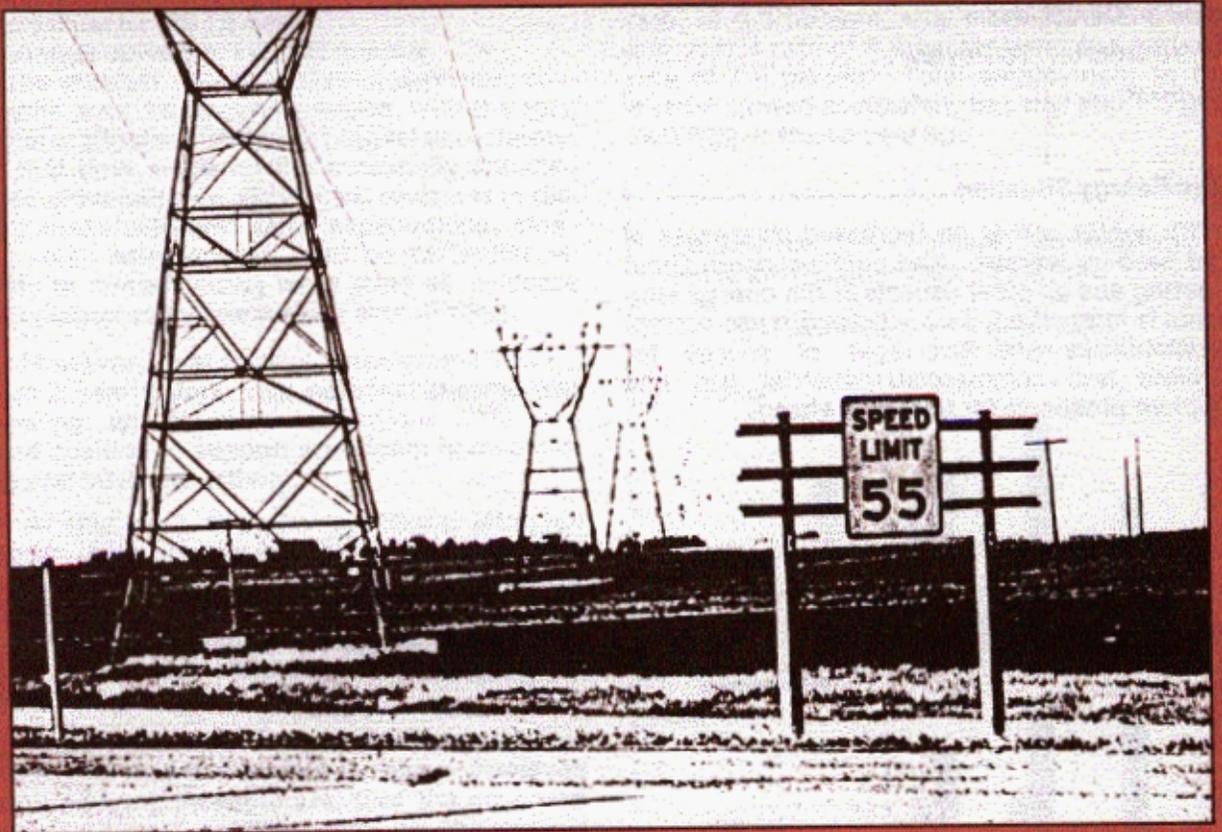


Ninth District Quarterly

Federal Reserve Bank of Minneapolis
October 1976

The Energy Situation



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With winter comes an increased awareness of the need for warmth. And public concern about heating and all other aspects of the energy situation is intensified. Two articles discuss current availabilities and shortages of energy for private and commercial/industrial use and explore prospects for the years ahead.

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District Conditions

Third Quarter '76 Review: Moderate optimism into the quarter

In the midyear report of district economic conditions, a mixed picture emerged, with the agricultural situation being the biggest uncertainty. At that time, a rise in the seasonally adjusted unemployment rate, downward revisions in district manufacturers' sales expectations, slowing retail sales growth, and no particular vitality in homebuilding were cited as evidence that district economic activity was slowing.

However, total district employment was up from a year before, real personal income was growing, and financial institutions were in a good position to support additional homebuilding and business activity.

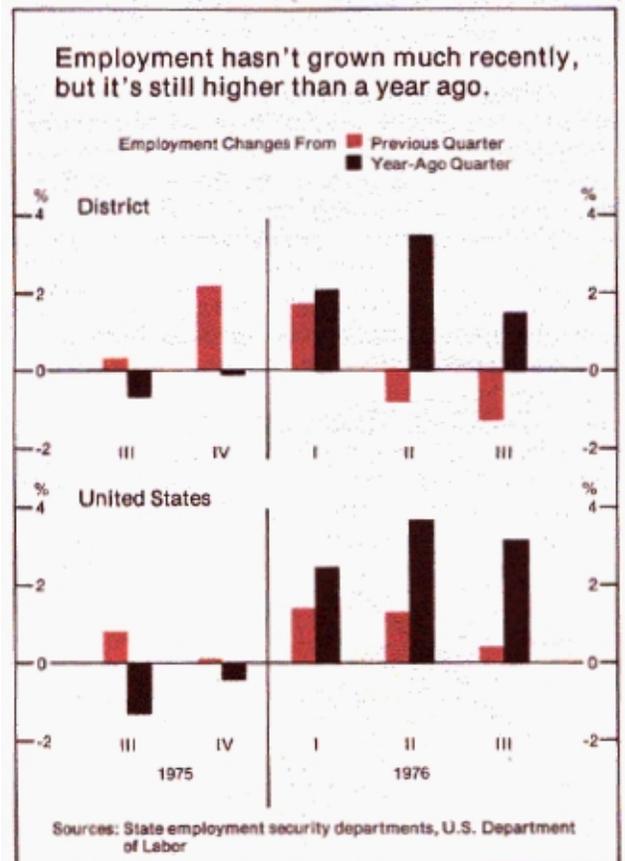
At that time, drought conditions, although spotty, were already putting strain on district crops and upward pressure on feeding costs. But due to increased livestock marketings, total cash receipts coming into midyear were above 1975 levels, and rural banks appeared to be liquid.

Weighing these various developments we concluded that the district economy displayed an underlying strength and that the economic recovery would continue through the second half, though at a more moderate pace than in early 1976. Are these conclusions still supported into the fourth quarter?

Third Quarter Strengths

As predicted, the various district economic indicators continued to show generally improved positions over last year. The unemployment

rate, at 6.3 percent, was more favorable than last year's rate of 6.9 percent and the nation's rate of 7.8 percent. Total employment in the district slowed somewhat, but was still 1.5 percent higher than a year ago.



