The Effects of Shortages and Controls of Energy Resources

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ABOUT THE AUTHOR

"The Impact of Shortages and Controls of Energy Resources on Small Business"

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His organization has been involved in energy-related problems since the 1973 embargo and it became the technical assistance base in 1977 as Pennsylvania accepted a pilot state role in the new Energy Extension Service. Small business is one of the target audiences for EES. In addition, he is a certified petroleum geologist who holds a number of patents and has published more than 15 works on topics related to technical aspects of his professional background and to energy.

His advanced degrees in mineralogy are from The Pennsylvania State University and additional studies have been in the fields of research and development management, technological forecasting and management. He is field center director for NSF Chautauqua-Type short courses for college teachers. He was on the president's staff for planning and technology of Cities Service Research and Development, and project leader for exploration and production research for Cities Service Oil Co. in Tulsa, Okla. He served on the graduate thesis committee at the University of Tulsa and Texas A & M.

DR. EDWIN W. BIEDERMAN JR.

with a solar collector
REGION III
CHAPTER K
ENERGY IMPACT

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ABSTRACT

Energy has imbedded itself deep inside the lifelines of American enterprise, implanting new breeds of style, new types of rules for consumers, and new consequences for ignoring the new mandates.

No one will completely escape the harshness of energy's influence. Total relief from all of the changes inflicted by energy shortages and feverish costs is simply not in sight.

The effects of fuel shortages and the serious economic infections can be softened by conservation. With conservation and the use of alternative resources -- where available and where applicable in reasonable and practical ways -- some relief can be found.

Even so, energy will continue to spread serious problems and the problems and the costs of whatever resources are tapped will be heavy. Research has confirmed the evidence which indicates that big government and big business cannot recoil swiftly enough to ward off the effects. Small business can. It has the necessary flexibility to react, to change directions, to implement imaginative solutions that could head off a colder and darker future. Big business is tooled to look at the big picture of the future, but the need is now.

Small business cannot do it alone. It will need government assistance. The assistance, however, must come from directions and methods vastly different from most types of assistance offered today.

The energy supply shortages since 1973 have cost jobs or forced layoffs, increased operating costs, cut profits, hurt productivity. True, the shortages also have created new opportunities for entrepreneurs.

But, on the minus side and the plus side, it is clear that government's role must be re-aligned to correspond to the need. The realignment should be in the direction of:

-- Intensifying practical programs that help with the critical need for conservation;
-- Clearing away bureaucratic debris so regulations, grants, proposals, innovation have faster turnarounds;
-- Earmarking more aid, more programs for small business;
-- Conducting more marketing studies on the feasibility basics of energy technology;
-- Amending away the conflicts and counter-productive rules among different government agencies.
CHAPTER K
IMPACT OF THE ENERGY PROBLEM ON SMALL BUSINESS

SECTION I
THE IMPACT SUMMARIZED

At no time in United States history has the whole economic system been so vulnerable to the whims of a very few people in a few relatively small countries. Against this darkening background the nation is struggling to chart a course through a rising sea of troubles, not the least of which is an increasing shortage of energy.

Small business, being most sensitive to the economic winds, reflects clearly what can and will happen ahead of the larger waves, blown by these winds of change. Whether or not the country can pull together to prepare for the full storm remains to be seen.

Recently, Llewellyn King\(^1\) summarized the situation pungently as follows:

"The fragility which characterizes all societies and which is evidenced throughout history by their rise and fall has been lost sight of in spoiled twentieth-century America. So much so that the mechanism which made the miracle possible, business, has fallen into disrepute. Business is under a broad attack for its excesses but is not defended for its virtues, which on the evidence far exceed its aberrations and its sometimes offensive venality. Nowhere is this misvaluation of a society and its benefits more evident than in the energy industries, although the public assault on commerce and its successes is not confined to energy...."

This paper looks at what the energy shortage will do to and for the small businesses of Region III. With traditional American do-it-yourself spirit, some small companies have used the drill-it-yourself approach to finding their own energy sources and have achieved success. The message on this is that they must know the risk! If a company will be put out of business by one or more dry holes, the risk is, of course, too great.

On a larger scale, what happens when a fair-sized city cannot obtain gas to run its industry? The city of Erie, Pennsylvania, found that a

\(^1\) King, 1979. *The Energy Daily*
prolonged stoppage causes loss of jobs, losses of equipment, decreased sales, increased expenses to install dual fuel systems, loss of market shares, etc. The conservation steps that the small industries took should have been taken before the stoppage occurred and forced the action.

Looking at the fuel consumption statistics for the Region's largest unit, the Commonwealth of Pennsylvania, the facts are that the smallest companies did switch to more readily available fuels; they did cut back on consumption of gasoline and electricity. At the large end of the small business spectrum (with 500 employees), there is evidence of a business as usual with little conservation in evidence.

Among the various industry classes, it appears that there was considerable shifting of fuels during the 1976-77 shortages; however, no clear trend emerges.

The business opportunities that developed because of the Arab Embargo and the growing price of oil and gas include new businesses in insulation and solar energy. The sharp operators, as well as those not technically qualified, hurt public confidence. Solar energy was hurt by the long fight in Congress over the Energy Act. The customers waited until they were sure of all the incentives and some small solar businesses went under. Competing for solar grant monies from the federal government was found to cost more money than it was worth.

Many business opportunities spawned by the growing energy problem lie ahead. One helpful task which the government could perform would be to conduct detailed market studies for new energy technologies in areas where the situation looks favorable. These studies should be readily available to the small business people so they can make more informed decisions on the risks involved. At the moment, the cost of assessing a business opportunity is discouraging.

Contrary to popular views, small business people in the fossil fuels business are suffering from a cost-price squeeze that is compounded by government regulations. This last complaint is heard across the whole population of businesses and the sense of the message is that if somehow there could be simplification and/or removal of the clinging vines of regulation and legal quicksand, the small businesses would tackle the energy problem with much greater enthusiasm and a much greater chance of success.
Nuclear energy is presently too costly and complicated for many small business personnel to tackle; however, the fact that its development has been slowed to a crawl will cause higher electrical costs for small business.

Both big business and big government cannot react swiftly enough to meet the energy problems that lie ahead. Only small business has the flexibility to change course rapidly and the imagination to save our citizens from a colder and darker future.
SECTION II
OBJECTIVES

It is imperative that an accurate picture be presented of what has been happening to small business in Region III because of the recent fuel scarcity, including the Arab Embargo. Present conditions and current problems need to be summarized and suggestions for future opportunities are appropriate.

