

ENERGY PERFORMANCE CONTRACTING FOR BUILDING OPERATION AND RETROFIT: LESSONS FROM THE FRENCH EXPERIENCE *

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ABSTRACT

Over the past four decades, France has evolved a complex system of performance-based contracting for the operation of heating systems in buildings and larger industrial and district heat facilities. Some U.S. observers consider the French heating service contracts as a model for the emerging energy services industry in the U.S. The assumption is made that contracting to pay an agreed-upon amount for "delivered heat" can sidestep the traditional reluctance (or inability) of building owners to invest in energy-saving retrofits—while also providing an effective incentive for long-term energy management.

This paper takes a closer look at the actual experience with heating service contractors ("exploitants de chauffage") in France, and some possible lessons for the U.S. Of course, direct comparisons between France and the U.S. should be made with caution, considering the differences in institutional structure, building ownership patterns, and levels of building energy use and cost. Nonetheless, U.S. policymakers should note the paper's conclusion that French performance contracting has yet to demonstrate, in practice, the advantages claimed for it in theory.

Heating service contracting as practiced in France is much more complicated than assumed by its admirers abroad, and French government intervention in the energy service industry has been far more intensive than any policies contemplated in the U.S. Even so, the French system of performance contracting has not fully overcome the barriers to retrofit investment or to sustained, energy-efficient building operation and management after retrofit. This teaches us, perhaps, to have more modest expectations from any incentive scheme that is designed, on a "macro" level, to influence complex, *localized* decisions. Finally, the paper notes that there are large gaps in the data needed to thoroughly evaluate the French contracting system; provisions for more careful tracking and evaluation of results should be a foundation for any future efforts to promote energy performance contracting, whether in France or the U.S.

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AN OVERVIEW OF ENERGY PERFORMANCE CONTRACTING

As the field of energy efficiency matures, both policy-makers and practitioners are shifting their attention from *what* to do to *how* to do things better. In particular, there is increased interest not only in the rate of implementation of physical improvements (“retrofits”), but in assuring that facilities are well-managed, and thus continue to reap the full benefits available, in theory, from energy-saving technologies. This is reflected in the growing popularity, in the U.S. and elsewhere, of performance contracting for energy services (Weedall *et al.*, 1986). Performance contracts shift to a private firm much of the responsibility for retrofitting or energy management, and provide payments to the contractor based on actual energy or cost savings.

The development of “energy service companies” in the U.S. is a relatively recent phenomenon, dating from the late 1970’s (Praul *et al.*, 1982; Sant, 1980). Unlike in France, growth of the U.S. energy services industry has been driven largely by special tax benefits, and by the attractiveness of “third-party financing” to cash-short public and private building owners unable (or unwilling) to finance energy-saving measures—even very profitable ones—on their own. Such firms offer a range of audit, retrofit, financing, and operating services, along with performance guarantees or formulas for sharing the savings and risks of a project. Some energy service firms are outgrowths of architectural, engineering, equipment manufacturing, real estate development, or building management companies, while a few are non-regulated subsidiaries of electric or gas utilities (Weedall, 1986).

The “National Association of Energy Services Companies” (NAESCO) was created in 1983, to represent the interests of this new industry in federal tax legislation, and to help members with marketing strategies and complex legal issues related to taxes, financing, and performance contracts. As of 1984, there were over 100 energy service firms active in the U.S. Most “third-party” energy financing in the U.S. has involved cogeneration, wind power, or other alternative energy projects, but more than 2000

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government and privately-owned buildings are served by performance contracts (Klepper, 1986). Shared-savings financing is a rapidly growing market in Federal buildings, federally-assisted public housing, and Defense Department facilities, as an "off-budget" alternative to federal spending (DHR, 1985). Several state and local governments, and a few utilities, have launched demonstration projects to promote shared-savings performance contracting and third-party financing (Wolcott, 1986; Weedall, 1986; Brown and Reeves, 1985).

Advocates of a growing energy services/shared-savings industry in the U.S. often cite the long history of French success with performance-based "heating service" contracts (O'Haire, 1979; McCaughey, 1980; Carlisle *et al.*, 1983; Rohman, 1983; Greider, 1984). The French system, according to many proponents, is a model of how a well-designed incentive system can overcome most of the barriers to energy-saving retrofits and building management. In France, the contractor is paid for the actual *service* required—a specified level of heating comfort. According to theory, this payment method creates the necessary incentives for the contractor to make rational trade-offs between investments in energy efficiency (or improved operation and maintenance) and savings in fuel costs.

