WHAT WORKS FOR ENERGY EFFICIENCY IN LARGE INDUSTRY

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INTRODUCTION

In recent years it has become clear that various groups interested in energy efficiency, including state energy agencies, utilities, and advocacy groups do not know how energy efficiency efforts are conceived and carried out within global industrial corporations. There are vast energy efficiency efforts underway of which almost no one knows, except those directly involved. Nevertheless, the criteria employed, the viewpoint on efficiency, the constraints, and the methods of evaluation are all either somewhat or even quite different in an industrial setting. This paper reports on work underway at Ford Motor Company.

Ford Motor Company has demonstrated a major commitment to energy efficiency. This paper illustrates the ways energy efficiency is approached, explains something of how the internal process works, and provides examples of the types of projects recently completed and underway

This paper first reviews certain organizational features of large industrial Demand Side Management (DSM). Second, it explores the model provided by ISO 14001. Third, specific experience of Ford Motor Company, General Motors, and Chrysler in working cooperatively with the Detroit Edison electric utility is reported." Finally, the broader scope of energy efficiency at Ford is indicated, and the ethical nature of energy efficiency is asserted.

THREE ORGANIZATIONAL FEATURES OF LARGE INDUSTRIAL DSM

Three features of energy efficiency work at Ford deserve special attention: positioning, project selection, and scale.

Upper Management Review as a Key Feature of "What Works."

From a sociological perspective, a key feature in the organization of energy efficiency at Ford is the yearly meeting at which energy efficiency group present accomplishments and plans to senior management. This meeting is with the head of Ford Automotive Operations and an operations committee composed of persons at the vice-president level. This meeting is held at least once a year, and recently has been held more frequently.[1] This meeting, and the placement of efficiency as one of the central policy provisions for Ford worldwide operations, anchors the focus on energy efficiency. The relative importance of efficiency in year-to-year operations is indicated by its top level policy status, and the level of corporate review.

Project Selection

Ford Motor Company's internal process for project selection is remarkably similar to the technical potential and least cost planning cycle (LCUP) used by state commissions and major gas and electric utilities. However, it is also dissimilar in some respects. Each year, worldwide plant managers are required to identify and submit potential projects to a central department in Detroit. This department coordinates and facilitates matters dealing with energy (supply side) and energy efficiency (demand side). As in LCUP, projects are reviewed in relation to payback. They are subject to a current corporate-wide criterion that is set by a different central department and linked to various financial criteria including current sales.

However, internal project selection differs from LCUP in that energy efficiency is viewed within an overall framework of production efficiency and process improvement. This means that a potential project (for example, improvement in the energy efficiency of a paint shop) is reviewed for its other benefits and costs in relation to the current operational plans. Another difference from LCUP is the emphasis on "best practices." Here, an operation within a particular plant that is determined to be a "best practice" becomes a matter for emulation at other plants worldwide. This creates a potential for quick replication of any particularly successful efficiency project.

Scale

The demand-side management (DSM) features of large industrial organizations are unique to the scale of the organization, that is, to the global nature of the enterprise. This feature may create a certain tension between State regulators and industry engineers. Regulators tend to be responsible for a limited geography. They may, for example, be familiar with utility programs that operate according to special rules within geographic service territories. Thus, for example, according to a State, a utility may not be permitted to engage in fuel switching and must attempt to show a certain benefit-cost ratio for each site or sometimes even each component of a project. Industry engineers, on the other hand, have the planet as their territory and begin with the idea of overall efficiency. Thus, they may increase use of energy at one or more plants while offsetting this increase with an overall decrease at other plants in other jurisdictions. They take a production or process viewpoint, and may continually re-optimization of fuel choice to control costs. Finally, their scale of operation is planetary. Once a targeted project area demonstrates a high potential for savings, replication throughout similar operations in plants worldwide can yield energy savings far beyond those usually achievable in other sectors.

ISO 14001 AS A MODEL FOR INDUSTRIAL DSM[2]

Having considerable experience with ISO 9000 quality control in the emphasis on "Ford Total Quality Excellence," Ford has introduced ISO 14001and are increasing the ISO 14001 certification of its plants (ISO 14001 certification is at the site level). The reason we emphasize ISO 14001 in this paper is not only for ISO 14001 in itself (as internally it is viewed as only one of many tools related to both environmental management and energy efficiency), as for its indication of a style of working. In general, for global industries, the features of ISO 14001 indicate a kind of "macro model" that is congenial to how global industries currently prefer to work.

