DFID Project R7413:
Mechanisms to Improve Energy Efficiency in Small Industries

Part Five: Conclusions

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PART 5: CONCLUSIONS

PREFACE

The main objectives of the DFID Project R7413 are to promote mechanisms to increase the adoption of energy efficient technologies and practices in the case of one small scale industry sector in India and Ghana. The sector chosen in India is the ceramic sector. The focus of the work has been in one large cluster of ceramic firms in Khurja, India. The process followed in the project has been to:

- map the operational practices in a sample of units and develop working relationships with relevant stakeholders;
- examine existing practices to determine possible improved practices that could be adopted including new technologies in the main energy using parts of the operations, and,
- analyse the extent to which energy efficiency gains can be achieved in a manner that is also financially attractive to the firms.

Finally, the intention of the project is to examine the barriers to the adoption of improved technologies and to suggest specific interventions to reduce the barriers. This is provided that the suggested improvements are found to have a sufficiently high rate of financial return, making them potentially sustainable without subsidies.

The work done in India is detailed in the following sections:

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CONCLUSIONS

Reframing the Issues: Micro to Macro and Institutional Arrangements

In Part One we discussed that the potential socio-economic contribution of small manufacturing enterprise is large and will remain so for a long time. In India the sector has grown significantly during the last three decades and has played a critical role in industrial growth. The total number of SME units in the country is estimated to be around 0.31 million employing 17.1 million people as of March 1999 thus being the second largest employer of human resources after agriculture in India. The total production in the sector was US$120 billion of which around US$11 billion has been towards exports from India. The SME sector thus accounts for around 40% of total industrial production and 35% of the country's total exports. It is clear that this sector must continue to play an important role for the foreseeable future if economic growth rates are to be increased, while also increasing employment opportunities and equity.

Research, knowledge generation and interventions in favour of the SMMEs can be categorised into three broad levels, the macro, meso and micro. At the macro level these interventions are directed at the broader policy and regulatory framework affecting small enterprises. This includes measures that are taken by government to control the economy and the role that the private sector performs in it. Programmes that reform the macro-policy environment to achieve what many refer to as a more "enabling environment" for small enterprise development may include the removal of obstacles, "bottle-necks" or constraints on small enterprise growth such as simplification of registration procedures, taxation rules, improved access to foreign exchange, credit and physical facilities, and macro conditions such as inflation, exchange and interest rates, etc.[1] While there are many past policy errors in understanding the importance and potential of the SMMES and in general Developing Country public policy toward and support for SMME have in the past ranged from fair to poor, that is not true for India.

In India there have been a number of supports provided for the development of SMMEs at various levels of government and institutions. At the policy level, there has been a number of supports provided to small and medium size firms. These have included reservations of certain products and sectors to manufacture by smaller scale units alone without the competition from larger more well financed firms. They have included protection from import competition, the provision of minimum lending to small scale units by the financial institutions, reductions or elimination of certain production, sales and other taxes and levies, and reduced government controls for units below specified sizes. For the units in Khurja this has included the provision of coal supplies at below market costs for the first four decades of the history of the cluster. All direct support to SMEs is

[1] See: "Report on Work in Progress in the Production of Guidelines for Small Enterprise Promotion and Development." The report was prepared for the Committee of Donor Agencies for the Small Enterprise Development meeting in Frankfurt, Germany, on 16 April 1996, by the Working Group on Non-financial Services for Small Enterprises, (Frankfurt: ILO, March 1996). See also: Michael Farbman and William F. Steel, "Themes for Donor Cooperation in Research on Small Enterprise Development," a paper prepared for the Committee of Donor Agencies for Small Enterprise Development, (February 1991).

co-ordinated at the national level by the Ministry of Small Scale Industry, while some of the generic policy support stems from decisions taken by the Ministry of Finance, or Trade and so on, as appropriate.

We will not discuss these larger policy issues in much detail here beyond taking note of some of the positive and negative elements affecting the economic environment for SMMEs and the changes in this environment. All economic reviews of industrial growth in India tend to agree that these promotional policies have contributed to the growth of domestic production by small scale manufacturing firms and together with that most employment growth in industry has been in the small and medium sector. While large scale firms have also been protected and provided support of many kinds, due to technological changes leading to higher labour productivity, the growth of employment opportunities in the large scale sector has been very small. Many observers of development tend to agree that the growth of small scale manufacturing and its spread across many parts of the country has contributed to increased capacity and technical skills that are likely to be useful as the country moves further along the economic growth path. Certainly the growth of the pottery sector in Khurja attests to the positive impacts from the supportive policy framework.