To place the energy impact in perspective, it is necessary to remember the 1973 embargo as the start of the crisis -- the time when the word "energy" suddenly acquired status as a national concern, the time when Americans suddenly realized there could be and would be shortages of fuel supplies.

While the concern among Americans may have lost widespread concentration after the affects of the embargo softened, the potential hazards were not completely ignored in the business community.

Across the country, mechanisms were examined that could assist the businesses and industries interested in solving energy-related problems. In Pennsylvania, such a mechanism already was in place helping business -- particularly small businesses -- with technical problems of all kinds. Because of the apparent need, that organization, called the Pennsylvania Technical Assistance Program (PENNTAP), geared itself to energy and conservation technologies.

The experiences of PENNTAP in providing energy assistance across the Region's most populous state can be related to this study through the appropriate and real examples it handled, showing how energy affected small business. The author, as one of the professional technical specialists on the PENNTAP staff, was involved first-hand in numerous and typical cases -- an involvement that was expanded after the Department of Energy selected Pennsylvania as a pilot state to implement the Energy Extension Service established by Congress in 1977.

From this background this paper will show what happened on scale of larger communities when one energy source, such as natural gas, is curtailed; on a scale of individual small businesses; on a scale of interest in and attempts to utilize alternative sources of energy; and on the scale of new business ventures and revival of passed-over or once-used energy sources.

Specific case histories will illustrate typical situations. This
approach has been chosen to put flesh and blood onto what would otherwise be a dull set of figures — figures that are often over-used, often questioned, and generally not understood in "energy solving" attempts that usually circumvent the real task of actually helping small business cut consumption and costs.

This approach is used, also, on the assumption that it is understood there is a definite energy impact on small business. Thus, it is somewhat futile to dwell on or compile statistical evidence of impact.

SMALL BUSINESS RESPONSE

The first case involves the typical American approach to the problem which is a do-it-yourself method. Pennsylvania, as the birthplace of the oil and gas industry, provides an excellent example of a state which has within its own borders the resources which are in short supply. Why not drill your own well on company-owned land? A number of small firms investigated this possibility, and it is instructive to take a look at what they found out.

Small Company X came to PENNTAP and wanted to know what might be involved if it explored for its own supply of gas on company-owned property. PENNTAP provided the following types of information.

The company was at a location where shallow wells sometimes produced from a Devonian shale; however, the quantity of the gas was usually small and the occurrence at any specific location, such as the plant site, was almost impossible to predict. In other words, even if gas was discovered from these strata, there was a good chance that the quantity would be quite small. Deeper down there was a zone that provided good production in other parts of the state, but in this area, the porous sand was absent. Still deeper, around 4,000 feet, there was another sand horizon which produced within the area but which frequently had to be stimulated with fracturing and acid treatments. It was pointed out that the cost of drilling to this sand zone would amount to around $20 per foot. The cost is now $30 per foot. Furthermore, it had to be realized that the odds of success were in the one-in-ten range.

With these rather sobering facts in hand, management concluded that a small company such as theirs could not afford to lose that much money where the risk was so high. In short, they would be put out of business if they failed.
For the sake of comparison, there was the case of a larger company in the same general area of the state. The major difference between this company and the last is size and the availability of venture capital. The increased size also meant that land was owned at more than one location.

The basic geological information which was provided to both companies was essentially the same; however, company Number 2 decided to take the risk. In this second case, it discovered gas on its own land and was able to use the gas at the plant that was located there. They enjoyed this experience so much that they are looking at neighboring land for additional drilling sites.

It should be pointed out that sometimes the story can be very frustrating. Another small company drilled on company-owned land that was 17 miles away from its plant. The well was successful, yet it was blocked because it could not succeed in using the Interstate Pipeline to move the gas from the well to the plant.

IMPACTS

The energy shortage has forced companies to curtail operations and lay off workers. These impacts are probably best observed by examining a whole community.

When trying to show the effects of a shortage of oil and gas, the city of Erie, Pennsylvania, is a good example because it is located at the northwest corner of Region III (6851 annual heating degree days) and is large enough (population 128,000) to produce meaningful statistics.

In January and February, 1977, supplies of natural gas became low and for 19 days, manufacturing firms in Erie were told to stop using natural gas for production operations. Enough gas could be used only to heat the plants to the extent that damage to equipment and property would not result. After this curtailment, the Manufacturers Association of Erie made a survey of the impacts which were experienced in order to analyze the effect of this shutdown on the economic health of the companies involved.2

A total of 82 firms responded to the survey, and these firms involved 28,972 employees or roughly 70 percent of the industrial labor force. Looking at the small business part, we find that 6,917 employees were included from 68 firms.

What kinds of impacts might a small business expect with increasing curtailments?

Table I illustrates the range of responses for companies with 50 to 100 employees.

The major message from all firms reporting was that the curtailments above 30 percent would cause layoffs and in some cases, shutdowns.

The increased cost to operations for 23 small firms amounted to a total of $485,554. Table II shows clearly the overall spread in cost increases upon the various types of businesses. When asked if the shortage reduced profits, 82 percent indicated that it did. In other words, they felt they could not merely pass on the increased costs to the customers.

When asked about losses to equipment, buildings, or products because of the gas curtailment, 36 percent of the small firms responded that they had indeed suffered such damages.

The major concern usually involves the number of people out of work because of the reduction in gas availability. During the 19-day period, a total of 4,321 people from 82 firms lost 20,031 regular work days with 11 workers laid off indefinitely.

In this temporary curtailment situation, it was asked what steps were taken by small business to modify operations. They replied:

1. Tried to keep the plant open only 40-50 hours a week.
2. Employed a four-day work week.
3. Reduced overtime.
4. Rescheduled shipping dates.
5. Limited production and repair to one day each week.
6. Changed forms of heating for different shifts.
7. Reduced employee time on the job to nine hours each week.
8. Set back deliveries.
9. Ran gas-fired cleaning operations more hours per day but fewer days per week.