In practice, though, contracting arrangements in France are considerably more complex, and their incentive effects far less obvious. This paper takes a closer look at the French experience with heating service contracting for the past fifty years. In evaluating this experience and its relevance to the U.S. we address the following questions:

- (1) How **successful** has the contracting system been? We define success primarily in terms of the energy-efficient provision of heat in buildings, but also in the sense of market penetration, the ability to overcome building owners' reluctance to invest in efficiency, and the continued efficient and reliable operation of systems over the long term.
- (2) What **public policies** have been used to stimulate customer demand for heating service contracting or retrofits, to protect consumer interests, and to structure incentives that improve contractor performance?
- (3) What **lessons** have been learned that might be instructive for the U.S., as we attempt to move toward performance-based contracting for energy retrofits and building management?

The next sections trace the history of French heating service contracting, its current status, and possible future. We examine the (limited) empirical data on performance contracting results in France, and conclude with some possible lessons for U.S. policy.

THE EVOLUTION OF FRENCH HEATING SERVICE CONTRACTING

The French system of contracting for heating system management originated over fifty years ago as a free "promotional service" offered by some small, local coal and oil distributors, who also assumed responsibility for boiler operations and basic maintenance (Bonaiti, 1983). A few local boiler repair firms began to offer similar services, but the industry was still characterized by individual "artisans" or very small firms serving localized markets and a stable clientele. In the 1930's, a few firms started to experiment with fixed-price service contracts, covering all the fuel and operating expenses required to provide a "comfort level" of 20 ° C (Merle, 1985).

The industry's transformation began during the World War II Occupation, when fuel was in short supply. Building owners not only had a strong incentive to manage heating systems efficiently, but were often more than happy to "purchase heat," leaving to their contractor ("exploitant de chauffage") the problem of how to procure enough fuel (Rohman, 1983). Growth of the French heating service industry accelerated during the postwar urban construction boom, with its emphasis on large apartment blocks and new or expanded district heat systems. Many smaller firms that had served local markets were acquired by large, regional or national fuel distributors, engineering firms, or equipment manufacturers. These larger firms, with their broader technical base, were better able to compete for the operation of large, automated heating plants serving multi-building complexes, industrial facilities, or district heat systems.

After the oil shortages and price increases of the mid- and late- 1970's, French consumers faced a further round of oil price shocks in 1984-85, due to the plunging franc-to-dollar exchange rate (which directly affected the price of oil imports, quoted in dollars). This series of fuel price increases had a major impact on the heating service industry. Although price increases initially meant larger profits for some oil suppliers, pressures were also mounting from building owners, renters, and local governments to reduce energy costs—sometimes by renegotiating existing heating service contracts (Bonaiti, 1983). By 1985, energy costs and other "tenant service charges" had become a significant part of most household budgets, adding as much as 75 percent to the basic rent. A 1981 survey found that fuel costs alone had increased average monthly payments in multi-family buildings by about 50 percent (Javault and Largier, ca. 1984). Another study found a similar energy-to-rent cost ratio in low-income public housing (Meunier *et al.*, 1984). Rising energy costs, and their increased significance compared to (price-controlled) rental costs, made energy management in general, and heating service contracting in particular, increasingly visible political issues in France.

A statistic often quoted in the U.S. is that heating service contractors serve "as many as 70 percent of France's apartment and commercial buildings" (Rohman, 1983; Greider, 1984). While contractors do operate up to 80 percent of the heating systems in low-income public housing (Meunier, *et al.*, 1984), other data suggest that for the buildings sector as a whole, this 70 percent estimate may be overstated by at least a factor of two. According to data from the national association of heating service contractors (SNEC, the "Syndicat National des Entreprises de Gestion d'Equipements Thermiques

et de Climatisation”), heating systems operated by its member firms used about 9.6 million tons petroleum-equivalent (Mtep) of fuel in 1983. This represented about 35 percent of total (1982) fuel use in all French multi-family and commercial buildings* (Halbronn, 1985; MIR, 1984; AFME/EPERE, 1985). Other building stock data suggest similar orders of magnitude. In 1981, SNEC members provided heating services for 3.5 million dwellings and 350 million cubic meters of non-residential buildings (SNEC Panorama, 1981). This represented about 26 percent of all occupied, heated dwellings, and about 22 percent of the total heated volume in commercial and industrial buildings (AFME/EPERE, 1985).

The heating service market has continued to grow during the past decade: according to SNEC data, the total capacity of heating systems managed by its members increased by 125 percent from 1971 to 1983 (Halbronn, 1985). However, most of this growth has been in contracts for system operation and maintenance only, not fuel sales. This trend is a matter of increasing concern to the industry, since fuel profit margins represent the largest revenue source for many firms. Another issue facing the industry is the dramatic shift away from central, fuel-fired heating systems in new construction. We return to both of these issues in a later section.