Philosophy of ISO 14001

Demand Side Management (DSM) is one of two sets of activities concerned with energy efficiency – which falls under this model.[3] Under ISO 14001, industries are organizing internal processes in a way that should enlist the support of all employees in considering environmental implications of technical choices. The essence of ISO 14001 involves self-action of the corporation. Its philosophy is uniquely suited to capitalist enterprise since it requires no validation by the State and allows complete secrecy (or none, or any intermediate level of communication with the public or government), at the sole discretion of the company. At the same time, it permits the highest order of internal flexibility in identifying potential future environmental problems. Ultimately, it establishes a broadly based environmental management and reporting system and the system should instill a proactive orientation at all work levels toward pre-empting possible environmental problems in areas that can be controlled.

Features of ISO 14001

ISO 14001 has several unique features. *First*, it diminishes the direct role of experts but extends their effectiveness throughout the corporation by shifting emphasis from the industry's environmental department to a diffuse but active responsibility throughout the organization (to be guided by the environmental department). *Second*, ISO 14001 (like ISO 9000) it is not a regulatory compliance approach. This means, for example, that there are no legal requirements, there is no role for state inspectors, there is no penalty for failure to accomplish pre-defined goals, and there is no formal restriction on ability to achieve a goal in an unorthodox or least-cost manner. *Third*, ISO 14001 establishes a management process: it does not in itself a requirement for product standards, performance standards, or test methods. *Fourth*, while certification is required, the certification vendor is selected by the corporation and the nature of the certification approach is thus largely under corporate control. *Fifth*, as already noted, no results (for example, of internal audits) need be disclosed outside the corporation.

This model provides a way to understand DSM at Ford Motor Company. The essential dimension that is asserted is *independent intelligence and organizational autonomy*, a model at variance with the regulatory compliance model familiar to regulated electric and gas utilities, state regulatory and compliance officials and their staffs, conservation and environmental advocacy groups, and the public. As with any other model, it has certain strengths and weaknesses.

Emphasis on Relative Autonomy endorsed in ISO 14001

The essential strength and the important weakness is autonomy. As a weakness, the main barrier in the way of understanding the industrial commitment to energy conservation is the degree of autonomy of global industrial organizations. Persons outside the largest of industrial organizations seldom see into how these organizations carry out environmental effort. Yet environmental and energy efficiency concerns, while industrial concerns, also have a more fundamental social nature, so it is quite possible that autonomy will be a flash point for transformation of environmental questions into social issues. From experience, the public looks to the State to underwrite and guarantee environmental quality. The reflex of the public and of the "attentive elites" that focus on environmental areas is to the State as the common instrument of information and control. This implies a "regulatory compliance model," with its performance standards, inspection, open measurement (open to inter-subjective validation), and lack of tolerance of anything that looks like secrecy. There is no public experience to legitimate the ISO 9000 and ISO 14001 dimension of autonomy. In fact, no organizational entity in society (with the possible exception of defense and intelligence agencies) actually enjoys anything like the autonomy of the global industrial sector, so it would be almost impossible for the public or the "attentive elites" to become comfortable with this dimension of operation.[4]

As strength, autonomy means no legal or regulatory interference in the development and application of sound technical solutions. It may be somewhat difficult for persons unfamiliar with the standard sociological problems of regulation to appreciate the significance of this strength and the inherent importance of this freedom. At the extreme, we may remember the kinds of typical problems which developed in the systems of highest State regulation – the Communist States with their "energy police" whose job was to insure conformance to plan. Because production was regulated by planning authorities, State inspectors tried to ensure that industries used their energy allocation – no more *and no less*. Using less, of course, would imply some failure to fulfill the overall plan of production on which social welfare was based – so a firm could be fined both for using more (scarce) energy than planned or using less. Managers and engineers in a firm in the former USSR had to take such rules quite seriously. Shifting now to the capitalist States and the mixed systems, we find similar difficulties. Regulatory law with its compliance and inspection requirements (while trying to insure that environmental and energy goals are met) can also have dysfunctional effects. For example, nearly everyone familiar with environmental regulation is familiar with how formal compliance requirements can sometimes take funds and staff resources away from actual solution of technical problems, or how a fully compliant formal solution is often neither elegant nor simple from an engineering perspective. The State does not have the technical background or expertise to fully understand industrial technical problems; thus, it is forced to rely on industry for answers. While the compliance model may be necessary in some ways, its typical side effects are also realities. Thus, relative autonomy is an essential principle for insuring that work is done effectively and at least necessary cost.

