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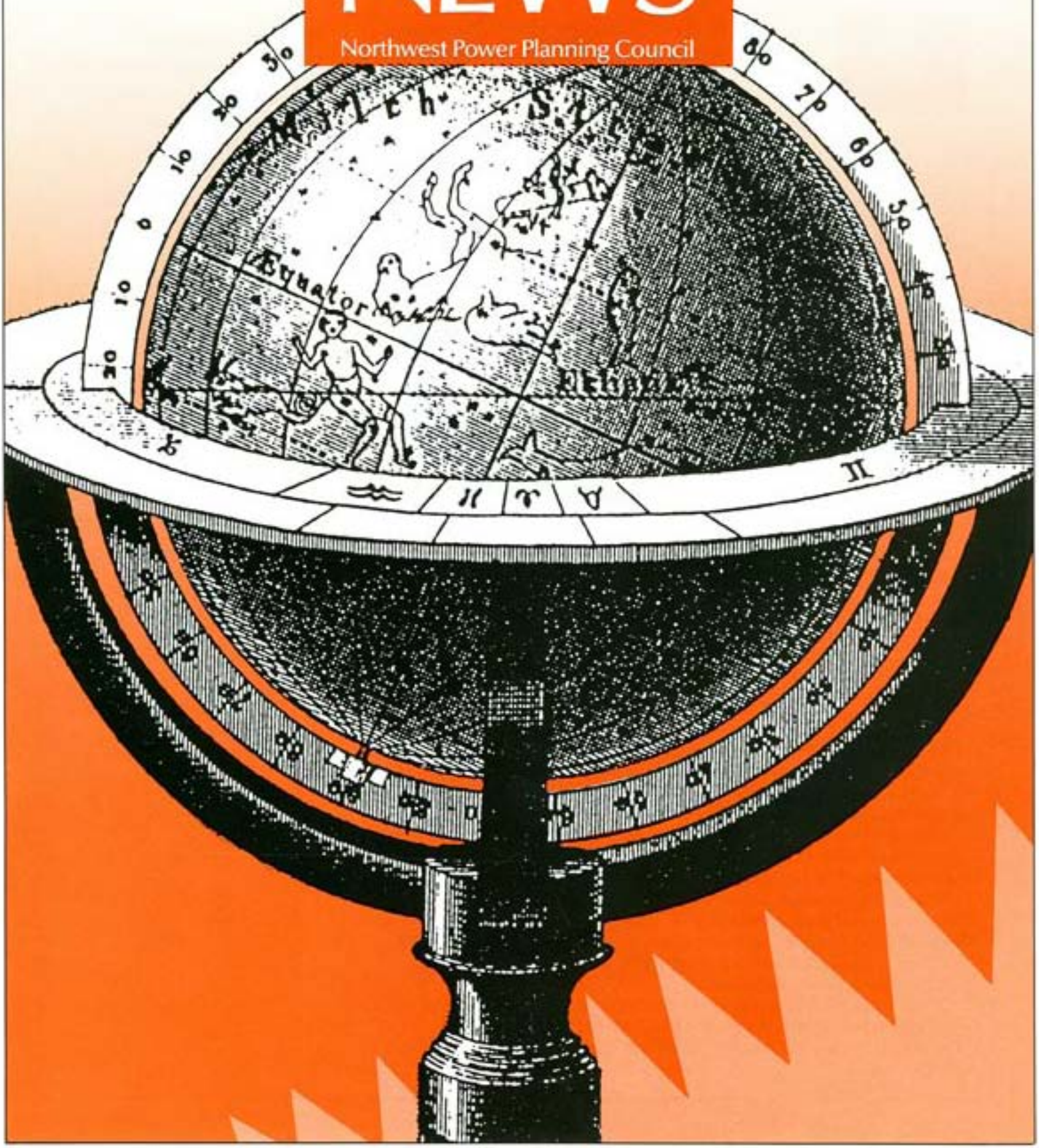
Northwest Power Planning Council



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Editor's Notes

1988 may go down in history in the Pacific Northwest and elsewhere as the year the climate began to pivot. Weather reports moved from the back pages to the headlines. Drought and long periods of record high temperatures singed most parts of the United States, including much of this region. And just when we were consoling ourselves with the knowledge that this, like all weather, would soon pass, the phrases "global warming" and "greenhouse effect" emerged.

Whether this summer is truly the first of a never-ending string of successively hotter and drier seasons cannot be known at this time. But the searing heat and brooding blue skies have certainly been taken as a warning; there is a price to pay for 100 years of atmospheric pollution. Exactly what that price will be is still anyone's guess.

The Council is looking at possible effects on the Northwest's energy scene from global warming. We begin that look with our lead story.

This issue's cover, which features an antique engraving, was designed by Stephen Sasser.

Is the Planet Baking?

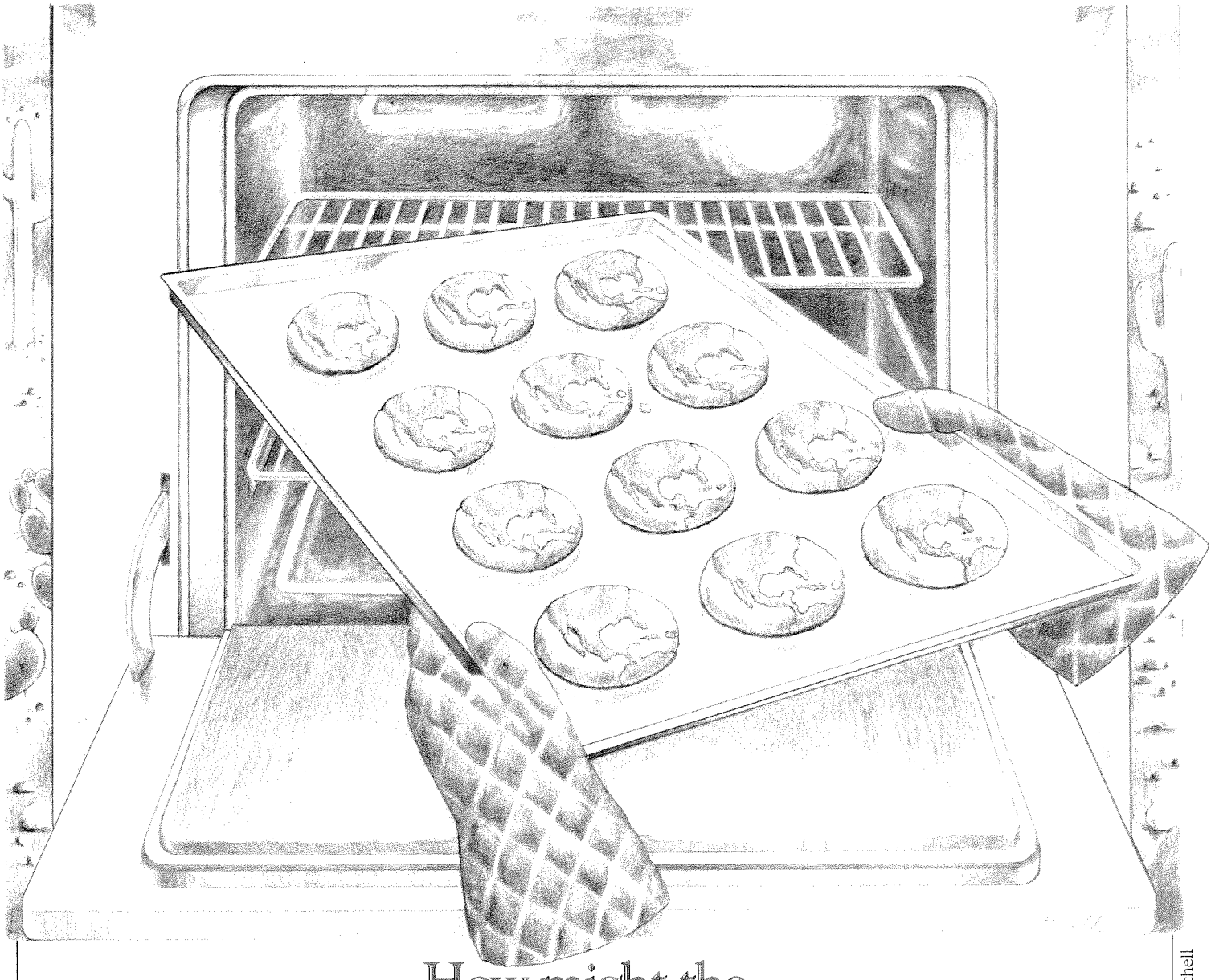


Illustration by Bonnie Mitchell

How might the "greenhouse effect" affect the Northwest's energy picture?

by Gordon Lee

Temperature records may not be the first things in the Northwest to go by the wayside if, as many believe, the greenhouse effect has already begun. The first casualties from global warming may be the region's traditional approaches to and assumptions about energy, economics and the environment.

The greenhouse effect—the global warming that's come from 100 years of man-made pollution—could reverse almost all fundamental assumptions about the Northwest and force politicians, economists and planners to rethink basic positions about commercial and social life in the region.

Long-standing assumptions about the region's economic, social and political structures could become obsolete if global warming changes the region's climate. Dryer weather, for example, could challenge fundamental notions about the Northwest economy, which for 50 years has been based on abundant, inexpen-

sive hydropower. Water may be neither cheap nor abundant in a warmer, more polluted world, and traditional alternative resources — coal or natural gas — may be environmentally unacceptable.

Already, the greenhouse effect has intertwined politics, power planning and pollution in the Northwest. A citizens group in Washington is circulating an initiative petition that would limit construction of new fossil fuel plants in that state. Before any new power plant that emits carbon dioxide could be built, the measure would require that an equal or greater amount of that gas be reduced from other power sources in Washington. Many scientists suspect carbon dioxide to be the prime, but not sole, culprit in global warming.

The greenhouse effect has intertwined politics, power planning and pollution in the Northwest.

Washington's initiative drive followed moves on the national scene this summer. Senators Timothy Wirth (Democrat-Colorado) and Bennett Johnston (Democrat-Louisiana), chairman of the Senate Energy and Natural Resources Committee, in July introduced a bill that calls for a 20-percent reduction of carbon dioxide emissions from the United States by the year 2000 and a 50-percent reduction by 2010. Senators Robert Stafford (Republican-Vermont) and Max Baucus (Democrat-Montana) offered a bill at the same time calling for regulatory reforms that would eliminate the sale and use of chlorofluorocarbons (which — in addition to contributing to greenhouse warming — destroy the globe's protective ozone layer — see accompanying story) in the United States by the year 2000, reduce carbon dioxide emissions by 35 percent by 2010 and set a goal to generate all domestic power from non-polluting energy sources by 2050.

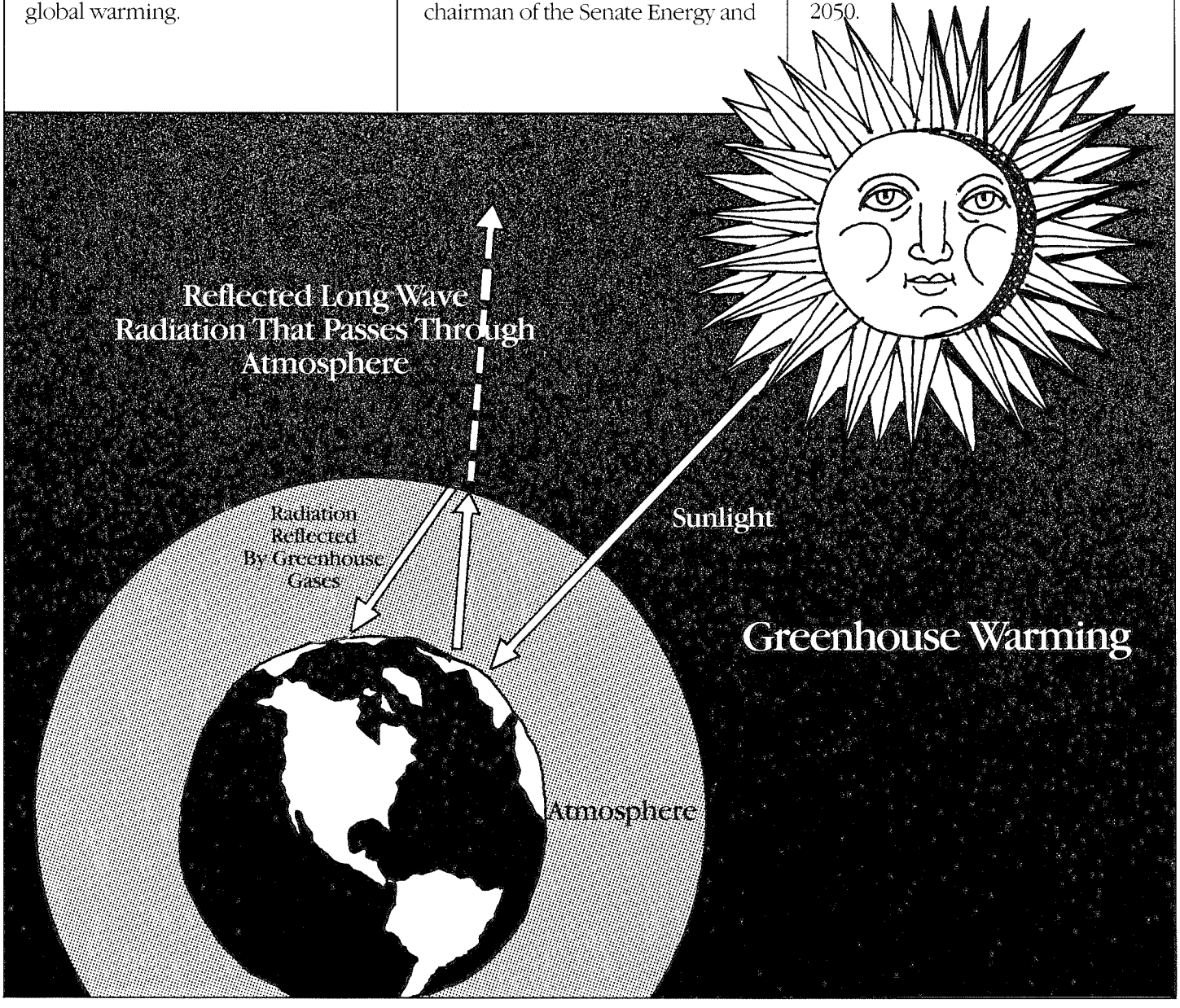


Illustration by Lyn Nance

The stakes are enormous. Warmer global weather could upset the rhythms of life as we know it by altering precipitation patterns, changing growing seasons, making fertile regions arid, flooding coastal regions and causing mass population migrations.

