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SHELF

SHALE COUNTRY



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In shale country, there's a certain group of people who have been involved with oil shale for years and years—and one of these is Dr. Charles Prien, Senior Research Fellow, Chemical Div., Denver Research Institute (DRI), University of Denver. SHALE COUNTRY recently interviewed Dr. Prien.

SHALE COUNTRY: *How did you get involved with oil shale?*

Prien: After I received my Ph.D. in chemical engineering from Purdue University in 1941, I came to the University of Colorado as a member of its engineering faculty and Engineering Experiment Station. I got a tiny grant to build an oil-shale lab and began some research.

In 1948, when I joined the University of Denver, I was able to expand my work. Since then, the Chemical Div. of DRI has done property evaluation work for oil-shale companies; we spent 10 years working on the development of the Tosco retorting process; we've prepared environmental analyses; and we operated the Center for Fundamental Oil Shale Research for 5 years. We still have such a center at DRI, on an informal basis, and we continue to do shale research for industry and government; much of it is now environmentally oriented.

SC: *Oil-shale development has run into several snags lately. Does this make you pessimistic about its future?*

Prien: Quite the contrary, I'm still optimistic. I admit that all the synfuels face an uncertain government energy policy, but technically oil shale is in a very good position. People tend to think that oil-shale technology is no further developed than the technologies for coal gasification or for solar energy. That's not true. Oil shale is technically closer to reality than any of the other alternative fuels. Of course, no one has ever built a 10,000-ton-a-day oil-shale plant, but in-



"Technology can assure that oil shale will be developed in an orderly way. In fact, I feel that you'll be able to fly over an oil-shale project in a small plane and barely see it," says Dr. Charles Prien, Senior Research Fellow, Denver Research Institute.

Industry Interview

Let's Not Restrict Ourselves

dustry has built two 1,000-ton-day semi-works plants—and nothing of this size has been built for any other new synthetic fuel source.

SC: *You're presently involved in a new oil-shale study, is that right?*

Prien: Yes. DRI, as a subcontractor to TRW Systems, is involved in a 3-year assessment for the Environmental Protection Agency. Its objective is to truly assess what the environmental impacts of a shale industry will be in terms of technology and where we will need additional technology to handle these impacts. Result: EPA will have a realistic base for providing the industry regulations needed under law.

It is believed that control technology now in existence, or soon to be, can provide much of the necessary environ-

mental protection for oil-shale development. The researchers have also concluded that the modular-size oil-shale plants now being proposed are worthwhile.

SC: *What about in-situ?*

Prien: We really need not wait for in-situ technology. For one, in-situ hasn't progressed far enough yet, and two, in-situ is not as environmentally clean approach to shale development as is usually thought. It just hides some problems that the surface methods expose. Don't misunderstand me, however. I believe in-situ technology has great future promise and should be pursued as rapidly as possible.

SC: *What do you feel should be done now?*

Prien: Let's build some plants and quit talking. The point is that the days of rapid change in basic oil-shale technology are past and now we need to build larger plants to find out what really happens in a scaleup. So I'd like to see each of the major processes given an opportunity to prove itself on a modular scale. And both the vertical and horizontal in-situ processes should also be tried out.

SC: **Do you have a particular message for SHALE COUNTRY readers?**

Prien: Yes. The U.S. is in the very fortunate position of having sufficient energy resources to supply a major portion of its energy requirements through the year 2000. But we are deliberately restricting the development of these resources in a process of national self-flagellation and we must cease to do so if we expect to maintain our political system and our modern civilization. We need to quit being afraid of ourselves. We are able to control new energy development and we should get along with the business of doing it. Most of the nations of the world would be grateful to have the choices we have.

A.N.

Industry Update

Election means same—and change

What do the election results mean to oil shale? Well, in November 1976, no one is about to answer that question specifically. In fact, it may take until November 1977 or even later before any clearcut clues emerge to indicate whether the results were "good" or "bad" for synfuels development. The delay, of course, is a standard one; it usually takes at least 1 year for political newcomers to move from the getting-to-know-everything-about-everything stage to the making policy phase.

Nevertheless, watch for some clues early in the year when new administrators and legislators will be making goals statements. Also, be aware that even though certain politicians may have stood on certain platforms during the campaign, their positions are subject to shift as they encounter the unpredictable events of the future. One key example: OPEC action on oil prices. Already it is expected that the price of foreign oil may be raised by 15 percent. Thus, it is not illogical to predict there will be a strong call for a national energy policy that *really* accelerates development of domestic energy resources—including oil shale.

For the moment, however, shale's political future remains in conjecture. But to get some perspective on what may happen, let's review some of the factors that will affect its future.

First, at the national level, the new Administration and Congress means some changes, as do all political switches. There will be new legislation, new agency heads, new approaches—all causing bureaucratic disruptions. In terms of specific policy and program changes, however, it's far too early to know what position the newcomers will take on synfuels development. To date, though, there has been some indication that Carter may not favor providing governmental financial incentives to encourage such development. In contrast, President Ford supported the synfuels loan-guarantee legislation proposed in the past two sessions.

Another unknown: how Carter's hopes

for establishing one Energy Dept. will affect synfuels programs. Another unpredictable: how the strong Democratic Congress will move on such synfuels related factors as price controls, air-quality regulations, oil-company dismemberment proposals. In short, the national political outlook for shale is hazy.

At the state level, it is less so. The shale state of Utah, for example, though it changed some political officeholders this election, has always been pro-shale development and its politicians should continue to be supportive. One example: the new Democratic governor of Utah, Scott Matheson, told SHALE COUNTRY: "The federal government cannot afford to overlook any major sources of energy. Oil shale is an economically feasible fuel. Research indicates that the technology will be available to extract and refine oil shale without permanent damage to area ecology, provided the state carefully monitors the development processes. The federal government should encourage use of this resource as an additional alternative to foreign petroleum."

In Colorado, there were some election results that may affect shale development, even though only Congressmen

In Colorado, there were some election results that may affect shale development, even though only Congressmen were up for election—and all incumbents were returned to office. The major political change that occurred in the state was reported this way by the Rocky Mountain Oil & Gas Assn. Committee on Oil Shale: "Colorado revived its conservative leadership in the Legislature, and defeated Democratic, consumer-sponsored measures on the ballot. Republicans maintain a one-vote majority in the Senate and regained control of the House with a 35-20 plurality. Amendment No. 7—the food tax repeal and corporate income and severance tax measure—was soundly rejected. Repeal of the food tax and enactment of new severance and corporate income taxes was the cornerstone of Governor Lamm's campaign for office." RMOGA goes on to say: "Forecast-

ing the issues likely to surface in January is difficult, but it is clear that the industry will have an easier time ahead than we had expected."

In short, from a state perspective, oil shale's political future is as good or better than before. From a federal level, the effect of the election is less predictable, subject not only to many new people with many new ideas, but also to international forces still on the horizon. Nevertheless, it can be clearly projected that such subjects as air-quality regulations, severance taxes, financial incentives and price controls will definitely be topics of discussion—if not action—in the 1977 political arena.

Shell out, Oxy in

The other big shale news in early November was the announcement from the Shell Oil Co. that it is withdrawing from the C-b Shale Oil Project, one of the federal prototype oil-shale leases in Colorado, and from the Colony Development Operation, a shale venture on private lands in Colorado.

Why? A. T. Ireson, Shell's manager of leasehold development for the C-b project, says: "Our evaluation of the economic, political, environmental, and technical considerations in the near term leads us to this decision." However, he adds, "Shell still views oil shale as one of the many potential sources for future energy."

Shell assigned its interest in the C-b lease to Ashland Oil, the only survivor of the four companies that initially formed this venture (Tosco and Arco withdrew last year). Ashland, in turn, has announced that Occidental Oil Shale, Inc., has become its equal partner in the venture, and that Oxy's modified in-situ technology will be tested on the site.

Note: This latest series of shale company moves has many significant implications for the industry—some negative, some positive. All will be discussed thoroughly in SHALE COUNTRY'S December encyclopedia issue, "A Guide to Oil Shale—1976/1977."

Moving People, Products—and Issues

Bob Kessler, Region VIII Representative of the U.S. Secretary of Transportation, insists he was a comedian in his first career. And there's no doubt that his sense of humor is an asset to the man who focuses on the complicated questions surrounding shale country's transportation needs.

In his present career, Kessler oversees the six arms of the U.S. Dept. of Transportation (DOT)—the Federal Aviation, Federal Highway, Federal Railroad, the National Highway Traffic Safety, and the Urban Mass Transportation Administrations and the U.S. Coast Guard (which in this region regulates such matters as boating safety). When asked about his responsibilities, Kessler explains that they heavily involve highway planning—where new roads are to be built and who will pay for them. However, he is the person who must take a look at the need for all types of transportation—whether or not there is adequate demand for air service to Gillette, Wyo., for example—and Kessler must then make recommendations to the Secretary of Transportation on these matters.

Apart from these general duties with DOT, Kessler plays another role that is of interest to residents of shale country—he serves as a member of the Oil Shale Environmental Advisory Panel. This Panel advises the Secretary of the Interior on environmental impacts that are likely to ensue from the development of the oil-shale industry, and then recommends courses of action. When asked why a representative from Transportation is serving on the Panel, Kessler explains his involvement this way: "First of all, the transportation industry is entirely energy-dependent, and is certainly the largest user of energy in the country—hence our institutional involvement in oil-shale development."

Looking Ahead

Kessler further divides his institutional duties on the Panel into making recommendations for transporting people, and for transporting commodities. For example, rather than necessarily planning to pipe oil across the country, Kessler sees instances in which it may make more sense to pipe shale oil to a rail head and then move it across country by rail.

Many questions . . . many possible answers

DOT also takes a careful look at energy-impacted communities for the possibilities for moving people both within towns (through urban mass transit) and for moving people to and from work. Kessler cites the example of a new highway that may be needed between Rangely and the Rio Blanco Oil Shale project. "Rio Blanco workers will need a transportation route to and from the work site, but there are numerous questions about who should pay for the highway. The state would like to look to the company for funding, but the industry

has already paid into the Shale Trust Fund, a sum of money planned for highway and school construction use, so it's not too inclined to put even more dollars into a road. My job, then, is to look at all possible sources of revenue. I'll look into monies from the Shale Trust Fund, from other state funds and from federal resources, the Federal Highway Trust Fund, for example. And out of these possibilities, I'll hope to negotiate a viable funding package."