At the same time, there is a general and policy recognition that these support policies have not been cost free. In many cases they have promoted a non competitive, non innovative and inefficient industrial structure. Striking a balance between providing support and promoting a healthy industrial growth, leading to efficient and innovative firms is a very difficult exercise. For instance, in Khurja, because of the subsidised coal prices, for many years it did not matter to many firms how they fared with their ceramic production. The manufacturing operations provided the legitimacy to acquire quotas of coal that could be resold at a profit. Even when not resold, the subsidy on energy, where energy costs were up to 40% of total costs, provided support to inefficient and poor quality production processes. The easing of bank loans provided a major spurt to the growth of new firms in Khurja in the seventies, but many of the entrepreneurs had no experience with the industry. Though we have no direct evidence from Khurja, similar practices in the country as a whole has created an excessively large portfolio of non performing assets with the banks and a reform of the financial sector to deal with this problem is a major priority today.

Even though, we cannot calculate the over all costs and benefits of the earlier support policies, the general perception in the country is that the past policies of excessive support has produced the desired result of significant domestic capacity albeit of low economic efficiency. Hence the new policy regime for the past decade has been to remove many of the support programs and to encourage a more competitive economic environment, both domestically and in terms of international trade. This has led to major changes in the environment and hence the behaviour of firms in Khurja.

For instance the decline of coal subsidies and increased competitive pressures, were the primary drivers leading the units to begin to explore alternatives to the coal fired Down Draft kilns that had been the only technology used in the cluster for over forty years.

From the environmental side there was a small pressure to increase the height of the kilns chimneys to disperse the pollutants further afield. As a few began to make the changes to diesel kilns and they were successful in the change, found that their products were improved and costs reduced considerably, the environment argument became more powerful, in that the regulators could see practical, viable alternatives. After a few years of experience, in the face of increased competition, the slow removal of small industry reservations and easing of import restrictions, the change over to oil fired kilns is accelerating.

A key lesson for policy is that the same set of instruments cannot be good for all times. All economies and industries undergo changes as they grow, gain knowledge and internal capacity, the markets change forcing other changes and the technology changes continually. So from a policy perspective, the question is not whether there should be support for encouraging the growth of small scale firms but the *nature* of such support. The other question is how to encourage a dynamic and sustainable set of responses from the industrial sector without relying on subsidies alone.

Micro level

At the other extreme of macro level policies are micro level interventions which are concerned with actions and instruments aimed directly at enterprises themselves to address some of their problems. Most governments and development institutions have stayed away from such direct support measures for a number of reasons, including: cost effectiveness, as such interventions are expensive and only very few institutions can be reached directly by large and external agencies. (See: ILO report, “Guidelines for Small Enterprise Promotion and Development,” Opt. Cit., p. 15) It is for these reasons that most project reviews suggest the need to work with local intermediary organizations for example at the meso-level intervention.

The bulk of the work undertaken under the this research project has in fact been at the micro-level, while keeping a larger macro policy perspective that takes into account the broader goals of poverty reduction and environmental improvements. As the earlier section describes, the policy issues are too broad to be all dealt with at the micro level at one time. They need to be further broken down to goals of employment, incomes, productivity, efficiency, emissions, health, skills and so on. In keeping with the findings of earlier research (such as the one described by Development Alternatives with Swiss support on the brick kilns), this project has focused on working in partnerships with meso level institutions that are mandated to provide services to the enterprises such as CG&CRI, PCRA, KPMA and others. And through them it has reached out to the firms. Also for reasons of conflicting objectives it is not possible to work on all the objectives at the same time and so we have focused on productivity, efficiency and emissions.