The Northwest Power Planning Council is in the early stages of addressing the greenhouse effect. "The Council plans to review all the current research and solicit advice from national experts," says outgoing Council chairman Morris Brusett of Montana. "In the coming year, we may publish issue papers for public comment and discussion on the implications of global warming for the regional power plan."

With its international implications, the greenhouse effect may be the most bedeviling problem the Council has tackled in eight years of regional power planning. It might change the Council's estimates of how the region should approach its growing energy needs and challenge the Council's fundamental economic assumptions about the region's energy future. Some resources that the Council includes in its portfolio of energy sources might appear less attractive under greenhouse assumptions.

But even though global warming may pose a matrix of new problems for the Council, it also represents an opportunity, says Ted Hallock, one of Oregon's members on the four-state planning organization. "We're a body that conceivably could influence everybody else. There's not another regional energy planning body like us anywhere else in the country. In the rest of the United States, it's everybody for himself. We have a chance to tell the nation, in choosing what goes into the power mix, that extraordinary attention must be paid to carbon dioxide emissions."

Council Chairman Tom Trulove agrees that the greenhouse effect provides the Council with an opportunity. "The solutions to the greenhouse problem are international in scope. They will require unprecedented cooperation by the industrialized and Third World nations to address all sources of the problem, from transportation, to energy production, to deforestation. The United States and the Northwest must provide leadership, and that will likely mean changes in emission standards."

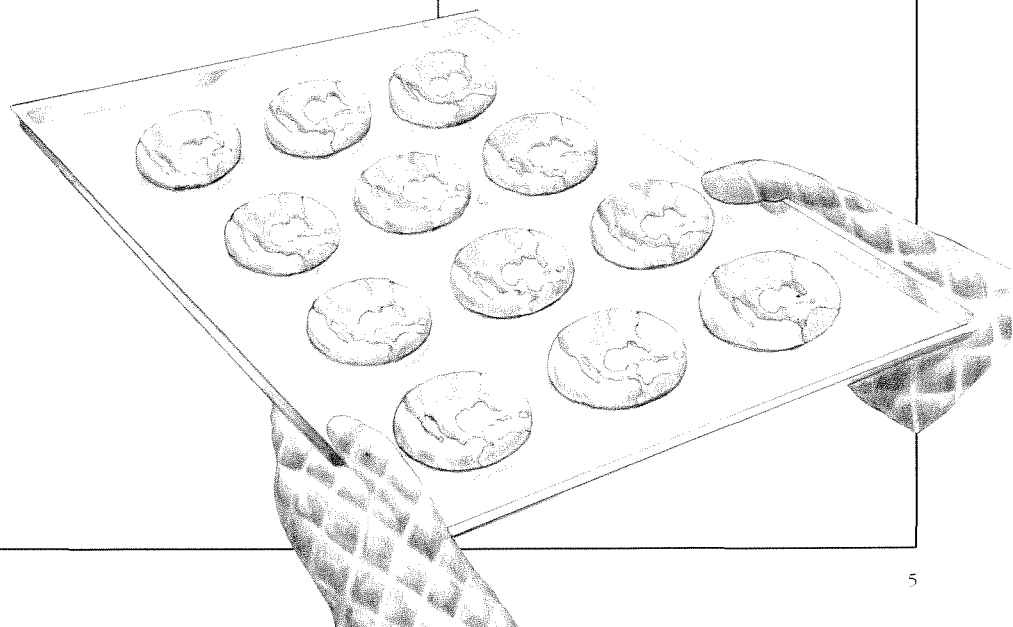
With its international implications, the greenhouse effect may be the most bedeviling problem the Council has tackled in eight years of regional power planning.

The greenhouse effect should force utility planners to take another look at how they estimate the real social and economic costs of a resource, says Senator Daniel Evans of Washington and former chairman of the Council. "No one does a good job of identifying the full costs of power plants. If I were [on the Council], I'd back off and try to look at whether these environmental costs can be identified and factored into the calculations."

Even though atmospheric scientists agree on the causes of the greenhouse effect, long-range weather predicting remains an inexact science. So, too, does long-range energy-price forecasting. As a result, pinpointing the implications of the greenhouse effect for energy resources in the Northwest involves as much speculation and guesswork as scientific analysis.

For some scientists, the jury is still out on whether global warming has started. Recent warming trends aren't outside of known heating and cooling cycles, they argue. But others are convinced the greenhouse effect is here. James Hansen, chief of NASA's Goddard Institute for Space Studies, told a Congressional committee in June that he was "99 percent" confident global warming has begun.

"We are struggling with not enough knowledge," says Evans. "Words like 'probably' and 'maybe' are being used."



But while politicians and scientists are uncertain about the timing and severity of global warming, the Council must address the issue soon, says Hallock. "I oppose coal-fired generators totally because of their carbon dioxide contribution to the atmosphere. It's a tremendous mistake to produce power for our convenience today and at the same time mess up the atmosphere for future generations."

Hallock acknowledges that the Council hasn't taken a position yet. At this point, his statements reflect personal beliefs about the greenhouse effect, not Council policy.

The 1980 Northwest Power Act charged the Council with coming up with long-range electrical energy plans for the region. Those plans try to identify how the Northwest can meet growing energy needs least expensively by envisioning a mix of conservation and generating resources that—depending on the rate of economic growth in the region—will provide electricity at the lowest cost to the region.

However, the greenhouse effect could change the Council's traditional least-cost planning calculations, Hallock predicts. Global warming adds a new wrinkle to the planning equation, so that new generating projects will be judged on a least-cost/least-carbon basis, he says. "I don't care about cost-effectiveness or least-cost alone. I've joined the Council to think about tomorrow."

If the rest of the Council takes that approach, gone may be the alternatives that the region turn to coal-fired electric plants or natural gas-fired turbines as ways to generate new power. Gone, too, may be potential resources that the Council hasn't even included in its regional energy plan, such as burning garbage or tapping into pockets of natural gas trapped in underground coal beds.

In their place may be an array of alternative resources whose economics looked daunting before they were viewed in light of the costs of avoiding global warming: conservation, nuclear power, geothermal, some cogeneration power and even solar and wind energy.

The region won't be able to avoid making these tough choices for long, because its energy surplus is shrinking. Two years ago, utilities could produce about 2,500 megawatts more power than Northwest customers consumed. That figure may stand below 1,000 megawatts today, and the Council calculates it could disappear as early as 1991. Under high economic growth conditions, the region could require as much as 13,000 average megawatts of power from new resources by the year 2010. That's enough electricity to light 13 cities the size of Seattle.

To further complicate matters, coal and gas-fired units account for 18 percent of the region's 43,360 megawatts of generating capacity today.

What is the greenhouse effect?

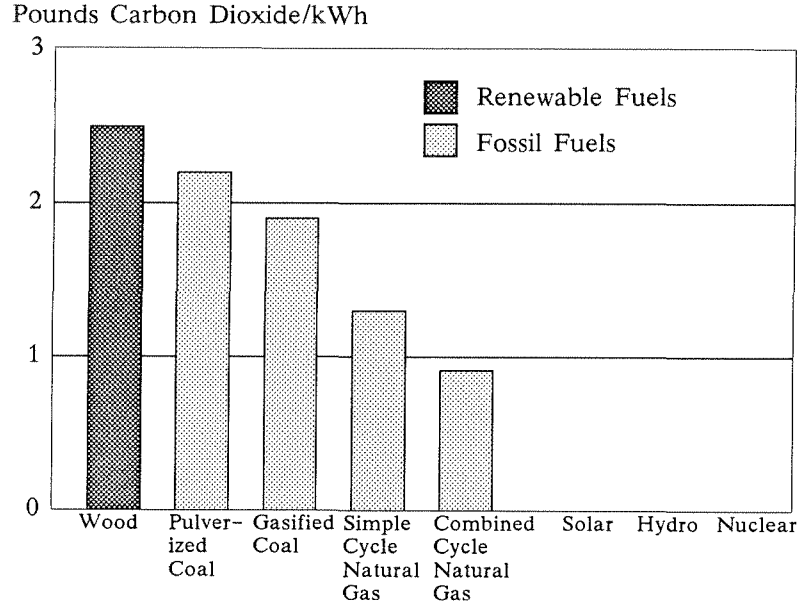
For Biblical scholars, the hardships that could come from the greenhouse effect are nothing new. The floods, pestilence, drought, mass population migrations and famines that many scientists forecast for the 21st century had their first run in the Old Testament.

But what's different this time is that righteousness alone won't get things back on track. Growing numbers of scientists predict that global warming already has started and that actions we take today can only postpone, not prevent, the trend.

To a certain extent, the greenhouse effect is a misnomer. Life on earth wouldn't exist without the atmosphere acting as a solar greenhouse. Gases in the lower atmosphere, particularly carbon dioxide, trap solar radiation as it bounces off the earth, keeping its surface warm. Without solar heat trapped by those gases, earth would be an inhospitably cold place.

That modest greenhouse effect has kept the planet's temperatures relatively stable for thousands of years. But what alarms scientists is

Carbon Dioxide Emissions
from Electrical Generation



Source: Washington State Energy Office

Graphs by Ruth L. Curtis

the rapid change the atmosphere has experienced during the past 100 years. Since the start of industrialization, when people began to burn fossil fuels in a big way, increasing amounts of carbon dioxide have been pumped into the atmosphere. Those emissions, from factories, automobiles and power plants that run on fossil fuels, have helped increase the concentration of greenhouse gases.

During the same period, worldwide deforestation has cut into nature's ability to handle greater amounts of carbon dioxide. When forests are leveled and the trees left to burn or rot, that not only adds carbon dioxide to the atmosphere, it also reduces the amount of the gas that is converted to oxygen during photosynthesis. The United Nations Food and Agricultural Organization estimates that between 0.6 percent and 1.5 percent of the world's existing tropical rain forests are cleared each year. That's equal to 40,000 square miles, an area roughly the size of Virginia.

In addition, some fossil-fueled processes have by-products that compound the greenhouse effect. Coal combustion, for example, can create acid rain, which—when it falls—defoliates forests, further depleting nature's capacity to reduce carbon dioxide.

Some facts behind global warming are not in dispute. Worldwide atmospheric levels of carbon dioxide have jumped 25 percent since preindustrial times. The earth's temperature has risen nearly 1 degree Fahrenheit during the past 30 years, and it is warmer today than at any time since measurements began 130 years ago. Compared to the 30 years ended in 1980, the world's mean temperature has risen just under 1 degree in the last year and a half alone. The century's four warmest years have been in the 1980s; six out of the 10 warmest years have taken place since 1978. And 1988 is likely to be the warmest yet.

Atmospheric scientists point to high concentrations of several gases as the culprits. Carbon dioxide accounts for about half of the warming, methane for 20 percent, and nitrous oxide, chlorofluorocarbons and lower atmosphere ozone are responsible for the remainder.

Many atmospheric scientists believe the greenhouse clock already is ticking.