FRENCH PERFORMANCE CONTRACTING - LEGAL STRUCTURE AND INCENTIVES

Types of Contracts

U.S. observers appear to have an over-simplified view of French heating service contracts: (1) that they are all based on a single, fixed payment that covers both fuel costs and operating services, and (2) that this reimbursement formula creates a sufficient right incentive for the contractor to make rational trade-offs between fuel purchases and investments in energy-saving measures. The reality of energy performance contracting in France is considerably more complex. The fixed-price (or “forfaiture”) type of contract is only one of several categories defined by law—and represents a *declining* share of new or renegotiated contracts. The contractor’s actual degree of flexibility and incentive are limited; in practice his willingness to trade off fuel purchases against efficiency investments may differ little from that of the building owner himself.

The complex statutes regulating French heating service contracts are of fairly recent origin; the current rules date from about the mid-1960’s. Major revisions were adopted in 1974, 1977, and 1981, aimed at easing the burden of higher oil prices and strengthening incentives for energy-efficient operating procedures (Bonaiti, 1983; CCTG, 1978). Government regulations classify heating service contracts both by the type of

* This fraction would be a few percent lower if we considered fuel use by district heat systems, also a target market for heating service contractors. Conversely, the percentage might increase if we had market-share data on contractors who are not Association members. While it includes most large firms, SNEC members do not represent the entire market.

services offered and according to the formula for reimbursing fuel and operating costs. Three major types of contract services are defined:

- Category P1: Provision of **heating fuel** by the contractor (generally, this means actual delivery of oil or coal, but in some cases the contractor assumes responsibility for payment of the customer's electric or gas utility bill).
- Category P2: System **operation and maintenance (O&M)**, including minor repairs (generally paid as a fixed, agreed-upon sum).
- Category P3: **Large repairs or major renovation** of the heating system (when P3 services are covered by a single contingency fee, the contract is referred to as a "total guarantee").

There is also a fourth category (P4), rarely used, which reimburses the contractor for his direct financing of replacements or major additions to the heating system (or, on rare occasions, for thermal integrity improvements to the structure). These projects are not covered by the normal contract payments; each case requires specific approval by the building owner (in other words, the contractor may provide capital financing, but no "risk protection" for the building owner). The fact that P4 is defined as a separate category of service, requiring the building owner's approval and supplemental payments, underscores the limited role of French heating service contractors in decision-making and financing of major energy-saving retrofits.

French regulations further categorize heating service contracts according to the method of calculating payments (CCGT, 1978):

- "**Fixed-price**" (M.F.): The contractor and building owner agree on a single fixed price, based on historical costs, that includes all fuel, operation, and maintenance services required to provide a specified level of *heating comfort* (and hot water, where appropriate), as well as to maintain the heating system in good operating condition. This type of contract, with its so-called "global incentive" for the contractor to optimize fuel costs *vs* energy-saving investments, is the method of payment traditionally favored by the industry and the one best understood by observers outside France. However, as discussed below, its popularity with building owners has been in decline.
- "**Temperature-Indexed**" (M.T.): As above, a single payment is made for fuel, operation, and maintenance, but the space heating component of fuel use is adjusted for actual heating degree-days each year. Compared with the first type (M.F.), this payment method—again, in theory—preserves the same contractor incentives, but assigns both the risk and benefit of annual weather fluctuations to the owner rather than the contractor.
- "**Metered Heat**" (M.C.): Reimbursement is based on the quantity of heat actually delivered from the boiler (measured with a calorimeter), plus fixed payments for O&M. In principle, this system has the advantage of costs which more accurately reflect the building heat load (adjustments for outdoor temperature or

degree-days may have inherent inaccuracies), and it gives the operator an incentive to manage the system efficiently to meet a given load. However, unlike the first two payment methods, the contractor has no incentive to avoid overheating the building, since payments are based on delivered heat.

- **“Purchased Fuel” (C.P.):** In this type of contract, payment is based on the quantity of fuel actually consumed, plus fixed O&M payments. This method provides no direct financial incentive to the contractor for optimizing operation or retrofit investments. The only performance incentives here are indirect—a function of professional norms concerning “accepted practice,” plus effective oversight by the owner.
- **“Operation only - no fuel” (P.F.):** Fuel is purchased from a separate supplier, with (fixed) payments to the heating service contractor for operation and maintenance only.

It is worth noting that the first four contract types, involving fuel provided by the contractor, also allow adjustments for fuel cost inflation. These inflation adjustments, set annually by the government, may not fully reflect changes in an individual distributor’s fuel costs, but the net effect is that the building owner rather than the contractor retains most of the risk of fuel cost increases.