Meso level

We have already outlined the central role that counterpart or intermediary organizations can play, and their critical importance to providing an enabling environment for such

units to thrive. *These meso-level agencies have increasingly seen to be fundamental to the design and delivery of effective services and programmes.*

Meso level mechanisms include service delivery institutions or organizations which provide a specific service to entrepreneurs and their enterprises. There are broadly three types of organizations which provide service mechanisms that can be used in small enterprise development. These include government agencies, non-profit organizations - such as the business associations, non-government or community-based organizations (NGOs); and, for-profit organizations - such as consultancy firms, private training agencies or other forms of private enterprises such as buyers of SMME goods and services. They include membership organizations, which are essentially self-help bodies created by entrepreneurs to support or represent their interests. They may be, for example, chambers of commerce, business associations, or sectoral associations, and this is represented by KPMA

The general lack of organization amongst SMMEs can create a difficulty in providing small enterprise development services on a sustainable basis. Successful institutions are seen to be demand-driven, responding to the needs of local entrepreneurs; flexible in their approach and adapting to changing demands and needs of local entrepreneurs; and having a professional management, free from undue political influence, ensuring that support services are based on commercial decisions, rather than nepotism. Ideally, the support services should also be able to attract funds and be sustainable.

Local enterprise development agencies are seen as valuable small enterprise development mechanisms. These community-based agencies provide advice, training, information, referrals and other support services directly to local entrepreneurs. *In general the review in 1997 of global experiences suggested that more information is required on the benefits of the different types of meso level institutions the best practice in institutional capacity building, practical experiences and lessons learnt (ILO).*

Networking and linkages are another meso level activities which refer to the formation of collaboration, clustering or twinning arrangements between and across firms (See: ILO, 1996). These can involve vertical (i.e., small firm to large) and horizontal mechanisms (e.g., small firms collaborating together) and can exist within a country or region, or amongst firms in different countries. Networks and linkages are important small enterprise development instruments and can be formed within specific industry sectors or regions or by particular types of entrepreneurs (e.g., women). They allow entrepreneurs to learn from each other rather than from outsiders.

It is important to distinguish between two types of networks which serve different purposes. Horizontal networks are formed between small enterprises and institutions to share information and experiences or to collaborate together to purchase goods, market their product, support one another, or advocate for changes of policy or regulations. Vertical networks link small and large enterprises, can be within a country or region, between a firm in a developed country and one in a developing country (ILO, 1996).

Linkages such as these can assist participants in acquiring technology, “know-how,” and expertise, to increase the competitiveness of participating firms, and to broaden market shares and opportunities for both parties (ILO, 1996). These types of linkages provide both great potential as well the possibility that the SMMEs can be helped or victimized by the large firms. Often, systems of collaboration like subcontracting have been of fundamental importance in increasing the growth, quality and productivity of SMMEs but also require institutional and legal frameworks to minimise negative aspects.

All studies of SMMEs confirm that the provision of suitable technical assistance is among one of the most critical requirements. The availability of the required knowledge with the smaller firm constitutes a difficult problem for a series of reasons. Often the firm is new and the entrepreneur is also still at the early stages of learning processes. Second, the limited number of people in such firms reduces specialisation and the flow of relevant information can strain the capacity to process and utilize the information. Technological inputs are harder because the system of supply of machinery and equipment and technical services tend to be less organized.

The assistance needs of SMMEs are divided traditionally into two broad categories, credit and technical assistance. Efficient systems for providing credit to SMMEs are a problem in all countries. This is an area where most international finance institutions and other bilateral donors are active. But in many ways the problems of providing financial support is easier to reolve than the problem of providing technical support. Many programs increasingly link financial and technical assistance. But that is not the solution in all cases as the technological needs are diverse and no single institution can deal with all the needs.

Support Institutions for the Khurja cluster

For that reason there are several organisations in India that are involved in the development and support of small scale industries and with pottery in particular, with each having different roles. There are also organisations specific to the Khurja pottery cluster. The list below begins with organisations involved with SMMEs more broadly, progressing to those more specific to the Khurja pottery cluster.

1. Ministry for Small Scale Industries and Agro and Rural Industries (SSI and ARI)

The Ministry for Small Scale Industries and Agro and Rural Industries (SSI and ARI) was created in October 1999 with a view to providing appropriate focus and support to the SME sector. This Ministry is responsible for formulating policy frameworks and initiating appropriate programmes for the promotion and growth of the SME sector in the India. The nature of support provided by the ministry includes techno-economic and managerial support, training, testing facilities and marketing assistance. In performing these functions, the ministry is supported by a host of central/state government departments, agencies and other autonomous institutions in the country.