SPECIFIC EXAMPLE: A MODEL INDUSTRIAL/UTILITY PARTNERSHIP

Ford Motor Company, together with four other global corporations is the five largest customers of a large urban utility in the United States. The five joined with the utility in a partnership to identify and carry out energy efficiency projects in the industrial plants within the service territory of the utility. Prior utility DSM projects were all of one "cookie cutter" variety, designed to offer rebates for specific items of efficient equipment.[5] Such programs could not deal with industrial processes, and were not intelligent when viewed from within the industrial paradigms of overall *production efficiency* or of *product efficiency*. From an industrial perspective, the programs were essentially unintelligent and inflexible. Thought up by utility planning engineers and designed for qualities congenial to State regulatory officials and their compliance staffs, the program approach could not adjust to the autonomy and independent intelligence of the environmental groups of and standard environmental practices of global industrial sector corporations. However, this particular project broke the mold. It was a first successful attempt at a project modal congenial to global industry. It also served as a transition step to a mode of utility/global Industrial Corporation partnership even more congenial to the industrial mode of environmental operation.

Cost-Effectiveness

The era of utility resource acquisition programs (1988-1994) demonstrated that energy conservation could be much *cheaper than building new baseload plants.*[6] The basic economics of conservation plus renewed regulatory oversight of this era stimulated a very strong utility DSM emphasis. The partnership project discussed here, as a transitional project can be judged successful for the utility when it produces a total resource costs (TRC) of $121 per kW and $0.017 per kWh. This kind of result is very good result for the utility not only from DSM resource acquisition perspective, but in the era of market restructuring quite *competitive in relation to small-scale gas plants.*

Evaluation Collaboration & Lessons Learned

However, from an industrial perspective, the more important result was what the utility and the collaborative parties (state government agencies, conservation advocacy groups, and representatives of other groups of utility customers) learned about industrial DSM. As suggested in the section above, by working with all of the other interested parties, industrial representatives demonstrated the capabilities of their corporations and built relationships of trust.

To do so, they traded a bit of autonomy to work socially with citizen advocacy groups, State agencies, and representatives of other utility customer groups such as universities, cities, and advocates of the poor. As a ground rule, they retained autonomy in project selection (working closely with the utility, which contributed a portion of the funds to "buy down," the DSM projects to the current hurdle rate of each industrial corporation). They also, conducted their own measurement and evaluation of results, according to each corporation's internal procedures.

However, each corporation dedicated the staff time to come to meetings and participate with the representatives of the other organizations and groups, and helped make decisions on other DSM project evaluations outside their industries. The opening of review of industrial DSM projects permitted independent review of projects and results by an outside industrial engineer selected by the collaborative.[7] The independent industrial engineer systematized the findings across the corporations into a single report and certified the results for the collaborative, and for submission to State regulatory authorities.[8]

The result of this sharing and participation was a number of lessons learned by all parties about doing DSM in a way that is congenial to Ford Motor Company and the other global corporations:

(1) Rebate programs interfere with corporate decision processes. *The normal decision cycle in global industrial organizations is three years*, whereas utilities offer their rebate programs for short windows of time and are likely to change or close a program before a large industrial organization can respond.

(2) For the best industrial savings opportunities, the locus of *knowledge lies in the energy efficiency staffs of the corporations*, not in the generalist engineering staff of the utility.

(3) Large industries have *very short windows of opportunity* to install efficiency measures, and at these times all available engineering staff has to work on a multiplicity of other types of projects to support the next cycle of production.

(4) *Rebate programs can cause career problems for industrial managers*. If a manager diverts funds from an approved project in order to take advantage of a short-term rebate opportunity, the manager may be perceived as to have acted outside of the expectations of corporate protocol.

(5) Industrial efficiency staff wants *the freedom to develop "locally appropriate" solutions* and to deal creatively with special cases but rebate programs often have general rules that do not allow specific exceptions.