Recent computer models, created by the World Resources Institute, suggest that the earth's average temperature eventually will rise from 3 degrees Fahrenheit to 8 degrees Fahrenheit, if greenhouse gases double the preindustrial concentrations of carbon dioxide. Most of the dramatic temperature increases would take place at higher latitudes. Those models, and similar computer projections created by other scientific groups, predict the world's carbon dioxide level is likely to double within 50 to 100 years.

That would be a staggering climate shift. A 5-degree rise would put earth's climate beyond anything in human experience, making it as warm as the dinosaur age, 65 million years ago.

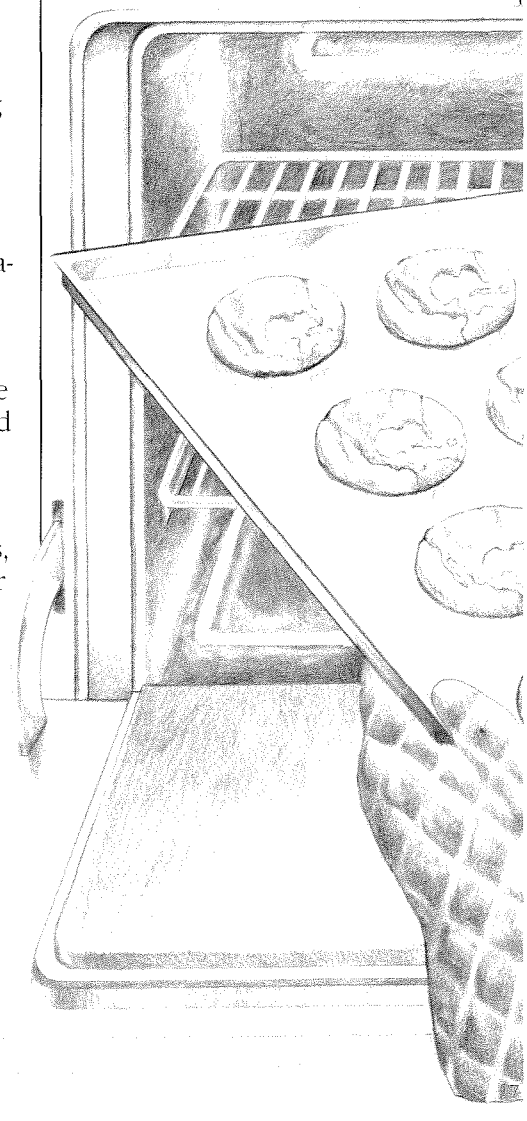
Almost all the earth's climate patterns could shift even if the temperature climb doesn't hit 5 degrees. Rainfall and monsoon patterns would shift. So would ocean currents and growing seasons. Polar ice caps might melt and sea levels could rise as much as three feet over the next 100 years, flooding coastal regions and fouling nearby water tables, according to Jessica Mathews, vice president and research director at the World Resources Institute.

Many atmospheric scientists believe the greenhouse clock already is ticking. Even if all carbon dioxide emissions stopped tomorrow, a global temperature rise from 1 degree Fahrenheit to 3 degrees Fahrenheit is inevitable, Mathews calculates. And since the rate of greenhouse gas emissions is accelerating, additional temperature jumps will come faster than in the past. That means speedier changes in climate and less time for societal and ecological adaptation.

But what global warming means for the Northwest remains unclear. Different weather patterns may translate into a dryer or warmer climate in the region. On the other hand, they could mean the Northwest will receive more rainfall than today. Scientists just don't know.

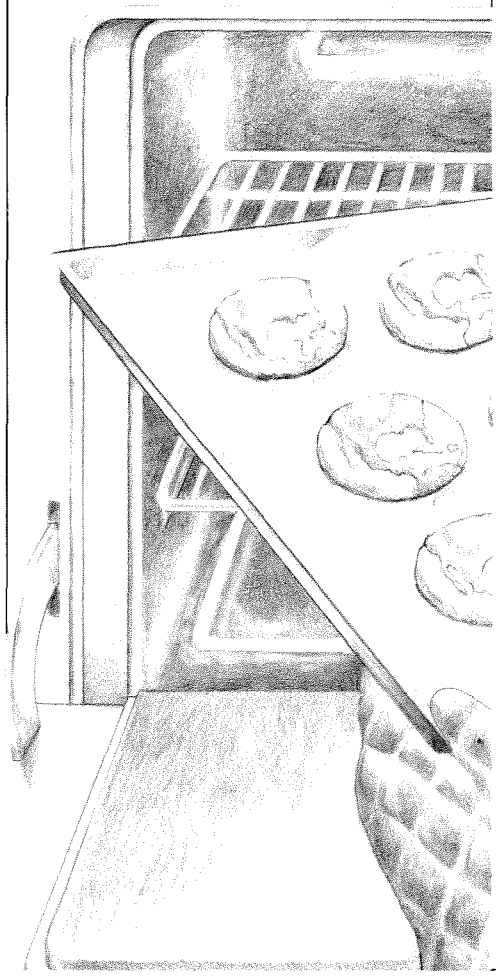
"You won't find any predictions for the Northwest," says Ron Neilson, an Oregon State University atmospheric scientist who's taken a leave to work on long-term global warming research for the Environmental Protection Agency. "All agree on temperature increases for the region, but they disagree on the rainfall implications."

The disagreements come because scientists are unsure what global warming will do to upper atmospheric winds such as the jet stream.



The jet stream, a long current of high-speed westerly winds seven to 10 miles above the earth's surface, plays a major role in the Northern Hemisphere's weather patterns. It generally enters North America near the mouth of the Columbia River, and many of the hemisphere's storm tracks follow its meandering path.

The Northwest's rainfall depends on the jet stream. If global warming were to push the jet stream away from the region, precipitation patterns would change. But it's still a puzzle whether warmer temperatures will speed or slow jet stream winds or cause them to depart from their traditional path.



HOLEY OZONE!

by Gordon Lee

Curbing carbon dioxide emissions into the lower atmosphere is only part of the answer to slowing the greenhouse effect, scientists say. Industrialized societies also must stop using chemicals that erode the upper atmosphere's protective layer.

Made up of a paper-thin sheet of ozone 15 miles above the earth's surface, that layer is all that shelters the earth from the intense ultraviolet radiation of the sun. Only three millimeters thick, it acts as a giant sunscreen filtering out ultraviolet rays before they heat up the lower atmosphere and damage plant and animal life.

That layer is fragile. Just as the lower atmosphere is warming as a result of greenhouse gases, so the ozone layer is jeopardized by 20th century chemical interactions. The culprit is chloroflurocarbons, the gas that since the 1930s has gone into refrigerator and air conditioner cooling systems and has been a prime component of plastic foam.

When released into the atmosphere, chloroflurocarbon molecules float free until they hit the upper atmosphere, where—under the right conditions—they act as high-altitude hit men. When it bumps into the ozone layer, an atom in a chloroflurocarbon molecule strips one of the three oxygen atoms in ozone.

The first warnings about this phenomenon came in 1974, but it wasn't until 1985 that there was concrete evidence that chloroflurocarbons are depleting the ozone layer. That's when a team of British scientists noticed a hole had formed in the layer over Antarctica. The hole, now as large as the continental United States, forms in September and lasts three or four months. The hole has gotten larger and lasted longer in the years since, scientists say.

If the ozone layer continues to shrink, the amount of ultroviolet radiation that hits the earth will jump dramatically, according to scientific projections. Skin cancer rates will go up. Since ultraviolet exposure weakens the human immune system, people's resistance to disease will drop.

But the biggest loser may be the plant and organic life at the base of the earth's food chain. Research suggests the one-celled plankton that makes up the bulk of life near the surface of oceans might not be able to adapt to greater amounts of radiation. Other research says that bacteria needed by some plants to process nitrogen wouldn't be able to survive long-term ultraviolet exposure.

The United States and several other countries banned chloroflurocarbons as an aerosol propellant in 1978. But that accounted for only a fraction of the world's use of the substance.

U.S. producers account for 30 percent of the world's chloroflurocarbon output.

Last September, the United States and 33 other countries pledged to cut chloroflurocarbon emissions 35 percent to 50 percent by the end of the century. But that may be too little, too late. According to estimates by the Environmental Protection Agency, world production needs to be cut by 85 percent just to keep chloroflurocarbon at its current atmospheric concentration.

Implications for power planning

The greenhouse effect likely will overturn traditional power planning assumptions. Up until the early 1960s, utility planners judged energy resources primarily on two criteria, price and availability. Thereafter, they began to factor environmental costs into their equations. But the greenhouse effect could put a new wrinkle into their equations, forcing planners to include carbon dioxide and other gases in the cost mix.

Power plants that burn coal, natural gas or oil all produce carbon dioxide and other gases. Cleaning up those emissions will add to the costs of the plants.

On the other hand, hydropower and nuclear plants, which produce no carbon dioxide, are more competitive in a greenhouse scenario. So are conservation and other renewable resources, such as wind, solar, tidal and geothermal power.

But those alternatives aren't risk-free. Nuclear power raises a host of safety and disposal questions. Hydropower might become less reliable if the greenhouse effect makes some regions drier. Warmer weather also may change wind patterns, making wind turbines more difficult to site.

Solar power, too, may prove to be unreliable if global warming causes more water to evaporate and increases the world's cloud cover.

"There are two immediate questions," says Ed Sheets, the Council's executive director. "Will there be changes in federal regulations regarding carbon dioxide emissions? And could that change the cost or availability of new resources?"

Council vice chairman Jim Goller of Idaho says that those questions should color the Council's agenda. "Looking at the increased greenhouse effect is a proper role for the Council. We need to get the facts before all concerned parties to make an informed decision. The Council should be a player in the international effort."

"Looking at the increased greenhouse effect is a proper role for the Council. We need to get the facts before all concerned parties to make an informed decision." — Jim Goller

The Northwest Power Planning Council has factored an array of environmental costs into its planning assumptions. But greenhouse assumptions weren't part of the environmental equation when it drew up its most recent outline of how the region should meet growing power needs over the next 20 years. Under conditions of high economic growth (which the Council feels are unlikely to occur), the region will need to build 12 large coal units by the year 2005, according to the 1986 Power Plan.

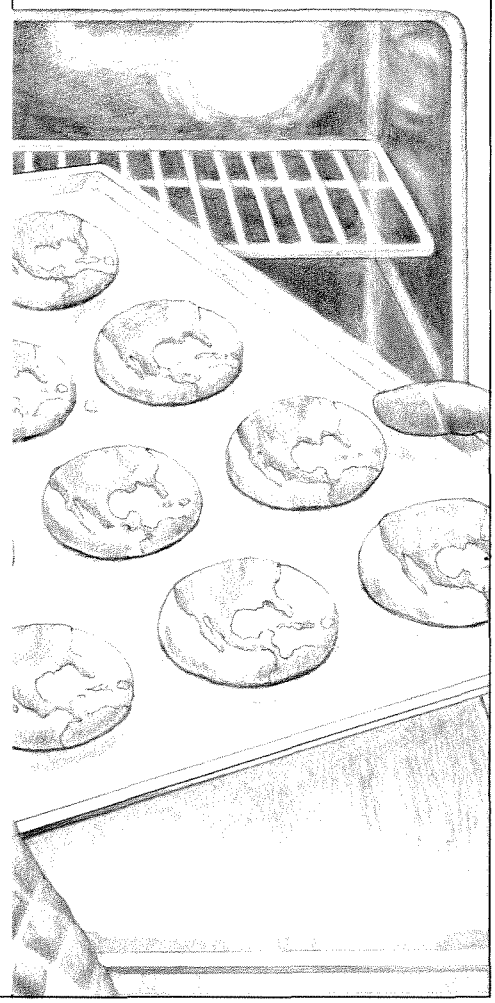
Those plants won't be needed if the Council identifies cost-effective alternatives. However, if no alternatives emerge, construction on the first of those plants would have to start in 1995. Under medium-high economic growth conditions, the region would need the power from two new coal plants by 2005.

With its reliance on hydroelectricity, the Northwest is particularly vulnerable to shifts in weather patterns. Some 70 percent of the region's energy comes from hydropower, which means that a drier climate could force the region to rely on other power sources for a larger portion of its load.

Moreover, a drier climate could prompt the region to reduce its estimate of "firm" power, which is the amount of energy that hydropower dams can produce even if there were a repeat of the driest years on record. While the Northwest's dams produce an average 16,400 megawatts of energy today, only 75 percent of that total is considered firm. That's because utility planners have figured that the system would produce only 12,300 megawatts if the region sees a repeat of the worst known water years.

The greenhouse effect could make those parched years seem lush and force the region to lower the amount of power it could guarantee to customers. That, in turn, would change the region's rate and revenue picture dramatically. Because its delivery can be guaranteed in dry times as well as wet, firm power is more expensive than nonfirm power. If the system has less firm power, utilities would have to turn to more expensive resources to make up the difference.