Another significant area involves probable production cutbacks. Firms were asked what would happen to production with 60 percent gas limitation, and Table III shows the response according to company size. The terms "moderate" and "severe" are highly subjective and do not get the idea across concerning the ripple effects for small companies. Some of the additional effects are as follows:
### TABLE I

**IMPACT OF ENERGY CURTAILMENT ON SMALL COMPANIES**

<table>
<thead>
<tr>
<th>If dual fuel curtailed by:</th>
<th>Result would be</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Company A*</td>
</tr>
<tr>
<td></td>
<td>loss in income of</td>
</tr>
<tr>
<td>10%</td>
<td>$55,000</td>
</tr>
<tr>
<td>20%</td>
<td>110,000</td>
</tr>
<tr>
<td>30%</td>
<td>165,000</td>
</tr>
<tr>
<td>40%</td>
<td>220,000</td>
</tr>
<tr>
<td>50%</td>
<td>275,000</td>
</tr>
</tbody>
</table>

*...Companies were asked to list the effect on their operation if dual fuel usage were curtailed in the 10% to 50% range. Company "A" chose to list their loss in terms of collars; whereas Company "B" showed their loss in terms or output. Both cases are examples of responses received.*
<table>
<thead>
<tr>
<th>Firm size by employees</th>
<th>Dollar volume increase in costs</th>
<th>Percentage increase in costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 or less</td>
<td>4 firms responding</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>$5,000</td>
</tr>
<tr>
<td>50 to 100</td>
<td>5 firms responding</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>can't convert</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>0%</td>
</tr>
<tr>
<td>100 to 300</td>
<td>11</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>10%</td>
</tr>
<tr>
<td>300 to 500</td>
<td>21</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>15%</td>
</tr>
</tbody>
</table>

$485,554
1. Effects on employee morale which will create inefficiency.
2. Lower profits due to penalties incurred.
3. Increased production tooling costs.
5. Reduction in sales.
6. Difficulty meeting Federal air pollution requirements.
7. Major expense of all dual fuel system installation.
8. Severe effects on competitive position.
11. Possible loss of share of market because of inability to deliver.

Energy conservation has been heralded and proven as a way to save money.

What was actually done in Erie?

1. Lowered thermostats.
2. Installed more insulation.
3. Reduced lighting.
4. Changed production schedules.
5. Stopped heating warehouses.
6. Increased efficiency of heating equipment.
7. Started a four-day work week.
8. Converted to new boilers.
9. Converted to electric heat.

None of this is particularly original, and most of these steps should have been carried out prior to the cut-off of energy. This verified, among other things, that many smaller businesses will not move on the energy conservation problem until a crisis forces action.
TABLE III

Anticipated production cutbacks by employment category

<table>
<thead>
<tr>
<th>Cutbacks will be:</th>
<th>employment size of responding firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50</td>
</tr>
<tr>
<td>negligible</td>
<td>11</td>
</tr>
<tr>
<td>minor</td>
<td>5</td>
</tr>
<tr>
<td>moderate</td>
<td>10</td>
</tr>
<tr>
<td>severe</td>
<td>4</td>
</tr>
<tr>
<td>extremely critical</td>
<td>0</td>
</tr>
</tbody>
</table>

TOTAL = 63
Moderate to severe = 29 or 46%

A LARGER SCALE LOOK AT CONSERVATION - CHANGES IN FUEL CONSUMPTION

It is appropriate at this point to ask, "Who in the small business community is taking fuel conservation seriously and what is the net effect?"

For this analysis, Pennsylvania is the sample in Region III because the state has 51.3 percent of the total businesses in the Region and detailed data on the sizes of businesses and their fuel consumption were available.14

Taking a look at the very small businesses employing from one to 19 people, accounting for roughly 8,000 firms, rather significant changes in the fuel consumption pattern from 1976 to 1977, as shown in Table IV15 were found. Actual quantities of electricity, natural gas, and gasoline used were sharply reduced. The fuels which were substituted were propane (+88%), coal (+25%), and fuel oil (+24.1%).

Now, in examining the larger end of the small business spectrum involving companies employing 200 to 499 people, an entirely different picture is shown for the same two years (Table V). Consumption of electricity, coal, fuel oil, propane, and gasoline all increased, with natural gas showing the

only reduction. This latter reduction was probably forced because of the 1977 winter scarcity of natural gas.

The surprising point is that gasoline consumption almost doubled for these firms, whereas it was reduced by 63.8 percent by the small firms. It should also be noted that propane appears to be a popular substitute for natural gas. In essence, it is concluded that the larger companies (with exceptions, of course) have not made many significant changes in their energy usage, whereas many of the smallest firms have. The message seems to be that as business becomes larger, the shift to other fuels becomes more difficult. The flexibility of the smaller businesses is once again demonstrated.

MAJOR INDUSTRY GROUPS

It is instructive at this point to measure the consumption changes that took place within the major industry groups (SIC 20 through 39). The first fuel to look at is propane because this showed significant increases in both ends of the small business distribution. Industry groups that markedly increased their use of propane from 1976 to 1977 included food and related products, lumber and wood products, chemicals and allied products, stone, clay, and glass products, primary metal products, and transportation equipment.

Natural gas usage showed appreciable decreases in chemicals, petroleum, and coal products, stone, clay, glass, and the primary metals.

The distribution of distillate and residual fuel oil reveals some numbers that deserve more study than can be provided in this report. Certain points, however, emerge and should be mentioned. The food industry (SIC 20) increased its use of distillate fuel oil and decreased its use of residual. The reasons for this are not clear. Similarly textile mills (SIC 22) in Pennsylvania increased their use of distillate while decreasing that of residual oil.