There is, however, one more role that has evolved for Kessler on OSEAP. The Secretary of the Interior formed the Panel to make sure all viewpoints were well represented in this federal prototype oil-shale program. The people on the Panel, however, not only represent their agencies or groups, but also specialize in a particular subject. For example, Kessler serves on OSEAP's socioeconomic committee. These subgroups try to balance out differing points of view when, for instance, the Panel reviews a Detailed Development Plan (DDP).

It is in this role that Kessler has established his reputation as a strong negotiator. In his words, "When people with different points of view clash, I think there is a need for a very human role to be fulfilled. There are times when both sides have deep-seated problems and questions regarding an issue in one of the DDPs, but often, just a softening of the language involved can make an unacceptable statement acceptable." Kessler's background as an attorney serves him well in his mediator role. So does his humor, which often helps to soften the tension.

When asked about the usefulness of OSEAP, Kessler has high praise for the Panel and for the work it has done: "The Panel is not just a haranguing session, it is well run, and I think a similar idea could well be used to examine questions associated with coal development. I would, though, like to see the members a little more optimistic," which would seem to be sound advice from a multifaceted, multi-optimistic man. R.M.R.



DOT's man on the shale scene: Bob Kessler, Region VII Representative of the Secretary of Transportation, is part chemical engineer, part lawyer, part transportation expert, part oil-shale negotiator—and part humorist.

The Shale Paperwork Maze of Permits, Clearances, Regulations

By Alys Novak

No oil-shale project can move a muscle until it knows its way through a maze of red tape—but the maze keeps moving, and multiplying

Ever dream of opening a door and finding a 300-person choir standing on the step, singing in unison, "You Gotta Have a Permit"? Probably you haven't, but many oil-shale developers have because they literally never know when another government agency is going to jump out of the bushes with another paperwork request.

Oddly enough, there is no master plan in terms of regulations, permits and clearances for oil-shale developers to follow. Instead, they must try to figure out for themselves what regulations affect them, and what permits and clearances they must get to proceed. And they must even figure out what agencies have jurisdiction over them.

Of course, this red-tape situation is not unique to the oil-shale developer. It has entrapped most industries, but with particular emphasis on the energy industry. One writer, J. Wes Blakely, in the publication, "Coal Mining & Processing," said in his article, "One ton of coal produces one ton of paper!", "One of the most serious and difficult problems facing the mining industry today is this matter of finding out just who all of the federal, state, county, and local agencies are—and the right people in them—who must review and approve the ton of paperwork involved in getting a given surface coal mine off the drawing boards and into production . . . (you may have to) hire enough of your own people to make up a specific government agency task force for this purpose . . ."

This approach is the one most oil-shale developers have chosen. For ex-

ample, the Rio Blanco Oil Shale Project asked Larry Weiner, a systems engineer on loan from its management contractor, Cameron Engineers, Inc., to establish a paperwork trail for the project.

Weiner recently told SHALE COUNTRY, "When we began, we decided we didn't know what permits, regulations and clearances applied to us. So we began by setting up a regulations library for just the state of Colorado, and its counties, especially Rio Blanco. We did not do this for federal regulations; we relied on our engineering contractors to do that.

"We ended up with a 20-volume set of all the rules and regulations of the state of Colorado and its counties that *might* affect us. Then we distributed these to our contractors and asked them to figure out which did affect us. Keeping up this library, however, turned into a full-time task. So we made an agreement with a Denver law firm to update it for us.

"Of course, many of the permits have time constraints attached to them because hearings are involved. In these cases, we do try ourselves to track these through our PERT charts, which plot everything on a sequential basis.

"Today, we can't tell if our approach has been 100-percent successful. As I recently explained to a subcommittee of the Colorado Energy Policy Council, 'We don't know who's regulating us—and we realize it's difficult for you to know. People keep coming out of the woodwork and saying you need a permit from us.'"

"In fact, when I started this job, I put

an organizational chart of the Colorado state government on my wall above my desk so I could track which departments we would need to get permits from. But then, after a little experience, I found out that if I took a dart and threw it at the chart, I was just as well off as when I tried to figure out the system logically. "We realize, though, that we can't expect state government to have a master checklist for us. We have developed a great deal of information about our operation as a result of completing our Detailed Development Plan. We still have to communicate with the state as engineering proceeds in greater detail. Since this is a prototype program, we and the regulators both are still learning, so we work together as much as we can."

A legal beagle sometimes helps

Of course, attorneys who work for companies involved in oil-shale development also get into the paperwork process. One such attorney explained how the legal department fits in: "To a great extent, we rely on our client to come to us and say, 'We have a problem, help us.' However, in the course of our routine affairs or research, often we will also run across a law or regulation that we feel will affect an oil-shale project, such as a proposed reclamation standard, and then we will alert the oil-shale project director and say, 'You might want one of your operations people to look into this.' Actually, the attorney serves as just another way of catching problems before they occur—so there are no surprises.

"Right now, most of the paperwork burden falls on the developer. Each government agency has its own sphere of interest and axe to grind. It's not, though, an adversary relationship between the government agencies and the developers. But the monkey is on our backs. No one in state or local governments is coming to us and saying this is what we need—with a couple of exceptions. For example, under the federal leasing program, we have gotten a lot of good input from the Area Oil Shale Supervisor's Office and from the Oil Shale

Environmental Advisory Panel. Because of our need to comply with their procedures, we actually have had much of the regulation-permit-clearance path made very clear to us, so we haven't run into some of the paperwork delays a private developer might encounter.

"Still, under the federal leasing program, there are some acts we are left to interpret—and the lease says we must comply with *all applicable* federal, state and local regulations. But what is applicable—and even more important, who has jurisdiction?

"In short, the present paperwork system is cumbersome, haphazard, helter skelter. But I admit there are some problems on the corporate side too. Because each project is an entrepreneurial effort, often there is poor interchange of information between company projects. Everyone does his job and no one has time to link everything together. The oil-shale projects, however, appear to be unique. These projects are entities unto themselves with excellent people on their teams, and a coordinator of top caliber at the helm; also they have had active participation from the Oil Shale

Supervisor. This has all contributed to the oil-shale developers'—and the governments'—awareness of what the paperwork system is and how it can be improved."

There are indeed cases that show the process can be improved. In fact, one of the shale-area counties—Rio Blanco—has developed a unified permit approach. Howard Scott, who is the 1041 (land-use) administrator for the county, explains, "Through our county Master Plan for Public Ways and for Public Utilities, we have established one place—the county planning office—that handles all county energy-resource facility permits. We do not have a unified application, but the developer only has to deal with one set of people, all in one place.

"The siting program has worked well; it provides efficiency, speed and a minimum of friction. Our only problem is getting out the information that we have such a system. If a developer doesn't know about it, we catch him after the fact and there is some delay.

"What I feel is most important about our system is that it originated from a citizen group and still involves much

citizen participation." Could such a system apply at the state level? Scott says, "Yes and no. When you have specific evaluations on precisely where to put a plant, then I feel the decision must stay with the local government. Yes, it would be helpful to have coordination, a clearinghouse—but not explicit directions."

This tends to be the opinion of many industry experts, too. Their reasoning: The type of data needed by each reviewing agency is different according to the mission of the agency and the purpose of the permit. No agency is interested in reviewing data that are not relevant to its own decision. Therefore, it is impossible to *consolidate* the permit process—the idea of a "one-stop" permit at the state level is an idle dream. However, it may very well be possible to *coordinate* the permit process, within a given agency or a given level of government, by improving format requirements, hearing schedules, and the like.

Now for some real insight into the present nitty-gritty of the developers' paperwork maze, see the following article and its accompanying chart.

The Permit Procedure: Many Steps, Many Stops

By Donna Davidson
Community Development Planner
Gulf Mineral Resources Co.

No energy facility exists or is developed by itself. A mine requires electric power, roads, railroads, and other support services. An electric power plant requires a fuel supply, roads, transmission lines, waste disposal facilities, and other support services. An oil-shale plant requires the same type of elements.

In addition, any major energy development is the combined efforts of a number of separate companies—the primary developer (usually the mine or power plant) and the secondary facilities developers. At each step of the way, for each company involved, there are numerous permits to be applied for and regulations to be met.

In the preliminary stages, when the feasibility of the project is still under study, permits are required for exploration, drilling,

construction of access roads, surveying, and the like. When a decision has been made by the principal proponent that the project is economically feasible, then a whole host of agencies must be dealt with for permits, regulations and clearances.

Each company involved in the project—the mining company, the railroad and/or trucking companies that haul the ore, the pipeline company, the electric company, and all other companies involved in the total development—must each apply for permits relevant to their particular operations. Some of the permits are major in character requiring considerable time and effort by both the applicants and the reviewing agencies; for example, preparation of environmental-impact statements and the review process thereof, preparation and review of engineering designs for compliance with environmental quality standards and safety standards. Other permits are minor, such as permits from the Federal Communications Commission to establish communication links, or special land-use permits to set up air-quality monitoring equipment.

Permits are required from the federal, state, county, municipal and special district levels of government by various departments

at each level. The type of data needed by each reviewing agency is different according to the mission of the agency and the purpose of the permit. Often there are agencies at the federal, state and local levels issuing permits for the same area of interest, for example, water quality. Each agency may require almost the same information but in a different format. This compounds the paperwork and the time spent in preparation.

The chart shows the number of agencies that may be involved in the permit/regulatory process at all levels of government for the multiple parts of an energy development in the state of Colorado. Naturally, not every company must apply to every agency. Many of the agencies do not issue permits themselves. Some agencies establish regulations that must be complied with. For example, the Colorado Occupational Safety and Health Dept. issues regulations that must be complied with during the development process. Other agencies give review and clearance to a permit application. For example, the National Park Service and the State Historical Society give clearance to projects with respect to preservation of archaeological and historical sites, but do not themselves issue permits. A permit, however, will not be is-

sued by the lead agency without their clearance.

