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RECLAMATION AND THE ENERGY CRISIS

The Bureau of Reclamation is both a leading water agency in the West and a leading producer and marketer of energy. I hope today to show more clearly that the tie between water and energy is not merely the production of hydroelectric energy.

During 1973, the Bureau of Reclamation generated 38 billion kilowatt-hours of electric energy from its 50 hydroelectric plants located in 11 Western States. This energy was transmitted over the Bureau of Reclamation's interconnected transmission system network. The network includes over 16,000 circuit miles of Reclamation high voltage transmission lines,
and 290 substations. The energy goes to load centers for delivery to the Bureau's 479 wholesale customers.

The Bureau's power sales, amounted to 50 billion kilowatthours and $163 million in revenues last year.

In addition to power sale revenues, the Bureau receives an estimated $10 million annually from wheeling of power for other utilities--public and private--with which it is interconnected. In turn, the Bureau pays wheeling charges to other utilities for wheeling Bureau power to its customers over their transmission systems.

If the hydroelectric energy produced annually at Reclamation's plants and that marketed by the Bureau for the Corps' plants were produced from fossil fuel resources, it would require an equivalent of about 100 million barrels of oil or 24 million tons of coal.

The electric energy produced at Reclamation plants alone is sufficient to supply the needs of about 5 million residential customers. Assuming three people per family, this would be equivalent to the residential requirements of the cities of San Francisco, Chicago, Dallas, Washington, D.C., and New York.
During the past year, the Bureau participated in an oil conservation program in the northern Central States. To conserve oil in critically short supply the Bureau modified its operations to utilize hydroelectric power as much as possible to meet peak demands. This displaced non-renewable fossil fuels that would otherwise have been burned in diesel engines and steam plants of public and private utilities. The on-peak energy is returned off-peak from the utilities base-load coal plants.

The effort worked. The Bureau expects to displace enough oil-fired generation in 1974 to conserve the equivalent of about two million barrels of oil.

In the near future the impact of the Bureau's operations on the energy situation will be greatly increased because of the construction program now underway.

The Bureau currently has four hydroelectric powerplants under construction. These include the Third Powerplant at Grand Coulee Dam, Washington; Mt. Elbert pumped storage powerplant, Colorado; Crystal Powerplant, Curecanti Unit, Colorado; and the Teton Powerplant,
Idaho. The authorized installed capacity represented by this construction is over four million kilowatts. (Reclamation's present total installed capacity is 9,700,000 kw.)

Of course, the Grand Coulee Third Powerplant represents the lion's share of this total and is a mammoth undertaking both physically and in its ultimate input to the Columbia River power system.

Completion of the initial phase of the new Third Powerplant will add 3,900,000 kilowatts to the present capacity of 2,295,000 kilowatts in the existing left and right powerplants and the two pumping/generating units that lift water to Banks Lake.

Construction on the 100,000 kilowatt Fryingpan-Arkansas pumped-storage Powerplant and the associated 11,000 kilowatt Otero Powerplant is scheduled to be completed in December 1976. This is the first stage of an authorized 200 megawatt pumped-storage plant. Construction on the second stage must await legislation to increase the appropriations ceiling.
You here in the Pacific Northwest are familiar with the Teton Project which will have a generating capacity of 20,000 kilowatts initially...with provision for an additional 10,000 kilowatts in the future.

The Crystal Dam Powerplant will provide some 28,000 kilowatts. However, the completion of the Dam will provide the regulation necessary to operate the Curecanti Unit at its full name-plate capacity of 209,000 kilowatts.

Auburn-Folsom South, California, and the Bonneville Unit, Utah, are under construction and both will have power although the power facilities are not yet under construction. Auburn-Folsom will have initial capacity of 300,000 kilowatts with provision for ultimate development of an additional 450,000 kilowatts. The Bonneville Unit is designed to provide 133,500 kilowatts of hydropower for irrigation pumping and for commercial sale.

Looking into the future, we are initiating this year a study of the feasibility of a further extension to the Coulee
Dam Third Powerplant. That study is scheduled to be completed in fiscal year 1977. We are also beginning a feasibility study to identify and evaluate new peaking power potential on the Colorado River Storage Project.

The Bureau also has identified 43 potential hydroelectric power developments for appraisal and feasibility level investigations. These represent new projects as well as additions to existing projects. The increased annual generation that could be expected from the development of this potential would be nearly 46 billion kilowatt hours of electric energy.

That covers in part where we have been and how we have reacted, but where are we going?

The Western Energy Congress is discussing new sources of energy, with emphasis on the coming five to 10 years. This could mean the practical development of such presently experimental energy sources as solar heat or the winds. It will call for the location of new oil fields, conversion of vast shale fields to oil
production, gasification and liquefaction of coal, expansion of efforts in the geothermal field, and more rapid installation of nuclear-fired powerplants.

