635.
Turner, J. Rodney, 2004. Farsighted project contract management: incomplete in its entirety. Constr. Manag. Econ. 22 (1), 75–83.
UNU-Merit, 2012. Maastricht Economic and Social Research Institute on Innovation and Technology. Innovation Union Scoreboard 2011, Rotterdam. http://dx.doi.org/10.2769/32530.
Uttam, K., Le Lann Roos, C., 2015. Competitive dialogue procedure for sustainable public procurement. J. Clean. Prod. 86, 403–416.
Vakkuri, J., 2010. Struggling with ambiguity: public managers as users of NPM-oriented management instruments. Public Adm. 999–1024.
Vollebergh, H., 2014. Green tax Reform: Energy Tax Challenges for the Netherlands. PBL Netherlands Environmental Assessment Agency, The Hague.
Walker, Richard M., Boyne, George A., Brewe, Gene A., 2010. Public Management and Performance: Research Directions. Cambridge University Press, Cambridge.