Following unexpectedly large sales increases in the second quarter, district manufacturers responding to our third-quarter Industrial Expectations Survey looked for their sales to continue growing.

District homebuilding regained much of its previously dwindling vitality. Although cumulative residential building permits into the third quarter were only 5 percent above 1975 compared to the 37 percent increase in the nation, the district's decline in 1973-75 was far less severe than the national drop. As a result, district housing unit authorizations were near the record 1972 rate, while the nation was still running 40 percent behind the pace it held in 1972. Further, availability of mortgage funds for private housing was good, loan commitments were at a high level, and liquidity at financial institutions was above year-earlier levels.

Member bank outstanding loans grew at about a 9 percent annual rate in the district compared to 3 percent in the nation. This relative strength was a result of the weaker business loan growth in the nation than in the district and the greater importance of nonbusiness

loans here. But as the quarter progressed, business loan activity appeared to be advancing here as well as it was in the nation. And district savings and time deposit growth increased substantially at S&Ls and commercial banks.

Third Quarter Weaknesses

Although the year-to-year comparisons in district business activity are encouraging, closer examination reveals that much of the growth occurred in late 1975 and early '76 and that the recently publicized "pause" in the national economy has also been evident in the district. According to seasonally adjusted rates, district and national unemployment increased from first-quarter rates. But while national employment increased somewhat, labor force growth here has not been growing. This implies that the nation's unemployment rate increase was a result of labor force growth while the district's unemployment rate increase was due to fewer jobs.

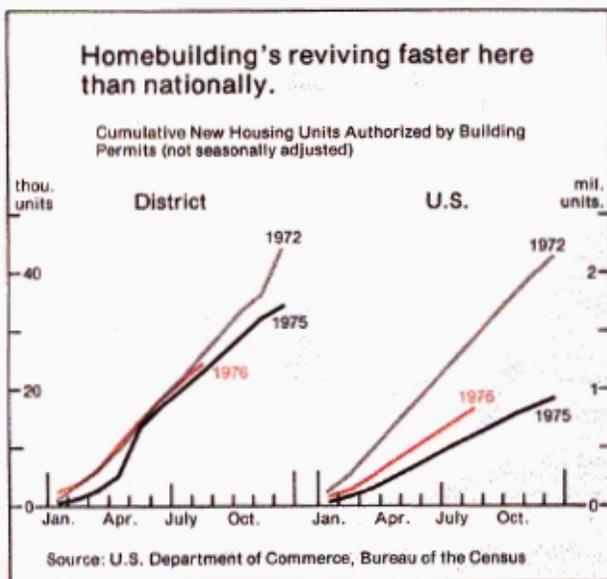
The growth in personal income is attributable more to earlier flows than to any midyear strength. Retail sales during the summer were nearly unchanged from early 1976 levels in real terms.

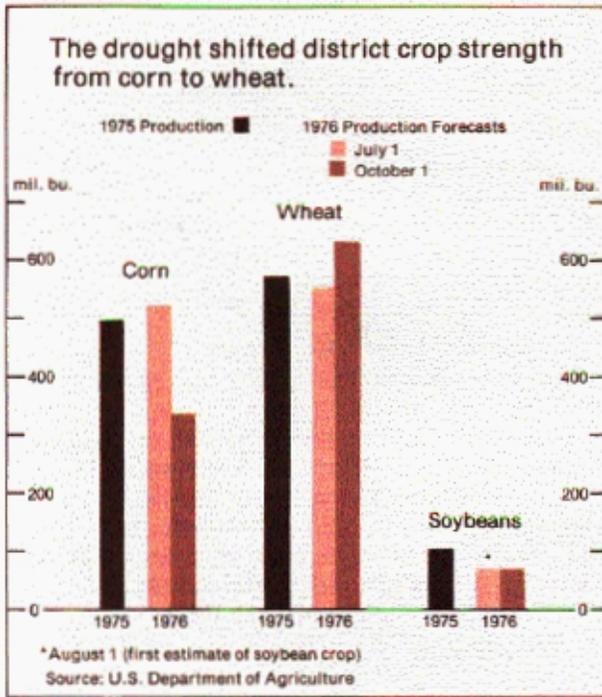
Homebuilding may be showing some strength, but other construction activity is weak. In dollar terms, both nonresidential and nonbuilding contract awards are off significantly from last year in the district and even more so than in the nation.

Agriculture Remains a Big Question

Regional drought conditions have further complicated the district's economic recovery. The most obvious impact is the reduction of crop yields, particularly Minnesota's corn and soybean crops. Another is an increase in feeding costs. And third is the impairment of river barge navigation. These regional effects have not taken a great toll on national agriculture conditions, however.

While the district corn yield has fallen, a record crop is still forecast nationally. However, recent downward revisions in the national forecast seem to be almost entirely attributable





to the shift Minnesota has made in cutting corn for silage instead of harvesting it for grain. Excellent wheat crops in Montana and North Dakota have added to the near record wheat crop forecast nationally. However, the record crops have strained storage facilities; river navigation problems have delayed shipments for export; and a large wheat crop elsewhere in the world has kept U.S. export sales to a minimum. These factors have combined to depress wheat and corn prices, and district cash crop receipts have fallen below 1975.

At the same time, red meat production in the district and the nation is very high. As a result, slaughter prices are well below last year. Increased marketings (which have helped depress prices) have kept district cash livestock receipts at last year's levels, however.

With district total cash farm receipts falling below 1975, loans at district ag banks and production credit associations have increased. According to our latest Agricultural Credit Condi-

tions Survey, ag bankers in our district felt able to meet loan demand, but some lenders were voicing concern about loan repayments.

The outlook for later this year and next year is not altogether hopeful. The drought conditions retarded winter wheat seeding. And if topsoil moisture is not replenished this winter and next spring, reduced yields are likely again next year. The cattle herd should be reduced by next year, so livestock prices can be expected to move upward by mid-1977. But tight feed grain supplies could increase feeding costs.

Outlook:

Less optimism for the close of '76

The district economy's gains over the past year and more recent strength in such areas as homebuilding offer encouragement in assessing future growth. On the other hand, recent labor market developments are a source of concern. And closing of many fall hunting and fishing areas has had locally adverse effects on the tourist business in particular and income levels in general. Further, drought-induced shortages in cash farm receipts throughout the remainder of the year and into 1977 will hold down personal income growth in the district and restrict business activity.

It now appears certain that the district's economic activity in 1976 will be further blunted by regional weather factors affecting the farm sector. Even if the national economy would increase quite sharply, the drought will continue to affect district economic growth into 1977. But there is not sufficient evidence to suggest that the moderate rate of recovery which we are experiencing will slip into a definite downturn.