Regulations adopted in 1977 provide for an optional “shared-incentive” clause to be added, at the building owner’s request, to any type of contract. This shared-incentive clause provides for a split of both savings and “excessive” (higher-than-predicted) consumption; the building owner receives two-thirds of the savings and pays one-third of any consumption above the (weather-adjusted) predicted usage. Such complicated incentive agreements work effectively—and are perceived as fair—only where baseline energy use is known (or estimated) accurately, energy metering is reliable, and proper corrections are made for weather and for changes in operating conditions (CNET-HLM, 1984). This provision differs from most shared-savings agreements in the U.S., which are often tied to specific retrofit measures. However, a small but growing fraction of U.S. shared-savings agreements now focus on facility operation and low-cost O&M measures.

Incentives for Contractor Performance

As these brief descriptions show, only those contracts in the first three categories are really performance-based; they reimburse the contractor for fuel and operating costs to provide a fixed inside temperature (or, for the M.C. type, base payments on the amount of heat actually provided to the building). In theory, buildings operated under performance contracts should be more efficient, as should those with “shared-incentive” clauses. Finally, we would expect to see evidence of higher retrofit rates where the heating service contract is performance-based, or includes a shared-savings clause. Except for a few individual case studies of contracts that have been renegotiated (see below), the hard data on energy efficiency and retrofit penetration rates, by type of contract, are

quite limited. Those data that are available do not support the above hypotheses.

Some information on heating energy use and costs, by type of contract, was obtained through a 1981 survey of 700,000 low-income housing units (Meunier, 1984). The survey was conducted by the CNET-HLM, an organization that provides technical services to the HLM, a national association of local public housing authorities. The CNET report on the survey concluded that, for oil- and gas-heated buildings, average fuel costs per square meter were *highest* for fixed-price contracts and lowest in cases where heating systems were managed by in-house personnel, rather than a contractor. This is one basis for the CNET's assertion, in direct contrast to industry claims, that fixed-price "M.F." and "M.T." contracts, in the absence of shared-savings clauses, are at least 10 percent more costly for the building owner (Meunier, *et al.*, 1984 interview). We return to this issue later.

One problem with the simple tabulations in the CNET report is that they did not control for other factors which affect fuel use or total heating cost, such as fuel type and fuel cost per unit, building location (climate region), and presence of energy-saving features. A separate analysis, which took into account fuel type and unit cost as well as contract type, showed that there was *no clear pattern* relating average heating costs to the type of contract (Harris, 1985). In principle, data from this CNET survey (or from a 1983 update, with less detail on contract types) should be analyzed using multiple regression techniques to hold constant all factors other than contract type.

Similarly, there are no widely published data on the extent of retrofits initiated by heating service contractors, or on whether retrofit rates vary according to the method of contract reimbursement. Anecdotal evidence suggests that, in many cases, major efficiency improvements are recommended by the contractor mainly in order to "close a deal," i.e., at the start of a contract or just prior to the renewal dates (Bastin, 1984). Heating contractors are rarely involved in retrofits to the building shell; they consider their expertise confined to boilers, distribution systems, and controls. For one of the contract types defined above (M.C.), where payments are based on metered heat delivered by the system, there is actually a financial *disincentive* for the contractor to propose shell improvements that would reduce heating loads. The same problem occurs where payments are based on the quantity of fuel purchased (type C.P.). On the other hand, contractors are often willing participants in boiler replacements or modifications that involve fuel-substitution—provided that the new fuel is one that they sell.

If the above discussion seems overly critical of heating service contractors, it should be noted that the industry as a whole has actively contributed to the development of national policies and plans for energy management, and that many firms have been quite responsive to specific program initiatives by the French Energy Agency (AFME) to promote building energy audits, and by the Ministry of Urbanism, Housing, and Transportation (MULT) to encourage retrofits with guaranteed energy savings (SNEC, 1981-85). But the fact that there was a perceived *need* for special energy management programs (including contractor subsidies) in itself suggests that the performance incentives theoretically built-in to heating service contracts is, at best, imperfect.

Renegotiating Fixed-Price Contracts - Specified Services vs Guaranteed Results

Since 1971, even before the first Oil Embargo, the CNET-HLM has been concerned about the impact of heating service contracts on energy operating costs for public housing (Robin, 1985; Bonaiti, 1983; HLM, 1982). It has urged local housing authorities to renegotiate their heating service contracts, prior to expiration, with the following objectives:

- To adjust (reduce) fixed-price fuel payments (P1) to account for fuel savings from retrofit measures.
- To *increase* the funds allocated to operation and maintenance (P2, P3), based on a belief that O&M effort and expenditures have not kept pace in recent years with the increasing complexity of heating systems and controls.
- To specify in detail the operation and maintenance services to be provided and the minimum required contractor effort, rather than relying on a theoretical incentive for the contractor to invest enough of his total payment in O&M.
- To encourage shared-incentive clauses, and require that building owners (i.e., local housing authorities) are provided with timely, accurate information on actual energy consumption.
- To shorten the duration of contracts—some existing contracts are written for periods of 20 to 30 years.