By raising the costs of conventional power sources, the greenhouse effect may give a boost to energy conservation efforts in the region.



Conservation has played a big role since 1980, when Congress passed the Northwest Power Act. That bill treats conservation as the preferred resource for the region, and says it's a wise investment even if it costs 10 percent more than the next most-competitive new resource because of its environmental acceptability.

The Council in the past has figured that conservation measures make economic sense if they cost 5 cents a kilowatt-hour or less. That's what it would cost to build a medium-sized coal-fired thermal plant, the most expensive resource the Council includes in its plan.

But that cost doesn't include measures to deal with carbon dioxide emissions, which may boost the price of a new coal plant to 7.5 cents or 8 cents a kilowatt-hour, notes Marc Sullivan, head of the Northwest Conservation Act Coalition.

In that context, conservation becomes more attractive. "If the 10 percent cost advantage that conservation has been given in the Act were added to these marginal costs, that brings the figure up to 10 cents a kilowatt-hour," he says. "That makes a big difference in the amount of conservation supply."

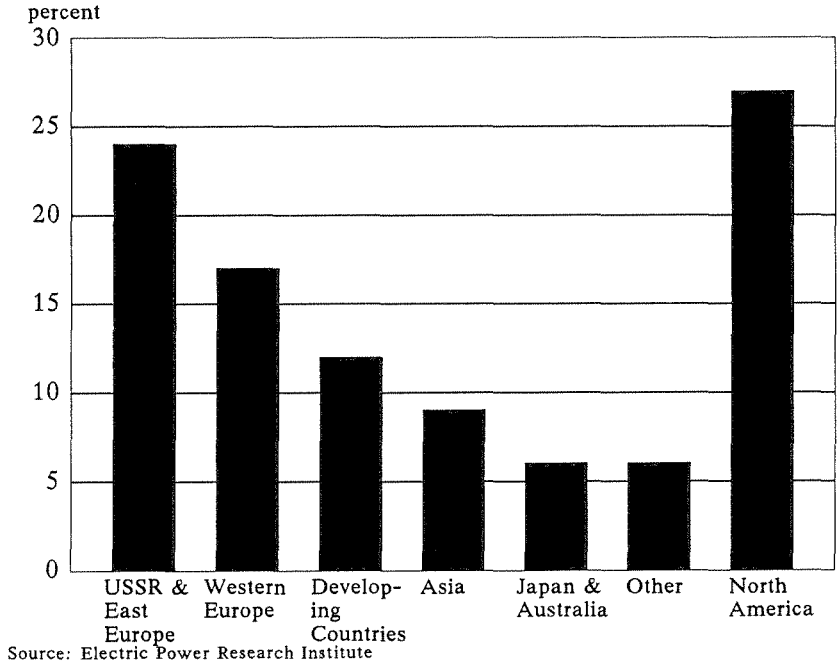
With its reliance on hydroelectricity, the Northwest is particularly vulnerable to shifts in weather patterns.

Jim Litchfield, director of the Council's power planning division, agrees that the greenhouse effect may make conservation more appealing. But conservation will take up only part of the slack if the region has to turn to non-fossil fuels, he cautions. "If we tried to meet our high-growth demand without thermal, we'd need to find roughly 10,000 megawatts. Even if we doubled the region's conservation potential to 4,000 megawatts, we'd still have to acquire 6,000 megawatts."

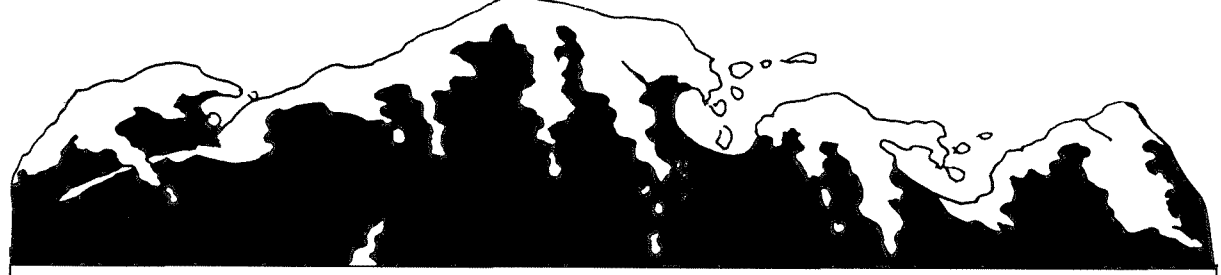
That's as much power as six cities the size of Seattle would consume, and it underscores the challenge facing the Council and other utility planners. If fossil fuels are removed from the energy picture, the region—under certain high-growth conditions—would have to turn to other resources to meet additional load. Some would be known and tested. Others would be new.

The Council and other utility interests are in a unique position to chart a path through this changing energy environment. But what's different this time is that the route will be characterized by many more unknowns than in the past. ■

Global Distribution of Carbon Dioxide Emissions – 1980



Source: Electric Power Research Institute



STRETCHING the River

Making the most of the region's hydropower.

by Dulcy Mahar

Not only is hydropower the Northwest's richest electricity resource — it supplies nearly three-quarters of the region's electricity — but it is also the cheapest source of power.

Given that fact, an obvious question for power planners is: can the Northwest's rivers be "stretched" to produce even more power without adding dams.

In its 1986 Northwest Power Plan, the Northwest Power Planning Council said: yes, there is a way to stretch the river. In the plan's portfolio of new resources, the Council included a resource referred to as "Better Use of the Existing Hydropower System." If that title seems cumbersome, the shorter title in the graphs — "nonfirm strategies" — is downright esoteric.

The resource portfolio is a list of the new resources the Northwest should develop to meet increasing demand for electricity. The portfolio includes an assessment of how much of the resource will be available, a schedule for developing the resource and a sequence for development (based on acquiring the most cost-effective first). To make it into the portfolio, a resource must be judged available, reliable, cost-effective (in comparison with other resources) and environmentally acceptable.

Most of the resources in the portfolio have straightforward descriptive names such as conservation, hydropower, cogeneration and coal. They are clearly products or processes for conserving or producing electricity. But "nonfirm strategies" is more difficult to clarify because it is a management strategy to "stretch" the river.

In 1986, this strategy grabbed considerable attention, because it was added to the portfolio for the first time (the other resources had appeared in the 1983 plan). The plan included 700 megawatts of the nonfirm resource, more than enough to power a city the size of Portland.

This year, as the Council has evaluated the need for a technical update of the 1986 plan, the resource is once again the subject of public comment. Based on improvements in generating technology and declining fossil fuel prices, a preliminary staff analysis estimated that far more than 700 megawatts of electricity from "nonfirm strategies" may be available to the region. Because of the potential to "stretch" the river at a lower cost than some other power alternatives, the Council expects to be focusing on this issue in the next year.

Firm power versus nonfirm power

To understand what the Council means by "better use of the existing hydropower system" or "nonfirm strategies," one has to look at the Northwest's existing hydropower system.

The Northwest's existing dams have a capacity to produce approximately 30,000 megawatts, far more electricity than the region presently needs. The dams don't produce that much electricity because they don't have the fuel: falling water. Unlike the rest of the country, which is constrained by "capacity" (how many megawatts a power plant can produce to meet peak needs), the Northwest is constrained by fuel, the availability of water produced by snow and rain.

The Northwest currently consumes approximately 16,000 average megawatts of electricity, with about 70 percent of this from hydropower. The rest of the region's energy needs are met by energy conservation and thermal generating resources. No other region of the U.S. comes anywhere close to using such a high percent of hydropower, because no other area has the unique combination of mountains and rivers that together produce the falling water to drive a dam's turbines.

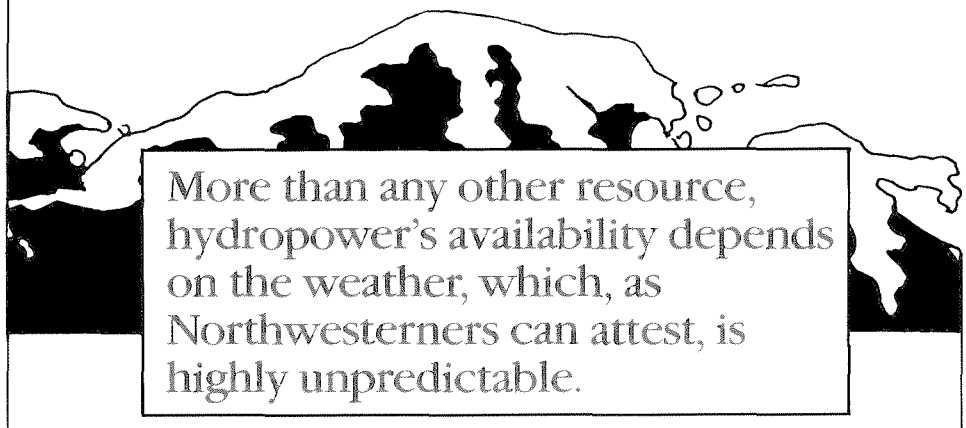
While the huge amount of hydropower has been an enormous economic boon to the Northwest—the region's average electrical rates are half those of the rest of the nation—there is a catch. More than any other resource, hydropower's availability depends on the weather, which, as Northwesterners can attest, is highly unpredictable.

In planning to meet firm loads (known demand for power based on contracts), energy planners can only rely on power whose delivery can be guaranteed. In the case of a thermal resource, planners can know the capacity of a generating plant and can make reasonable assumptions about what percent of capacity the plant can be expected to run at, taking into account normal shutdowns for maintenance and repair.

But while planners know the capacity of a dam's turbines, they don't know how much fuel they'll have to run those turbines, because this depends on the relative wetness or dryness of the weather. To estimate how much energy the rivers can be guaranteed to produce annually, Northwest energy planners use the "critical water standard." Critical water refers to the amount of water available to produce hydropower in the driest period on record.

To calculate that amount—which is about 12,300 megawatts—planners have looked at the driest four-year sequence since record keeping began in 1879. That period occurred from 1929 to 1932. A sequence is used to determine critical water because it takes consecutive years of low water to produce the lowest level.

Thanks to storage dams built on headwater streams in both the United States and Canada and a treaty between the two nations to share stored water, about 40 percent of the average runoff of the Columbia River Basin can be stored. Thus, isolated dry years are not devastating to the energy system (although they may cause problems for fish and irrigation). Stored water in the reservoirs can be released to run the turbines and, if the following fall and winter are normal and the reservoirs refill, power system needs can be met. Power supply problems occur only when there is a sequence of years with water so low that reservoirs cannot adequately refill.



More than any other resource, hydropower's availability depends on the weather, which, as Northwesterners can attest, is highly unpredictable.

So energy planners use the critical water standard to determine how much hydropower they know can be delivered annually. Because this power is guaranteed, it is called "firm power." However, in each year where there is more water than the critical level, there is the potential for producing more hydropower. This is called "nonfirm power" (or sometimes "interruptible power") because it depends on the weather. In an average water year, there are approximately 4,100 megawatts of nonfirm power available, enough power to supply four cities the size of Seattle.

Uses of nonfirm power

Nonfirm power isn't wasted, but it can't be used to meet firm power needs or to avoid the construction of new resources to meet those needs, because the Northwest must have a guaranteed power source. Public health and safety depend upon a reliable supply of residential and commercial electricity. The economy depends to a significant degree on the availability of a reliable supply of electricity to industry and agriculture.

Nonfirm power is sold primarily to the aluminum industry, which can run at fuller production when such power is available; to Northwest utilities that can shut down expensive thermal plants when nonfirm power is available; and to utilities in California, which also use this power to shut down their more expensive thermal resources.

There are two obvious advantages to "stretching" a river to produce more firm power. First, hydropower from the Northwest's existing federal dams is the cheapest electricity. It costs little more than half a cent per kilowatt-hour. What's more, this is largely a fixed cost—like the payments on a fixed-rate mortgage—which means the price will remain relatively constant even with inflation.

Taking inflation into account, over time the price will be closer to a quarter of a cent compared to the cheapest new hydropower at costs between 2 and 3 cents or electricity from a coal plant, which costs between 4 and 5 cents.

The second advantage is that additional power from the existing system does not increase the number of dams with their serious impacts on fish and wildlife.

Firming up nonfirm power

Nonfirm power could be converted to a firm power resource if it could be backed up with some other resource that would operate in poor water years when nonfirm power is not available. To the extent that some portion of nonfirm power could be safely and economically firmed up with a back-up power source, it could be used to meet firm loads and could displace or delay the need to build more expensive thermal resources in the Northwest.

To determine the amount of nonfirm power that can be firmed up, energy analysts compute the percent of time additional hydropower is likely to be available and in what amounts. Given that a back-up system will have costs of its own, the analysts must also calculate what mix of the relatively cheap hydropower, used in conjunction with the more expensive back-up system, will still result in an average system cost lower than electricity generated from coal, the highest-cost resource currently in the power plan.