The Energy Situation

As the winter months come upon us, the outlook for fuel once again becomes a "hot" issue. Will energy supplies be great enough to satisfy the needs our chilly climate imposes on homes and businesses in the Ninth District? Government and industry officials have several opinions about what the energy situation is in the district and in the nation.

In this issue of the Ninth District Quarterly, we are presenting two articles regarding what seems to be, once again, a critical issue. The first is a summary of the Research Department's information about current energy conditions in our district. The second, an excerpt from a paper produced by the Upper Midwest Council, places a stronger emphasis on the nationwide situation and its problems.

Ninth District Energy

David S. Dahl

The energy situation does not command the public attention now that it did three years ago when the Arab oil embargo was imposed and petroleum prices shot up. Nevertheless, both the nation and the district continue to be confronted with serious energy problems. Recent developments regarding district oil and natural gas may help alleviate some of those problems.

Petroleum

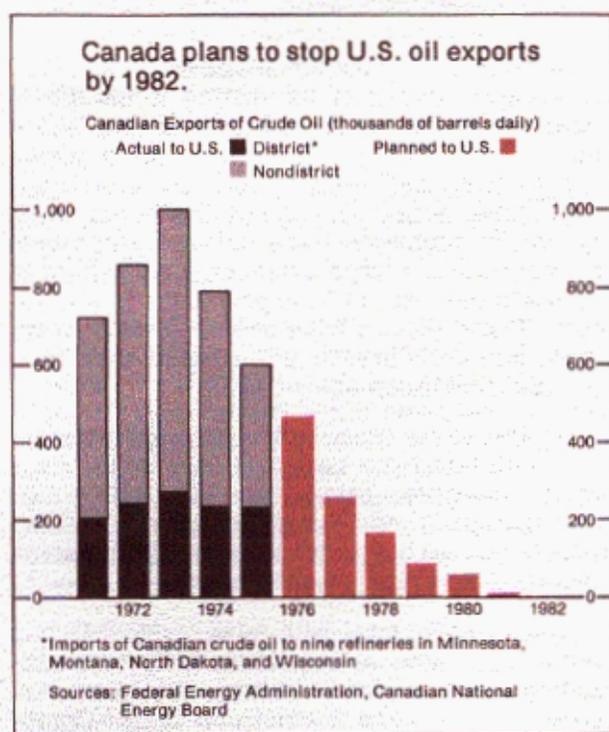
Probably the most pressing energy problem is how to offset this region's dwindling Canadian crude oil imports. Recent actions taken by government and industry offer some encouragement.

In 1977 the Federal Energy Agency's allocation program, which gives preference to district refineries for available Canadian crude oil imports, will combine with limited assistance from

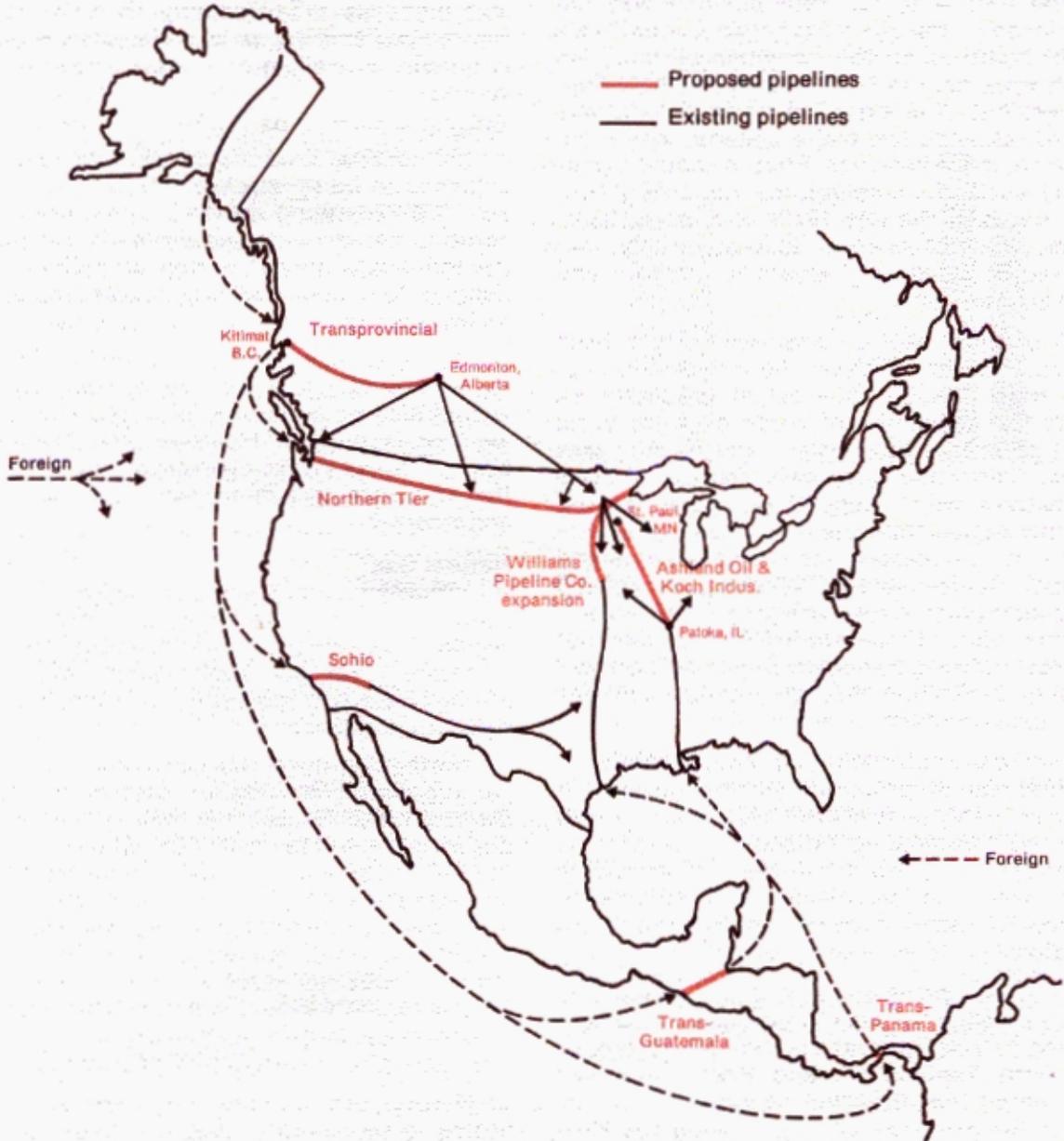
the Canadian-United States swap program to help satisfy this region's petroleum needs.