By contrast, the lumber and wood products industry (SIC 24) markedly increased its use of residual fuel and decreased its use of distillate. Chemicals (SIC 28), petroleum (SIC 29), plus rubber and plastics (SIC 30) all increased their consumption of distillate. Of these three, only the chemicals industry significantly reduced the use of residual oil.
### TABLE IV
BUSINESSES WITH 1 TO 19 EMPLOYEES

<table>
<thead>
<tr>
<th>FUELS</th>
<th>QUANTITY</th>
<th>% CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1977</td>
<td>1976</td>
</tr>
<tr>
<td>Electricity</td>
<td>202 Million KWH</td>
<td>285 Million KWH</td>
</tr>
<tr>
<td>Coal</td>
<td>15,000 Short Tons</td>
<td>12,000 Short Tons</td>
</tr>
<tr>
<td>Fuel Oil</td>
<td>634,000 BBLS</td>
<td>511,000 BBLS</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>4,000,000 MCF</td>
<td>23,000,000 MCF</td>
</tr>
<tr>
<td>Propane</td>
<td>1,613,000 Gals.</td>
<td>858,000 Gals.</td>
</tr>
<tr>
<td>Gasoline</td>
<td>2,038,000 Gals.</td>
<td>5,633,000</td>
</tr>
</tbody>
</table>

### TABLE V
BUSINESSES WITH 200 TO 499 EMPLOYEES

<table>
<thead>
<tr>
<th>FUELS</th>
<th>QUANTITY</th>
<th>% CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1977</td>
<td>1976</td>
</tr>
<tr>
<td>Electricity</td>
<td>5,740 Million KWH</td>
<td>5,459 Million KWH</td>
</tr>
<tr>
<td>Coal</td>
<td>1,605,000 Short Tons</td>
<td>1,470,000 Short Tons</td>
</tr>
<tr>
<td>Fuel Oil</td>
<td>6,667,000 BBLS</td>
<td>5,911,000 BBLS</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>37,000,000 MCF</td>
<td>41,000,000 MCF</td>
</tr>
<tr>
<td>Propane</td>
<td>16,808,000 Gals.</td>
<td>10,430,000 Gals.</td>
</tr>
<tr>
<td>Gasoline</td>
<td>2,540,000 Gals</td>
<td>1,274,000 Gals</td>
</tr>
</tbody>
</table>
The changes in the pattern of coal usage in Pennsylvania over the 1976-1977 period are not as obvious. Bituminous coal usage was clearly increased in the petroleum and coal products classification (SIC 29). Anthracite showed a consumption decline in the stone, clay, and glass products industry from 213,000 short tons in 1976 to 15,000 short tons in 1977.

The consumption picture of electricity does not reveal many sharp advances or declines. Significant increases appeared to be more characteristic of the metals products group (SIC 33 and 34).

Summarizing these data, it appears that each major industry group assessed its energy problems on the basis of the technologies and the economics peculiar to their products. With the possible exception of propane, there appears to be no consistent switch to a specific fuel in response to the overall energy problem.

OPPORTUNITIES AND HAZARDS THAT DEVELOPED

In the early stages of the energy shortage, the new business opportunities focused upon the short term. Specifically, one of the first industries to get a boost was the insulation business. Entrepreneurs began by learning how to manufacture cellulose insulation and then going into the field with a hard sell. This points up another facet to any new business area and that is the small operators who, either by accident or design, produce an inferior product. Worse yet, the product may be dangerous. Early in this surge to supply every household with insulation against the winter winds, it became apparent that the fire-proofing technology was not altogether uniformly successful or safe.

Other forms of insulation, such as foams, required very careful installation. Some of those business people who got into the business did not understand the technical requirements.

In the case of plastic foams, there are still unresolved technical questions concerning their response to fire conditions. As a 1978 report from the Society of Fire Protection Engineers points out:

"Traditional fire test methods do not necessarily predict the fire performance of foam plastic insulation materials."

Smoke emission from these materials appears to be quite high and toxicity of combustion products is not known...

- No nationally developed consensus standard exists for large-scale fire testing, due to the many variables that are present...

Those who sell, specify, accept, or install foam plastic insulation may be subject to legal liability if it is shown that installation was not equivalent in life-safety protection to that required by law."

Since the Fire Protection Engineers have not developed a standard on a national scale, it is small wonder that some installers are in trouble. The unfortunate part about these problems is that many legitimate businesses are hurt by the actions of a small minority.

It is clear that solar energy is an area in which the small business person can carve out a significant part of the market. Experience to date indicates that the risks are high. A point that must be appreciated in the future, particularly on the part of government, is that if incentives are to be legislated, the time interval between the proposal and the enactment can cause a complete collapse of a market while customers hold off buying until their full advantage becomes a reality. Some small businesses which strove to develop a solar market early were wiped out because of the legislative delays associated with the National Energy Act.

Other problems which must be realized involve grant programs designed to encourage the solar energy industry. According to a 1979 Department of Energy (DOE) study, only 27 percent of the grant monies available for solar energy research went to small business. It turns out that it is necessary to be a fairly large business to have the time and people to compete. For instance, one solar industry businessman indicates that it commonly takes two or three people 100 to 150 hours to prepare a grant application. Another small businessman has stated,³

"The paperwork, the redtape, the administrative overhead...One $12,000 grant ended up costing us $18,000...So we got out of the grant business."

THE PRESENT

The opportunity to shift to new sources of energy still exists, but many

small businesspeople are by no means certain as to which way they should go. Even in the heart of the coal region, there are misgivings about staking the future on this option. Why? It is very clear to those who live in the midst of coal country that strikes are a perpetual problem. The fact that coal-fired boilers are larger, plus the storage space required for the coal pile and the ash means that the associated costs require a major investment locating in a new industrial park where a coal gasification plant provides the BTU's in one way for firms to meet the problem without the whole frontend cost load. This kind of community boot-strap operation is presently taking place in Hazleton, Pennsylvania. It should be pointed out that Hazleton relied on the in-place know how of a brick manufacturer who was using the low BTU gas from anthracite to fuel his operation. It was obvious to this small businessman that his operation could be scaled up to provide more fuel which would attract businesses looking for a long-term secure source of energy.

Obviously the initial financing of such an operation required a number of sources, such as the Economic Development Administration. Incidentally, some of the technical information concerning the quality of the anthracite was supplied by the Pennsylvania Technical Assistance Program (PENNTAP). It is at the critical feasibility stage where organizations such as PENNTAP can and do make highly significant contributions. In other words, at the point where there is an idea but nobody is willing to risk the money to find out whether the assumptions are real, a PENNTAP-type organization of highly educated and skilled personnel can help out, thus saving valuable time as well as considerable amounts of money.

Somewhere, somehow, it will be necessary to cut down the complexity of the system so that a straightforward relationship exists between a government agency that wants new technology and the small business person who has a good idea.

The author's experience in this field indicates that the agencies in the government have a habit of arbitrarily changing the agreed-upon targets midway in the programs. This practice is one of the most costly, frustrating, and time-consuming parts of doing research and development on a grant. In brief, the logical step is to clean up our governmental management and aim towards simplification.
Some small businesses which rely heavily on sales persons to show their products will probably have to change their marketing approach. During the last decade, shopping centers and malls have grown up at various intersections around the cities. A salesman must log many miles to cover these marketing centers -- but with reduced gasoline, the ability to call on all these customers will be sharply curtailed. The immediate impact may be in terms of increased use of the telephone and the mails. Will these modes of communication be able to handle the load?