Several systems have been looked at to back up nonfirm power. These include combustion turbines and other power plants, short-term purchases of power from other sources, load management (e.g., contracts to interrupt power in exchange for lower rates), or a mix of these and other alternatives. The Council's plan does not advocate a particular back-up system, but instead calls for the region to use the grace period supplied by the present power surplus to explore and develop the most appropriate back-up system.

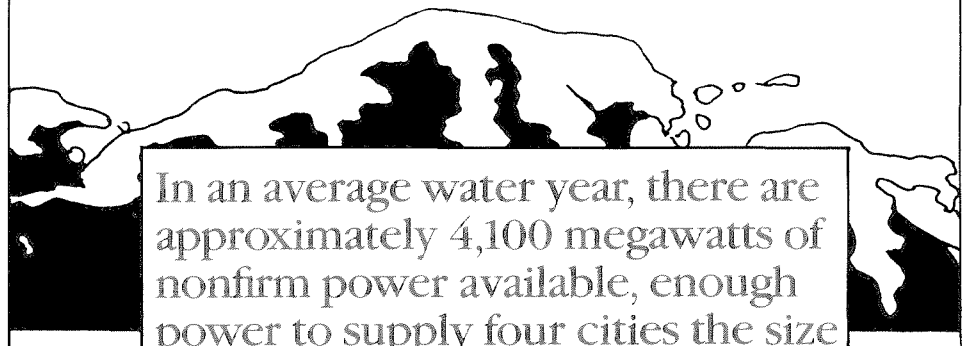
To avoid underestimating the costs of firming up nonfirm power, the Council staff calculated the cost of using combustion turbines, because they are the most expensive (but still cost-effective) back-up. Combustion turbines are gas- or oil-fired jet engines, similar to those on commercial aircraft, that are hooked up to a generator to produce electricity. They are cheap to build when compared to construction costs for a coal or nuclear plant, but expensive to run because of fuel costs. The more they are used, the more expensive they are.

However, if they are only run a small portion of the time (the 1986 plan estimates a back-up system for nonfirm power would be needed 16 to 20 percent of the time), their high fuel cost is incurred only for the percent of time they are run. The rest of the time the electricity would be produced by the available nonfirm hydropower, and its cost would be calculated in terms of the lost revenues from nonfirm sales to California.

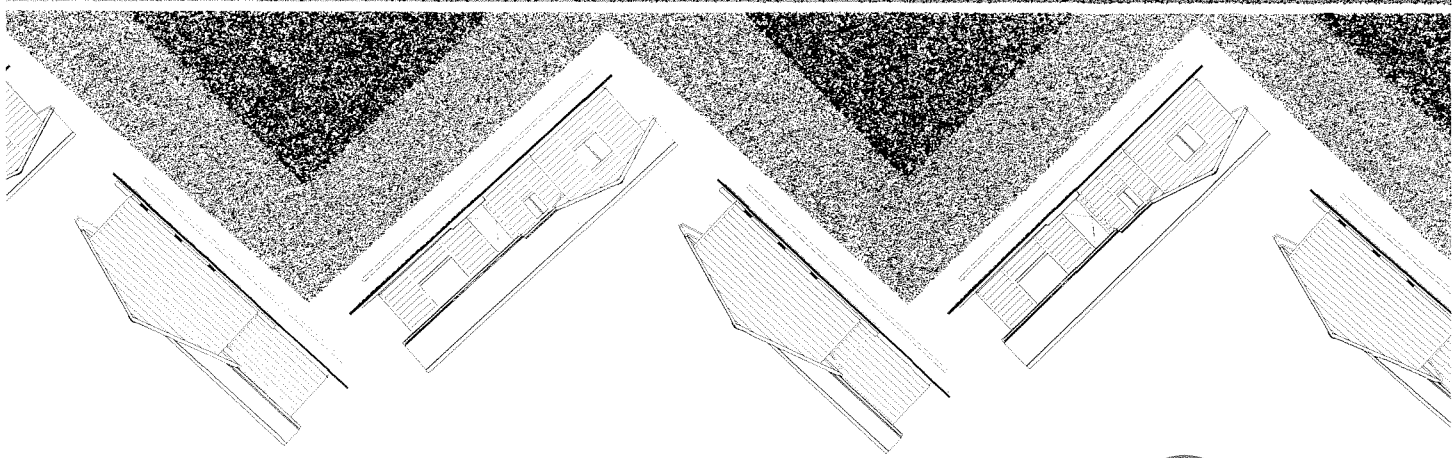
The cost of the two resources together makes for a firm power supply that is more expensive than firm hydropower and conservation, but cheaper than building a coal plant. Theoretically, a coal plant could be constructed to back-up nonfirm hydropower, but much of the cost of a coal plant is in fixed capital costs of construction. Thus, these costs would be incurred whether or not the coal-fired units were operated. Of the thermal alternatives for backing up nonfirm power, combustion turbines, with their lower fixed costs, appear to be most cost-effective.

Combustion turbines are used as place-holders for the resource portfolio for the purpose of evaluating costs. If cheaper back-up systems are available, they would be used. And growing concern for the "greenhouse effect" raises questions about the use of combustion turbines at all. While they produce about one-third of the carbon dioxide emissions produced by coal plants for each kilowatt-hour, and would be used a small percent of the time, the Council would have to weigh their environmental acceptability. But because there are a number of alternatives for backing up nonfirm power, the Council considers it a sufficiently reliable resource for inclusion in the power plan's resource portfolio.

Currently the region is selling nonfirm power as interruptible power at lower rates than firm power. It is not backing up nonfirm to meet contractual firm loads. The Council's power planning director, Jim Litchfield, described the issue succinctly at a public meeting in Boise this past summer: "The question we face is: is there a higher value use of the water (nonfirm) than we are making of it." Idaho Council member Jim Goller pointed out, "The Council is not advocating we go to combustion turbines, but we're using them as a base to cost out the resource." And Washington Council member Tom Trulove added, "One way of looking at it is that we've been building high-cost thermal plants here (in the Northwest) to preserve cheap nonfirm power that goes to California." ■



In an average water year, there are approximately 4,100 megawatts of nonfirm power available, enough power to supply four cities the size of Seattle.



INDIAN NATION

Super Good Cents housing comes to Northwest reservations

Something new came to the Northwest's Indian nations this year. For the first time, many of the housing authorities on the Indian reservations are taking part in the Super Good Cents program to build over 250 energy-efficient houses.

Super Good Cents is a marketing program sponsored by the Bonneville Power Administration to promote the efficient use of electricity in new construction. The program markets homes built to the Northwest Power Planning Council's model conservation standards. These homes use about half the electricity of conventionally built homes. Energy saved through their construction is one of the most cost-effective sources of new electrical power available to the Pacific Northwest.

Super Good Cents is available to Northwesterners through most of the region's utilities. Working with Bonneville, these utilities provide builder training, technical information, financial assistance to cover the incremental cost of energy-saving measures, quality control of the work being done (including approval of house plans and on-site inspections) and advertising to help sell the finished product. With 3,000 houses built in the Northwest through Super Good Cents, the program is credited with changing residential construction practices in the region.

The Nez Perce Reservation in Idaho was one of the first Indian communities to get involved with the program. In 1988, about 40 Super Good Cents homes were built. Another 40 homes are planned for next year. According to Jim Sueuga of the Clearwater Power Company, which serves the reservation, "There was a need for housing on the reservation, and the housing authority wanted to get as much as it could for its dollar. With Super Good Cents, they get good quality homes and also homes that folks can afford to live in because of their low operating costs." Sueuga also stresses that "from the utility's point of view, it helps us with our electric load. Efficient use of energy is what we want."

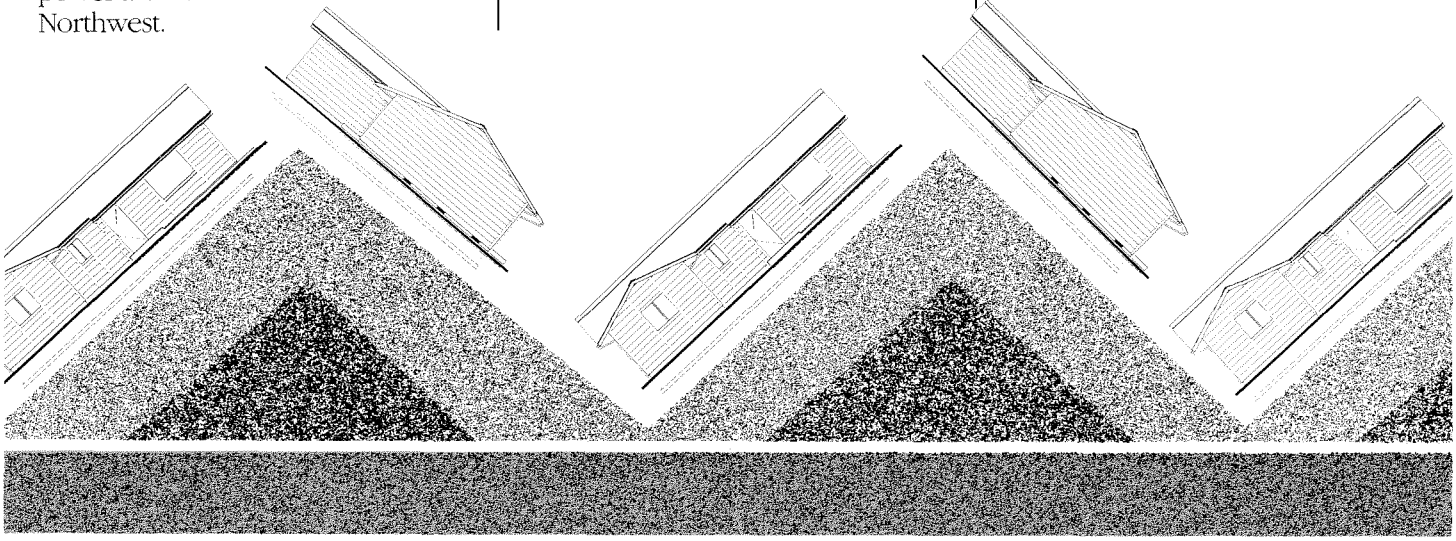
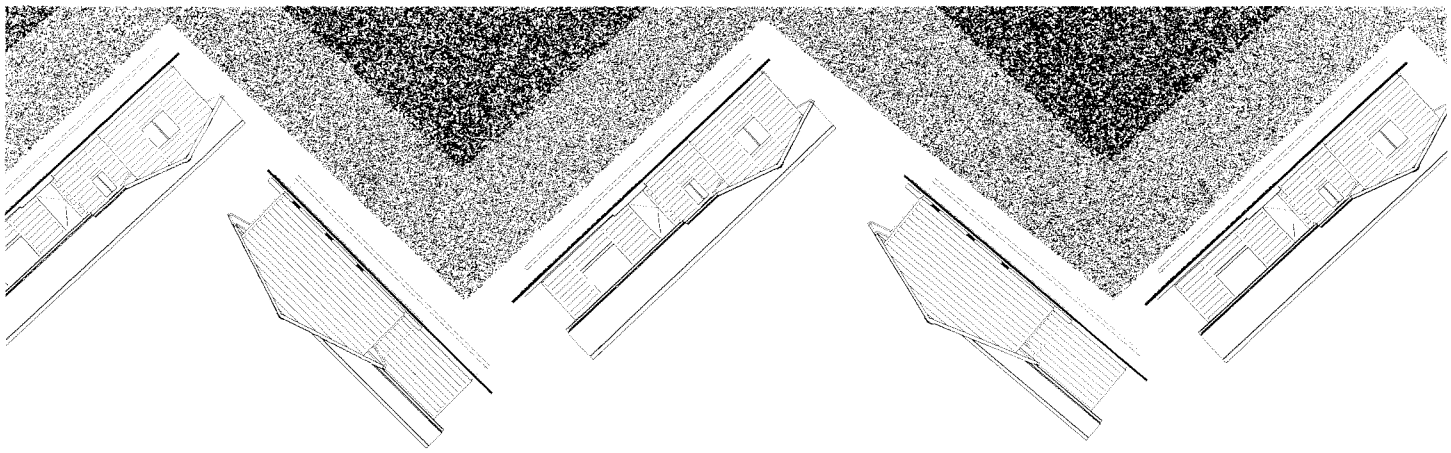