Most of these sources of energy are vitally dependent upon water. This is significant to our discussion today, for Reclamation is primarily a water agency. The Bureau is interested in and involved with water from every source...including surface runoff, ground water, sea water, geothermal water, and atmospheric water. Implementation of Project Independence for full development of energy resources will greatly intensify the Nation's interest in development and use of water.

Within the next five to 10 years, the quickest and most profitable avenue for strengthening America's energy reserves is through better management and more efficient use of presently developed water resources. The Bureau's program is directed both to this approach and, in the long-range, to more innovative directions.

In current irrigation project operations, there is some potential for energy saving on
those projects which have to pump their water supplies.

The Bureau is increasing its emphasis on better utilization of presently developed resources through its Irrigation Management Service Program. This program is designed to assist farmers in the scheduling both in timing and amounts of irrigation to reduce water, pumping, and fertilizer use, while increasing production and providing more efficient and economic control of drainage problems.

Here in the Pacific Northwest, the program was initiated first on the Minidoka Project in southern Idaho. It has now been expanded to the Boise Project, and we hope to see it in operation on other projects in the near future.

We work closely with the Department of Agriculture, county agents, and irrigation districts in improving water delivery systems and utilization, which should provide considerable opportunity for better water use and conservation.

In the 17 Western States during 1973, the Bureau of Reclamation used 2.4 billion
kilowatt hours of electric energy for project irrigation pumping. Even a five percent reduction in water pumped would be an energy saving equivalent of 240,000 barrels of oil.

More innovative programs in which the Bureau of Reclamation is deeply involved are "Project Skywater" and geothermal studies.

The Bureau was directed by the Congress in 1961 to undertake research on increasing precipitation by cloud seeding. "Project Skywater," as this precipitation management research program is called, has been an intense, coordinated scientific effort of meteorologists, engineers, physicists, chemists, biologists, mathematicians, lawyers, economists, and ecologists to explore and develop the technology of weather modification to meet the Nation's growing need for new supplies of clean water.

The program is now in transition from strictly research and development to a combination of research with operational demonstration. The Colorado River Basin Pilot Project in the San Juan Mountains of southwest Colorado—an experiment especially designed to study the practicality of winter storm
cloud seeding--is now in its fourth year.

The remaining research effort is shifting from winter seeding in mountainous areas to summertime seeding in the high plains region to solve some of the significant unknowns. The High Plains Cooperative program--announced May 8, 1973--is a second generation research effort into the complexities of managing precipitation in the 10 High Plains States.

The project is expected to require up to seven years and will cost up to $20 million. States cooperating in the project will furnish supporting services and facilities and assist in funding the research.

Here in the Pacific Northwest, the Cascades winter-time seeding research project, carried out by the University of Washington through contract between the Bureau and the State of Washington, is being concluded this year.

Most of the additional runoff resulting from winter weather modification will be stored in reservoirs and then released to increase power production from downstream
hydroelectric plants enroute to points of diversion where it will help satisfy the growing multi-purpose demand for water including development of energy resources such as oil shale and coal.

New water may also be developed from geothermal resources. The Bureau has studied utilization of geothermal brines since 1968. There is an excellent, and perhaps unique, facility at the Imperial Valley, California, East Mesa Test Site.

Two geothermal production wells have been completed with appropriate surface plumbing, separator, silencers, and a lined holding pond. Two desalting test units have been installed. A well-equipped laboratory is on site. Three additional wells—one to be used for injection—are scheduled for completion this year.

Although the Bureau's geothermal research and development program has been limited to the East Mesa anomaly of the Imperial Valley, it has been estimated that the Valley is underlain by more than one billion acre-feet of recoverable hot saline liquids.
The basic objective of Reclamation's geothermal resource investigation program is to develop the required technology and determine the feasibility of desalting geothermal fluids, using the natural heat of the resource. Conceptual studies have shown that the production of fresh water from geothermal brines could also be tied together with production of electric energy in a dual operation resulting in lower costs for both products.

Although Reclamation is interested in both the water and the power aspects of potential geothermal development, we are presently confining our activities to the production of pure water and are leaving the power aspect to others. Many of the difficult technical problems encountered with hot-water geothermal systems—whether the development is for water, mineral, electric power, or process heat—are the same. Thus, information gained through Reclamation's program will be easily transferred to other uses of the resource.

The Bureau has several other programs underway although less exotic than Project
Skywater or geothermal investigations. These, too, can provide important contributions to the overall solution of the energy problem.

Reclamation has active programs looking at all potentials to insure water availability for development of coal and oil shale. The Bureau is participating in the Northern Great Plains Resource Study as the lead water agency. The prime purpose of that study is to identify the constraints associated with the development of the vast coal resources of the Northern Great Plains. We are focusing attention on the physical means of meeting water needs for the development of coal.

In addition, the Bureau is evaluating alternatives for providing water necessary for development of the oil shale in the Upper Colorado River Basin.