Herein, perhaps, lies another opportunity for new forms of sales communication. The time to put imaginations to work is now.

The message for the federal planners is that there is likely to be a new surge of pressure on the telephone communications and the mails. As things now stand, the nation is almost exceeding the capacity of the United States Postal Service in terms of reasonable delivery times. It is also clear that with diminished fuel availability, the large trucks and jet aircraft which have taken over the function of the old mail-by-rail system may not be able to respond rapidly to the increased load.

It should be pointed out that with the proper equipment, telephone conference calls can be arranged now so that 15 or more remote locations can join in a conference and interact with each other. Greater use of this type of communication can save many gallons of petroleum.

Can the Hazleton type coal gasified-fueled industrial park be replicated elsewhere? The answer seems to be positive, but as usual there are significant difficulties.

In the case of Shippensburg, Pennsylvania, there was a prototype incinerator which had ceased operation because of a breakdown in key mechanisms involved in the kiln. The cost of replacement was high, yet the location of the incinerator and the possibility of using the waste heat to provide an attractive incentive for industrial users spawned another industrial park concept. It might be asked as to where the solid waste would come from. In this case, a number of surrounding communities had been involved previously and again were expressing interest.

The message in all this is that by working together, business and the community can come up with concepts which fit their own situations.
TRANSPORTATION

Tied to the industrial park concept is the energy problem as it applies to transportation.

Many small and large businessmen have become so discouraged with rail transportation that they no longer consider it when locating a new plant. With the energy situation continuing to degrade, the small businesses must periodically review the logistics situation. If the manufacturer is located in an industrial park with rail access, his two or three carloads per week will be part of the critical mass of carloads coming to that location, making rail transport relatively inexpensive and efficient. Railways with light density traffic are being phased out because it makes little sense to send a 1600 horsepower engine to haul two or three cars once or twice a week. In essence, careful consideration must be given location and access to efficient transportation for the longer term. (Full ramifications of the energy situation on transportation and on motor fuel availability and cost are discussed in the next chapter of this Regional Volume.)

IN VIRGINIA

In tackling the problem of helping small business conserve on their energy bills, the state of Virginia, financed by the Department of Energy, has conducted a series of 29 workshops for owners/users of commercial buildings. The special targets included retail stores, grocery stores, and food service establishments as well as office buildings. A follow-up study was conducted to determine if the participants actually did something as a result of the workshop. After a telephone survey which covered 37.2 percent of those attending, the following major conclusions were obtained.

1. Overall, 60 percent of all participants took one or more conservation actions as a result of the workshop.
2. Participants with one relatively small building tended to take one or more workshop related management actions.
3. Participants responsible for multiple large buildings had taken three or more conservation steps before the workshop and relatively few of them took new action as a result of the workshop.

The message seems to be that the smaller business can benefit the most from government-sponsored conservation workshops. Beneficial parts of the program which were thought to be most useful included:

1. Information on electric bills and meters.
2. Exchanges of ideas with other participants.
3. Practical (no investment) energy saving ideas.
4. Workbooks distributed at the workshops.

If state and federal officials wish to help with energy conservation by putting on workshops, the smaller businessman is the one who will benefit the most and the one who will take action.

It should also be pointed out that in some areas, such as western Pennsylvania, energy conservation workshops were carried out by a number of government agencies at an early stage. In this area the market is saturated; therefore, it pays to investigate the market before attempting to carry out an extensive workshop program.

**STEPS THAT WOULD AID SMALL BUSINESS IN ENERGY**

It is becoming apparent to those who study the energy problem in any depth that a number of new industries are emerging. Around each of these industries, demand for suppliers of goods and services grow with the industry. For instance, General Motors indicates that it has 26,000 such suppliers and these suppliers receive almost 50 cents out of every General Motors sales dollar. 4

At this stage, it is safe to predict that industries of varying sizes will continue to develop around coal gasification and coal liquefaction projects. The technology is such that businesses should be able to analyze in some detail the kinds of suppliers they shall need. In fact, a clear, detailed analysis of the markets associated with each of the energy technologies would be valuable to the federal government as well as to the entrepreneur.

Large corporations, at least in the past, have not tended to bother with markets that have a potential gross sales value of less than $100 million per year. With some number such as this for a cutoff, the relatively small but critical markets can be assessed. The Small Business Administration or the Department of Commerce could contract to have this done; however, small businesses must be able to state clearly what they need to know.

In the past, many studies have been so full of research jargon that they have been very difficult for the small businesses to use. At this point, there is obvious need for editorial rewrites of most of the papers routinely reproduced by the National Technical Information Service (NTIS). If decks are to be cleared for use of taxpayer-supported data, it must first be made readable and understandable. Short of sending a scientist along to translate the data, the results must be more readily comprehensible to the person who is going to take the risks.

Obviously, any market research reports should not only address the size of the market but also should stress the requirements for those who plan to enter the field. Minimum cash flows and capital requirements should be delineated with charts for assessing the continued impact of various inflation rates.

It is also clear that labor requirements are extremely important, yet the unavailability of skilled labor in many areas means a whole training program must be established. Small businesses find this burden very difficult to handle. The tendency is to assume that labor moves close to the job, and hence the new coal mine builds the population rapidly. This is not necessarily the case. In southwestern Pennsylvania, the development of a large new mine increased the number of commuters but did not immediately cause expansion of the community itself.

Another part of the market assessment should cover such problems as the degree of sophistication - i.e., engineering know-how, special tooling, required reports for the federal government, etc.

In examining past federal reports which were targeted at moving the technology into commercialization, it was found that many of them focused mainly on the larger applications, such as the technology surrounding fuel cells. The opening sentence reads, "The fuel cell is a device that converts fuel to electrical energy in a highly efficient and environmentally acceptable manner regardless of unit size." Further, in the same paragraph it says, "When used to complement other types of generation equipment within a utility system, the fuel cell permits the entire system to be operated in a more effective manner."