The CNET's philosophy was summed up in a recent statement by the head of their technical staff:

Our country is fortunate to have available highly competent professionals who are specialists in the management of heating systems; thus, direct operation of these systems by the building owner is rather rare. But paradoxically, this situation has not served the interest of energy management, since it is the building owner who retains the means to initiate the necessary technical studies and investments. During the era of cheap, abundant fuel, with little emphasis on maintenance, the problem of furnishing heat was simply delegated in its entirety to the contractor. Today, despite their good-faith effort, heating service contractors cannot make all the decisions on behalf of the building owner—it is the latter who must take the initiative. To do this, the contractual relationship between building owner and contractor must be very clearly defined, and must introduce a dynamic that is supportive of energy management actions. (P. Robin, 1985-6)

Statutory changes adopted in 1977 addressed each of the CNET's objectives, but in a permissive rather than mandatory fashion. Even with legislative authority, the CNET reasoned that, without special efforts, there was little chance of rapid reform in contracting practices. Consequently, the CNET began to provide technical assistance, for a fee, to local housing authorities in renegotiating their existing contracts. As of 1985, the CNET had helped to renegotiate contracts for about one million public housing units,

representing roughly one-third of all public housing. For comparison, this is 25 percent *more* than the total number of low-rent dwellings in France retrofitted, to date, with energy-saving measures (Robin, 1985-86; Meunier *et al.*, 1984). The CNET also claims that heating service contract renegotiations have, in the aggregate, saved housing authorities and their tenants nearly *400 million francs/year*—more than the combined savings estimated from all retrofit measures in this sector (Robin, 1985-86).

Another figure cited by the CNET is that contract renegotiations lead to an average 15 percent reduction in total heating costs for fuel (P1) plus system operation (P2) (Bonaiti, 1983; Gruget, 1984). This is an impressive number, but unfortunately there are few hard data to support it.* However, the CNET did have data available from two case studies of low-rent housing projects, with 68 and 115 dwellings, respectively (Meunier *et al.*, 1985 interviews). The modified contracts for these projects called for total heating costs at the two sites to be reduced by 9 percent and 14 percent. Actual savings (degree-day adjusted) were even higher: 17 percent and 29 percent. Although these savings were achieved while the contract negotiations were still underway (a process that can take one to two years), the CNET believes that it was the negotiation process itself that was largely responsible for significant changes in the contractor's operating practices. Unfortunately, these results are further clouded by two factors: (1) the prior year's "baseline" fuel cost was estimated by the contractor (not documented by actual fuel delivery records), and (2) while the contract changes were being negotiated there was also a turnover in management of these housing projects—it is possible that other changes introduced by the new, more activist manager may have reduced tenants' use of heating and hot water.

Ideally, the best way to verify the savings claimed by CNET from renegotiating contracts would rely, not on cross-sectional survey data, but on an analysis that tracks changes in energy use and costs, for a statistical sample of housing projects over several years before and after contract renegotiation. The analysis should also take into account changes in weather, building use, energy retrofits, and other factors. One difficulty is that prior-year data on fuel use and cost (P1) may be difficult to obtain for contracts of the M.F. type, that used a fixed-price reimbursement prior to renegotiation. Within its own public housing sector, the CNET appears to have little need for such results in order to effectively market its renegotiation services. However, contract renegotiation is proceeding much more slowly in other buildings sectors, where there are no organizations playing a role equivalent to the CNET (Bonaiti, 1983; Meunier *et al.*, 1985). Extending the contract reform process to other types of public and private buildings may yet require better evidence of the dramatic results claimed.

Industry Views of Contract Renegotiation

Surprisingly enough, not all contractors are solidly opposed to modifying an existing agreement. Some, for example, are more than willing to renegotiate, if their present

* As discussed above, the simple cross-tabulations of CNET survey data on heating costs *vs* contract type are not reliable because they fail to account for other important variables.

contract expires soon and a cooperative attitude might mean the difference between a contract renewal—even if only for 5 to 8 years—and losing the client. The views of the heating service industry as a whole, however, differ sharply from those of the CNET on the “best” form of contract. In particular, the industry opposes any shift away from comprehensive, fixed-price contracts covering both fuel and operating services. The industry strongly resists contracts which cover operation and maintenance only (no fuel purchase), and those which specify in detail the O&M services to be provided.