Oil shale development and gasification will use a lot of water. Present studies are geared to plants on the demonstration level, small enough to keep control over the amount of water to be used and still large enough to demonstrate feasibility. This must be our policy until water supply problems can be resolved.
Now, let's turn to some areas where Reclamation, through research, improving efficiencies and economies can step up hydroelectric generation. These begin with more studies in water availability and siting of projects. This can include the possibility of surface-to-underground pools for pumped storage. Then, we can do more in automation and systems control...including rapid start-up and loading of hydromachines...and development of better turbine-generators and pump-turbines.

It has been suggested within the Bureau that we explore possibilities in low-head generation, without major dams, which theoretically could open a vast new area for hydroelectric generation with a minimum of environmental disturbance.

While the Bureau of Reclamation is an engineering and resource development agency with a specialized competency in hydroelectric energy, there is a remarkably broad potential beyond that. I believe that there is a substantial area—which of course includes geothermal, and could include both wind power and solar—where the Bureau could make worthwhile contributions.

In areas with prevailing winds, such as much of the Northwest, wind power has possibilities.
France, Germany and the Soviet Union have done fairly extensive research with the winds. There has been at least one rather large and initially productive unit built in the United States...in Vermont, during World War II.

With new materials available for airfoils and bearings, new techniques and control devices, and research in variable speed generators, the cumulative energy that could be obtained from wind-powered generators warrants investigation.

While the Northwest does not have the potential for solar power that exists in the Southwest, where radiation from the sun is perhaps three times what it is here, solar power is an area worth exploration.

The use of solar energy in pumping water for forebay storage, for later release through conventional turbine-generators, could be an attractive approach and one which is related to our primary purpose. Solar energy may also have potential for the economic desalting of brackish water.

Outside the Bureau, ideas are being advanced for 100 megawatt solar power towers. These towers—utilizing energy from a field of reflectors focusing on a heat collector high in the air—may be 20 years in the future, which is in the same time
frame as nuclear fusion.

A more reasonable possibility, one clearly related to Reclamation and within existing technology, is the development of small solar units to provide power for irrigation pumping. These units are additive, and a field of them could provide a fairly large amount of power where land-use permits.

I hope after this relatively brief but broad-based survey of Reclamation and its impact on the energy situation, you will have gained a better understanding of this 72-year-old agency.

Now, as we turn on the lights, I would like to close with a few additional remarks prompted by a copy of a talk sent to me by J. H. Wright, Director of Westinghouse Environmental Systems. He draws comparisons between the extinct dinosaur and some bureaucracies too ponderous, too dull, and too slow to respond to the challenges and the needs of changing times.

"All organizations and institutions exist at the pleasure of society," states Mr. Wright, "and will continue to exist for so long as they truly serve that society."

Otherwise they become extinct.
He points out, and I think correctly, that "...the historical role of government in our system is one of passive consent rather than leadership, one of responding to crisis rather than planning to avoid crises."

In fact, the government is usually in the role of playing catch-up ball. The system is designed to respond to the needs, desires, and demands of the people and, therefore, it is not surprising that action in a democracy is likely to respond rather than anticipate. It pays to remember that if members of the Congress were to get too far ahead of their constituencies, they might well lose their seats.

Recognizing this inherent characteristic of our form of government, I believe there is still ample opportunity for a democracy to read the tea leaves, evaluate trends, foresee potential crises, and then act to prevent trouble rather than wait until they are upon us. That approach would be far better than reaction to seek cures on a crash basis. The old adage is as good today as ever: "An ounce of prevention is worth a pound of cure."
We need to apply this philosophy in the case of water. A good many years ago, soil erosion became a crisis. More recently, environmental degradation became a crisis; today, energy shortage has become a crisis. Water supply is likely to become a crisis unless we do things now to prevent it.

For the average water project, the time which elapses between initial planning and water delivery to the kitchen tap is many years...perhaps 20.

Population is growing, demands on water for people, for mineral resource development, for powerplant cooling, for industry, for agriculture, are all growing.

Funds for research and development seem to be diminishing. Bureau planning funds have been reduced in the past two years; atmospheric water research funds have been reduced the past two years. Yet atmospheric water is the cheapest source of clean water on the horizon. Time and the finest expertise in the world are being lost.

These actions hasten the day when we will face a water crisis. When that time comes, we will scramble to find a cure, and it undoubtedly will cost many times more than prevention would have cost.
Water is perpetually renewable, land and water properly used in concert will produce indefinitely. Hydropower is nonpolluting and is not a consumer of water. Water is frequently reclaimable, at a cost. Greater efficiency in use of water is possible, at a cost. Augmentation and regulation can be accomplished, at a cost.

Research is needed to find more effective, more efficient, less costly ways to augment, develop use, and reuse this vital resource.

The Bureau of Reclamation is one agency that doesn't shrink from the challenge.

We are dedicated to meeting the real needs of real people--in homes, in farms, in industry--for food fiber and energy, with massive side benefits...physical, economic, environmental, and social.

Our mission is to help solve or prevent society's problem in these areas. We pledge our resources to that end.

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