Obviously, the authors are looking at the larger consumers, but there should be a market for smaller customers and units which could be manufactured and sold by and for small business. Clearly the major opportunities may be for the suppliers of component parts and services to a fuel cell industry. A detailed analysis of parts and services required by fuel cell manufacturers as well as a survey of the market for smaller units should be carried out by the Department of Commerce in the very near future.

Since companies have been waiting to see what technology will emerge as the big winner and at reasonable costs, small businesses need a list of technologies with in-depth studies in terms of what the small businesses can expect in the marketplace. It is certainly desirable that all of these technologies develop to some extent, depending upon the nearest available fuel source.

For instance, coal liquefaction and gasification and methane from coal as industries will have major impacts in West Virginia and Pennsylvania in Region III.

In terms of wind potential, the best area in Region III is in the Erie County area of Pennsylvania; however, the remainder of the state, as well as parts of West Virginia, Maryland, and Delaware, have moderate opportunities. Offshore, opposite the Delmarva (Delaware, Maryland, Virginia) Peninsula, is very high in wind potential. Perhaps some enterprising organization will use oil well platforms for wind energy recovery.

Small low-head hydro opportunities exist -- water turbines which produce electricity from streams. In the rolling Appalachian Mountains with their fairly high rainfall and numerous streams running headlong into fertile farm valleys, there are numerous opportunities for harnessing this energy source. Modern farming takes great amounts of electricity, and the farmer as a businessman is looking for ways to cut costs. Any market study should focus on these needs.

The potential target areas for water power in Region III are obviously central Pennsylvania, all of West Virginia, most of Virginia, and some of Maryland. One might also think of tidal water power; however, the obvious prime target for this energy source is coastal New England where the rise and fall of the tides are greater. Nevertheless, some inlets between the barrier islands along the coast of New Jersey and Delmarva have swift tidal currents which might be exploitable.
Everybody thinks of solar energy as being ubiquitous. Within Region III, there are certainly some areas of potential that are much better than others. Southeastern Pennsylvania, Delaware, eastern Maryland, Washington, D.C., and eastern Virginia are logical target areas for solar developments. Again, such statements need to be qualified. A recent Department of Energy report entitled, "Solar Energy Potential for Residential Water Heating and Space Heating in the 12th Congressional District of Pennsylvania," stated, "Results indicate that solar systems are not cost competitive with conventional systems except under special circumstances." The special circumstances involve solar hot water heaters. The mountains of central Pennsylvania where the 12th District is located are not as favorable as the area to the east. It should be pointed out that businesses which cater to summer vacationers should think about solar hot water. Time of year will, of course, influence these potential markets.

The Delmarva Peninsula is somewhat unique in its geographic setting with its proximity to the large metropolitan cities and yet its rather rural character. The Delmarva Advisory Council has recognized the importance of energy to the many small businesses in the area and regularly includes information on energy-saving projects in its Delmarva Reports. One of the unique projects reported upon is the drilling for geothermal heat that took place outside Crisfield, Maryland. Geothermal energy is often viewed as being the concern of large utilities; but a closer look reveals some interesting opportunities.

The first drilling phase of the Department of Energy well goes to 4,200 feet and the final phase is designed to drill 700 feet further into the granite pluton. The data from this well will assist DOE, state and local officials in determining the amount of heat available from the water-bearing sedimentary rocks, the costs and possible uses.

It is estimated that water temperatures around 145°F is available, and although this is too low a temperature for the generation of electricity, it has other possibilities. A few of the ideas mentioned are as follows:

1. Grain drying for poultry feed, heating of brooder and poultry houses, and hot water for poultry processing and packing.

2. Food processing industries using large volumes of water in the 120 - 200 degree Farenheit range for seafood and vegetable processing.

3. Heating of greenhouses growing vegetables, cut flowers or bedding plants.

4. Agricultural uses such as drying of grain, lumber and tobacco.

5. Space heating and domestic hot water...."

Another fascinating heat recovery project involving the use of waste heat from the municipal power plant is taking place at Easton, Maryland. The cogeneration system, as it is called, uses hot exhaust gas to generate up to 3.5 million kilowatt hours of electric power which may produce annual savings of $190,000. All this should provide small business in Easton with lower electricity bills.

What the above seems to say is that it is a good idea to produce an energy technologies opportunity map for all of Region III. This map would be keyed to market profiles for specific areas within the Region. With this in mind, the author has constructed a simple map of Region III and has placed the alternative technologies in those areas where the chances appear to be best.

The term "coal" refers to both the small mine operator and the retailer for domestic use. This latter category may seem surprising; however, in some counties in West Virginia, 80 percent of the homes are heated with coal. Certain energy technologies are not related to geography, and these will provide region-wide opportunities for small business.

Of particular interest is the electric car and all the new light-weight equipment needs which its introduction will mandate. As the National Petroleum News (May, 1979) states, "And though EV's (electric vehicles) will have an impact on commercial and fleet users before the private motorists, experts state that all the incentives will be in place by the late 1980's to make the EV attractive as a second or third family car..." "Predicasts predicts EV's will account for 10% of new car sales by 1990 (1.1 million units units by 1978 standards)." And, General Motors unveiled in Washington in

ENERGY OPPORTUNITIES MAP
REGION III

- WOOD
- BIOMASS
- GASOHOL
- COAL
- LOW HEAD HYDRO
- WIND
- SOLAR
- GEOTHERMAL
- TIDAL
- WIND
- COMMUNICATIONS
- WASHINGTON D.C.
in September an EV with long-term power batteries and 100 mile recharge capabilities.

Clearly, this market deserves to be watched and the opportunities assessed.

Fuel cell technology is another energy industry which transcends regional boundaries and local suppliers of needed materials.

IMPACTS ON THE FOSSIL FUEL BUSINESS

In the mining of coal, there is evidence that the small companies are being squeezed out. The Mining and Reclamation Council of America estimates that as many as 1,000 small strip mine operators expect to go out of business by the end of 1979. The reason for this decline in numbers is attributed to the 1977 Surface Mining Reclamation Act and the Interior Department's subsequent regulations. Roughly 80 percent of operators with production smaller than 25,000 tons per year reported this expectation. From the production point of view, it is estimated that overall coal production will rise by 17 percent; however, the output from small operators (less than 100,000 tons per year) is estimated to decline by 36 percent. It appears that some parts of the energy business are becoming off limits for the small operator because of government action. It should also be pointed out the "soft" coal market and recent increases in transportation costs may be equally important factors in squeezing the small operator out of the coal marketplace. Obviously, the states in Region III which are suffering the most in this regard are Pennsylvania and West Virginia. As the overall energy situation worsens, the spot market should become stronger, particularly as the homeowner decides to use coal as an alternative source for heating. In view of this somewhat longer-term expectation, the small miner may return under the inspiration of high coal prices.