2. Office of the Development Commissioner of Small Scale Industries (DCSSI)

The office of DCSSI, also known as the Small Industry Development Organization (SIDO), was set up in 1954 on the basis of a report by a Ford Foundation Study Team. SIDO is the nodal agency for the implementation of central government policies in the SME sector. The organization functions through a network of small Industry Service Institutes and other field centres. It provides a comprehensive range of extension services through allied institutions and it monitors a large number of government-sponsored programmes in the SME sector. With a view to coordinating developments within the World Trade Organization (WTO), DCSSI has created a special cell to disseminate information to SME associations and units on recent developments and to organize seminars and workshops to sensitize the sector regarding WTO related issues.

3. National Small Scale Industries Corporation (NSIC)

NSIC helps the small industries through its various schemes such as hire purchase, equipment leasing, marketing, raw material assistance and single point registration of units. Under the hire purchase scheme, NSIC supplies both indigenous and imported machines to SMME units on easy hire purchase terms. It also provides both indigenous and imported raw materials by procuring them in bulk quantity at a concessional rate. It conducts technical training and entrepreneurship development programmes in its various technical service centres. In the context of economic liberalization policies of the government, NSIC has enhanced its training capabilities in technology areas such as IT applications and electronics.

4. Small Scale Industries Board

The Small Scale Industries Board is an apex advisory body constituted by the Indian government in 1954 to facilitate coordination and provide inter-institutional linkages for the development of the SME sector. The Board consists of state Industry Ministers, select Members of Parliament, Central Government Department Secretaries, heads of financial institutions, industry associations and eminent experts in the SME field.

5. Small Industries Services Institute

These are training and technical support institutions which are organised under the Ministry of Small Scale Industries (and Agro and Rural Industries) and provide a range of services to all small scale industry within their area. Unfortunately Khurja falls almost in between the two nearest Institutes, one in Delhi and the other in Kanpur. It is not very convenient for either one to service the Khurja cluster.

6. NGOs

There are institutions like TERI and Development Alternatives that have made a special effort to study and provide support to small scale firms in improving their energy efficiency. But for the scale of the need the supply that can be provided by these institutions is naturally limited.

7. All India Handicraft Board, New Delhi

This is an all India institution that is concerned with the development of smaller scale and artisan and handicraft side of the sector. The firms in Khurja operate on the more industrial scale than in the artisan level. The board is also involved in developing markets and directly marketing products in the national and international markets. There may have been some interactions between the Board and Khurja firms but these could not be traced.

8. All India Khadi & Village Industries Commission, Mumbai

The KVIC has a number of programs for the support of small scale industries and specially promotes "appropriate technologies". They may have done some work on improving EE in pottery sector specially the smaller scale units. But again the size and nature of manufacturing in Khurja is a little larger than the universe that KVIC normally focuses upon.

9. Petroleum Conservation Research Association (PCRA)

This is a national organisation formed with the joint support of the Government of India and the national oil industry. Its mandate is to promote energy efficiency in general and specifically in the use of oil. PCRA has supported a number of initiatives towards increasing the efficiency of energy use in transport and several industries. Some of the earlier work has included work on the energy efficiency of furnaces for small rolling mills. This is the first time that PCRA has been involved in the ceramic sector.

10. Indian Ceramic Society

The Society is the professional association of professional ceramists. The CGRI and Indian Ceramic Society regularly organize training programs for information dissemination and exchange”

11. Central Glass & Ceramic Research Institute, Calcutta / Khurja

This is a part of the national level, publicly supported, system of scientific and technological laboratories which are all members of the Central Scientific and Industrial Research (CSIR) system. It has its headquarters in Calcutta and has two extension service centres, one in Ahmedabad and the other in Khurja. The centre in Khurja was established in 1981 with the objective of providing technical support to the pottery cluster, and makes for a very appropriate choice for the extension unit, given the size of the cluster.

CG&CRI has taken proactive steps to promote the modernisation of the cluster, prepared several status reports for the cluster and assisted in organising meetings for information dissemination and exchange.

12. Pottery Development Office (Khurja)

The PDO is the oldest pottery related institution at Khurja; it was established in 1946 to promote the pottery industry. Its other activities include data collection analysis, approvals and registrations.