Next, Williams Pipeline Company is increasing its capacity to transport petroleum products from the southwestern states to Minnesota by 80,000 barrels per day (B/D). This expansion is scheduled to be completed by October 1977 and should improve the district's petroleum prospects for 1978.

Then in the fall of 1978, the recently announced 250,000 B/D pipeline from Patoka, Illinois, to St. Paul is scheduled to be available to ease petroleum shortfalls anticipated for this region. This pipeline will interconnect to pipelines transporting crude oil from the Gulf Coast and Rocky Mountains and is being built by Ashland Oil, Inc., and Koch Industries, Inc., which operate two refineries in the Minneapolis-St. Paul area.



Possible New Ways to Bring Oil to the District



Sources: Federal Energy Administration, industry publications

These are major pipeline expansions to regional refineries' current capacity of around 262,000 B/D.

The Patoka to St. Paul pipeline was not mentioned at the Joint Economic Committee's recent hearings on the Canadian oil situation which were held in Minneapolis this past September; but it is expected to go a long way toward resolving two major uncertainties highlighted at those hearings. First, it should significantly assist in meeting the region's petroleum needs in the late 1970s and early 1980s. Second, it indicates a way, at least initially, that this region could gain access to offshore and Alaskan crude oil.

Two other sets of alternatives had been proposed earlier to offset the decreasing supplies from Canada. One set of proposals involves the movement of crude oil from West Coast ports into the western and Great Lakes states. The other proposals represent those alternatives which depend on crude moving into this region from the Gulf Coast ports. For environmental reasons, resistance has emerged in both California and Washington against using their ports to receive crude oil for transfer to other parts of the United States. Another proposal utilizing a western Canadian port and building a pipeline through Canada contains many uncertainties.

Even if the objections and other obstacles to the first set of proposals were overcome, it would probably be well after 1980 before any of them could become operational. Consequently, it appears to be more feasible in planning to meet near-term petroleum requirements to transport Alaskan crude oil into this region via Gulf Coast ports, at least initially.

However, plans are still going forward to build a pipeline from the West Coast or Canada to bring petroleum products into this region. In fact, both Ashland Oil and Koch Industries have stated that they will continue to participate in the group which is proposing the Kitimat line. That proposal is for a deep water unloading facility at Kitimat, British Columbia,

and a connecting 30-inch pipeline to Edmonton, Alberta, which would interconnect to pipelines supplying this region. Moreover, these companies feel *both* the Patoka-St. Paul and Kitimat pipelines are necessary in order to accommodate this region's anticipated economic growth as well as to diversify their supply sources.

Prospects for This Winter

At the national level the demand for fuel oil is expected to be up markedly from last winter, but 1976-77 heating season supplies are anticipated to be adequate. Analysts are relying on the industry's ability to step up refinery production, to import needed products, and to call on inventories.

Conversations with government and industry energy officials indicate district supplies should also be adequate, provided our winter weather is normal. However, the Minnesota Energy Agency has expressed some concern that spot shortages might occur even with normal weather.

Natural Gas

As with petroleum, there are concerns about the continued availability of natural gas in this region. Domestic production has been declining in recent years, and each winter natural gas utilities have had increasing difficulty meeting their requirements.

Northern Natural Gas Company, the principal supplier to the eastern part of the Ninth District, has projected that their annual natural gas supplies will fall from 805 billion cubic feet in 1976 to 732 billion in 1981. In an attempt to alleviate the anticipated decline, Northern Natural Gas has instituted a curtailment plan. Under their plan residential and small commercial/industrial users will have top priority for this region's available natural gas. But as a consequence, large industrial users will have to turn more often to alternative energy sources.

Natural gas supplies are never again expected to be bountiful, but two recent actions may slow somewhat the decline in production which has taken place in the past few years.

Natural gas prices: Because the Federal Power Commission (FPC) has held interstate natural gas prices below market levels, producers have not had incentive to expand production. And Congress is still not willing to deregulate those prices. But effective December 1, the FPC will allow the price of natural gas, either newly discovered or recently sold in the interstate market, to rise from \$.52 per 1,000 cubic feet to \$1.42 per 1,000 cubic feet.

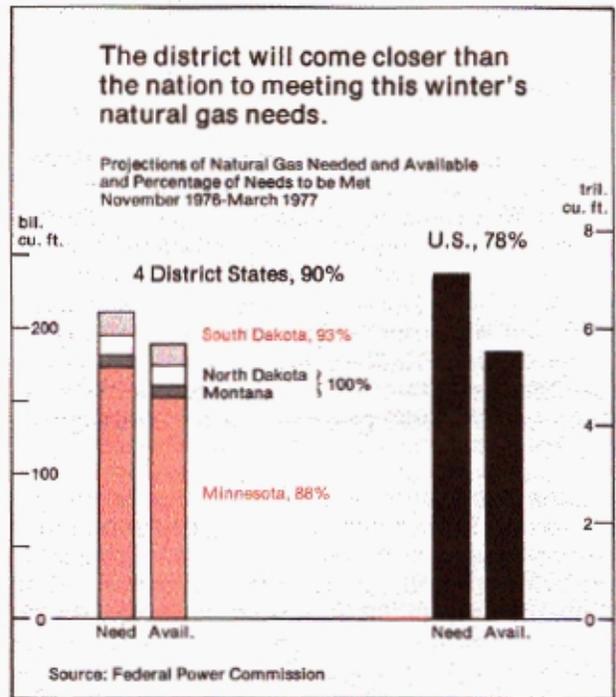
Various consumer groups have termed the FPC's new price limit as excessive. But the natural gas industry doesn't consider this increase adequate and will continue to press for complete deregulation. The FPC, however, hopes their action will help augment our dwindling natural gas supplies.

Alaskan natural gas: This is an important new energy source, but many uncertainties exist as to how and where this gas will be transported to the lower 48 states. Some of the uncertainty may soon be resolved, however. Congress has enacted legislation to expedite a government decision on the pipeline route, and several alternatives have been proposed. The legislation requires the FPC to make its route recommendation to the President by May 1, 1977. After further comments and deliberation, the President is to announce his decision by September 1, 1977, on which route, if any, he favors.

Also covered in this legislation is the requirement that the pipeline system which is chosen must be capable of delivering Alaskan gas both east and west of the Rocky Mountains. And further, each waiver the President grants from existing law to expedite the pipeline's construction would have to be approved by Congress. The President's signature of approval on this legislation is expected soon.