Coal is being relied upon as the great energy hope for the future of this nation; therefore, when it becomes clear that the small coal operator is suffering, the situation must be viewed more closely. One of the most costly parts of the present coal picture is rail transportation. The Interstate Commerce Commission is allowing the railroads to up charges in a rapid sequence, particularly for the shipment of coal. If the railroads are deregulated, the prospect of additional price increases may cause a

reexamination of the basic ways in which coal is hauled. Clearly, the
driver who owns his own coal truck will be one of the small operators to
be relied upon. Other coal operators will think of the coal pipeline
approach. Such pipelines probably will become a new and expanding energy-
related industry in which small business can have a sizable share.

Other problems for small operators which are not covered in the popular
press involve such areas as the difficulty small operators have in obtaining
the cash bonds required for surface mining. Bonding companies are loath to
take the risk on small surface mining ventures because of rapid changes that
frequently occur in the regulations.

Another area where delay is encountered is in the approval of environ-
mental impact statements. Apparently, although the federal government may
take a year or so, it is the state governments which may require two or
three years. At this point, the United States cannot afford delays of this
magnitude. We MUST speed things up.

Yet another waste of energy, time, and money for the small operator is
the vast amount of step-by-step engineering detail required to be carried
out by the Office of Surface Mining in restoring the mined out areas. Small
operators feel that if they can achieve the desired end result, the methods
for obtaining it should not be crammed down their throats.

In addition, the small coal operator dealing with metallurgical coal is
suffering because some of the foreign markets, such as Japan, have switched to
Australia as their source. At this point, these operators need help in
developing new markets for what should be a prime product.

The small coal operator can and will return only when he has the freedom
to fill society's need for energy in an economically efficient manner.

GASOLINE DISTRIBUTION

The other main small businesses involved in energy are the gasoline
station leasees and owners. The future for these small businesses is
difficult to estimate. State and federal actions designed to help the
consumer with gasoline shortage have sometimes caused additional difficul-
ties. For instance, a recent Maryland law forbids company-owned stations.
The turnaround period between the enactment and the effective date was so
brief that companies were left with unleased locations, thus reducing the
number of stations in operation.
In Pennsylvania, the allocation problem between company-owned stations and the independents was and remains a point of contention.

Refiners have run out of spare capacity for the first time since World War II, and as they look at the future, most refiners do not plan to invest in large and very expensive new plants. What this suggests is that product supply will remain a problem well into the 1980's. Specifically, the total United States demand for petroleum products exceeded 21 million barrels per day in early March, 1979. The total refinery capacity for the nation is about 17,169,700 barrels per day, and it should be understood that only 85 percent to 90 percent of this total can be relied upon for long periods of time. This leaves a significant capacity shortfall.

The question faced by the large refiners are:
1. Will product demand taper off in the early 1980's as the experts predict?
2. If the demand does drop, can the $600-800 million investment in a new refinery be justified?
3. If the demand continues, can companies survive the political storm?
4. Will decontrol of domestic crude oil prices encourage foreign refineries to pour products into the U.S. market?
5. Can new refineries be justified under today's economic conditions no matter what occurs in the supply situation?

In contrast with October, 1973, when the Arab Embargo started, the U.S. was producing one million more barrels of crude per day, and America was consuming about 2.5 million barrels less. Foreign imports now account for half our supply as opposed to 35 percent six years ago.

At the level of the small gasoline station leasee, the problems associated with decreasing allocations and, in some cases, fixed or rising lease costs, provides the leasee with no other alternative than to increase prices and decrease hours if he wishes to stay afloat. This rather sobering fact, plus the regulatory problems involved, have driven a number of operators out of business. A trip across America's heartland, including parts of Region III, in May, 1979, revealed a larger than average of stations standing empty.


K31
All these factors point toward less travel which means that the small businesses, the hotels and motels, the restaurants, etc., in resort areas will suffer. For Pennsylvania it has been estimated that this means an overall reduction in tourism of 30 percent compared to 1978. The percentage of reduction for the Delmarva area is roughly the same. At this stage, it appears that the resort areas near the major population centers may continue relatively minor changes; however, those that are more remote may have to provide additional services, such as gasoline pumps, if they are to survive over the long haul.

The beaches and mountains of Region III are within striking distance of the major population centers; therefore, the changes brought about by a continued gasoline shortage will probably not be as great.

CRISIS STAGES

There is now a tendency to regard the energy question in terms of price and temporary shortages only. In other words, if consumers pay enough for it and put into effect various measures of conservation, it will be available. This may change. Should only relatively small cutbacks in supplies occur, the fact is that the slack in the system is not large. Coal gasification cannot be brought in on short notice, nor can the oil shales. Hurried shifts to buy more from Mexico and Canada would not necessarily turn on the tap for much of their production is obligated to others.

In brief, it is altogether possible to go abruptly from the situation of grumbling and paying high prices to the situation of literally no supply at all. The inclination is to think that this is not possible -- but the possibility exists!

RECOMMENDATIONS

1. At every level of government, there should be a campaign to simplify and expedite. Whether it involves regulations or permits or just information, the legal and bureaucratic debris must be cleared out so that action on the energy problems can occur.

If hotlines are established, there should be enough of them available so that the busy signal bottleneck is avoided. The hotline offices should be manned 24 hours a day if the demand exists. Referrals to other phone numbers should be cut to a minimum.
2. If grant monies are made available for the development of innovative energy-saving projects, the proposals should be limited to 15 pages of double-spaced text in plain, understandable English.

3. Separate grant competitions should be held for small energy companies as they cannot compete with large companies for money; yet, they can often do the job at less cost. The Small Business Administration has provisions for low-interest loans to energy businesses. Unfortunately, this is not enough when the risks are so high.

4. Competent market studies covering the technical feasibility of various energy-based technologies in specific marketing areas should be made available to small businesses interested in plunging into new technologies.

5. Any such energy market studies originating from a federal agency or office should be reviewed to insure that they can be understood by someone not familiar with the technology or the jargon of marketing. Many of the people who have risk capital to lend to small businesses are independent backers who are risk takers but not technical people.