Many of the permits are concerned with land use. Companies involved in a project must either purchase land or get permission for use from every owner. For a linear facility, such as a road or pipeline, right-of-way acquisition, plus permits to cross roads, highways, rivers, and the like is a major effort. In order to put up environmental monitoring equipment on land that is not owned by the company, the company must get a special land-use permit or permission from the owner, whether government or private party, for the stationing of the equipment and for any access roads that are needed to reach the equipment. For example, if a project requires four separate air-quality monitoring sites, three of them on government land and one on private land, three government permits may be required plus the private owner's permission in order to meet the requirements for getting a permit at a later date from

the federal and/or state and/or local air-pollution control authorities. *It takes permits to get permits.*

Because it takes so many years to plan and construct major facilities, the companies do not prepare all their permit applications to be ready at a single point in time. Generally permit applications track with site acquisition progress and with design and engineering progress throughout the 5 to 10 years required for the development of a major project. Each agency receiving the applications works within its own time frame for review.

Within the permit sequence there are certain points where major problems that may be caused by the development become visible, where the public can make comment, and where the public or other interested parties can intervene. If it becomes clear that a problem will arise because of the development, the proponent of the project has opportunity to make mid-course corrections in

the development. If the problems cannot be resolved satisfactorily, then the agency has the option to deny the permit. The significant permits of this nature are those associated with land use, water-resource availability and pollution control.

Taken altogether, the total number of permits required for a major energy development may be well into the hundreds and the process continues from the moment of the inception of the idea until the project is ready to go.

P.S. If the development is going to cause growth in nearby communities, then there is a whole series of permits that must be acquired for community development. Permits for additional water supply, new roads, sanitary facilities and other public services may have to be acquired by local authorities. Permits must be acquired by developers and businesses to provide housing and secondary services. These, too, may take years to acquire.

Shale Regulators and Steps

	Mines & Process					
	Power Plants	Transmission	Pipelines	Railroads	Roads	
P = Permits						
R = Regulations						
C = Clearance or Review						
FEDERAL GOVERNMENT						
Department of Interior						
Bureau of Indian Affairs	P	P	P	P	P	P
U.S. Geological Survey	P	C	C	C	C	C
Mining Enforcement & Safety	R					
Bureau of Land Management	P	P	P	P	P	P
Bureau of Reclamation	P	P	P	P	P	P
National Park Service	C	C	P	P	P	P
Fish & Wildlife Service	C	C	C	C	C	C
Department of Agriculture						
Forest Service	P		P	P	P	P
Soil Conservation Service	C	C	C	C	C	C
Rural Electric Administration		P	P			
Environmental Protection Agency						
Water Quality	P	P	R	R	R	R
Air Quality	P	P				
Solid Waste Disposal	R	R				
Hazardous Materials	R	R		R		
Department of the Army						
Corps of Engineers	P	P	P	P	P	P
Department of Labor						
Occupational Safety & Health	R	R	R	R	R	R
Department of Transportation						
Federal Aviation Administration	P	P	P			
Federal Highway Administration	C	C	C	C	C	C
Materials Transportation Bureau	R			R	R	
Federal Power Commission		P	P			
Federal Communications Commission	P	P	P	P	P	P
Interstate Commerce Commission				P	P	P
Nuclear Regulatory Commission	P	P				
STATE OF COLORADO						
Department of Health						
Air Pollution Control Div'n.	P	P				
Water Pollution Control Div'n.	P	P				
Engineering & Sanitation Div'n.	P	P				
State Historical Society	C	C	C	C	C	C
Department of Highways						
Division of Highways	P	P	P	P	P	P
Highway Safety Division	R	R	R	R	R	R

	Mines & Process					
	Power Plants	Transmission	Pipelines	Railroads	Roads	
P = Permits						
R = Regulations						
C = Clearance or Review						
Department of Labor						
Co. Occupational Safety & Health	R	R	R	R	R	R
Department of Natural Resources						
Div'n of Water Resources (State Eng)	P	P				
Geological Survey	C	C				
Co. Groundwater Commission	P	P				
State Board of Land Commissioners	P	P	P	P	P	P
Division of Mines	R					
Oil & Gas Conservation Comm.	P					
Mined Land Reclamation Section	P					
Co. Soil Conservation Board	C	C	C	C	C	C
Co. Water Conservation Board	C	C	C	C	C	C
Division of Wildlife	C	C	C	C	C	C
Div'n of Parks & Recreation	C	C	C	C	C	C
Public Utilities Commission	P	P	P	P	P	P
Land Use Commission	C	C	C	C	C	C
LOCAL GOVERNMENTS						
County						
Land Use	P	P	P	P	P	P
Air Quality	P	P				
Water Quality	P	P				
Health	R	R				
Fire	R	R	R	R	R	R
Flood	R	R	R	R	R	R
Building Codes	P	P				
Roads	R	R	P	P	P	P
Municipal & Special Districts						
Land Use	P	P	P	P	P	P
Air Quality	P	P				
Water	P	P				
Sanitation	R	R				
Health	R	R				
Fire	R	R	R	R	R	R
Flood	R	R	R	R	R	R
Building Codes	P	P				
Streets	R	R	P	P	P	P

Oil shale has always been a crisis-oriented subject. For example, it was World War II that prompted passage of the Synthetic Liquid Fuels Act in 1944, which made possible significant government financing for oil-shale research. However, the nation's interest in oil shale as a source of petroleum passed with that crisis, to be rekindled again only by the 1973 Arab oil embargo, and now those embers burn low.

Situation Report

The In-Situ-ation at the Laramie Energy Research Center

By Rae Marie Rosenblatt

There is, however, at least one notable exception to this oil shale now/oil shale never ambivalence: the Laramie Energy Research Center (LERC) in Wyoming where interest in oil shale and shale oil has been consistent over these years. A Wyoming Senator sponsored the 1944 Act, and part of the result of his successful efforts was to augment the already established Research Center in Laramie.

The Center had been operating as an adjunct to the Bureau of Mines since 1930, and its early aim was to aid in developing petroleum resources in the West. However, with the war-time crush for aviation gasoline, its functions were expanded into the realm of synthetic fuels.

Two 5-year appropriation cycles financed the early research. The first of these, for the 1947-51 period, amounted to \$10 million. This sum financed both the research work at the Laramie Center,

and the field studies at the then associated Anvil Points Center near Rifle, Colo. At that time, about one-fourth of the Center's work centered on petroleum; about three-fourths on oil shale.

Reduced appropriations ended the operations at Rifle in 1956, but activities at Laramie continued, with emphasis on laboratory and pilot plant research together with studies of the characteristics of oil-shale deposits. In fact, operations continued in such a way as to make the Laramie Center, in the words of its present director, Dr. Andrew Decora, "the largest bank of background information and technical resources on the chemistry and engineering of oil shale in the U.S."

Dr. Decora has a good personal reason for his pride in the Center and in its functions, since he has been involved with LERC since the first synfuels appropriation in 1947. One might even say he grew up with it, progressing from being an undergraduate student working there part-time, to today being not only its director but also the recent recipient of the Energy Research and Development Administration's Distinguished Service Award. (ERDA is now the federal umbrella agency that oversees the Laramie Center.)

In April 1975, just after ERDA was created and absorbed many former Bureau of Mines research centers, SHALE COUNTRY briefly interviewed then acting director Decora about his expectations for the Center's future. The following discussion is an amplification of that article, and provides an update on what's happening at LERC today.

Q. *When we spoke with you in 1975, you expected the creation of ERDA to mean more money and more research for you at the Laramie Center. Have these hopes materialized?*

Decora: Yes, I would say they have. Our 1975 budget for oil shale and related research was about \$5 million. That figure has grown to about \$7.6 million in 1976, and I'm expecting about \$8.6 million in our treasury for 1978. All of which sounds good financially, but with the increase in our budget has come at least a proportionate increase in our responsibilities.

Q. *In what ways have your responsibilities expanded?*

Decora: On the administrative side of that question, we are now deeply involved in carrying out part of the federal government's commitment in oil-shale development. For example, recently ERDA extended a Program Opportunity Notice (PON) for in-situ development of oil shale. Four out of the nine respondents to that notice are now being con-



Dr. Andrew Decora, director of the Laramie Energy Research Center, feels a responsibility for both sides—for research and for socioeconomic developments—of the energy question.

sidered for further negotiations. And not only do we mediate between the federal government and these people, but our Center will also be the government's project manager for whatever agreement(s) is finally signed.

Q. *And how about your research role, how has that expanded?*

Decora: Oil-shale technology has been the Center's major program since the passage of the Synthetic Liquid Fuels Act; however, the major thrust of our research now is toward the in-situ (in-place) recovery of energy from three sources: oil shale, tar sands and coal. These three programs of in-situ recovery, together with the associated chemical, analytical, and environmental supports, are our major efforts here now.

Q. *You mention three experimental areas, where do you do your field research on these subjects?*

Decora: Our in-situ oil-shale retorting

The Laramie Energy Research Center's oil-shale retort is located about 7 miles west of Rock Springs, Wyo. The 70-ft. by 70-ft. pure in-situ experiment was ignited on April 5, 1976, and produced 60 barrels of shale oil in its 36-day run—a very successful technological feasibility test.



research area is located near Rock Springs, Wyo.; our underground coal gasification experiment is located near Hanna, Wyo.; and our work with tar sands is carried out near Vernal, Utah.

Q. *To return for a moment to your role in the federal opportunities program for in-situ development, can you tell us first of all, with which companies ERDA is now negotiating?*

Decora: Yes, we're now talking with Occidental Oil Shale, Geo-Kinetics, Equity Oil Co., and Talley-Frac (a division of Talley Industries). Successful negotiation could mean that all of these companies might be selected to joint venture with the government.

Q. *When the government considers a company's proposal, what points do you question? What are the negotiable items?*

Decora: When the government looks at a joint venture, it acts just as any business partner would, and there are numerous points to negotiate. For example, who will own the oil produced at a demonstration plant? Will it be kept for government use, or will it be the industrial partner's to sell?

We must also agree with our partner on environmental assessments, questions about the size of an operation, type of technology to be used, the conduct of the experiments. And last but not least, we have to decide who will own the plant once the experimental period has

culminated.

Q. *Are you still involved strictly with "true" in-situ retorting, or are you considering experimenting with any of the modified in-situ processes? (True or pure in-situ means no mining is involved; with modified methods, some mining is required.)*

Decora: If you're looking at return on investment, the return on the pure in-situ process is probably farther off than the return from other processes. I think this is a good reason for our sustained interest in pure in-situ retorting. As a government laboratory, our involvement should be with developing materials and processes ahead of the need for them, ahead of demand. Industry should be involved with the shorter-range experiments, with modified in-situ and other retorting systems, which have a possibility for an earlier return on the required investment. We have preliminary cost data indicating a very favorable rate-of-return possibility for true in-situ. Of course, the technology is only at the early demonstration of feasibility stage.