13. Khurja Pottery Manufacturers Association (KPMA) and Kutir Avam Hasthshilp Potters Association

The KPMA, and also the KHPA though to a lesser extent, play an active role in voicing the concerns of the pottery cluster at government forums. The KPMA represents independent potters and currently has around 350 members. It has expressed the concerns of the industry on issues including power quality, fuel quotas, fuel types, environmental regulations, and export promotion. The Kutir Avam Hasthshilp Potters Association represents the concerns of dependent potters in Khurja. It was formed only recently in May 2000 and has about 38 members.

There are also technical consultancy organisations set up by and linked to the financial institutions. Most of them provide managerial and financial services and not he type of work that was undertaken in this project.

So while all of these organisations can and do provide support for small scale firms, the only one dedicated to the area is the CG&CRI. The CG&CRI has excellent technical knowledge and many skills on the ceramic processes but lacks the capability to undertake detailed work on kilns. It is apparent that meeting the different needs of the units in Khurja or for that matter anywhere else is not easy and there are special difficulties with technical assistance, the focus of our attention.

There is often a shortage of appropriate information to be offered, particularly in terms of technology. Then, the technological problems will vary greatly from one sector to another, while the managerial shortcomings vary even between firms within the same sector. Appropriate assistance demands a degree of knowledge about the firm's operations which is not usually required in credit programs. Indeed, most credit schemes for small enterprise basically rely on an assessment of the reliability of the borrower, leaving it up to the borrower to determine how the loan should be best used.

On the other hand, while there are many national institutes dedicated, more or less, to this need, most appear to have had little impact on the process of technological improvement in SMMEs (this should perhaps be softened to say that as the history of Khurja shows, there have been many positive impacts, but yet there is a very long way to go to make the necessary technological information and services readily available to the needs). Many official institutions have been starved for financial and/or human resources, too political in the selection of personnel, or too low in the prestige hierarchy of public sector agencies. In any case, it is clear that there does not exist a “blueprint" for the how to organise an adequate flow of effective R & D for this sector which may be the

reason why an evaluation of World Bank lending to SMME in general found discouraging results from the technical assistance component of projects. It even recommended getting out of this aspect entirely! It is the existence of this kind of knowledge gaps that this project is designed to examine. But even more than an examination, it also demands a strategy of implementation whereby innovative practices can be developed, tested and diffused widely, and these have usually been biggest weakness.

Services for Increased Energy Effciency

PRI has done substantial research on improving energy efficiency in five different developing countries: India, Ghana, China, Chile and Colombia. The work done by PRI and the literature on promoting energy efficiency has some special relevance to the work in Khurja. The earlier work of PRI has focused on a set of key questions. First, is there in fact a large energy efficiency gap between actual practice and what would be economically efficient? Second, if such large gaps in fact exist, what are the barriers preventing the adoption of more efficient practices and technology? Third, to what extent and how can these potentials for economic and environmental goals be attained, and what is the role of the meso level institutions in realising these gains? Fourth, what lessons emerge from past experiences in different countries of attempts to improve economic and environmental performance? We summarise below the key findings and relate them to the work in Khurja.

The first key issue asks whether there are really win-win options for energy, environment and the economy or not? The earlier work by PRI found that there are many examples of energy efficiency options that exist in all countries that are financially attractive but a set of existing and complex barriers is preventing the implementation of these attractive energy savings options. Based on the evidence collected it is certain that useful programs can be undertaken in all countries and that these programs can demonstrate immediate and achievable energy efficiency gains which are also economically attractive. Many of the possible interventions were found to be highly cost effective for the user, the economy and the environment. Our findings in Khurja add to the global evidence and confirm the earlier findings that such opportunities are quite large and significant in Khurja.

At the same time, much of the literature promoting energy efficiency tends to be biased, exaggerating the possibilities and minimising the problems, and thus adds to the noise and misinformation. This “noisy” knowledge transmission process contributes to the low acceptance of the view that energy efficiency is a useful component of national energy policy, or of sectoral programs or of technological interventions in most developing countries. This we found in the review of the literature of past work that we reported on in Khurja. Or instance every study that we have seen, discusses the issue of improved energy efficiency and so has a section devoted to the existing energy used in the kilns and how it could be improved. In the tables that we have provided, which already has only a subset of the numbers available, there is wide variation on the figures for energy consumption with the existing technology. Yet, most reports do not take this fact into account at all.