Prospects for This Winter

The accompanying chart shows the FPC's recent projections of gas curtailments for the coming heating season. With regard to the 1976-77 heating season, no curtailments are foreseen for Montana and North Dakota, but



deliveries will fall short of requirements in Minnesota and South Dakota. In the United States the anticipated shortfall for this winter is much greater than in the district, and deficiencies will have to be covered by alternative energy sources: electricity and fuel oil.

Discussions with industry and government energy officials indicate the district will be able to handle the situation this winter, but there is less certainty for coming winters. And even though curtailment plans have been set up to protect residential users, there is some evidence of supply tightness at that level. Recent announcements that two Minnesota natural gas distributors will no longer hook up new residential customers in several Minnesota communities give some credence to expectations of a worsening situation.

America's Current Energy Situation

Michael J. Murphy*

Despite mandatory lower speed limits, higher gasoline prices, and bigger utility bills, the American people continue to consume energy at an ever growing rate. The nation is moving toward yet another energy crisis as our demands grow quicker than our domestic supplies and our imports increase to fill the gap. Demand for virtually every form of energy we consume is growing at rates comparable to those experienced prior to the oil embargo of late 1973.

The symptoms of an impending crisis are increasing in number as our dependence upon foreign crude oil sources grows and domestic exploration and production declines. Our domestic natural gas supply continues to shrink while we debate unsuccessfully the issue of natural gas price levels. Electric utilities, once optimistic that consumer demand growth was slowing, are watching their hopes fade as demand growth continues to inch back to pre-embargo levels. Propane, particularly important to rural energy users, is linked directly to natural gas availability; and shrinking propane supplies could pose problems. Coal and nuclear fuels, backbones of the electric utility industry, represent primary alternatives to meet growing demand; yet both fuels are under pressure from public interest groups and landowners who will feel the direct environmental, economic, and social impacts of accelerated use.

*The author is a member of the Upper Midwest Council, a nonprofit, nonpartisan corporation . . . promoting better understanding of regional choices for the future.

This material is taken from AMERICA'S ENERGY FUTURE: CRISES ARE JUST AROUND THE CORNER, a Future Choices publication of the Upper Midwest Council. The specific contents of this report are a product of the Council staff with assistance and guidance from several individuals who have worked closely with the Council on energy matters for the past three years. Individual members of the Council's Board of Directors were not asked to agree or disagree with statements made in this report.

Even as we move to expand our energy supply and transportation systems to meet even the needs created by ordinary growth, an increasing number of people are organizing in opposition to refineries, pipelines, transmission lines, railroads, power plants, and pollutants.

Not only have consumers ceased energy conservation practices which contributed measurably during the oil embargo, they have allowed their energy demands to expand to pre-embargo levels and higher.

Total energy use presently is equivalent to 41 million barrels of crude oil, up from 36 million barrels or up 13.8 percent from use at the time of the oil embargo nearly three years ago. At this rate, the nation will need the equivalent of 95 million barrels of oil per day to meet energy needs present in the year 2000. This represents a growth rate in excess of 4 percent annually in total energy use in the United States.

The Department of Commerce estimates that even with "most stringent" energy conservation measures employed throughout the energy use spectrum, we can expect total demands to reach the equivalent of 84 million barrels of oil per day by the year 2000. By exploiting to the fullest our oil, natural gas, hydroelectric, and other now available energy sources and by keeping oil imports to the level of pre-embargo days (about 20 percent), we can expect to provide ourselves the equivalent of about 60 million barrels of oil-equivalent energy per day. We would, even under these "best" conditions, experience a shortfall in supply of about 24 million barrels of oil-equivalent energy. In other words, we would have available only about 71.5 percent of the total energy we would need by the year 2000. To provide some meaning to that gap between supply and demand, the federal Office of Energy Programs noted that we would have to place one large-sized nuclear power plant (each costing about \$1 billion in current dollars) into operation every ten days from now to the end of the century to fill the void. Impossible to say the least.

The remainder of this report is a review of the national situation and problem, relating to each of our primary energy sources—crude oil, natural gas, electricity (supplied by coal and nuclear power)—as well as a review of current energy conservation practices and problems, energy pricing issues, and federal and state energy policy questions. Each topic area also will look at questions and problems at the regional (Upper Midwest) and state (Minnesota) level.

Crude Oil and Its Products

As a nation, our dependence upon foreign nations to meet our crude oil needs is growing alarmingly. In late 1973, when the oil embargo began, imports totaled 29 percent of our total crude oil supply. Today, only three years later, imports amount to about 42 percent of total supply.

While as a nation and as individuals we have discussed, argued, debated, and forgotten our energy problems, we have filled the gap between our ability to supply our energy needs and our demands for energy merely by opening wider the imported oil spigot. And for at least the next two years, we can count on becoming even more dependent on foreign sources and, in particular, on Arab supplies. Sometime in 1978, we can expect some relief when oil begins to flow south from Alaska. But the 2 million to 2.5 million barrels per day of oil which will flow from Alaska in the early 1980s are expected to be barely sufficient to offset increasing consumer demand and declining production from traditional domestic oil fields in Texas and Oklahoma. Thus, even with oil from Alaska, our dependence upon foreign sources is likely to continue to rise into the 1980s.

U.S. oil consumption rates, down during 1974 and 1975 due to economic slowdowns and higher prices, have increased more than 4 percent during 1976. Production of U.S. crude oil dropped to its lowest rate in a decade during this same period—8.1 million barrels per day.

While gasoline consumption has risen by about 4.8 percent this past year, the Federal

Energy Administration (FEA) predicts that refiners should be able to meet consumer demands for gasoline and petroleum products. Refiners are not so optimistic, however. The National Petroleum Refiners Association (NPRA) has forecast a gasoline shortage for next summer (1977) in the amount of 530,000 barrels per day. Gasoline shortages during the 1973-74 embargo were about 600,000 barrels per day. The NPRA attributes much of this potential problem to the federal plan to phase out production of leaded gasoline. NPRA claims it will take at least three years for refiners to add the additional production capacity in order to manufacture lead-free gasoline. There may be secondary impacts, too. To produce lead-free gasoline, refiners will need to draw upon raw materials normally allocated to the petrochemical industry.

While gasoline consumption nationally continues to rise, fuel oil usage remains down from preembargo and midrecession periods. Midsummer 1976 fuel oil consumption was about 2 percent below 1975 levels for the same period, 11.4 percent below 1974 levels, and 8.3 percent below 1973 levels.

Balance of Payments

Growth in oil import volumes is creating yet another problem. In 1974, the United States spent about \$24 billion for imported oil; in 1975, about \$27 billion. Current estimates are that 1976 oil imports will cost the United States in excess of \$35 billion.