Illustration by David Rose/Design Council



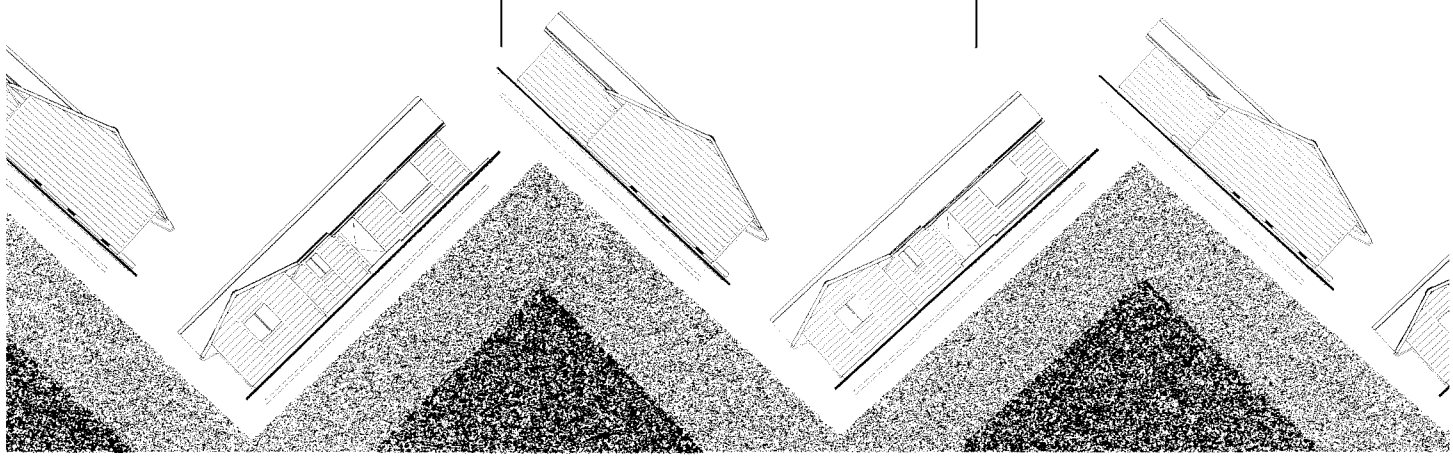
CONSERVATION

by Ruth L. Curtis

Money to help build these homes comes from the U.S. Department of Housing and Urban Development as part of an annual housing allocation. It is up to the reservation housing authorities to stretch that money as far as it can go. So one of the attractions of the Super Good Cents program is the cash payment Bonneville offers for each house certified. That payment ranges from $1,000 to $1,500 depending on the local climate. Melvin Wheeler, development inspector of the Nez Perce Housing Authority stressed that the "incentive offered is particularly attractive when you are building in quantity."

The housing authority on the Blackfeet Reservation in Montana, working with Glacier Electric Cooperative, has 75 Super Good Cents homes in the works. These homes are currently in the blueprint stage, with construction planned to begin this fall or next spring. Scott Sherburn, the executive director of the tribal housing authority, explains that "on the reservation, we have everything from very poor to reasonably good housing. We expect the Super Good Cents homes to be very good houses, but we will monitor them and see how they do."

Other reservations constructing Super Good Cents homes are Montana's Flathead Indian Reservation, working with the Flathead Irrigation and Power Project; Washington's Kalispel Reservation, in cooperation with Inland Power and Light; the Spokane Reservation, through Washington Water Power; and the Makah Indian Reservation, with the Clallam County Public Utility District. ■



SHORTS

Business in the Northwest is "astonishingly strong," if measured in employment figures and record high payrolls, report top executives in small and medium-sized manufacturing firms. One businessman remarked that, "I've been in business 45 years, and I've never seen anything like it." The biggest problems identified by these manufacturers were increasing costs of raw materials and "just trying to get the orders out the door." (Source: *Marple's Business Newsletter,* 911 Western Avenue, Room 509, Seattle, Washington 98104, 206-622-0155.)

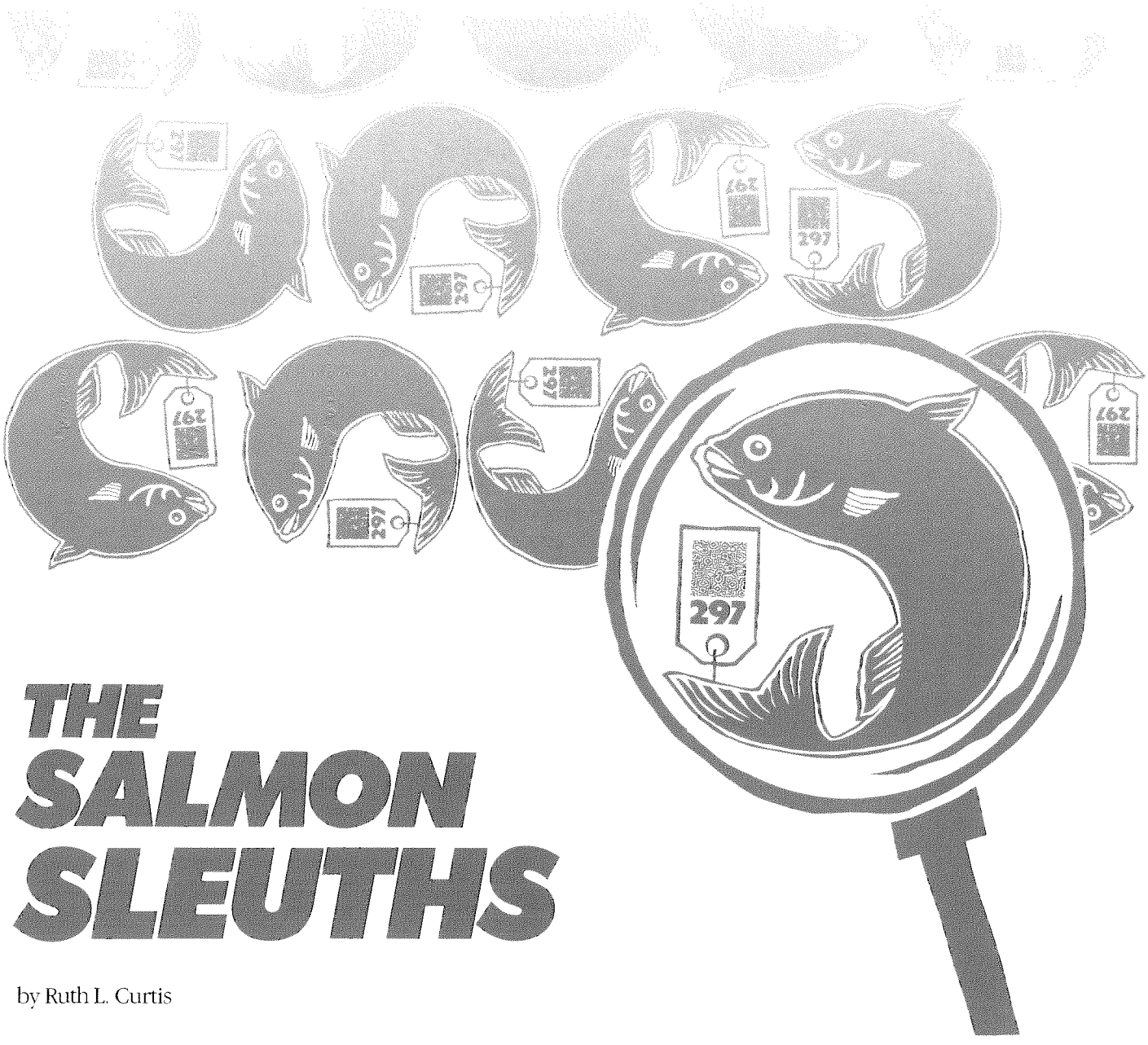
"Smart windows" could reduce energy required for building heating and cooling by 25 percent, lighting by 50 percent and peak electrical power requirements by 30 percent, according to scientists at Lawrence Berkeley Laboratories in California. Experimental windows filled with foamlike silicon materials called aerogels may have the insulating capability of a 4-inch-thick wall. Windows that change color when an electric current (supplied by photovoltaic panels) is applied can block excess sun and admit daylight as needed. While too expensive to manufacture for broad distribution today, scientists expect many of the developments to be in use in only a few years. (Source: *The Register-Guard,* Eugene, Oregon.)

A poster presentation on indoor air quality prepared by Northwest Power Planning Council and Bonneville Power Administration staff received international recognition at this fall's Conference on Healthy Buildings, in Stockholm, Sweden. The conference, sponsored by the International Council for Building Research and organized by the Swedish Council for Building Research, pulled together energy and building specialists from around the world. The Northwest's poster was honored for both technical merit and design presentation.

Emerald Peoples' Utility District's new headquarters in Eugene, Oregon, won national recognition for energy design innovations this fall. The award, one of 69 given nationally, came from the U.S. Department of Energy. Emerald's building relies on passive solar heating and daylight for interior lighting. It will beat Oregon's state building code by 33 percent, according to estimates. (Source: *Clearing Up,* Box 9157 Queen Anne Station, Seattle, Washington 98109, 206-285-4848.)

The U.S. District Court in Oregon has approved a settlement of the 20-year-old U.S. versus Oregon litigation. The case clarifies Indian and non-Indian rights to harvest fish in the Columbia River. Parties to the legal action include the states of Oregon, Washington and Idaho and the Yakima, Warm Springs, Nez Perce, Umatilla and Shoshone-Bannock tribes. Idaho and the Shoshone-Bannocks had objected to parts of the settlement, but the Court found that their concerns were adequately covered by the agreement.

Emerald People's Utility District's new headquarters in Eugene, Oregon.



THE SALMON SLEUTHS

by Ruth L. Curtis

About $12 million to $16 million is spent each year to learn more about the extraordinary lives of salmon and steelhead in the Columbia River Basin. This money is used to gather and interpret data. It is fundamentally detective work, but it is known in the field as research. This research encompasses an incredible number of subjects including habitat requirements of fish, hatchery operations, fish diseases, harvest management, salmon and steelhead passage at dams and reservoirs, and fisheries genetics.

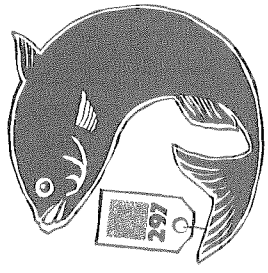
Two recent developments have made it easier for fisheries detectives to gather data on salmon and steelhead—the coded wire tag and the "PIT" (Passive Integrated Transponder) tag. The coded wire tag allows monitoring of specific groups of fish and has become one of the most important tools in harvest management. The actual tag is a small metal wire with a code etched into it that is implanted into the cartilage of the young fish's snout. A fin is clipped to indicate the presence of the tag.

When a fisherman catches a tagged fish or when it is trapped to be used for hatchery production, the head is sent to a lab. There, workers remove the tag, and, by studying the etched

Research efforts unlock mysteries of the deep.

Illustration by David Rose/Design Council

These are complex fish. They travel thousands of miles between freshwater rivers and saltwater oceans; they are affected by logging, urbanization, dam building and many other human activities.



code, can determine what stock the fish belongs to. This provides data about the return and survival rates of various species and stocks.[1] The information has been used to manage harvests, but is being used more and more in hatchery decisions. The tags can provide answers to questions about variables in hatchery operations, such as what diets tend to increase survival and when is the optimum time to release the fish.

Recently another type of tag has come into use in the Northwest — the PIT tag or Passive Integrated Transponder. These tags have been used for years to identify race horses, to route boxcars, and in computerized security installations. About five years ago they were reduced to a size that was small enough to use in fisheries research (about a quarter of an inch), and the National Marine Fisheries Service started using them to identify fish.

The PIT tag consists of a printed circuit board encased in glass that is inserted into the juvenile fish's body cavity. Each board and consequently each fish has a unique code. When the fish goes through a detection area at a dam, a radio frequency beam reads the code and identifies the fish.

PIT tags are used primarily to track juvenile fish through Columbia River dams. There is speculation that when a fish reaches adulthood, its body may reject the tag. But the advantage of the tag is that individual fish can be tracked as they migrate through the river system so fewer fish need to be tagged. In addition, once the tags are in place, the fish don't need to be handled or killed to recover the information. And, while the PIT tags are expensive and time consuming to encode and install, recovery of the information is considerably less labor intensive than with the wire tags.

[1]A species is a group of individuals of common ancestry that closely resemble each other and that can interbreed, producing fertile offspring. A stock is a population of fish spawning in a particular stream during a particular season. Such fish generally do not interbreed with fish spawning in a different stream or at a different time.

Using the information

A great deal of research is now concerned with getting fish safely through or around the dams. This research centers on guiding juvenile fish successfully into bypass facilities to enable them to avoid turbines; attracting adult fish to ladders that help them over the dams; ensuring young fish survive being carried in barges around the dams; and determining when to effectively use augmented water flows to speed young fish through reservoirs.