These views are well summarized in a statement by one official at the 1983 SNEC convention:

This future which we envision can only be achieved if we are able to overcome two serious illusions: The first consists in believing that the client can obtain an economic optimum without allowing the heating service contractor to provide fuel, which represents 80 to 90 percent of heating costs. To reduce the heating service professional to the simple role of serviceman may make it easier to monitor energy use, but without any assurance that such use is reasonable—let alone minimal. Since it is human nature that one only excels in his field to the extent that he has an overall responsibility, and is paid accordingly, it makes sense to entrust the heating service contractor with the responsibility to deliver a product—heat—at a competitive price; why should the client care about the components of that price...? If you are buying a car, you compare performance and price, you don't ask the manufacturer how many kilograms of steel he used, nor how many hours it took the workmen to assemble it.

The second illusion consists of wanting to transform these *results*-oriented contracts, which we have always considered the essence of our profession, into *means*-oriented ones. Requiring a firm to simply carry out a specified list of activities, often with a minimum number of people and man-hours, is a harmful trend, since it restricts any alternative approach and limits productivity gains, which are important for positive client relationships. (P. Fretz, 1983; emphasis added)

Similar views were expressed in my interview with an executive of an energy service contracting firm, a subsidiary of a major energy development and fuel distribution conglomerate (T. Merle, 1985 interview). He echoed the SNEC statement, that heating service contractors are members of a highly competent and steadily evolving industry, which will continue to develop and use its expertise most effectively only in response to market pressures—i.e., if the government stops trying to intervene in contractual relationships with clients. In his view, contracts renegotiated along the lines favored by the CNET (shorter contract periods, shared-incentive clauses, explicit O&M services and reporting of fuel use, separate contracts for O&M and fuel purchase) posed a serious threat to the entire structure of the industry. Without revenue from fuel sales, he believed, most heating service companies would not survive in the long term. Once again, though, this individual had no actual data to support the industry's position that

systems operated by contractors perform better, on average, than those run by a building owner's in-house staff.

Despite the industry's resistance, there is some evidence that the CNET's campaign for contract reform, combined with legislative and market pressures, is having some impact on the contract process. The limited data available on national trends point to: (1) an increasing percentage of contracts involving maintenance only, without fuel purchase, and (2) a shift from fixed-price contracts (M.F., M.T.) to other forms. Annual data from SNEC on contracts held by its members show that the number of maintenance-only contracts grew faster than any other type, increasing from 19 percent of the total in 1973 (based on boiler capacity) to 36 percent by 1983 (Halbronn, 1985). As noted above, this is a growing cause of concern to the industry, since operation and maintenance represent only about 10 percent of the total cost of providing heat to a building—and, in most cases, an even more modest share of the profit margin (Javault and Largier, ca. 1984).

Other data on the distribution, by type, of heating service contracts are available for about 1300 low-income rental buildings managed by local housing authorities, for both 1981 and 1983 (Meunier *et al.*, 1985). These data show that the percentage of fixed-price contracts (M.F. and M.T.) in public housing declined from 31 percent to 26 percent in just two years. Over the same period, there was an increase in the use of shared-incentive clauses, from 27 percent to 37 percent.* This tendency to abandon fixed-price contracting in favor of other options, especially shared-incentive contracts, is strongest in the low-income public housing sector, due in part to a well-developed national organization of local housing authorities and, of course, to the CNET's advocacy and technical assistance efforts.

Up to now, the French Energy Agency (AFME) itself has paid little attention to issues involving heating service contracts; one reason is that the Agency sees its primary mission as one of improving energy *efficiency*, rather than reducing owner or tenant *costs*. When heating service contracts are renegotiated, cost savings to the owner or occupant are not always due to improved energy efficiency; there is also an element of *cost reallocation* between the contractor and client. However, at least one AFME regional office has recently begun emphasizing heating service contract issues, as part of a program to provide municipal governments with technical help in energy management "beyond the retrofit stage" (Petrongari, 1985).