6. The National Technical Information Service (NTIS) should not be the sole distributor of energy-related market studies. Specifically, the cost of printing, mailing, etc., should not be recovered. The taxpayer paid for the information in the first place when he paid his taxes. To stimulate new industry, everybody should not have to pay for return-mail service. The go or no-go decision is a delicate matter which needs all the help it can get. The amount of money invested to get the critical information out is trivial compared to the discouragement inflicted by paying what appears to be too high a price for a report which may or may not contain what is wanted.

7. On energy-related grants to small business, do not change the agreed-upon target in mid-stream. Do not heap on additional reporting requirements, known as "supplemental understandings," after the document has been signed.

8. New people who take over as project managers for a federal agency should actually read the proposal that was initially accepted and abide by that agreement. Evidence shows this is not now in practice.

9. The assessment of new energy-related inventions should be conducted with a rapid turn around. This function should be coordinated with other Commerce Department agencies so that when a real winner is about to emerge,
it can be helped into the marketplace. Along the same line, the Department of Energy must be informed of such events. There are too many instances where government agencies do not cooperate or communicate with each other.

10. Agreement on what rules apply to the fire testing of insulation and what tests are legitimate must be reached as soon as possible. This will need to be applied to all energy-related safety tests. The public must be apprised of the requirements arrived at immediately.

11. In applying the rules of the Environmental Protection Agency or the Department of the Interior, a new small operator should be accorded a period of grace of up to five years so that he will have a chance at being in a position to survive before he is saddled with the full weight of government regulations.

CONCLUSION

A recent editorial in *Science* by Philip Abelson

"The public does not understand the extent of our vulnerability. A recent national poll conducted by NBC News and the Associated Press posed the following question: 'Do you believe there is really an oil shortage, or do you believe that it is a hoax to get consumers to pay higher prices for oil?' Of the group polled, 22 percent responded that there is a shortage, 68 percent said it is a hoax, while 10 percent were not sure."

The shock to the American system is going to be extensive and expensive. Americans cannot sail on as they have been doing, oblivious to the gathering storm. Right now the Organization of Petroleum Exporting Countries (OPEC) levies a tax or tribute of nearly $50 billion per year. That number is going up fast and more jobs and money are being exported to them. Because of their ponderous proportions and internal bickerings, both the federal government and big business are unable to move fast enough to meet this problem.

As Llewellyn King summarized in *Science*,

"We have not built a major oil refinery in ten years. We cannot, it seems, build liquified natural gas terminals. We cannot build a major coal-fired generating station. We cannot lease coal on federal land. We cannot, except very belatedly, drill the Atlantic shelf. We cannot build a nuclear power plant. We cannot come to a decision about what to do with nuclear waste... And so we sit, stagnant...."
Small business has the fleetness of foot and the precious independence to gear up and be ready to move swiftly when the lines at the gas stations become longer, brown-outs obscure the TV news, and only a limited amount of fuel oil is available to heat our homes. When these events occur, the demand for do-it-yourself power from all sections of the economy will be strong. Some business people will be saying, "Why didn't somebody tell us it was coming?" The opportunities will be there -- the opportunity to found new businesses which can achieve a profit; the opportunity for small business to raise its image to the hero level. The time to put a good plan of action together is NOW.

The word which can be passed on to the federal government can be summed up by one of Patrick Henry's potent remarks:

"Perfect freedom is as necessary to the health and vigor of commerce as it is to the health and vigor of citizenship."

At present, there are too many problems with well-intentioned laws. Mechanisms for modification of these laws must be found immediately so that our nation can respond to the deepening energy crises.

The "perfect freedom" envisioned by Patrick Henry no longer seems to be possible, yet the basic message deserves to be heard. During World War II, there was an expression that applies to the present energy situation. "When the going gets tough, the tough get going." It was Oliver Wendell Holmes who believed that character emerges from adversity. It appears that small business is one of the few segments of our nation that has the flexibility, the toughness, and the character to survive the coming years and emerge triumphant.
SECTION III - DATA CONSIDERATIONS

NEW ENERGY-RELATED TECHNOLOGIES AND INDUSTRIES

1. Electric car
2. Fuel cells
3. Wind
4. Solar - Photovoltaics
   Thermoionic converts
   Heating cooling
5. Water - Small scale hydro
6. Oil shale
7. Gas from coal - methane
8. Coal liquefaction
9. Coal gasification
10. Energy from solid waste
11. Geothermal
12. Biomass - Wood
    Gasohol
13. Tar sands
14. Hydrogen
15. Magnetohydrodynamics generators
16. Thermal gradients - Sea (ocean thermal E.)
17. Tidal Energy - Small hydro
18. Energy storage - Batteries
    Compressed air
19. Small scale coal furnace technology - Anthracite
    Bituminous
20. Methane from manure
21. Insulation
22. Communications - Picto phones
    Conference - TV, etc.
## DELMARVA

**SMALL BUSINESS**

- Biomass - gasohol
- Hyacinths - clean up heavy metals
- Solar
- Tidal

**LARGER BUSINESS**

- Geothermal
- Wind - off shore
- Oil-Gas - off shore drilling
- Cogeneration

## PENNSYLVANIA

**Solar**
- S.E.

**Wind**
- Erie area
- West

**Coal**
- West

**Water**
- (low head hydro)

**Biomass**

**Waste**
- all over

**Gasohol**
- (Methanol from coal, corn and others)

**Methane**
- from coal

## MARYLAND

**Solar**

**Biomass**
- wood

**Communications**
- electronic

**Low head hydro**
- West

**Waste**
- (Solid)

**Geothermal**

**WEST VIRGINIA**

**Coal**

**Low head hydro**
- (potential)

**Methane from coal**

**Wind**
- selected mountain sites

**Gasification**

**Liquefaction**

**Methanol from coal**
VIRGINIA

SMALL BUSINESS
Low head hydro
Solar - S.E.
Gasohol
Biomass - wood
Communications
Wind - selected sites

LARGER BUSINESS

TV conf. room

NON-SITE-SPECIFIC TECHNOLOGIES
Fuel cells - multi-family residential complex
heat pump
Energy Storage - batteries
Electric cars
Hydrogen
Insulation
SECTION IV - BIBLIOGRAPHY