Q. *What does your work mean in terms of energy dependence/independence?*

Decora: The technology we are investigating could have a very significant effect in the energy field in the long range because it will allow America to tap the 90-100 billion barrels of shale oil locked in the thin, lean seams of Wyoming's Green River Basin—barrels that are not

economically recoverable any other way. And this technology also could be put to use on other unmineable oil-shale areas, and it could be used in coal and tar-sands efforts, too.

I must stress, though, that our present experiments are feasibility—not production—studies. We are very proud that our recent experiment produced 60 barrels of oil during a 36-day run; but what we are really proud of is that we proved we could keep an in-situ fire going underground—and we did. In fact, it's still going. The other major significance of our work: our in-situ related environmental studies.

Q. *As an expert in the energy field, what are your major concerns for the next 10-year period?*

Decora: Because of my federal assignment, and in view of the country's energy needs, I have the responsibility for being on the side of increasing supply. Thus one of my concerns is for providing enough energy.

The energy problem alone is enough to keep us busy, but there are others along with it, the socioeconomic ones. The hyperurbanization stories of places like Gillette and Rock Springs are becoming well known, and as a native of Rock Springs, I feel committed to improving that side of the picture, too. There must be a way to ease the burden that energy development places on communities like these.

Community Planning: Early Effort at RBOSP

Since it acquired the rights to federal lease tract C-a in January 1974, community development planning has been a major concern for the Rio Blanco Oil Shale Project (RBOSP). Therefore, internally, RBOSP committed its entire management team to participation in this effort to optimize its social and economic effects. In fact, efforts to inform the Western Slope communities of its plans and resulting impacts started immediately. On January 19, 1974—11 days after RBOSP's successful bid—officers of Standard of Indiana and Gulf (the RBOSP partners) appeared before a Public Lands meeting in Grand Junction to review early development plans.

Since then, RBOSP has continued to give socioeconomic topics as much attention as mining or environmental matters. And, this year, RBOSP filed a social and economic impact statement with the Area Oil Shale Supervisor in conjunction with its Detailed Development Plan (DDP); while DDPs were required of all the federal tract developers, socioeconomic impact statements were not. The report includes not only standard demographic data, but also RBOSP's community development goals and growth management policies. As the following abstract shows, a unique feature of this document is that it considers qualitative as well as quantitative data.

In addition to preparing the socioeconomic impact statement, Gulf and Standard employed Gulf Oil Real Estate Development Co. (GOREDSCO) to assist the community of Rangely, Colo., with the development of a master plan for growth. That plan is completed and has been submitted to the citizens of Rangely; public hearings now are being held on the plan prior to final adoption.

Goals . . .

The major *objective* of RBOSP's planning activities is to ameliorate social and economic impacts and to avoid the mistakes and resulting problems encountered in other areas experiencing significant population increases caused by new industry. The ultimate *product* of community development planning activities connected with tract C-a developmental efforts is a social and economic growth-management program.

These policies were adopted to guide RBOSP's growth-management program commitment:

1. **Participation as a cooperative partner;** Rio Blanco believes that it is important to be a cooperative partner with the local area rather than an isolated and external force.
2. **Openness and accessibility;** RBOSP believes a policy of open communication is necessary to ensure that the communities, and state, local and federal governments will have as much knowledge as possible of RBOSP activities on which to base planning.
3. **Recognition of the individuality of the area;** RBOSP feels that one of its responsibilities is to recognize the uniqueness of the communities with which it is working.
4. **Making and announcing decisions early;** Rio Blanco has committed itself to making and announcing decisions as early as possible for planning purposes at the city, state and federal level.
5. **Commitment to citizen involvement;** RBOSP desires to incorporate a broad base of citizens into the planning efforts.
6. **Regional approach;** without attempting or desiring to be responsible for the welfare of the entire region, RBOSP will

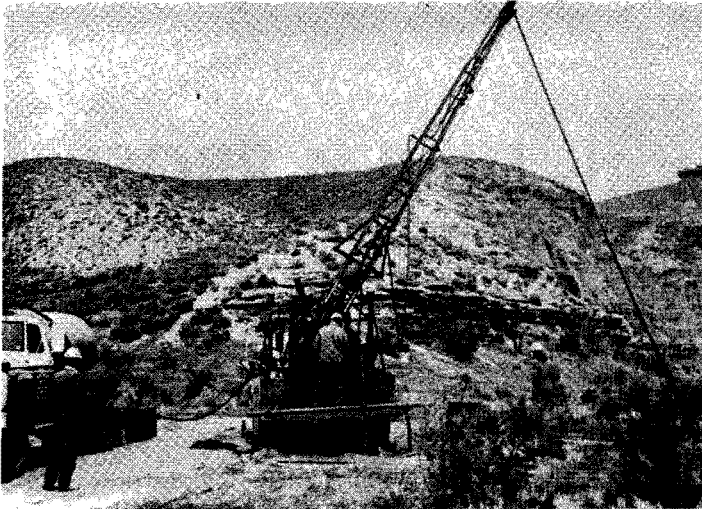
make regionally responsible decisions.

Programs . . .

The program for regional growth management suggested by RBOSP states:

1. Management concepts that should be adapted for use on the regional scale include: time sequencing of construction needs; coordinating recruitment and hiring regionally; support for educational, training and retraining programs; regionally integrated preventive healthcare delivery systems; temporary support teams and facilities that can serve an area at peak impact times and move out when no longer needed.
2. Special emphasis should also be placed on developing a recruitment and settlement program that would use local human resources whenever possible, minimize temporary workers, and expedite permanent settlement of newcomers.
3. New legislation at state and federal levels should be considered to enable implementation of programs dealing with temporary but potentially destructive impacts.
4. A regionwide monitoring program should be developed that would focus on a "preventive-early warning system" to spot potentially destructive impacts and mobilize the proper responsible parties and resources to intercept or mitigate such impact.
5. An early abandonment program should be developed to prepare for and respond to negative social impacts that result from the termination of an energy project. Technical assistance, job retraining, resettlement of people, should all be planned in specific detail to enable mobilization of the plan when needed.

J.P.



As the primary inspector of federal oil-shale tracts for the AOSSO, Chuck Joy keeps busy looking at almost everything, including (1) a slant-corehole program on tracts U-a and U-b;

(2) energy dissipators used for an underground water-pump test on tract C-b;

Environment

Oil-Shale Tracts: Under Inspection

If one of the oil-shale companies wanted to build a road through its federally-leased tract of land, but there was some concern that the road might ruin the black-footed ferrets' natural habitat, what would happen?

The answer to that hypothetical question comes from Chuck Joy, biological technician with the Area Oil Shale Supervisor's Office (AOSSO). "I would visit the site and try to determine if the road is environmentally compatible with the ferrets' range and life-style patterns. Then, if I had sufficient information, I would make a decision for the lessee to either go ahead or try another road-building site," he says. And, mini-recorder and camera in hand, Joy would note his observations for later reports to the AOSSO. But if Joy needed further information or advice, he would phone an expert at his office in Grand Junction via a telephone unit in his truck; or he might ask one of the staff members to visit the site with him and personally

look at the situation.

In other words, says Joy, his responsibility is "to do most of the inspections of the prototype tracts to make sure the lessees are complying with the lease's environmental conditions." Thus, Joy is the designated traveler for the AOSSO, an office established under the U.S. Dept. of the Interior's Geological Survey, Conservation Div., which oversees the federal oil-shale leasing tracts in Colorado and Utah. "The AOSSO has experts in subjects ranging from air quality to geology to hydrology," explains Joy. "However, they do most of their work in the office, so I take care of the on-site inspections. Then, from information these experts have already compiled, I can often make determinations on what steps the lessees should take on a tract, even if I'm not an actual expert on, for instance, air-quality control."

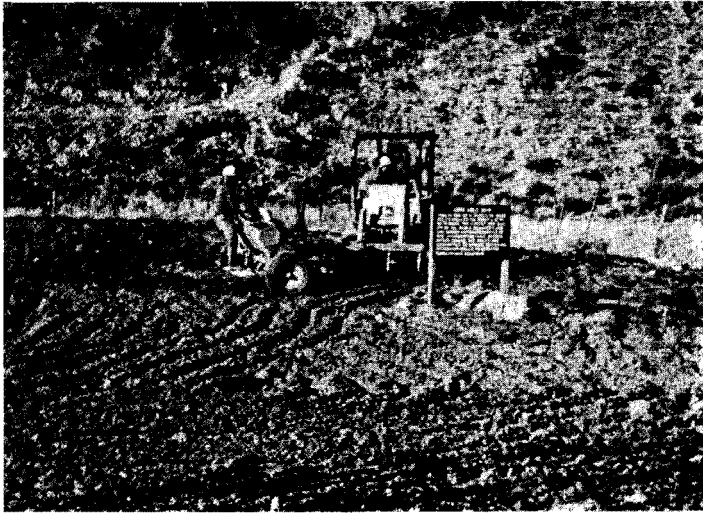
Joy's background is well-suited for this job—it is more general than specific. A graduate in biology from Northwestern

Nazarene College in Nampa, Id., Joy, who moved to Colorado 12 years ago, first worked for Coors Porcelain as a research technician. Then after a short stint as a wildlife technician for the Bureau of Land Management (BLM), he was hired in November 1974 by Pete Rutledge, Supervisor of the AOSSO.

Since that time, Joy says his range of knowledge has grown tremendously. "Pete has given me quite a bit of responsibility," he comments, "and I've learned something about every area involved in the environmental protection of an oil-shale tract, not just wildlife behavior, which was my original specialty."

From tract site to tract study

Joy outlines his schedule: "My typical day starts at about 5:30 a.m., if I have an 8 a.m. meeting on one of the tracts with an oil-shale company or contractor. Then I'm often not home (Clifton, Colo.) until 9 p.m. So if I'm going to visit more



(3) a reseeded operation on a disturbed pad site, also at C-b.



(4) Joy, on left, also gives numerous tours of the tracts, such as this one on tract C-a.