Balance of payments concerns have been raised ever since the oil embargo occurred. In 1974 and 1975, however, we were able to offset increased oil-related expenditures with agricultural product and other export sales. This year, the balance of payments picture is worsening with each passing month.

A continued surge in oil import levels caused the largest U.S. trade deficit in the past two years in July as imports exceeded exports by \$827 million. Of that total deficit, foreign oil purchases accounted for \$527 million, up \$10 million from June 1976. If our current trend in

monthly trade deficits continues through the remainder of 1976, the United States could end up with a total balance of payments deficit of \$3.2 billion.

The Upper Midwest

The Upper Midwest, too, is experiencing growth in demand for crude oil and petroleum products. Unlike the rest of the nation, however, this region is highly dependent upon crude oil supplies from Canada. The Canadians have undertaken a planned reduction in exports to the United States, creating energy supply problems for the Upper Midwest.

During 1974, Canadian crude oil supplies accounted for roughly 65 percent of total crude oil processed in the Upper Midwest. In Minnesota in 1974, about 88 percent of the crude oil used by four refineries in the area was obtained from Canada. Nearly 60 percent of the output from these refineries was sold in Minnesota during that year; and most of that—about 90 percent—went to gasoline, distillate and residual oil.

Already, the federal government has instituted a preferential allocation program to provide those refiners most dependent upon Canadian crude oil sources first call on supplies exported. By January 1, 1977, however, total Canadian exports to the United States will be only about 255,000 barrels of crude oil per day (down from 380,000 in late 1976 and about 800,000 in 1974). Refiners in Montana, North Dakota, Minnesota, and one refinery in Wisconsin used, on the average, 254,000 barrels of Canadian crude oil per day during 1974 alone. In early 1977, the Upper Midwest will need to employ a variety of alternatives to bring adequate supplies of crude oil and petroleum products into this area: rail unit-trains, barges, trucks, and spot capacity on product pipelines from areas to the south and southeast. These alternatives will be more costly, however, due primarily to higher transportation charges.

Demand in the Upper Midwest is moving upward similarly to the national rate. Minnesota experienced an all-time high in gasoline

consumption during one month in the spring of 1976.

It is almost certain that some consumers, particularly rural residents and some commercial-industrial operations, will experience some fuel oil and gasoline supply problems in the January-February-March period of 1977.

Shortages of petroleum products in the Upper Midwest and, in particular, Minnesota would be greatly aggravated by colder than normal winter weather due to greater petroleum demands coming from curtailed natural gas users. Estimates on colder weather shortages range from a low of 10-25,000 barrels per day in early 1977 to a high of 80-90,000 barrels per day. There are many variables in making these estimates, including prices, Canadian actions regarding curtailment of exports, shifts from natural gas to fuel oil during this winter period and consumer actions.

Natural Gas and Propane

U.S. natural gas reserves have declined continuously in recent years. In 1968, the nation began consuming more natural gas than it discovered annually for the first time. The nation's reserves to production ratio (the amount of natural gas in reserve compared to the amount used annually) currently is about nine years. Six years ago, this ratio was about thirteen years.

Much of this decline in reserves development has been attributed to the lack of sufficient economic incentives for exploration companies to drill for new natural gas fields. Also, natural gas once was found frequently with newly discovered oil. This often is no longer the case. The United States has found about 23 trillion cubic feet of natural gas in Alaska. Potential reserves in that area are estimated at another 76 trillion cubic feet. These volumes are not that significant, however, because the United States consumed more than 22 trillion cubic feet of natural gas during 1974 alone. Most experts believe that by the time Arctic natural gas reaches the 48 states (sometime in 1981 under most optimum conditions for regu-

latory approval and construction), supplies delivered will do no more than offset some of the curtailments which will be ongoing at that time due to declining production from gas fields in the Texas-Oklahoma-Louisiana region.

Natural gas prices on the interstate market are regulated by the Federal Power Commission (FPC). Gas sold in producing states (intra-state supplies) are unregulated. Thus, producers have been able to obtain premium prices for intrastate gas, and as a result, about three-fourths of all new gas finds in recent years have been sold or contracted for in the producing states.

Proponents of natural gas price deregulation believe that some of the supplies now sold intrastate would be available on the interstate market. They also believe higher prices would spur additional exploration. Others argue against deregulation because consumer impacts would be too severe. There are questions whether supplies would, in fact, reach the interstate market; and there are questions whether the new supplies are there to be found at all.

Important to note is the fact that the lead time between first testing and drilling to full commercial development of a new gas field is about six years. This means that actions taken to find new supplies today will not benefit the consumer until 1981 or 1983.

Because natural gas reserves are declining in the 48 states, pipeline and distribution companies are having to implement curtailment programs to a greater degree with each passing year. In early 1974, portions of the Southeast and areas in Ohio were hit severely by natural gas curtailments, causing unemployment problems as a result. In most all other parts of the nation, except where consumers are supplied by Canadian or intrastate supplies, curtailments have grown. In the past two years, demands for natural gas for residential use and for smaller users in the commercial and industrial sectors have grown and have been met. Some larger users in the industrial sector have

not been so fortunate, however. As total gas availability declines each year, coupled with rising demand from firm users, natural gas service to interruptible users and lower priority users becomes more restricted.

Natural gas curtailments nationwide are expected to be about 27 percent greater in the coming year. In addition, colder than normal weather could cause even greater curtailment of service to large interruptible customers than in the past. These factors certainly will place even greater stress on our petroleum product supply system, causing shortages of varying amounts and for varying periods of time in most regions of the United States. Many interruptible natural gas consumers use fuel oils as alternate energy sources. Some are considering switching to coal or electric power; yet investments for coal systems are extremely high, and there are growing questions as to whether electric utilities will have the capacity to serve significantly larger demands in the next five or six years.

The natural gas future for the United States is not one which spurs a great deal of optimism. Best sources indicate a continued period of declining reserves and higher prices. Alaskan sources will help somewhat to replace current domestic supplies which are dwindling. Synthetic natural gas production from coal could help some regions a little; but large volumes from this technology are not expected prior to 1990. New gas fields in offshore areas could add to our reserves; yet they are not likely to be available until the mid-1980s. Thus, our foreseeable alternatives for securing new gas supplies will likely do little more than slow the gradual reduction in service nationwide. FPC ultimate priorities designate residential and small commercial users as having highest priority, and current policies are tailored in that direction in the long term.