Diseases also pose major problems for fish survival. In the Northwest, many researchers are studying fish disease prevention, diagnosis and treatment. For example, bacterial kidney disease is very common in spring chinook salmon. In fact it is difficult to find spring chinook without it. Jim Warren, regional fish health manager for the U.S. Fish and Wildlife Service, is working on a program that tests for the disease in adult fish coming to the hatchery, and then selectively mates those fish that are only minimally infected. Through coded wire tagging, Warren and others on the project are finding that the offspring of these matings have a return rate three times better than those from non-selective matings. Warren says the idea behind the program is to "amplify the best stocks, and minimize the worst ones."

Advances in the diet of hatchery fish are also occurring. In the 1960s, the development of the "Oregon Moist Pellet" diet was a revolution that allowed consistent and convenient hatchery fish feeding without exposing the fish to diseases previously present in fish foods. Such diet-related research is continuing. Researchers recently found that a meal made from chicken feathers is protecting fish against kidney disease. Now they are trying to figure out why.

Despite this successful detective work, there are many gaps that exist in our knowledge of Columbia River salmon and steelhead—areas where researchers don't have enough data to form theories. These are complex fish. They travel thousands of miles between freshwater rivers and saltwater oceans; they are affected by logging, urbanization, dam building and many other human activities; and during their migrations, they cross many political boundaries. The result of this complexity has been that coordinating the detective work necessary to fill in these knowledge gaps has not been easy.

There is a consensus among those who observe fisheries research that more coordination is needed if our knowledge of the fish is going to improve. Speakers at the Northwest Power Planning Council's Salmon and Steelhead Round Table this summer pointed out this need for coordination. Bill Bakke, the executive director of Oregon Trout, a sport-fishing group, stressed that "We need to integrate the research program. Rather than looking at boxes, we need to look at ... how various aspects of the research program interrelate, and how they work together for a bigger success."

Dr. Ray Hilborn of the University of Washington's Fisheries Research Institute went further in saying:

"We really don't know very much about what has happened on the Columbia River. We, for instance, don't know what kind of survival rates we get from hatcheries. We don't know how much of the production comes from hatcheries, how much comes from natural stocks. We don't know whether supplementation [using hatchery-bred fish to help replenish natural streams] *will work or not ... And there is a long tradition in fisheries management of taking action, doing things without really sitting down and evaluating whether it worked or not."*

"In order to reach the interim goal of doubling, we're going to have to be a lot more careful about understanding the effects of the actions, and there are going to have to be more people who simply sit there and ask questions about what actually happened."

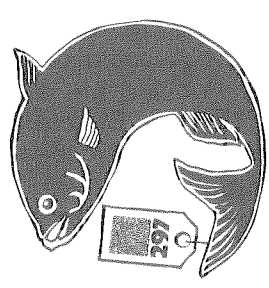
In the 1987 Columbia River Basin Fish and Wildlife Program, a salmon and steelhead research and monitoring program was outlined to focus research by establishing overall areas of emphasis, provide a long-term research planning process and improve the participation of all parties in research planning.

Much of the research now being done is a result of measures in the program. Progress is being made, but a number of problems remain—problems such as improving the communication of research and monitoring results, improving the technical quality of research, and deciding on the mechanism to provide guidance in setting priorities and resolving disputes.

The Council, working with representatives of the Columbia Basin Fish and Wildlife Authority, the Bonneville Power Administration, the U.S. Army Corps of Engineers, the Pacific Northwest Utilities Conference Committee and others, recently developed an issue paper now being distributed for comment. It identifies major concerns in fisheries research and describes potential solutions. Public comment is being taken on the paper until mid-November. (See back cover to order a copy.) Through the comment received, the Council hopes to fine tune the research process.

It is essential to know more about salmon and steelhead if the Northwest is to reach the goal of doubling the Columbia River's salmon and steelhead runs. The detective work is being done in the basin, but with fine tuning it can be done better. As a famous detective would say "That's elementary, my dear Watson." ■

"We really don't know very much about what has happened on the Columbia River." —Dr. Ray Hilborn



Dulcy Mahar Interview with

JOHN JONES

It has been five years since six Northwest natural gas companies filed suit against the Northwest Power Planning Council, charging that some of the Council's activities provided an unfair advantage for electricity over other fuels.

The lawsuit was settled out of court with neither party admitting error, but with both sides attesting to a new sensitivity to each other's needs and roles. Since that time, the gas industry has followed the Council's activities regularly, sending representatives to Council meetings, submitting testimony on a variety of issues and holding consultations with Council members. While both parties sometimes still disagree, both would likely agree on one thing—the relationship has matured and become more positive.

One industry representative who has worked most closely with the Council is John Jones, executive director of the Association of Northwest Natural Gas Utilities. Members of the Association, which is based in Portland, are Washington Natural Gas and Cascade Natural Gas, both based in Seattle; The Washington Water Power Company, Spokane; Northwest Natural Gas, Portland; CP National Corporation, Medford, Oregon; and Intermountain Gas Company in Boise.

How do Northwest gas companies fit into the regional power picture?

The Association helps coordinate and develop programs to meet common needs and issues among its members. This includes information exchange, monitoring legislative and regulatory changes, developing issue positions, preparing testimony for hearings and rate cases, and maintaining liaisons with industry groups such as the American Gas Association and Gas Research Institute.

Jones "never expected to be employed by the natural gas industry, and I guess that is fairly typical of many of us who set a course for one thing and end up doing something different." (He said he wanted to be a fisherman when he grew up.)

Before joining the gas industry, Jones worked for the electric utilities, most recently Pacific Power & Light Company. One of his responsibilities at Pacific was drafting the proposal for and administering the Hood River Conservation Project, a $21-million contract to insulate approximately 3,100 electrically heated homes.

For the nine years prior to that experience, Jones was president of Energy and Man's Environment, an energy education corporation that conducted conferences and seminars throughout the country. He came to that position from the University of Puget Sound, where he was director of continuing education and professional studies, as well as an associate professor.

Jones holds a Ph.D. in administration from the University of Oregon, with undergraduate work in political science and pre-law from the university. He also attended Willamette University Law School, but found a future in law short-circuited when he "ran out of money."

Jones' family includes his wife, a special education teacher in Beaverton, a son in the military and a daughter who attends the University of Oregon. The family spends "most of our time getting wet backpacking in the Oregon rain forests."

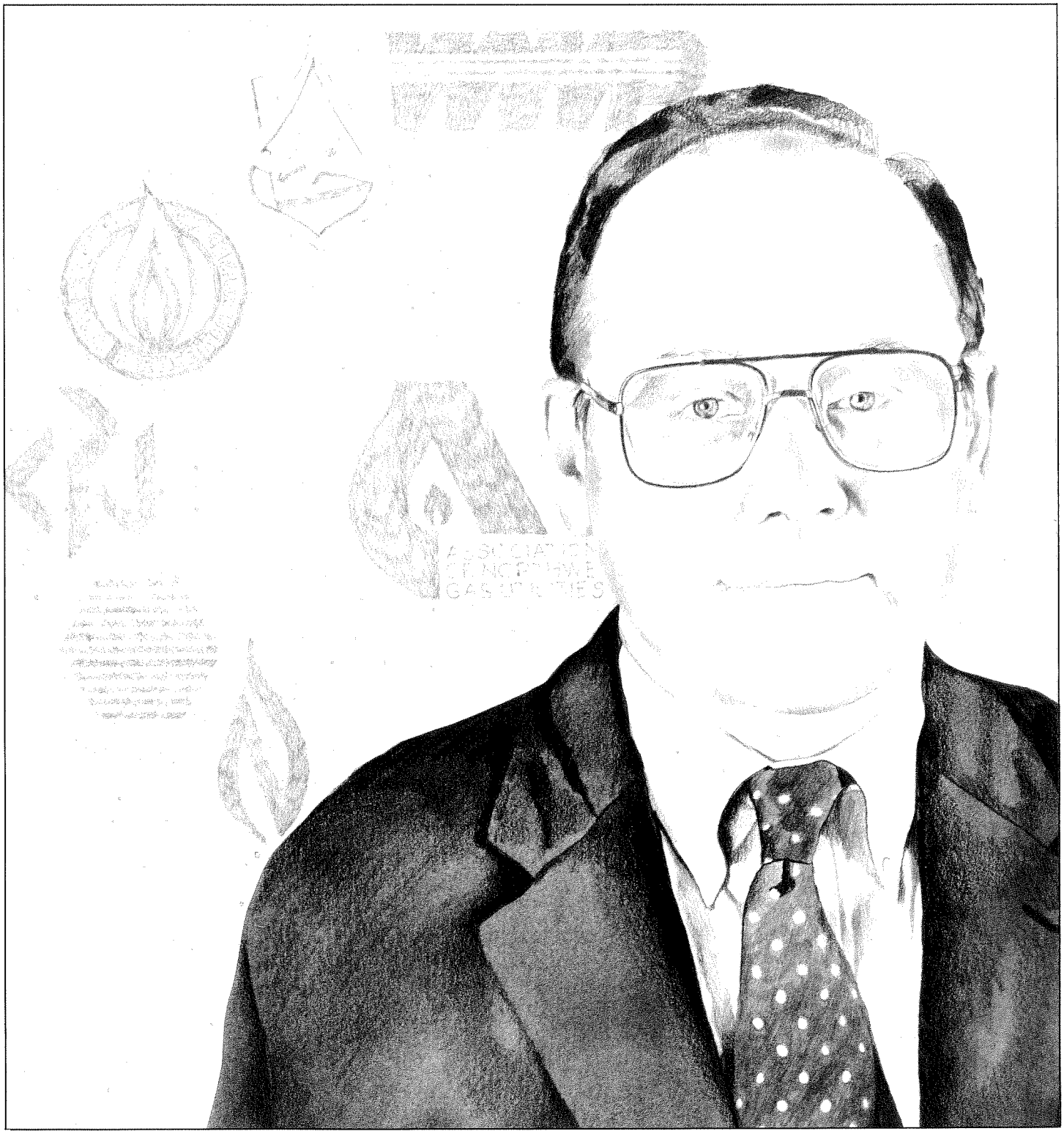


Illustration by Lynn Carson

Q. What role does the gas industry play in the Northwest power picture? What is the regional market share?

Our companies serve an area that is about the same as the Bonneville Power Administration's. It's generally from Canada to California and the Rocky Mountains to the Pacific Coast. We serve approximately 860,000 customers. About 740,000 are residential, 106,000 commercial, while interruptible and an interruptible-firm mix make up the total balance. It is about a $2.25 billion-a-year industry in terms of gas sales and transportation revenues.

We produce about as much energy for the region per annum on an equivalent Btu[1] basis as does the Bonneville Power Administration. This makes the natural gas industry a significant contributor to the region's energy needs.

Q. What percentage of new residential homes use gas?

That differs from service area to service area. One of our companies has most of its load in the commercial sector with a very small residential base; two others are heavily residential. The larger companies serving major metropolitan growth areas are getting about 90 to 95 percent of the new home hook-ups. That's primarily because of the cost of our fuel. Right now, on average, natural gas is approximately half the cost of electricity sold by the investor-owned electric utilities. It is a little bit more in some places, a little bit less in others.

Q. How is the gas brought in?

We have one major pipeline serving the region, and that is the Northwest Pipeline Corporation located in Salt Lake City. We have two primary producing areas — western Canada and the U.S. Southwest, principally the San Juan Basin. With both Canadian and U.S. producers and suppliers, we have a situation that provides our region with unusual leverage and flexibility. In that regard, the Northwest is completely different from any other part of the country. There are tremendous hydrocarbon resources in Canada; they need our markets, and we need their gas. It is an excellent arrangement.

I believe a primary reason for the public misunderstanding regarding our commitment to conservation is that we don't have a Bonneville Power Administration with its large and aggressive promotion efforts.

Q. Since early 1986, gas and oil prices have been down. Does the gas industry see this as a plateau that is going to last for some time, or is it some point in a cycle?

The cost of natural gas is market driven. Traditionally, the price has been closely linked with the price of petroleum. While that relationship has not been entirely severed, the natural gas price has been largely decoupled from oil. This means that the rapid run-up of prices following OPEC's (Organization of Petroleum Exporting Countries) embargoes and the U.S. government's hasty legislative reactions are not likely to occur again.

In the short term, we can expect natural gas prices to remain relatively stable, with minor increases and decreases depending on supply and demand. In the mid-term there will probably be a steady but moderate increase in prices as pressures are applied to use more gas due to its positive environmental characteristics. I'm probably not smart enough to guess about the long term, beyond the 68-year proven reserves.

However, we have enormous gas supplies in the overthrust belt and tight sands[2] that will undoubtedly yield to new exploration and extraction technologies. The cost of exploration and delivery will be greater. But nothing would suggest that our costs would approximate those of new thermal electric generation. Given our expectations for the cost of electricity, we are taking the approach that we have an ideal fuel for many applications at a price that will be attractive compared with the cost of other energy options.