(6) Industrial staff wants the *freedom to go for "high risk/high reward"* projects.

(7) Industrial staffs want *committed funding with multi-year duration*. Rather than a rebate program with a yearly cycle and a competition among customers for funds, industry needs a multi-year commitment of a fixed amount of funds. Ideally, the utility provides the DSM funds to be used as a adder to buy down projects to the current corporate hurdle rate, and then the industrial energy efficiency department acts as the industry's own internal energy service company.

(8) A feature most liked by industry is the *assignment of top utility engineers* to work in the industry. These engineers learn the industry, propose and document possible projects, and assist the industrial energy efficiency manager in project implementation.[9]

(9) An *advantage of having a utility cost contribution and utility engineers on site* (as if they were contract staff) is that some projects were approved by industry management that would not have been approved if proposed by their own staff without the credibility of a trusted "second option" from another organization with a stake in the project. In particular, some "high risk" compressed air projects were supported and they had savings at a multiple of the savings projected. Global industrial corporations are skilled at copying such "wins" Ford Motor Company, once demonstrated in an individual plant.

(10) Collaborative members were impressed by the excellent engineering and financial analysis abilities of the industrial representatives, although there was a difference in style. For collaborative members drawn from outside the world of global corporations the experience of working together opened a window on another kind of worklife. They learned that large industrial corporations are *highly capable* of carrying the common energy efficiency goals of conservation advocates, regulators, and concerned government agencies. In addition, that the global industrial corporations prefer to take the initiative on efficiency projects outside of the "command and compliance" system of State regulation. Industrial people feel they work best in relations to the realities of the plants when not subject to rules set in the abstract by State regulators and utility DSM engineers who are generalists. They prefer the freedom to optimize their own efficiency projects with additional reliable DSM funding from the utility. Although it does not resolve the problem (from the point of view of those outside the global corporations) of autonomy, collaborative experience of this type goes a long way to build trust.[10]

Trade-Off

Clearly, this kind of increase in understanding involves a trade-off. There are costs in terms of staff time and some potential risk in opening projects and measurements to outside review. The result is better understanding of industrial perspectives and capabilities among technical and advocacy leaders of groups representing other sectors of society, including new knowledge about what is congenial and what works.

DSM & BEYOND: A WIDER VIEW OF INDUSTRIAL ENERGY EFFICIENCY

From the point of view of the collaborative, participants approached DSM from an overall advocacy and regulatory perspective, some with particular concern for DSM in their own institution or for customer groups.[11] In this paradigm, people start out in the abstract with the goal of accomplishing energy conservation and/or protecting the environment. For people outside of industry, industrial DSM first appears as a potentially important sector approached from a general and abstract viewpoint, but about which little is known.[12] As discussed above, the mutual participation of Sr. Industrial Engineers/Energy Efficiency & Environmental Project Manager briefly opened a window of mutual understanding, which is normally closed. For everyone outside the global industrial corporations, and with access only to personal experience and information available from the media, it was a window on a vast and different effort that is generally unknown[13], a different way of approaching environmental problems. However, what more lies on the industrial side of the window, which the collaborative members may have glimpsed in part?

One of Many Projects

The whole collaborative effort which was the center of perspective for most State and customer group participants was only of one of a multitude of environmental and efficiency projects underway at each of the participating global corporations. For Ford Motor Company engineers, the two to three years of collaborative meetings and joint work are only one instance within a career filled with efficiency and environmental projects. During the time of the collaborative, the small Environmental & Energy staff at Ford Motor Company was also facilitating conservation and environmental work by every level of employee in operations Ford Motor Company. The net effect of these projects is massive. Some of these projects include:

Body & Assembly Operations -- Stamping Plant. At the Monroe Stamping Plant, the UAW local and Ford Motor Company conducted a prototype energy conservation campaign. The campaign involved all hourly employees and all salaried employees as a total plant team. The campaign was developed as a way of reducing overhead cost of operating the plant by reducing the amount of energy it takes to produce parts. Lowering energy use means lowering cost and efficiency is seen as a way to increase both profitability of Ford Motor Company and job security in the plant.