EVALUATING THE HEATING SERVICE CONTRACT SYSTEM

We have repeatedly emphasized that, despite an active debate in France over alternative forms of heating service contract, there is a lack of empirical data comparing heating system performance, energy use, and costs by type of contract—as well as

* There may be some inconsistency between the 1981 data, expressed in terms of (multi-building) housing projects, and 1983 data, calculated by number of buildings.

between (otherwise similar) buildings managed by contractors and by in-house personnel. But are there less direct indicators of how good a job contractors are doing, in the aggregate? One such indicator can be calculated from SNEC data concerning trends in fuel use and rated capacity of heating systems operated by its members; the ratio of fuel use to capacity is at least a rough index of operating efficiency. Between 1977 and 1983, this ratio (weather-corrected) declined 28 percent, from 0.152 to 0.119 tons-equivalent of oil (tep) per kW of capacity (Halbronn, 1985). However, this trend reflects more than just improvements in heating system operating efficiency; presumably part of the gain resulted from energy-saving retrofits and changes in building operation (such as lower indoor temperatures), which reduced the loads to be met by heating systems. Systems not operated by contractors probably realized some gains over the same period, but there are no comparable statistics.

We can also assess heating service contractors' overall performance through opinions expressed by past, current, and future clients. While such data are, once again, limited, there are useful results from a 1984 survey covering 30 smaller communities in the north of France (Bastin, 1984). Responses to the survey illustrate the diversity of experiences with—and opinions about—heating service contractors. About one-third of the towns, mostly the larger ones, now use a heating service contractor for their municipal buildings. However, the most positive statements tended to come from local authorities that did *not* use contractors, but instead managed their own buildings:

This idea of a heating service contract, we've thought about it; you simply turn over all the boilers to this firm, and then never have to worry about anything. They take care of updating the systems, and maybe they'll even take care of all this energy efficiency stuff. You pay them pretty well, I suppose, but at least you don't have to worry; they're the ones who are responsible. (Bastin, 1984, p. 17)

Often, the appeal of a heating service contract is one of administrative simplicity, particularly for small municipalities with only limited staff resources:

The contract will be a complete package and in addition, our distribution system will be completely renovated at the end—it's the contractor who wanted to do that... We also have some financing options. We'll have to extend the contract for 10 years if we have the contractor do our financing, but it will be just one more item buried in the overall cost. In terms of the municipal budget we'll only have that single cost to pay, and we won't have to deal with a separate lender. There will be only one person to deal with; that will make it much easier for us. (Bastin, 1984, p. 16)

Communities that had previously used a contractor to operate their buildings and then decided to use their own staff cited several reasons for the change. In addition to cost and performance, they were concerned with responsiveness to occupants and with the principle that public agencies should, in some cases, provide services themselves. The following comments are from personnel in two cities that had not renewed previous service contracts:

They never talked to us once about saving energy efficiency ever since the 1973 oil crisis, and never proposed any improvements. Moreover, the P1 [fuel cost] is a fixed-price, so their interest was to use as little as possible. They saved energy by cutting back [on service], so we started to have complaints; costs sometimes varied by a factor of two for identical rooms, things like that, so of course we weren't happy... When we manage things ourselves we can get serious, start managing the budget better, and avoid such abuses. We began to notice the improvement as soon as we started operating the municipal heating plants. (Bastin, 1984, p. 18)

Heating service firms? We've given up that idea. OK, first it's difficult for us to settle the contracting arrangements, and second, why go to all the expense of paying for a separate organization? No, direct operation, that's the best. And then you always have the users who complain, and that [contractor] would add a separate barrier. With direct operation you can respond much quicker. With consumers, it's good to be able to give them an immediate response. In this case, rational management and political philosophy go hand in hand: there's no reason to contract with someone else for something that a public agency can do itself... (Bastin, 1984, p. 18)

A very significant finding of this study was that, whether the heating system was operated by a contractor or by city personnel, a key ingredient to effective energy management was the extent of interest and involvement on the part of elected officials—which in turn contributed to a sense that they could influence energy expenses. This active involvement by both local officials and municipal staff was widely seen as the key to an effective relationship with the heating service contractor. It contrasts sharply with the notion that "turning everything over to the contractor" can be a simple, effective way to overcome institutional barriers to retrofit investments and long-term energy management.

FUTURE PROSPECTS: BROADER SERVICES FOR A NARROWING MARKET

Perhaps the most serious issue facing the heating service industry in France is the continued erosion of its primary market: multi-family buildings and large complexes with fuel-fired central boilers. French statistics on new construction show a dramatic shift *away* from both fuel heat and central systems. In just five years, from 1979 to 1984, the saturation of electric heat in new single-family construction (representing two-thirds of all new homes) increased from 55 percent to 87 percent; electric heat in new multi-family buildings rose from 46 percent to 66 percent (T. Meraud, 1984). This movement from fuel to electric heat has been reinforced by even longer-term trends toward use of individual apartment heating in new multi-family buildings, as well as a shift from multi-family to single-family construction. The net result, of great concern to the heating service industry, is that while multi-family buildings with central heat represented 46 percent of all new construction in 1974, they had dropped to only 4 percent of the market by 1981 (SNEC Panorama, 1983; AFME/EPERE, 1985).