Biological technician becomes 'tract rat'—and likes it

than one site, I'll stay on the road—maybe 2 to 3 days each week—which is why I travel in a pickup and camper," he relates.

However, Joy notes that since the completion of the initial phase of the oil-shale tracts' development (compiling the Detailed Development Plans) and the lessees' subsequent slowdown, he is not traveling to the sites as often. And because of this, Joy's job has changed somewhat in recent weeks.

"Currently, I'm spending most of my time working on the supplemental environmental impact statements (EIS) for the proposed new in-situ tracts." As Joy explains it, these in-situ tracts, which are completely separate from tracts C-a, C-b, U-a and U-b, evolved partly because Interior Secretary Kleppe said the government, and many others, would like to see in-situ mining of oil shale more fully explored. (In-situ involves underground mining and heating of shale to produce a liquid shale oil, which

is then pumped to the surface for further processing.) Thus, four sites have been chosen for study: tract C-2, 2 miles southwest of tract C-b in Colorado, and tracts U-7, 8, and 9 in eastern Utah.

However, before two of the four tracts become eligible for bids by oil-shale development companies, the AOSSO and other federal agencies must write a supplemental EIS for all four tracts. Then, the Interior Dept. will select two of the tracts and offer them for lease to companies that will develop prototype in-situ oil-shale processing on them.

"Several members of the AOSSO staff are involved in researching the tracts and writing certain sections of the EIS," Joy explains. "My particular responsibilities are land use, transportation and grazing. So for each section, I will take an overall look at the region, then analyze the environmental impacts certain kinds of development will have on each tract." This research also involves travel. For example, about 2 weeks ago, Joy and

other members of the task force visited the proposed in-situ sites and asked questions of BLM personnel and other experts familiar with the area, questions such as "Are there pipelines, right-of-ways, patented land within the tract boundaries?"

In addition, Joy is spending some time studying the DDPs, which were submitted several months ago by the current holders of federal oil-shale leases. "My particular responsibility in this job is dictated by whatever assignment the tract coordinator gives me," Joy notes.

So Joy is more confined to the office these days. However, when asked if he minds this, he replies, "No, I enjoy my job—I've learned a great deal. And, although I like to travel—especially when I see unusual wildlife—I can't complain about the variety of my work. I hope to stay with the job for quite awhile," because, he affirms, "there's a future in oil shale."

C.K.

Shale's Proficient Public Affairs Pros

By Jonijane Paxton

It is 8:00 in the morning. You have been at work for half an hour already so that you can organize your day. You have reports to review; a speech to edit and smooth out; press releases to write and transmit; a luncheon meeting to attend at a local civic club, where you must give a speech you have made before but have to modify for this group; then there is an industry gathering to attend in the after-work hours. And in-between you know you will get many miscellaneous phone calls, with inquiries from legislative aides, local and perhaps national media, and concerned citizens. Also, during your day your mail will be delivered, bearing demands from various individuals for information—and maybe a request from a student for a complete term paper to be sent typed and double-spaced. Or maybe some kid will just want a piece of oil shale.

What you are is a public affairs representative for a shale company. What you do is provide information to the various publics that demand and need facts about what an energy-resource development company is doing. These publics are many and diverse, ranging all the way from the student to an environmental group to a lawmaker to NBC, plus all kinds of people and groups in between.

In an effort to find out what a shale company public affairs person is, what he (or she) does and how he feels about it, SHALE COUNTRY interviewed three representatives of this profession: Bob Jirsa, senior representative, Public Affairs Division, Atlantic Richfield Company; Tom Siebert, public information representative, Tosco Corp.; and Ted Neptune, manager of public affairs, Rio Blanco Oil Shale Project. From widely

divergent backgrounds, these three have ended up representing their companies' shale projects to many publics, and their remarks reflect a diverse approach to their job.

Bob Jirsa



"My job is divided among all the publics Arco encounters," says Bob Jirsa, "but the most fascinating part is being able to work with people who have lived many years in the same area—the Western Slope and Utah people. You get such a feeling of their pride in the area, and it makes you want to work that much harder to cooperate with them in preserving that heritage."

When Jirsa's job opened up, he already had a "love for Denver," and moved here happily from northern California. The opportunity in Arco's public affairs department followed a background that included 4 years in the Air Force ("I left as a captain"), and a bachelor's degree in business administration from Fresno State University in California, plus some graduate work in business. From there he took a job with Arco's marketing department in San Francisco, also spending time in Sunnyvale and Santa Rosa, Calif.

Then, Arco became the operator for the Colony Development Operation;

the C-b consortium won the bid on a federal lease tract; and the public affairs department needed a professional to work from a base in the Denver headquarters. "I always wanted to get into public affairs," Jirsa explains, "so I interviewed for the job, was selected, and came to Denver in June 1974."

Jirsa's main emphasis then became oil shale, until Colony went into suspension and Shell became Operator of the C-b project. However, at the same time, "I represented the corporation in all its endeavors in the Rocky Mountain region. This included its coal operations and conventional oil and gas exploration and production, in addition to oil shale. Now I deal more with the coal aspect than with oil shale. The job includes such things as representing the Atlantic Richfield Foundation, which gives grants to non-profit organizations. I also do media relations; and we provide photographs and information to the public. Also, I give four or five speeches a month to various service and professional clubs."

Jirsa is an energetic man, and a great deal of energy is required for such a job, especially when it concerns a new industry like oil shale. Says Jirsa, "When I came to Denver, the people in oil shale impressed me with their genuine enthusiasm and excitement about what they were doing. In fact, the whole industry had an aura of excitement—it was a most impressive thing. It was vigorous and vibrant, probably because it was untried."

He continues, "Getting accurate information out about the industry has been a fascinating job. Management is aware of the problems of informing the public

about our industry, and our philosophy has been that we provide accurate and full information as the public needs it."

Tom Siebert



Tom Siebert, public affairs representative for Tosco (formerly The Oil Shale Corp.) is a former Denver Associated Press newsman who had worked on several oil-shale stories before joining Tosco in the fall of 1974. His educational background, which he calls "unexciting," includes a bachelor's degree in history from Loyola University in Chicago. However, Siebert did not pursue work with that degree, turning instead to journalism, a "long-time interest." He worked in this field in Chicago and later moved to Denver and joined the AP wire service after his military stint.

When he joined Tosco "to be their public information guy in Denver," his main function became "to maintain relations with a variety of publics..These included the general public, the company's stockholders, other businesses and industries, public officials, the press." Today, although Tosco has geared down its Colorado oil-shale activities and Siebert has been transferred to the company's Los Angeles headquarters, he says he still works with shale, especially in Utah, where Tosco has oil-shale leases. And, whatever he focuses on, Siebert says he feels that "The human relations aspect of my work is most important. My major function is to act as a liaison between the company and people outside the company who have questions. Tosco has always welcomed questions and wants people to know what it is doing.

"Over the past few years, Tosco has emerged as a new kind of energy company: it is a petroleum refiner, a leader in oil-shale technology, it recycles scrap

tires, and operates conventional refineries. But we haven't lost interest in oil shale or our conviction that it will benefit the states where it lies as well as the nation.

"Tosco feels information breeds understanding," he continues, "and this is where public affairs or public relations work fits in. As traditionally defined, PR is very important to any company because it simply means disseminating information. However, the term has come to carry a taint, so perhaps human relations is a better word. Public relations is more than merely image building—it is informing many different kinds of publics about what you are doing."

Ted Neptune



Ted Neptune, public affairs manager for RBOSP, also has a journalism background, although in a different area than Siebert's. A graduate of the University of Oklahoma in broadcasting, Neptune was a newscaster at Oklahoma's educational radio and TV stations. He also did graduate work in journalism, then became a paid officer of the Alumni Association, for which he did PR, fund-raising and conducted tours.

Neptune realized, however, that this type of work was not what he wanted for a career. "What I wanted to do was get into industry, preferably the petroleum industry." Thus, when a job opened up at Amoco Production Co., the exploration subsidiary of Standard Oil Co. (Indiana), Neptune took it readily.

"I was in the employee relations and public relations department," he says. "In those days, the two departments were combined and I did both kinds of work."

Neptune came to Denver in 1970 with Amoco, where he did the same type of

work until "Standard and Gulf won the bid on tract C-a in 1974—and my life changed dramatically. I was asked to take the position I have now, which meant I was into a whole new technological field." (Although C-a is in suspension, work, including public-affairs work, is continuing steadily on the project.)

In his capacity as public affairs manager, Neptune has made numerous trips to the shale-country area, is a registered lobbyist in Colorado, does press relations work (writes releases, answers inquiries), writes speeches and is the chairman of public affairs for the Oil Shale Committee of the Rocky Mountain Oil and Gas Assn. "I do a lot of writing," he says, "and spend a lot of time at the state house. I am an information person. I do what I can to get the information straight for people."

Which pretty much sums up Neptune's philosophy of his job. He says, "Oil shale has always had the reputation of being boom or bust—never anything in between. However, at least in the past few years it has never been just boom or bust; it has been in shades of gray, but that's not news. Whatever's sensational is news and that's where the boom-or-bust distortion comes in—it's dramatic. But one of the most important messages to get across is that the oil-shale industry will create a new economic base in Colorado.

"The hardest part—and one of the most important parts—of my job is trying to keep the industry in perspective as to where we are at any one moment. Our management philosophy about public information has always been to be very open. We have felt that if we can get the facts of the story out, we can make our case and it will carry itself, so a great deal of emphasis has been placed on public information—on letting people know. And, you find it is a two-way street. I give information, but I also learn a great deal, which helps the company make sound decisions."

(Editor's Note: In sum, that's what a job in public affairs is—relaying and receiving information—and that's why the leaders of the oil-shale industry sponsor SHALE COUNTRY.)



Vignette

John Rold Repays Geology and Colorado

"I think one of our big problems today is making decisions. For example, I feel we had enough information 3 years ago to make an intelligent decision about how to proceed with oil-shale development. I strongly feel that the only way to upgrade the learning curve is to have actual development—then our storehouse of knowledge will really jump," says John Rold, Colorado State Geologist.