> If we assemble a catalytic converter, for example, for $10.00 per unit, and another plant makes the same part for $8.00, how long do you think we will stay in business?
>
> Each employee must ask, *"What can I do to make sure that I have a job tomorrow?"* You can become an energy conscious employee that wants to reduce "wasted energy" and in turn lower the overhead cost of the plant.

As a first step, the project focused on reduction of compressed air, then to inspecting and repairing all hoses, switches, pipes, electrical cords, stop buttons and pumps. Employees were asked to find all pieces of equipment without shut off switches and bring them to the attention of the team. Posters were developed showing "Mr. Waste" as a burden on workers, and slogans such as "Get Rid of Mr. Waste" and "Shut it off if you don't need it" were promoted. Measured results showed very substantial savings, and the model was then promoted to other plants, which were free to adopt it or not, or to set up their own approach.

Energy Savers Brochure.. Ford Motor Company produced and distributed an Energy Savers brochure to heighten awareness regarding energy conservation. The brochure drew on materials developed by the utility that serves the corporate headquarters of Ford Motor Company and on materials developed by the US Department of Energy. In addition to practical guidelines for saving energy in the workplace, it includes an emphasis on saving money, and helping to reduce pollution and improve the environment. It also includes information on saving energy in the home, a condensed buying guide for selecting energy efficient home appliances, and a home "walk-through" audit. The guide is endorsed by Ford Motor Company and introduced by the Operations Manager for ACD Plastic and Trim Products.

*The RAPID*s. In 1996, ten "RAPIDs" were run at different plants. These involved assembling on-site teams, supported by staff from the Energy & Environment department, and with facilitators much in the manner of the ISO 14001 model to develop optimum energy reduction ideas specific to the each *type* of plant. For example, the Powertrain RAPID focused on reducing air leaks in worldwide powertrain operations, looking for the top energy savings ideas, which could be replicated across facilities, and including all forms of energy.

Annual Energy Meeting. Each year Ford Motor Company brings essential personnel from around the world to its headquarters city for a two-day conference on energy. This conclusions of the annual energy report are presented, along with reports on successful energy efficiency projects from plants around the world, a report on ISO 14000, reports on new technologies, energy metrics, special projects, and changes in the environment for energy supply.

Development & Facilitation of Strategies. The Energy & Environment department at Ford Motor Company develops, helps codify into operational procedures, and facilitates energy efficiency strategies in a form that can be implemented in the plants across the planet. These strategies currently include increasing energy awareness and making it part of the Ford Motor Company production system, paint shop projects, energy teams, systems for tighter energy accountability within the corporation and the plants, improving maintenance operations, setting standards to insure the purchase of energy efficient equipment, retrofitting existing equipment and processes, organizing RAPIDs, and securing arrangement whereby local utilities agree to place top engineers on-site to help identify opportunities and carry out energy efficiency projects.

Conducting Energy Partnership Meetings. The Energy & Environment department has ongoing involvement with all parts of Ford Motor Company. This involves an annual series of meetings in plants to discuss increasing awareness and facilitating integration of energy efficiency as a part of normal operations, as well as way to developing ways to fund specific projects.

Conducting the Project Cycle. As a core principle in Ford Motor Company's central organizational charter, efficiency – including energy efficiency, product efficiency, and production efficiency – is a central focus of the corporation. In fact, efficiency is placed as one of the highest level objectives of the corporation. In implementing its coordinating role for this corporate-wide responsibility within Ford Motor Company, the Energy & Environment department orchestrates the yearly cycle of project proposal and review. In this cycle, plant managers all over the planet are to propose efficiency projects. These are reviewed by the department, which is located in Ford Motor Company's headquarters city and matched against the current hurdle rate (which applies through the corporation, not only to energy efficiency projects). Each year, the best projects are authorized. The ongoing cooperation with the utility in Ford Motor Company's headquarters city now provides fifteen utility engineers to work on-site as if they were contract staff. It also provides utility DSM funds on a dedicated and predictable basis with which to "buy down" projects to the current hurdle rate. Altogether, combining the cooperative projects with those which would have been funded independently given the current hurdle rate, the department may be responsible for 30 projects at any one time with a pipeline of 220 projects in various stages of approval. At the same time, the department is the central point for knowledge of other projects in distant parts of the global enterprise for which it may not have as direct operative responsibility.