The Upper Midwest

This region receives natural gas from three areas: the Southwest, Canada, and local fields in Montana and North Dakota. While interest in

exploration has grown in Montana and North Dakota, new successful wells have not been significant. Canada curtailed service in Montana in 1975 (due to field mechanical production problems) and has raised prices significantly, also. The net result has been an economic strain on users in those two states. Natural gas systems serve designated areas, and thus, users cannot switch from one source to another but must bear the price charged. Some communities in North Dakota and Minnesota depend upon Canadian natural gas, but the volume makes up only a small part of these states' total annual usage. Montana, on the other hand, depends upon Canada for about 70 percent of its total natural gas supply. Canada has a policy of pricing its gas exports at their equivalent fuel oil price per BTU so its exports continue to rise in price but remain competitive with fuel oil, the next most usable fuel. It is expected that Canada will not curtail exports in the near future. In fact, at the current time, there is a large surplus of Canadian natural gas available in the western provinces, and gas utilities in the northwestern United States have returned to marketing programs to try to sell the gas they have available.

In the upper midwestern region, some users are particularly sensitive to higher prices and/or declining supplies of natural gas. While agriculture users have priorities for natural gas, some agribusiness users do not. Fertilizer production relies heavily on natural gas, so curtailments to that sector could markedly affect the cost of farm operations and, to some degree, the size of operations. Some agribusiness operations—food processing and milk drying, for instance—must have natural gas to process raw products.

States face difficult choices in times of shortage in determining who should get natural gas and how much. The political ramifications of these problems are obvious. Minnesota faces yet another problem. Some communities use higher-priced Canadian natural gas while others receive lower-priced gas from the Southwest. In addition, while two gas distributors

have ceased adding any new customers of any size to their systems, others continue to take on some new customers.

In Minnesota, Northern Natural Gas Company supplies 90 percent of the state's total gas demand and currently proposes to discontinue service to all electric utilities shortly. Some other large-volume users also will experience increased curtailment. This will allow Northern Natural Gas to continue to meet future demands of residential and commercial users. To replace these curtailed supplies, it will take the equivalent of 330 million gallons of fuel assuming no losses in efficiency. It is highly doubtful that such a large volume (equivalent to more than 25 percent of the total fuel oil used in Minnesota during 1974) could be replaced.

Propane availability relies heavily on natural gas supply conditions as about 65 percent of all propane produced in the United States is derived from natural gas. The remaining 35 percent comes from the petroleum refinery process. Propane is an excellent fuel for replacing natural gas where possible as it, too, burns clean, is easy to transport, and can be mixed with natural gas supplement supplies during peak demand periods. Propane is used primarily in this region for rural space and water heating, cooking, and crop drying.

As natural gas curtailments increase, some larger users may enter the propane market and, as a result, force other smaller users out. The lack of reliable data on propane use and on its relationship to other fuels makes it difficult to be very precise in forecasting potential problems.

Electric Power

There usually is some excess generating capacity available in the electric utility network to handle some small increased demands not forecast. However, wholesale shifts of large users to electric power would be impossible to fulfill in the short or near term.

In 1975, utilities across the nation thought they were seeing a softening in demand growth

for electric power; now they are not so sure. Rate increases brought on by the oil embargo and double-digit inflation caused demand growth curves to level out during 1974 and early 1975.

In 1973, electric energy consumption grew about 6.8 percent, a growth level which had been experienced for several previous years, too. In the wake of the oil embargo and inflation-recession, growth for several utilities dropped to zero, causing requests for additional rate increases to offset fixed costs and bringing about a new wave of consumer outcries. In general, growth was about 2.2 percent in 1975, a deceptive increase because, while industrial use was down due to recession conditions, residential and commercial demands grew sharply. These consuming sectors had become used to higher rates and were not conserving as much as first expected.

Total electrical energy consumption during the first seven and a half months of 1976 grew at an annual rate of 5.2 percent, and this rate is moving upward as the year proceeds. Estimates are that total growth for 1976 will reach, if not exceed, 6 percent. Utilities are forecasting brownouts and actual cutoff of even residential users in some regions—the Southwest in particular.

Coal Use

Coal, king of fuels in the early 1900s, declined in importance until quite recently. And even now, coal is a critical fuel only in some parts of the nation and there primarily for generating electric power.

On the heels of the oil embargo, federal policies have directed many oil-burning utilities to switch to coal, the fuel they ceased using not many years ago to reduce air pollution. Some utilities in the eastern regions of the United States must switch to higher-sulphur coal mined in those areas and must invest heavily in air quality control systems. Utilities in the western Great Lakes area and in most all states west of the Mississippi River have access to

large reserves of western lower-sulphur coal in the Southwest and the Northern Great Plains.

There is no shortage of coal in the United States. Environmental policies and increasingly tight safety rules have reduced production in mines east of the Mississippi River. Production there is growing, however, as higher post-embargo oil prices have offset some of these higher mining costs and made eastern coal more competitive. West of the Mississippi River, coal mining is accelerating at a rapid pace in terms of total tonnage mined and shipped. Utilities can secure large-volume blocks of coal at competitive prices and lower-sulphur content also makes these coals more attractive.

Coal is a demand-limited resource, however. That is, the amount of coal produced and the growth in coal production and utilization is contingent upon the rate at which new electric generating facilities and industrial coal-using facilities are built. Lead times for new generating plants, from initial planning to commercial operation, run from eight to twelve years—seldom eight, sometimes ten, and often twelve. Thus, rapid consumer shifts off fuel oil or natural gas onto electric power are quite impossible in large quantities.

Nuclear Power Use

Nuclear power has fared no better than coal. In fact, its position has deteriorated markedly since the embargo and higher-level inflation. Increases in capital costs for nuclear power plant construction, coupled with regulatory delays and public opposition, have caused cancellation of several nuclear plant orders. In addition, uncertainties over rates of demand growth for electric power caused some utilities to cancel, or at least postpone, plans for nuclear facilities.

Several states, led first by California, are holding or have held nuclear moratorium referendums. California's, of course, was beaten; but the net effect of that vote has been an increase in demand for testing the public desirability of nuclear power in other states.

Like coal plants, nuclear facilities take the

eight to twelve year period to begin commercial operation. Nuclear-fueled plants cannot be perceived as an answer to our energy problems during this decade-plus period ahead.

Other Electric Power Issues

Increasingly, individuals and groups are resisting utility plans for power plants and transmission lines. Likewise, landowners and environmental and other public interest groups are objecting to strip mines, unit trains hauling coal, slurry pipelines, and increased consumption of valuable water resources otherwise available for agriculture and other uses. Each and every one of these issues, all valid and equally important as the need for electric power, raises the cost of electric power produced and raises uncertainties about future availability of electric energy on a timely basis.