How does a person get to be a state geologist? Well, in the case of John Rold, director of the Colorado Geological Survey and state geologist, it all began back on an irrigated ranch west of Salida, Colo., where he grew up. He explains, "My dad died when I was 12. Mom and I ran the ranch and I worked for the Forest Service during the summers to earn money for the winters. But ever since I was 10, I wanted to be a forest ranger. When the Navy sent me to college, I started taking any course that would fit into a forestry degree program. It happens geology fits, so I took several geology courses.

"When I was discharged, I decided to go ahead and get my commission, but I needed a degree to do that. The quickest one I could get was in geology, which I received at the University of Colorado. I found geology so challenging I also got my master's in geology and then went to work for the California Oil Co. (Chevron), where I stayed for 19 years. I worked up to being District Geologist and worked all over the Rockies.

"Why did I leave a career with an oil company to become a state geologist? Well, I spent lots of time trying to answer that question once the job became available. The big reason was *challenge*. Also, it gave me a chance to work permanently in the state where I grew up, and it would let me repay some of the good things that the profession of geology and the state had done for me.

"Today I have no qualms, no regrets

because of my decision to take the job—80 percent of it is fun. I still feel like I'm doing geology through the hands and eyes of the geologists who work for me and through my own field trips and investigations. I also go to lots of meetings, some of which are fun, and some of which are in the other 20 percent."

So, Rold, who is married and has four children, has no desire to change jobs. "I have lots of unfinished things I'd like to do—for example, I'd like to see a good statewide evaluation of all of Colorado's mineral resources; I'd like to see geology used even more than it is in public and private decision-making; I'd like to see our geothermal resources developed; I'd like to see reasonable coal development in Colorado—and I'd like to see moderate, prototype oil-shale development in the state."

The Survey and Shale

One of the charges of the Colorado Geological Survey is "to promote economic development of (the state's) mineral resources." Rold says, "I insert the word 'orderly' in that phrase," and he notes another charge is "to inventory and analyze the state's mineral resources." He says, "We see those two as closely allied and part of the reason we got involved in oil shale." Another part of the reason comes from another charge: "to advise the state and act as liaison agency on transactions dealing with natural resources between state agencies and with other states and the

federal government."

And that "sure sounded like oil shale to us," says Rold. "So back in 1971, then-Governor John Love and Tom Ten Eyck, former executive director of the Natural Resources Dept., set up a Colorado Committee on Oil Shale Environmental Problems. Ten Eyck was chairman and I was vice chairman and coordinator. This \$750,000 cooperative state, federal, private funded project studied the major environmental concerns—from water quality to land use—over a 3-year period, and resulted in a benchmark effort. It was probably the first time such a diverse group from all levels of government and the private sector has successfully worked together toward a common goal: the optimum development of the energy resource consistent with adequate and proper environmental safeguards.

"I also served 1 year on the Oil Shale Environmental Advisory Panel and like to feel I made a contribution there." Rold adds, "Oil shale has to be developed sooner or later, since it is such a large, critically important resource. I also see that if something jeopardized our imported oil sources, we would be forced into a crash oil-shale development program—and that's not the way to do it. We should go ahead now with a moderate program, even though the economics are not favorable. And, society should assume some of the costs because our need for oil shale is greater than a dollars-and-cents analysis shows."

A.N.

A Local Affair in Housing

Moderately-priced housing is scarce on Colorado's Western Slope—the shale area—but residents of Mesa, Delta, Montrose and Routt counties have probably noticed several housing projects underway in their areas. And if those units will house low-income persons, chances are the state of Colorado has had something to do with their financing.

Specifically, the state legislature appropriates a yearly sum of money to one of Colorado's cabinet-level departments, Local Affairs, which in turn passes the dollars to its Div. of Housing. These funds, which amounted to \$1.5 million in fiscal 1976-77, may be used to construct or rehabilitate all types of housing—from single-family frame homes to mobile homes—with the stipulation that the Division only provide up to 50 percent of the financing, and that the housing be for low-income residents and workers.

For the Western Slope, this appropriation has meant \$511,000 invested by the state in housing construction and rehabilitation during 1976. Currently, 13 projects, with a total of 343 housing units, are completed or underway on the Western Slope. And, the Division reports that its funds attracted an additional \$2 million in local and federal monies.

Funneling funds . . .

At the Division's state office in Denver, Harold Knott, director, explains how the Division funnels its money into these projects. "We will work with the federal government, a local government or a private, non-profit organization," he says. An illustration he provides of the way the state can bring federal housing grant money to an area took place recently in Grand Junction.

"For about 1-1/2 years, the Grand Junction Housing Authority tried to get a federal Housing and Urban Development (HUD) commitment for a million-dollar-plus project," Knott recalls.

"However, it ran into problems because HUD had set a maximum market rent that could be charged for each new unit—a rental price that contractors found too low to cover the costs of constructing the housing. So, the Colorado Div. of Housing stepped in with a grant that reduced the mortgage just enough to lower the operating cost below the figure established by HUD; thus, the federal subsidy was approved and private construction and mortgage financing of the project was assured."

. . . for better housing

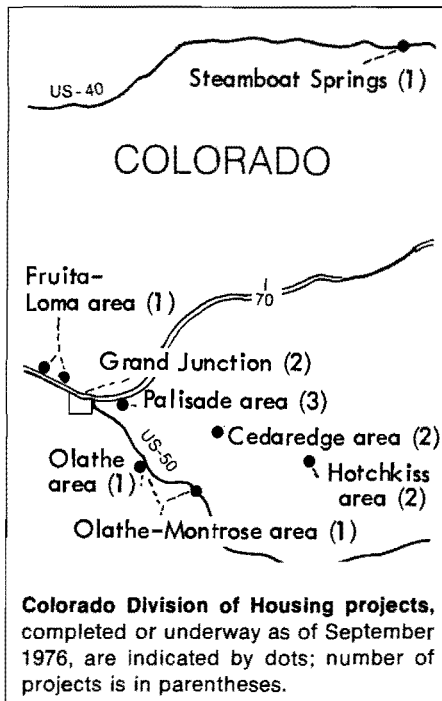
Such projects fall under the Div. of Housing's program for new housing grants. A second major program provides technical assistance and matching money for the rehabilitation of low-income homeowners' housing. "In this case, the low-income family would apply

to a sponsor organization, perhaps to a county or city housing authority," Knott explains. "Then, with some state funding to complement local private and public funds, the local sponsor will have sufficient funds to pay a private contractor to renovate the housing unit."

As Knott indicates, the Div. of Housing's grants primarily serve low-income families. And, he says, "Quite a number of Western Slope residents fall into this category, especially agricultural workers and elderly residents. They are the ones most affected by western Colorado's recent growth spurt, which has made low-cost housing increasingly scarce." The cause of this growth, according to Knott, is primarily coal development, coupled with a general increase in population because of the desirable location of western Colorado.

On the other hand, Knott does not feel that oil-shale development has had much effect on housing needs. In fact, Knott recalls that his only major contact with oil-shale companies was a discussion with the Rio Blanco Oil Shale Project on the state's possible involvement in developing some low-income housing. "Of course, that was just preliminary brainstorming, and does not mean a project is underway," says Knott.

To help Western Slope developers make full use of the Div. of Housing's programs, the Dept. of Local Affairs has a regional office in Grand Junction. Located in Parkwood Plaza, the Department's representatives consist of the Divisions of Housing and Planning and Office of Rural Development. In addition, the office can also answer questions about other Department assistance programs, federal Four Corners and Economic Development Administration programs, and Colorado Housing Inc., a private, non-profit agency which works in the area. "The Department is in Grand Junction to respond to anyone who comes into the office with a housing question or a housing need," Knott states. C.K.





Guest Column

Health Effects of Oil Shale Processing

By R. Merrill Coomes
Tosco Corp.
For the C-b Shale Oil Project

The cancer-causing potential of oil shale in all its forms has been a question not only to the people who live in shale country, but also to the companies that are developing the resource. Thus, the shale companies' involvement in carcinogenic (cancer-causing) research has been extensive—and expensive.

Dr. R. Merrill Coomes, group leader of organic research at Tosco's Rocky Flats Research Center (Golden, Colo.), is one of the shale scientists most deeply involved in the research. Therefore at the recently held 9th Oil Shale Symposium, he delivered a paper refuting some research reports previously issued and updating the attendees on research underway. Following is an abstract of that paper, with particular emphasis on the history of suspected shale-related cancers, and the current biological testing being done to determine the carcinogenicity of TOSCO II shale in different forms. His remarks:

Introduction

What are the known facts concerning the carcinogenic potential of oil shale?—All oil shale materials contain benzo(a)pyrene (BaP), a known carcinogen to animals, but not humans, and other polycyclic aromatic hydrocarbons (PAH). BaP is one of many PAHs, which are formed during combustion of organic material. BaP is the PAH usually tested

for because it is a known animal carcinogen, and is relatively easier to detect; however, the presence of BaP alone does not make a material carcinogenic. (Coomes points out that when it is said BaP is "easier to test for," it doesn't imply a simple process. The chemical analyses performed are complex and expensive; however, in relation to other PAHs, BaP can be detected and quantified under less involved testing.)

—Crude shale oil has been shown to be no more carcinogenic in animal tests than other petroleum products.

—The Scottish experience with shale oil indicated it was carcinogenic to humans.

—Raw Scottish oil shale was non-carcinogenic in animal tests.

—BaP is not a proven carcinogen to humans.

History

Referring back to the Scottish experience, which took place during the early 1900s, this occurred in two ways: (1) Mule spinners (a type of weaver) were exposed to shale oil, because it was used as a lubricant on their machinery and dripped onto them during their entire workday.

(In fact, says Coomes, oil was splattered over the entire work area because the machinery turned at 10,000 revolutions per minute; the weavers worked in a "mist of oil." The spinners were not particularly hygienic, and did not wash

the oil off for many hours; today animal tests have shown the importance of personal hygiene in reducing the potency of known carcinogens. Also, the shale oil used in Scotland was highly refined. All steps taken in its refining process served to concentrate the PAHs, says Coomes, intensifying the exposure to workers. In contrast, it has been proven that the refining process used today reduces the carcinogenic potency of shale oil.)

(2) Scottish oil-shale workers experienced a high skin cancer incidence of 1/1,000/year (which is much lower than the rate experienced by the weavers); but not a single case of lung cancer was ever detected.