If there do exist efficiency gains to be achieved through the adoption of new technology (i.e. the efficiency gap is real), the next question therefore is what are the possible explanations for the under-investment in energy efficiency? The study found that the principal generic barriers to a more rapid diffusion of energy efficiency can be attributed to the following group of barriers and these are shown below in relation to Khurja:

Barrier	**Relevance in Khurja**
A. Externalities that tend to reduce the price of energy from the socially desirable level and thus lead to lower valuation of the benefits of energy efficiency.	Yes, more important in the past, less so now
B. Split incentives that occur when the agent who benefits from energy efficiency gains is not the same person who pays for the energy costs.	NO
C. Regulated prices that are set too low to provide incentives to save energy.	More important in the past, less so now
D. Energy market features may act as barriers to the implementation of energy efficiency measures.	Yes, on electricity.
E. Financing required to implement projects may be lacking.	Yes, but not severe for high pay back ratio.
F. Energy users may lack sufficient information on technology characteristics, economic and financial costs and benefits, energy savings potentials, maintenance requirements, etc. needed to make confident decisions on the energy technology choices available.	Severe problem.
G. Bounded rationality or firms and individuals tending "satisfice" rather than "optimize".	Yes.
H. Users and financial institutions may perceive energy investments to be high-risk in financial terms due to the cost-recovery risks created by high front-end costs. Lack of familiarity and experience with energy efficient equipment can also lead to perceptions of a high degree of technical risk.	Perception of high risk.

I. The transaction costs associated with identifying, procuring, installing, operating and maintaining energy efficient equipment may reduce the profitability of energy efficiency options.	High. Can be reduced.
J. Energy users may lack the technical capacities to evaluate, design and install energy efficiency improvements due to shortages of appropriately trained personnel.	Yes.

While this is a useful conceptual framework to group the barriers, most often they also interact among themselves in different ways. The specific barriers that were found to affect the applications of efficiency solutions in Khurja and in India were found to be overly complex and yet poorly applied regulations, difficulties in obtaining finance for efficiency investments, poor information flows and awareness by firms, poor formulation of solutions by service providers, high risk perceptions, high transaction costs, and unevenly distributed technical capacity.

The next question therefore is how these barriers can be overcome to enable the potential for economic and environmental goals to be attained? This leads to the principal hypothesis of this study, that there is an important need for further institutional innovations, in particular the development and strengthening of intermediary institutions, which can mediate between the available solutions and the needs of the users and specially which can recover the costs of the intervention and investments from the benefit stream accrued by the user. We refer to these as Energy Service Institutiions Companies or ESCOs.

However, historical evidence from several reviews of experiences suggests that private actors will not necessarily emerge on their own. A healthy growth requires partnerships between public and private agents.

Public institutions must:

1. Provide the initial demonstrations that there are solutions that work;
2. Participate in documenting the successes and failures;
3. Educate potential users and suppliers regarding the approach; and
4. Improve standards, codes of conduct, legal and financial frameworks and arrangements so as to reduce the initial risks of the private actors. As these informational, organisational and institutional barriers are removed, the demand and supply of these services and their uses will expand.

The scope for increasing efficiency in the use of energy and other inputs is very large in the pottery industry in Khurja. And performance contracting approaches can potentially make a contribution to improvement, but progress in this area faces a classic dilemma.

Not enough effort has been expended because many remain unconvinced that such opportunities are available. Without co-ordinated and systematic effort, there is not enough evidence to convince the different policy and market actors to increase the focus on efficiency investments. Further, without a co-ordinated effort there are insufficient scales of activity to sustain a cadre of suppliers to develop the required projects; and, without the stream of projects and the necessary organization, financing is not readily available for the projects available.

An effective strategy to break through this impasse requires the incorporation of new actors, particularly from the private sector and production organizations, together with support from the government, research institutions, financial institutions and donor organizations to jointly develop new institutional structures and new mechanisms for demonstration and risk insurance, documentation and training, experience sharing and networking, which will then promote adoption via market mechanisms.

ESCOs

ESCOs initially emerged in the U.S. and in Canada in the early to mid 1980s. Subsequently, there has been an evolution of ESCOs, their activities and operations. This growth has been promoted by several initiatives and supporting measures by federal, state and local governments, non-profit groups, research centres, and utilities and their regulators, as well as private companies. ESCOs combine together the technical, managerial and financial requirements for energy cost saving. The investment in energy efficiency is paid for by the energy cost savings subsequently generated in a concept known as (energy) performance contracting.