Capital Shortages

Coincident with higher energy costs, double-digit inflation, and declining industrial production of the 1974-75 period, has been a rise in concern over capital shortages. Generally stated, the question is: Will there be enough capital available to finance the kinds of energy-related development and other economic activities forecasters see as required? Conflicting opinions exist.

Several factors contribute to the capital problem, all of them having a potentially negative effect on our ability to expand energy development activities, perhaps the most capital-intensive economic sector in our society. Among those events are:

- Growth in deficit spending compelling government to intrude into money markets and taking dollars which historically flowed into the private sector.
- Rising balance of payments problems.
- Continued high-level inflation.
- Rising material and labor costs.
- Continued lack of investor confidence.

Energy systems' costs are rising sharply and are expected to rise at a rate greater than

the average inflation rate for the nation for the foreseeable future. In order to find and transport new energy supplies, extraordinarily large blocks of capital are being committed. The Alaskan oil pipeline will cost well over \$10 billion. A natural gas pipeline from Alaska through Canada to the United States is estimated to cost \$8.3 billion. There is another recently realized inflationary factor in pursuing new energy supplies. The farther and deeper we go to acquire energy, the more energy we consume just in development and transportation, making our total energy system increasingly inefficient.

The Energy Research and Development Administration (ERDA), charged with directing the nation's near- and long-term efforts for developing new energy supply and use technologies, has clearly pointed out that, "it typically costs less to save a barrel of oil than to produce one (or its equivalent) through the development of new technology."*

Far more dollars are being spent today on efforts to produce the new barrels or their equivalents than on finding ways to reduce consumption or at least growth in consumption.

Energy Conservation

From early embargo days, when we first recognized the need for becoming more energy efficient, a parade of ideas, policies, programs, and rhetoric has marched across the country. First, we had Project Independence; then we had appeals for voluntary energy conservation. Consumer response to the embargo was critical to our success in weathering that difficult period. Consumer actions have slowed nearly to the point of nonexistence, however.

Programs designed to raise oil and natural gas prices have fallen away in this difficult period preceding national elections. Consumer impacts from higher oil and natural gas prices would be, for sure, significant. Only strict

*U.S., Energy Research and Development Administration, A NATIONAL PLAN FOR ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION, Vol. 1, Energy Research and Development Administration Publ. No. 76-1 (1976).

taxes, controlling potential windfall profits and returning dollars to those people most affected because of fixed and low incomes, could counter the impact of deregulated oil and natural gas prices.

Even though we have not developed a deregulation policy acceptable to our decision makers, prices have risen substantially. The net effect was a marked decline in consumption; but this decline was short-lived.

Political leaders are waiting for public consensus to form before taking action. Consumers suffer from lack of objective information and, thus, cannot develop individual or group opinions. Businesses are reluctant to make investments or change operating methods when faced with political and consumer uncertainties. Polarization is markedly noticeable between political parties.

There is no dearth of studies outlining the "what-ifs" of energy conservation. But, for every suggested energy savings program, there is the other view questioning the impact on Gross National Product, on employment, on fixed and lower income groups, etc.

Prices

As energy prices increase, consumers do take action. Recent experience has shown us that such consumer responses take time—three to five years, perhaps—before noticeable changes in consumption are evident. Presently, greater attention is being given to tax credits and incentives which will spur business action in particular, and residential energy consumers too. Such programs as low interest loans for home insulation are critical and can cause immediate impacts. Every cubic foot of natural gas not consumed to heat a home can be used to offset curtailment to commercial and industrial users.

Tax credits to businesses and industries for employing new systems which will use less energy are seen as important to provide the needed incentive for action. Subsidy programs also are critical. Small- and medium-sized

businesses and industries, in particular, will need assistance in becoming more efficient. They seldom have the expertise, employees, knowledge, or money with which to survey their energy use, institute new procedures, or invest capital in new operations.

Energy Policy

A review of national energy actions to date would indicate this unspoken policy: *As rapidly as possible, develop the full range of domestic energy sources.* However, it appears increasingly unlikely that we can develop a comprehensive national energy policy. Perhaps we should, instead, attempt to define those critical decisions that *must* be made at the national level. They include:

- The level of foreign dependence on energy the economy can tolerate in a world market.
- The deregulation of oil and gas prices.
- Development of federal energy resources with respect for the need for state controls on ameliorating impacts.
- Uniform guidelines for transportation efficiency, building codes, and appliances that could be effectively administered at the state level to cope with geographical differences.
- Coordination of research for alternative energy sources and information/education efforts which would provide lower-level decision makers with current data and support.

We seem unable to reach consensus on many aspects of the energy problem at the national level. A potentially more workable alternative would be to develop consensus at regional and local levels, relying upon the marketplace for ultimate allocation or distribution of energy and of efforts to develop new energy supplies and improve efficiency. Such regional-local efforts would form the building blocks for national policy and action.

Decision Making

There appears to be widespread reluctance to

make decisions; each sector—government, business, and the mass public—is waiting for the other to act first. Rather than trying to anticipate problems and develop alternatives, we are more willing to react, suffer, and deal with resulting dislocations, then to wait again for the next problem or crisis.

In times of uncertainty and rapid change, there is a tendency to withdraw from interaction with other sectors, to minimize risks. Now, more than ever, there is an explicit need to expand interactions, even with those concerned groups and individuals which possess opposing views. Without interaction comes increased conflict, the risk of bad decisions, and greater uncertainty.

Both business and government need to increase dialogue with citizens during planning and decision making, well in advance of the announcement of private decisions or federal policies, and prior to regulatory hearings. Citizens buy goods and services; citizens vote. They also are receptive to new ideas and new programs, provided they don't come in surprise packages. Increased citizen input will not solve all problems; but it will help smooth processes and reduce uncertainties.

All of our efforts to solve our energy problems die without the support of the general public which has difficulty taking a position for more efficient automobiles (which will cost more too) when there is no shortage of gasoline. Individual voters have difficulty relating their ample supply of natural gas at the residential level to the prospect of industrial curtailment and shutdown due to the unavailability of natural gas at that level.

Every day, week, or month of delay in action by all persons at all levels only aggravates our current situation. The net result of continuing our present circumstances is an energy crisis of immense proportions which will demand precipitous responses to fill the supply-demand gap. We will, in fact, have designed our energy future by doing nothing; and we likely will find that future unpleasant.

THE FED IN PRINT

A cumulation of articles appearing in the Federal Reserve Bulletin and in the business and economic reviews of the Federal Reserve banks from the year 1973 to date is available upon request.

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