FORD'S EVEN WIDER VIEW OF INDUSTRIAL ENERGY EFFICIENCY

At a wider level of vision, Ford Motor Company is working on product efficiency. This involves projects to lower auto emissions, develop successful alternative fuel and dual fuel vehicles (including a range of electric vehicles), and to improve aerodynamics and introduce flywheels. Also in the area of product efficiency are a whole series of projects to incorporate post-consumer materials into production to displace the need for new materials. Projects include using soda bottle caps, soda bottles, old battery casings, used tires, old computer housings, and old auto bumpers in the manufacture of different auto components. Ford Motor Company maintains a Recycling Research Center in Cologne, Germany that is developing cars that are easier to dismantle and recycle. The goal is to be able to recover 85% of "end of life vehicles" by 2002 and 95% by 2015.

Ford Motor Company is also working on new emissions controls for autos and on displacing production processes that create hazardous waste with environmentally friendly alternatives. Since the 1970s, Ford Motor Company has reduced its paint shop solvent emissions by 80% and is working on raising this to 90%. There is a strong emphasis on reuse of waste materials generated during production. As part of its general strategy, the company is bringing its plants into conformity with ISO 14000, and is Merseyside

Plant in the UK is the first auto manufacturing plant on the planet to conform. Under its corporate citizenship program, Ford Motor Company provides conservation awards named after its founder who was himself an advocate of efficiency and conservation, and has cooperative projects with national governments to protect ecosystems.

A NOTE ON THE RELATION OF ENERGY EFFICIENCY & ETHICS

The domain of ethics is concerned with the problem of choice in which (1) alternatives exist, (2) alternatives are valued differently, (3) choice may be expected to lead to consequences, an (4) consequences are not only immediate and personal but also either long-run or social or both.[14] This is exactly the situation that ISO 14001 is designed to address. It heightens awareness among all members of an organization and provides procedures to focus material resources on discovering and resolving potential environmental problems. Here, whether the problem identified is some form of toxicity (i.e., a by-product of a cleaning process that could be displaced by an alternate cleaning process using high-pressure water), an energy saving alternative (like installing on/off switches on each piece of equipment), or a chance to improve product efficiency (i.e., by increasing the percentage of recyclable components by weight) all four elements are present.[15]

There are four striking features the model congenial to global industry.

1) It explicitly attempts to involve all people at all level (hourly, salaried, and managerial/executive), to orient the workplace culture toward recognizing opportunities to protect the environment and to conserve resources.

2) It is explicitly flexible, future oriented and proactive.

3) It is limited to choices, which are within the sphere of technical control – that is; it is based in the reality of the material world.

4) Inherently, and without explicit emphasis, it understands that technical problems are ethical problems.[16]

CONCLUSION

This paper is about "what works" and some of the special features of large industrial energy efficiency effort. Three features of industrial energy efficiency are discussed, along with lessons learned from a specific project. ISO 14001 is used to interpret a style of high relative autonomy congenial to industry. The main difference between global industries and other organizational sectors is that global industry has the economic base, which permits a degree of relative autonomy, which is not available in other sectors. We conclude that this is both a problem and strength. At the same time, industrial energy efficiency is both an ethical and a technical concern. Specific results from a particular utility/industry partnership were reported along with its collaborative evaluation. Finally, the industrial perspective was expanded to a wider and wider level. There is a vast worldwide energy efficiency effort

REFERENCES

[1] While this meeting concerns the work in energy efficiency improvements in Ford plants and facilities, there are other dimensions to the commitment to efficiency. These include fuel efficiency, recycling and product efficiency, minimizing waste, the development of alternative fuel vehicles (AFVs), and other major projects. Some of these are noted later in this paper.