Chemical analysis

TOSCO II processed shale was analyzed for Colony Development Operation in 1965 for carcinogenic potential. These tests showed less than 100 parts per billion (ppb) of BaP. (One ppb is an extremely tiny amount; in distance, its equivalent would be 1 inch in 16,000 miles.) Later, in 1974, the Denver Research Institute (DRI) found 12-116 ppb of BaP in TOSCO II processed shale. Further testing using a more sophisticated method of chemical analysis has shown that processed shale actually contains less than 40 ppb BaP. The important question is, what does a BaP content of 40 ppb mean? Is that amount of BaP a potential health hazard? In order to get the proper perspective of the impor-

tance of a BaP content of less than 40 ppb, comparisons must be made.

Because of the publicity that processed shale has received, it is inconceivable that the typical person would volunteer to consume this material. However, that same person would not hesitate in using coconut oil for food preparation or as a suntan lotion, or in consuming oysters from Norfolk, Va., but these have very high BaP contents. The same person, while hesitating to touch processed shale with his hand, would probably not hesitate to feel a handful of dirt from a farm field such as that analyzed near Moscow, which also contained high BaP content. An extreme example is perhaps the BaP content of oak leaves—the analysis of oak leaves showed up to 300 ppb BaP based on the dry weight. It does not seem likely that the general public would ever consider oak leaves as being potentially ten times more carcinogenic than processed oil shale, but based on BaP content they are.

(Coomes repeats that the presence of BaP alone does not make a material carcinogenic. He says, "When you take a given concentration of BaP in a pure solvent, it is carcinogenic to animals. However, the same concentration of BaP mixed with other materials may not be biologically available, which means that it doesn't do anything when it comes in contact with the skin.

"The DRI report, which was the basis for much of the media publicity about whether or not shale is carcinogenic, was based only on BaP analysis, and did not look at its presence in terms of complexity of structure or anything else. That is why we compared oil shale to such common materials as coconut oil and oak leaves. This gives the DRI work a frame of reference. Certainly it is simplistic to compare oil shale to oak leaves, but in terms of the information generated by DRI, they are comparable.")

Biological testing

The best method available for determining the carcinogenicity of a material is laboratory animal testing. These tests are being done by Bio-Research Consultants, Inc., and Eppley Institute for Cancer Research for the C-b consortium to

determine the potential carcinogenicity of raw oil shale, processed shale, coke produced from shale oil and solid scrubber effluent from the raw shale preheat system. These materials are being tested since workers might be exposed to them.

The experiment at Bio-Research has been completed, and was a "total exposure" experiment. That is, since there are no standard methods available to test the carcinogenic potential of a solid material on the skin, hairless lab mice were bedded on processed shale mixed with corncob bedding in various percentages: 100 percent, 50 percent, 10 percent and a control group that lived on 100 percent corncob bedding. The bedding materials intimately contacted the animals' skin since they were hairless. A total of 1,350 mice were used in the experiment.

Of the animals exposed to various concentrations of processed shale and raw shale, a total of 468 skin examinations have been made. In every case, the skin areas were found to be totally free of any lesions or cancers. The average weight gain and mortality rates of the animals living on shale were identical to those of the control animals.

(Coomes points out that the body weight is a crucial factor since it indicates potential toxic effects. Also, he says, when the animals were killed and autopsied, all their organ weights were comparable to the control mice. The mice that lived on the shale did turn black, but simply because shale particles stuck to their skin, and while they tried to groom themselves, they could not lick off all the dust.

Coomes also notes that the animals ate a great deal of shale dust on their food—"since they lived on it, obviously they kicked it up on their food." Yet, when they were autopsied and different sections of the stomach analyzed, no tumors or other abnormalities were found. Interestingly, Coomes says, deposits of shale had accumulated in the mice's cecums, an organ similar to a human's appendix. Again, however, no tumors or abnormalities were found there.)

Other biological testing being done

includes "skin painting," a technique used to apply the material tested directly to the skin of the animal. In skin-painting experiments, the shale materials are extracted with an organic solvent. This is then painted on the shaved backs of mice throughout their lifetimes, and they are observed for occurrences of tumors. Another type of experiment involves lung exposure. The technique being used is called intratracheal instillation, and involves injecting the test material directly into the lungs of hamsters. These experiments will be completed in 1977.

In conclusion, chemical analyses at various laboratories have shown that crude shale oil produced by the TOSCO II process contains quantities of BaP similar to those found in many petroleum or refinery products. Biological testing has proven that the carcinogenic potential of crude shale oil is of the same magnitude as petroleum products, and that hydro-treating or upgrading the shale oil reduces the carcinogenic potency.

TOSCO II processed shale contains about twice as much BaP as raw oil shale. This amount of BaP is less than many materials which are found naturally in the environment and are considered non-carcinogenic.

Test animals who lived with very high exposures to TOSCO II processed shale for their lifetime did not develop skin cancers.

Present industrial hygienic standards for processed shale dust would limit the amount of BaP in the oil-shale processing work environment to less than 20 percent of the ambient levels found in the Denver atmosphere.

It is felt that the data presented in this paper are more meaningful than any previous information for the evaluation of the potential carcinogenicity of oil-shale materials. The chemical contents of oil-shale materials have been compared to the same chemicals contained in common materials. It is concluded from chemical analysis, and animal testing, that shale oil presents a carcinogenic hazard that is similar to, or less than, normal petroleum refinery streams, and that processed oil shale does not present a carcinogenic hazard.

Mother of 7 Helps Shape State Land Use

By Carol Edmonds

Guiding 63 counties: nobody wants a dependent 'child'

The woman at the meeting with the baby in her lap introduced herself: she was Barbara Chambliss, one of nine members of the Colorado Land Use Commission. She was at this meeting to hear citizen concerns about land-use planning and legislation in Colorado. She explained that the Land Use Commission, created in 1970, had scheduled these neighborhood meetings and a series of hearings in ten areas throughout the state in response to a request from the Governor that the Commission review and make recommendations on land-use legislation.

She also explained that the Commission was responsible for enforcing such existing land-use laws as Senate Bill 35, a measure requiring counties to adopt certain subdivision regulations, and House Bill 1041, an act providing counties with model guidelines for dealing with specific hazard areas. The Commission is also known for its temporary emergency powers, contained in the revised Colorado Land Use Act of 1971. The act empowers the Commission to halt any land development in the state if it deems such development a danger to public safety or the environment.

Barbara Chambliss, a Grand Junction resident who was appointed to the Commission by the Governor last May, has long displayed a knack for weaving family life into civic responsibilities, but it's no small task for a woman who, 4 years ago, married an architect, Blake Chambliss of Grand Junction, who already had a family of six teenagers. She was, incidentally, a grandmother before she was a mother; the oldest Chambliss girl gave birth to a child 5 months before Barbara's son Becket was born last August. Since then—in between work on Colorado land use—Mrs. Chambliss has shingled the family's roof, taken her children on backpack trips, taught planning courses with husband Blake at the local college, and woven at her loom. She is also a member of the ski patrol for Powderhorn Ski Area near Grand Junction, and she has worked as a consultant for the planning firm of James Bowers & Assoc. of Denver and Grand Junction.

In a sense, oil shale and planning first

linked Barbara Bowes to Blake Chambliss, an architect who has a keen interest in land-use planning (see March 1976 SHALE COUNTRY). Before they met, she had trained and worked in planning. After graduating in 1966 from Mills College in Oakland, Calif., she studied at Doxiadis Center for Ekistics in Athens, Greece, then earned a master's degree in conservation from the University of Michigan in 1970. She was employed by a Denver planning firm as an economist, then by Vail Associates as a planner and later by a Tacoma, Wash., firm as a consulting economist. In 1971, she was hired as planning coordinator for a newly-organized group, Colorado's Oil Shale Regional Planning Commission, forerunner to the Region 11 Council of Governments now representing northwestern Colorado. One of the advisors to the planning commission was Blake Chambliss. After their marriage in 1972, Mrs. Chambliss resigned from the commission post.

She has, however, continued her interest in wise use of the land. In addition to serving on the Colorado Land Use Commission, Mrs. Chambliss is on the board of directors of Rocky Mountain Center for the Environment, a privately-

funded organization serving six states in the region. She reports that ROMCOE and an ad-hoc agricultural study group in Mesa County organized a model seminar last month on preservation of agricultural lands in Mesa County.

In an interview with SHALE COUNTRY, Mrs. Chambliss spoke of some of her key concerns about land-use planning in the oil-shale region of Colorado.

SHALE COUNTRY: *What are some of the themes emerging from citizen comments at neighborhood meetings and public hearings of the Colorado Land Use Commission? (As of press time, the hearings were still going on.)*

BARBARA CHAMBLISS: Local control is a major interest. Many persons are saying, "We want local control. We know we're making mistakes, but we're willing to live with our mistakes. There are, however, some areas where we need help."

The comments seem to indicate that not all the legislation we've started is bad. And they often say, "We're just getting to the point where we understand it (the legislation). Don't jerk it out from underneath us. Don't add any more legislation. Let us spend time refining what we have."



S.C. *Frequently, local citizenry object to state intrusion into decisions about local land use. Do you see any way Colorado can respond to this resentment of state intervention?*

B.C. In thinking through this problem, I keep referring back to the way we're raising our children: nobody wants a child who's always dependent on them. Basically, it's in everyone's best interest to take responsibility for their own well being.

The same principle applies at a state level. When the activities of one entity interfere with the well being of the others, the 'parent' ought to come in.

For example, in our own family, our son Bobby wanted to buy an expensive bike. We asked him if he had checked out other bikes first. He hadn't. We required him to do that, and to seek outside advice on other kinds of bikes. Then even if he picked a crummy bike, we were willing to let him live with his own decision. But we wanted him to make a decision with more information than he originally had.

Returning to land use, the best way to write legislation for 63 counties is not to tell anybody what to do, but to set goals you'd like to see the state headed to-

ward. You must see that the legislation is flexible enough so that you have the wherewithal to help those who ask for help and the structure that keeps any one county from ruining the rest of the state. You must be able to administer a swift kick-in-the-pants to those who don't do things right, and you should have room in the system for those responsible enough to do things on their own.

All this involves obligations of the state and local governments. Counties have to start taking more responsibility for their long-term decisions in land use, especially in energy/mineral development. There has to be an entity the mineral companies can deal with—not just an entity that reacts to mistakes. Also, the counties must consider the synergistic effects of their decisions not only on the county but also on the state as a whole.