Performance contracting in its purest form holds out four principal potential advantages over other approaches to promoting improvements in energy and/or resource efficiency. The first is that the investments in efficiency improvements are made at no initial cost to the user. Second, the return to the ESCO is contingent to some degree upon achieving the level of savings projected, and to that extent some or all of the technical and financial risks are shifted from the user to the ESCO. This is important for users who lack knowledge, skills, manpower or confidence in achieving these efficiency gains. Third, this being the principal business of the ESCO, it can afford to have a level of expertise that is higher than most users. Fourth, it creates an external market (as opposed to the internal value to the user of efficiency gains) in efficiency gains, which allows different types of providers such as equipment suppliers, consultants, financial institutions and so on to reorganise to provide these services efficiently.

In developing countries, the application of ESCO principles has yet to emerge or is in relative infancy. A very small number of respondents in developing countries are aware of the concept and its potential, but even they are often not sure how it can be best developed in their specific circumstances.

Basic Steps to a Performance Contract

Step 1 Initial Meeting: The concepts of performance contracting are explained and a request for historical data is made.

Step 2 Preliminary Audit: At this step, a rough estimate of possible savings provides confidence that further time and investments are warranted.

Step 3 Review Cost Data and make finer estimates: Develop patterns of energy use, from which the analyst forecasts probable savings and efficiency improvements. Analysis of industrial process efficiency is more complex and require case specific engineering analysis to determine savings potential

Step 4 Go and No-go decision: If there is not sufficient potential, the project ends, or alternate solutions are sought. The cost of the preliminary audit process is generally borne by the ESCO. If the potential is good negotiations proceed to next stage.

Step 5 Letter of Intent: This step ensures that the facility owner is fully aware of his/her responsibilities under a performance contract, and to confirm the expectation of all parties that if a sufficiently attractive project exists, a contract will be negotiated in good faith. ESCOs typically ask owners to sign a non-binding letter of intent which states that, provided a subsequent detailed energy study confirms the existence of cost effective savings, the owner will enter into a performance contract, or provide project financing, and proceed with the project.

Step 6 Detailed Audit: The ESCO conducts a detailed audit and submits a plan detailing the work to be done and the savings to be achieved.

Step 8 Project Acceptance/Rejection: If the owner decides not to proceed to the contract phase upon acceptance of the study, then he/she is billed for the work. Otherwise, the cost of the study is rolled into the performance contract. If the owner and ESCO proceed to a contract, then the detailed recommendations become the deliverables under the contract.

RECOMMENDATIONS

The results from this research study have relevance to a number of different actors and institutions. These range from individual firms in Khurja, to other pottery firms in India, and to industry associations such as KPMA. There are issues that are relevant to the intermediary research and technical support agencies such as CG&CRI and PCRA, our other partners in the work. There are other issues that are of relevance to policy level institutions such as the ministry of Small Scale Industry and to DfID. We will present our recommendations accordingly.

Support Institutions

CG&CRI must start to offer a number of new services to the industry. These need to be started initially on a grant or subsidy basis to check that the advice or service in fact works as predicted. After that has been demonstrated to a number of firms, in the range of ten to twenty, then CG&CRI should reduce the subsidy element to zero, possibly over a period of one to two years. It can add the training sessions that is already conducting on the new areas, which also provides it revenue. Over time once the service has proved valuable it should be continued only on the basis of the gains to industry and the industry's willingness to pay.

Initially candidates for group services arise from the fact that certain tests and measurements are required by the firms in Khurja if they follow the approach outlined. Examples of such services include:

- Testing dried greenware
- Testing moisture content periodically
- Pressure profile of kilns

Over time these services should evolve towards a "Performance contracting" of technical services framework. That is a procedure where the customer contracts for a specific result, usually cost savings, rather than for the actual products or services. The Performance contracting agent assumes the risk that a specific minimum level of performance will be achieved. The payments are contingent on the results being achieved.