[2] Cascio, Joseph, editor (1996), *The ISO 14000 Handbook*. CEEM Information Service, Fairfax, Virginia & ASQC Quality Press, Milwaukee, Wisconsin. Internally, ISO 14001 is referred to internally as the "Ford Environment System." Also see: (A) Wustenhagen, Rolf, "Environmental Management Systems as New Tools to Enhance Sustainable Energy Use," Panel 3 - ID133 in Vol. 2, *Sustainable Energy Opportunities for a Greater Europe: The Energy Efficiency Challenge, Proceedings of the 1997 ECEEE Summer Study, 9-14 June 1997, Spindleruv Mlyn, Czech Republic*. Prague & Copenhagen: European Committee for an Energy

Efficient Economy; (B) Ramesohl, Stephen, "Duplicating the Success – From Positive Exampes to Socioeconomic Marketing Strategies for Greater Energy Efficiency in Industry," Panel 3 – ID9 in Vol. 2, *Sustainable Energy Opportunities for a Greater Europe: The Energy Efficiency Challenge, Proceedings of the 1997 ECEEE Summer Study, 9-14 June 1997, Spindleruv Mlyn, Czech Republic.* Prague & Copenhagen: European Committee for an Energy Efficient Economy.

[3] The other is optimizing supply-side energy efficiency.

[4] Sociologists, such as Peach, suggest the relation of a global industrial corporation to national states (or to the individual American states which are members of a federal union of states) as analogous to the relation of the universal church to the European kingdoms of the early medieval period. Strictly, based on the size of their internal economies, the church was often more powerful than any single king, particularly on certain issues. Today it is often observed that global industries control larger internal economies than all but a handful of national states or provinces within states. This provides the material base that has historically implied a certain autonomy. On a smaller scale, but in a similar way universities insist on limited autonomy from local authorities and national states. Conventional economics has been outdistanced by these sociological changes. Thus, for example, international transactions are accounted in national import/export statistics when they might be better analyzed (sociologically) as internal transfers between branches of and suppliers to global corporations.

[5] The rebate approach can work well in residential and small commercial applications. The difference with large industrials is that they have their own in-house energy efficiency managers as well as ongoing efficiency programs. In addition, the most inexpensive and high potential for energy savings is in the area of industrial processes.

[6] Although, of course, this could not solve the problem of the costs of existing baseload plants, as embedded in rates.

[7] Carl Castelow, a noted DSM authority, consultant, and industrial engineer with extensive in-plant experience.

[8] At the same time, the consulting industrial engineer, having inspected all data, wrote the report at a level of generality that protected proprietary results and trade secrets. This is one of the necessary requirements of such a consultant: to have seasoned industrial experience so as to be able to write at a level which conveys essential results but avoids disclosure of proprietary information. See: Castellow, Carl. 1996. *Evaluation of Large Manufacturing Pilot Program for the Detroit Edison Company.* Foresight Group, Inc., Raleigh, North Carolina. Also see: Castellow, Carl, C. Eric Bonnyman, H. Gil Peach, Joseph C Ghislain, Phares A. Noel, Mary A. Kurtz, J. Malinowski, & Martin Kushler, "Energy Efficiency in Automotive and Steel Plants" Panel 3 – ID 166 in Vol. 2, *Sustainable Energy Opportunities for a Greater Europe: The Energy Efficiency Challenge, Proceedings of the 1997 ECEEE Summer Study, 9-14 June 1997, Spindleruv Mlyn, Czech Republic.* Prague & Copenhagen: European Committee for an Energy Efficient Economy.

[9] Many industrial corporations have experienced waves of re-engineering and corporate downsizing. It is now generally recognized that most of the early participants in re-engineering over-downsized. It is not unusual to experience internal personnel constraints that limit the ability to optimize operations.

[10] In this instance, Ford Motor Company and the other four corporations worked closely in a DSM Evaluation Collaborative with conservation advocates, state agencies, and other customers to insure an evaluation of industrial DSM projects that everyone agreed was an example of truthful measurement and successful bottom line results.

[11] All participants were technical or advocacy leaders for their own group.

[12] Except through media accounts, which tend to be about environmental problems.

[13] Or discounted as so much corporate public relations. When it come down to it, global corporations cannot communicate environmental concern through public relations and advertisements because such approaches to communication are discounted as cynical manipulation and greenwashing. Working directly – on real projects – with other counterparts from other sections of society avoids these problems.

[14] Wheelwright, Philip, (1959), *A Critical Introduction to Ethics*, Third Edition. New York: The Odyssey Press, Inc., Pp. 3-21.

[15]. These are three of many projects completed by Ford Motor Company and reported in its *1995 Environmental Review*.

[16] This is a very remarkable dimension to introduce into the cultural life of all levels of workers in industrial plants and into the control structures of technical work. Ford Motor Company, in cooperation with the UAW union is introducing exactly this approach in its plants.