At a state level, planners need to streamline certification and approval processes. In effect, land-use decisions should be orchestrated through one concert master rather than through a myriad of musicians, each with a different score.

S.C. *How do you determine that point when the state should intervene because a county is jeopardizing the state's welfare?*

B.C. Every decision a county makes has some effect on the well being of the state. If the state is asked to intervene, we have several alternatives: we can do nothing, we can request the county treat the situation as an area of statewide concern, we can work informally as mediator of the conflicting interests or we can exercise the temporary emergency powers. We would use whatever alternative is appropriate to the particular conflict.

When we reach such a point in our family, we sit down with the child and say, "What way would you like to correct this?" We agree on a method, and we agree on something to do if that method doesn't work.

Thinking about the state, it's much more complex. Clearly local control is better. The local official is available to his

constituents, but he is also more malleable, and he lacks the technical knowledge that could back up tough, farsighted decisions.

S.C. *How does oil-shale development fit in with wise land-use planning? Is it a threat, an opportunity?*

B.C. I see it as an advantage. The Western Slope is one of the few places in the whole United States where a planner does not have to spend time undoing mistakes. The oil-shale potential is a push from the outside, coming at a time when our resources are basically unspoiled. This push is the best thing that can happen, encouraging planning. For example, what Rio Blanco County has done (working with oil-shale developers to draw up a master plan) is fantastic.

Of course, the ecological part of me looks at oil shale and says we shouldn't be using non-renewable resources for energy. I'm opposed to pulling anything out of the earth for energy. But right now renewable energy resources just aren't ready. However, I'd always vote for a program to work toward that.

S.C. *Do you think the Colorado Land Use Commission can come up with ways of helping to meet the energy crunch and to preserve important land values? Do you think this hearing process will work?*

B.C. The hearings and neighborhood meetings are the hardest way to go about it and the only way to go about it. The testimony and comments were so vast and varied, we'll never incorporate everything. But it's the best way I know of to get trends of information.

It's an awesome task to write legislation for 63 counties that will work tomorrow and next year. We are working toward dealing as much as possible with everybody on an individual case basis.

Too often the dollar bill determines whether an area should be developed. We don't stand back and ask what the carrying capacity of the water and the land is, and what the best interests of the community are. I would like to see these decisions to use the land based on information tied to what is financially, aesthetically and ecologically sound for the community.

Letters To The Editor

Refining refining

"The refining of crude shale oils has been the subject of comment in recent issues of SHALE COUNTRY. I would like to add to this dialogue a slightly modified concept of the refining problem.

"There are two basic options available to a shale-oil project developer. The first is to do the minimum processing necessary, within environmental constraints, to make a transportable product which can be fully refined elsewhere. The second is to produce finished fuel products or a high-quality synthetic crude oil.

"The Detailed Development Plans of the federal prototype leaseholders in Colorado and Utah indicate all three developers currently propose to install high severity hydro-treaters to desulfurize and denitrify the shale oil. This synthetic crude would be of higher quality than conventional crude oils and would be suitable as a direct replacement for imported crudes in most refineries. Unfortunately, economic evaluations have shown that severe, high-pressure hydrotreating of the shale-oil product to very low nitrogen levels increases the product cost by \$4 to \$5 per barrel. Therefore, there is strong incentive to eliminate this additional capital and operating cost, at least for the first prototype plants. Considering the high risk of such first-of-a-kind plants, utilizing commercially unproven technology, the added investment on-site for hydrodenitrification unnecessarily compounds the risk. Prototype or modular demonstration plants should therefore consider no more than a transportable and saleable synthetic fuel. Any additional processing should be done in existing refineries. In fact, some limited direct blending of high-nitrogen fuels may be feasible for certain applications.

"Concern has also been expressed that raw shale oil is a highly unstable material and excessive gum and polymer will form during transport, storage, and in direct use as a fuel. Such observations result primarily from the diolefins present in most high-temperature pyrolysis products. These diolefins can be selectively saturated by hydro-stabilization at relatively low temperature over conventional hydrotreating catalysts at only a fraction of the cost of denitrification. We estimate the hydrogen consumption for this stabilization at about 100 standard cubic feet (SCF) per barrel of feed, compared with

approximately 1800 SCF per barrel for severe hydrodenitrification.

"Gulf Research & Development Co. has tested the combustion properties of hydro-stabilized shale oils and found them to be stable in storage and cleaner burning than conventional oil fuels of equivalent boiling range. The adverse aspect of such hydro-stabilized shale fuels is still the high NO_x emissions (oxides of nitrogen) on combustion. Further research is required to determine the optimum refinery processing or other utilization of such high-nitrogen shale oils, but the high cost of on-site denitrification provides incentive to develop such alternatives."

Allan P. Grossman
Sr. Staff Engineer
Shell Oil Co.
Houston, Tex.

It is not drab!

"I refer to Mrs. Elberta Francis' Letter to the Editor in your August 1976 issue. Mrs. Francis, and others, say that shale country is not beautiful, but is a 'drab, dry and desolate area with sparse vegetation and little wildlife.'

"Little wildlife? The Piceance Basin is habitat for the largest migratory herd of mule deer in the ENTIRE United States and Mexi-

co! Almost 6000 deer are 'harvested' by hunters from the Piceance Basin annually. Some of the headwaters sport the best game fishing in the western world. The basin is almost overrun with cottontail rabbit; grouse and dove populate the area. I've seen many pheasant and quail.

"It is apparent that Mrs. Francis is unaware that the environmentalists have already made their demands upon the Oil Shale Impact Statement. They are now satisfied to a degree that shale-country's wildlife will be adequately protected when production gets underway.

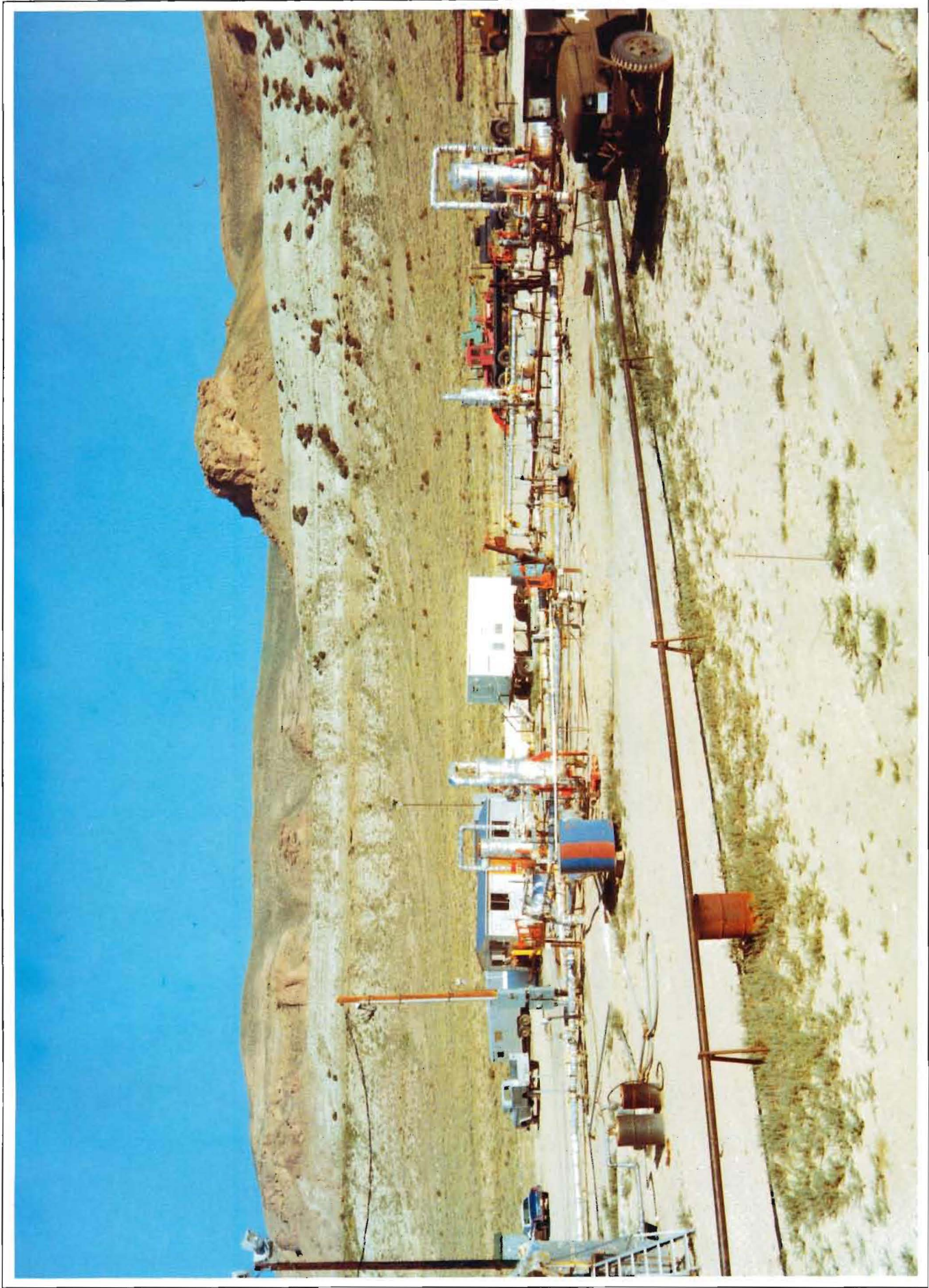
"Drab? Unless Mrs. Francis is color blind, I'd strongly suggest she visit the shale country in the spring when the countryside is alive with billions of flowers from her 'sparse vegetation.' In reality, SHALE COUNTRY photos DO show the region's true color.

"As an ex-native of Los Angeles, I think the Piceance Creek Basin is pretty close to heaven when you compare it with skyscrapers, wall-to-wall houses, concrete canyons, smog and people pollution. Shale country has an aesthetic beauty for those persons who are not themselves drab, dry and desolate, but who are willing to keep their eyes open and appreciate God's good earth."

Ron Gitchell
Meeker, Colo.



Reader rebuts: In response to some comments that shale country is desolate and drab, Ron Gitchell of Meeker, Colo., says, "... the Piceance Creek Basin is pretty close to heaven."



Laramie Energy Research Center's in-situ field operation at Rock Springs, Wyo.

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