The support institutions must ensure that their services are redesigned to meet client concerns which will primarily be focused on:

- Finding time for initial discussions and making an informed choice;
- Reluctance to turn over information to third party;
- Confidentiality of process and company information;
- Credibility of technical advice;

- Client knowledge on the reasonableness of proposals;
- High cost of finance;
- Fitting the services into company's experiences;
- Perception of know-how;
- Lack of knowledge about what the providers can do;
- Difficulties in establishing the baseline;
- Confirming the real savings with ongoing measurement.

Policy Institutions

The scope for increasing efficiency in the use of energy and other inputs is very large in most developing countries, and technical services combined with performance contracting approaches can potentially make a contribution to improvement. But progress in this area faces a classic dilemma. Not enough effort is expended because many remain unconvinced that such opportunities are available. Without coordinated and systematic effort there is not enough evidence to convince the different policy actors to increase the focus on efficiency investments; without a coordinated effort there are insufficient scales of activity to sustain a cadre of suppliers to develop the required projects; and, without the stream of projects and the necessary organization, financing is not readily available for the projects available.

An effective strategy to break through this impasse requires the incorporation of new actors, particularly from the private sector and production organizations, together with support from the government, research institutions, financial institutions and donor organizations to jointly develop new institutional structures and new mechanisms for demonstration and risk insurance, documentation and training, experience sharing and networking, which will then promote adoption via market mechanisms.

All work related to the industrial sector has the added complication of the changing demand conditions which face industry as opposed to households or institutions, which adds another degree of uncertainty. In many countries and many enterprises, if they do not have basic monitoring systems in place that can provide the initial historical consumption data, proving the savings over a non existing data set can prove difficult. For SMEs in particular, in many countries there is a tradition of poorer record keeping which will need to be overcome. So ultimately those customers who are paying little or nothing for their use of energy cannot save money by saving on energy consumption! This has also been pointed out in Colombia.

The costs to develop the market are quite high. Therefore in all instances that we have seen, there are none where the market has developed on its own. In all cases there have been a large number of publicly funded support programmes and significant subsidies. The issues of efficient and effective intermediation to provide efficiency services are currently among the most exciting research and public policy issues

relevant to increased efficiency for SME units, for promotion of cleaner production, and possibly for other development issues.

Essentially here we have several innovations: some are embodied in products which appear fairly simple, such as high efficiency lighting systems; others are more complicated such as sophisticated controls, motors and drives; others are processes such as audits, performance contracting, financing of efficiency and changes in production processes. All of these are interlinked and no social actor is currently responsible for the chain of products and processes and few delivery agents. While making them all work will lead to private gains they will also lead to large public gains. At the same time, as the private gain to each economic actor is too small, the process of creating a complete delivery system is fairly risky, public support and new social institutions and organisation are required for the innovations to diffuse rapidly on their own.

Similarly, the fact that SMEs tend to be too small to generate their own innovations, often too small to generate the market demand for appropriate financial, technical and managerial services and the fact that they are employment intensive, has made them a group towards whom special attention is devoted to improve their performance. We believe efficiency services which can be paid for from the gains, can be an important additional way for SMEs to be serviced effectively and also to create a whole new category of specialised SME service providers.

Local Knowledge in Khurja and Limitations

We have discussed that there is considerable knowledge locally available to construct and operate the kilns, on the property of the raw materials, glazes, and in fact on all aspects of the processes used there. This is only to be expected, as all human beings possess inherent abilities and keenness to learn about the processes they are involved in. So it is a mistake to assume a priory that any differences and shortcomings in the operations that were observed are all due to a lack of knowledge. Some of the so called “deficiencies” or gaps are due to the firms being smaller and their having to operate at scale and with capital intensity that is considerably smaller than what “best practices” require.

For instance, over the past ten years at least, there is increasing and possible universal knowledge, that oil fired kilns are more energy efficient and provide better output and lower rejects than coal fired kilns. But, the barrier for many is not the lack of knowledge, but the fact that all oil fired kilns cost more so require a higher capital investment. And also, they have a higher throughput per kiln than the coal fired kilns, thus again there is more capital required for materials, labour, inventory, moulds and so on. Finally it is not only the increase the capital and scale of operations that they require, the change also requires the owner to have sufficient confidence in the market for the sales of the higher outputs.

In arriving at the recommendations all support institutions must carefully distinguish the exact barrier that prevents the take up of the solutions offered. These include size and scale issues, capital required, risks of various kinds and finally, knowledge and information.

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