The only relatively bright spot for the heating service industry has been district heating, a natural market for combined fuel/operating contracts. Expansion of district heat systems has been strongly favored by government policy; the Eighth National Economic Plan called for doubling the use of district heating between 1980 and 1990, to reach a total market share of 10-15 percent of residential and commercial heating (SNEC Panorama, 1981).

In addition to a shrinking market, energy service firms face another major source of uncertainty in the recent decline of world oil prices, reinforced by the improved franc/dollar exchange rate (which further reduces the cost of imported oil in France). The net effect on the heating service industry of sharply lower oil prices is difficult to predict. On the one hand, lower oil prices may reduce profits on fuel sales, lengthen the payback period for contractors that have invested in efficiency measures, and make it more difficult to sign new contracts, as building owners become less interested in controlling energy costs. On the other hand, lower oil prices may simply encourage contractors to emphasize service and convenience, rather than efficiency and energy cost savings. It may also become easier for the industry to return to its preferred pattern: contracting at a fixed price for both fuel and operating services.

The requirement for increased technical sophistication in the operation of heating systems is another source of pressure for change in the industry. From its decidedly "low-tech" origins—small, local coal and oil suppliers who gradually took over maintenance tasks and then full operation of boilers and distribution systems—the heating service industry now has the responsibility to operate and maintain an increasing number of large, complex systems, many with computerized controls. In a small but growing number of cases, the contractor (or the building owner, or both) uses computer-based systems for remote monitoring or control (Le Bellac, 1984; Pennequin, 1984). The industry's national association, SNEC, has responded its members' needs for greater technical sophistication with an extensive series of training programs and newsletter articles highlighting new energy technologies and alternative fuels.

Finally, there is a likely trend toward diversification for the heating service industry. A few firms are starting to offer their clients additional (non-energy) services, such as building maintenance, protection (fire, security), and special training for on-site personnel. With some changes in government regulations (and a return to higher oil prices), heating service companies may find an attractive market in direct financing of major heating system (and building shell) improvements, possibly through lease-back arrangements similar to those practiced by U.S. energy service companies (and by equipment vendors in both countries).

To summarize, the French system of heating service contracting grew to its present size in large part because of structural changes in the postwar economy, accompanied by nearly three decades of cheap energy. In the mid-1970's, the industry benefited temporarily from rapidly rising fuel prices, but was then subject to heavy consumer pressure to help reduce costs, and strong encouragement by the government (and groups like the CNET) for major transformations in the well-established pattern of stable, long-term

agreements that placed the contractor in virtually complete charge of operating heating systems to meet their customers' needs. While it has vigorously argued in favor of the traditional, fixed-price contract, the industry has yet to clearly demonstrate that such contracts result in more cost-effective management of heating systems, compared with alternative forms of service contract—or with direct management of a facility by in-house staff.

At the same time, the industry must respond to other pressures, such as the struggle to maintain market share in the face of a radical shift to individual electric or gas heating systems in new residences, and the increasing technical complexity of new heating systems, controls, and alternative fuels. Although the French heating service industry faces a difficult transition at home, it continues to inspire interest and praise in other industrialized countries, including Belgium, Switzerland, Holland, the U.K. and, of course, the U.S. At a distance, the French system is an ideal model that appears able to overcome many institutional barriers to effective energy management. Some of the perceptions held abroad might surprise the industry's critics (and allies!) within France.

In the concluding section, we consider some possible lessons of the French experience with heating service contracts for U.S. policy in promoting energy performance contracting.

IMPLICATIONS FOR U.S. POLICY

Performance Incentives - The Limits of a "Macro" Approach

As U.S. energy conservation policy has assumed a stronger "market orientation," there has been growing interest in energy service contracts that appear to provide a simple, built-in incentive for economically rational results. The French system of heating service contracting seems to offer a way around the many barriers to economically optimal investments in energy efficiency, and to good long-term energy management. In theory, a single performance-based payment for "heating comfort" gives the contractor the proper incentives to choose, on behalf of his client, between energy-efficiency measures and future cost savings.

In practice, though, we find relatively few French heating service contractors who respond to contractual incentives by making major investments in improved heating system efficiency. In most cases, they see their role as one of properly operating the existing heating system and maintaining it in good running condition. Where contractors do recommend major improvements—at an added cost to the owner—this is often in order to sell a new contract or renew an existing one, or else in response to specific government programs to promote (and subsidize) contractor participation in audits and retrofits. Heating service contractors are rarely involved in thermal improvements to the building shell. Shifting the responsibility for efficiency investments and good building management from the owner to the heating service contractor may only shift the *barriers*, as well, not remove them.

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