Q. What role does conservation play in your industry?

It is a question we believe is very important. It seems to be a commonly held opinion that the natural gas industry is in some way not interested in conservation, at least to the extent that the electric utilities and other industries are. It is important to note that we are obligated under the same state statutes as are the other energy providers to carry out and pursue energy conservation efforts. It is indeed a fact that every single one of our companies is actively involved in a variety of conservation efforts, such as providing retrofit services and making major investments in more efficient technology.

I believe a primary reason for the public misunderstanding regarding our commitment to conservation is that we don't have a Bonneville Power Administration with its large and aggressive promotion efforts. But that's not to say we don't have those same convictions about the importance of conservation.

Q. Originally you opposed the Council's model conservation standards. What were your reasons for opposing the standards then, and what is your position now?

I think it is important to say for the record that, although our industry's beginnings with the Power Council were initially a bit rough, the Association in general and our membership in particular have come to respect the Council

[1]British thermal unit is the amount of heat energy necessary to raise the temperature of one pound of water one degree Fahrenheit (3,413 Btus equal one kilowatt-hour).

[2]Overthrust belt and tight sand — Geological formations which are potentially rich in natural gas, but which also present drilling difficulties making them less economical currently.

and its staff and the work they're doing. It is fair to say that our attitude has changed as our insight has grown. The Council's effort to be evenhanded and objective, the open public process, the opportunity to take part in the process — all these things have helped our relationship.

I think that the genesis for the gas industry's initial opposition to the Council's work, especially in the area of building standards, was our need to make sure that the newly emerging conservation programs designed for the electric industry were not applied unfairly to the natural gas industry. If that had occurred, our industry would have been placed at a serious disadvantage competitively. That would not only have been hurtful to the gas industry, but hurtful to the region in general. Now let's deal with the natural gas industry's position vis-a-vis the model conservation standards.

The fundamental problem is that the assumptions that drive the cost-effective calculations for electricity don't apply to natural gas. The issue of avoided cost[3] is the foundation of that assumption. Obviously we don't build billion dollar electric generation facilities or construct power lines across the countryside. So, by applying the electricity-designed standards to gas, you're using the wrong assumptions for what is cost-effective to the region and the consumer.

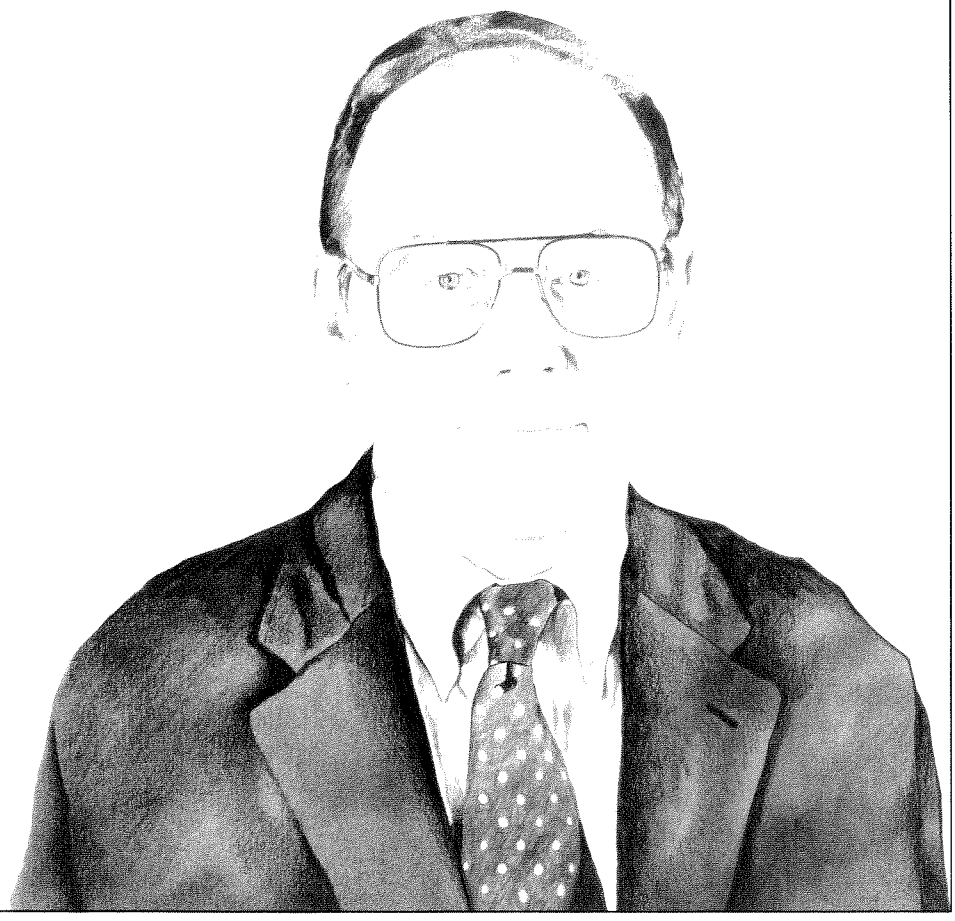
The position of the natural gas industry regarding model conservation standards — and let's be right up front about it — is that we support the standards and believe they should be applied as they were designed to be used — to delay the construction of new, expensive electric generation facilities and buy us time. When you look at it from that point of view, then natural gas is making a major contribution to the conservation goals. By taking part of that new load growth, our industry is helping extend the time before new power plants have to be constructed. If, in fact, the standards had been applied to the gas industry, then that would have — by legislation — eliminated the cost advantage to the consumer and the reason why so much of the new heating load is going to gas. Much of that load would now be on the electric system.

If the model conservation standards had been applied to gas-heated homes, and with the cheaper up-front cost of electric forced-air heating systems, most of the new homes would have been built with electric forced-air or baseboard heat. All of that pressure that the gas industry relieved from the [overall power] system would have been placed on the electric system, which is to say that the conservation investment would have bought far less time, far less advantage than it has.

As it is, we have a diverse [power] system. I think that diversity is extremely healthy for the region. If we put all of our eggs in one basket, be it the gas basket or electric basket or any other basket, we become vulnerable if there is any system failure. But right now we have several options. Greater flexibility is beginning to emerge in the discussions that the Council is having with regard to how to integrate gas into the regional mix.

I think that diversity is extremely healthy for the region. If we put all of our eggs in one basket, be it the gas basket or electric basket or any other basket, we become vulnerable if there is any system failure.

We think it is time for the natural gas industry to be directly involved in discussion with the Council. We need to talk about how the uses of gas can best be played out for the purposes of the regional [North-



[3]Avoided cost — An investment guideline describing the value of of a resource in terms of what is saved by not having to acquire a more expensive resource.

west Power] Act on behalf of the region.

I want to emphasize that the problems we have had have not necessarily been with the Northwest Power Planning Council directly. We've found the staff and the members over time to be very open and willing to talk and accepting of the concerns we've expressed. However, what we have experienced time and time again, is the good plans and the good ideas generated by the Council have been mutated by the Bonneville Power Administration into marketing efforts. Electric marketing efforts subsidized by public money tend to make my members cautious about their relationship with the Council and Bonneville.

We've appreciated the Council and will continue to express the basic point of view that we support the model conservation standards and the various programs designed to implement them, but they are designed for electricity and they should be applied in that sector. At the very same time, the natural gas industry is cooperating with a variety of agencies—energy offices, commissions, legislatures—to determine what is cost-effective for natural gas and to appropriately improve construction building standards.

Q. At the Hood River Conference you gave a position statement that suggested you could live with a dual code, that you weren't against codes.

We should have codes. We need to have a standard to live and practice by. We feel the states are handling that code-making process adeptly. Processes exist for public input and the careful consideration of what state codes should be. We participated in the last code cycles and felt very comfortable with the results.

In Washington, the process produced a dual code, one which provides exceptions based on what is cost-effective for gas as opposed to what is cost-effective for electricity. In Oregon, there is a single state code, but, recognizing the differences between our fuels, it provides for a single state code with an exception for high-efficiency gas furnaces and for the electric heat pump. We felt that was entirely acceptable.

We do think there may be some improvements to be made in the electric side of the code and perhaps on the natural gas side as well. But we have used the Council's own assumptions and its own program, working with the Oregon Department of Energy, and have rerun the cost-effective calculations. We find that in the states of Oregon and Washington we're just about at the limit of what should be done with natural gas, given current economics. We will continue to monitor the issue very closely.

Q. If the Council went after a fuel-blind code for model standards, then you would have to oppose it?

We would have to oppose fuel-blind codes because they are not in the best interests of either the consumer or the region. Fuel blind is really fuel dumb. Seeking fuel-blind codes would be an admission that the fairly applied cost-effective standard has been abandoned for some other purpose, primarily political. We're more than willing to abide by what is fair and equitable. That [fuel-blind code] is not only unfair and inequitable to the gas industry, but to our customers. It would deliver much of the new heating load to the electric utilities. It would accomplish legislatively what cannot be accomplished in fair marketplace competition. Yes, we would oppose any fuel-blind standard.

The bottom line is to create more competition through deregulation, and indeed that is beginning to happen. We don't know what the long-term effect will be.

Q. The Council has been discussing the greenhouse effect [see related story] and its implications for the power system. What is the gas industry's involvement in this issue?

Well, first let me say it is refreshing to have new members move through the Council from time to time. I understand that Mr. [Ted] Hallock, has brought the greenhouse discussion to the table. This is an issue which we believe may become increasingly important to all of us. We're all, of course, concerned about our environment and how to preserve it for future generations.

Our industry is not yet ready to make a policy statement. We recognize the issue as one that deserves attention and have employed the services of a research consultant to assemble available information from the scientific literature. We shared those findings with the region's scientific and energy leaders at a briefing this month. We heard two of the country's leading greenhouse specialists tell us what is currently known about the greenhouse effect and how it is likely to affect our future.

Q. There is media speculation that the greenhouse effect could be a boon to the gas industry.

Well, there is media speculation about nearly everything. We think this issue belongs, at this point, within the thoughtful scientific community. It does seem clear that the carbon dioxide load in the atmosphere is exacerbated by the industrial nations, principally through the burning of fossil fuels (coal, oil and the emissions from our vehicle fleets). Natural gas is a fossil fuel, but when compared with coal and petroleum, the combustion products are limited and more benign. To the extent that it is technically feasible, natural gas may provide us with an option to

the use of dirtier fuels. Obviously there is a great deal more that must be known before any course of action is taken.

Q. There has been increasing discussion — both pro and con — about gas-fired turbines as a possible back-up to nonfirm power [see related story]. Do you have a viewpoint on this?

Obviously that is not a new technology. Outside this region, natural gas is a principal fuel for electric generation. We've been fortunate not to have to use this technology except in limited applications in this region because of our hydroelectric base. We have about 700 megawatts of combustion turbines already in place in the region. I believe that one of our members, the Washington Natural Gas Company, provides gas to Puget Sound Power & Light Company for its combustion turbines.

As we move into a period when we don't have that [electricity] surplus in the region, and if in fact we have not picked up options on the coal and nuclear or developed new hydro, all of which have some significant lead times, combustion turbines can be installed within a short period of time. Again, it goes back to the economics of the issue, and while it is completely doable, it is a question of whether it is the best thing to do in the region.

Q. What do you perceive to be the key issues your industry would be following with respect to the Council?

We need to investigate gas supply with you; we need to determine whether natural gas is a viable option in terms of deliverability to the region. We need to talk about how the various energy options can be integrated. We need to discuss the deregulation in our industry and how that affects traditional relationships. The issues run from the technical to the economic to the political; and they are inseparable.

Q. How do you see deregulation affecting your industry?

There is a major change in the way our industry operates. Under the old protocol, we had people who explored and produced gas, and pipelines that brought it from the region where it was being produced and delivered it to areas where it was needed. The local distribution company took the gas and, through its own system, delivered it to the burner tip at the home or the commercial establishment or the industry where it was used in heating, processing or other end-use applications.

In the new deregulated environment, any one of the members of that old conventional structure may be doing any one of those functions. For example, we may have a local distribution company that goes directly to a producer, buys the gas and hires the transportation of that gas from the pipeline. We might have a customer that goes directly to the pipeline and, having found its own gas, hires the pipeline to deliver it. And the pipeline may or may not go through the local distribution company. It may build its own pipeline directly to a customer. Almost any permutation is possible. That seems to have been FERC's [Federal Energy Regulatory Commission] intent.

Of course the bottom line is to create more competition through deregulation, and indeed that is beginning to happen. We don't know what the long-term effect will be. Right now there is a good deal of confusion. This almost always happens when an industry is suddenly unstuck from the conventions by which it has been operating. Our industry is still working very closely with the FERC and certainly with our local regulatory agencies in trying to determine new rules and procedures under the new protocol.

If you ask that question six months from now, I may be able to tell you a little more definitely what is happening as far as the economics. We are not sure what the result will be, except that business will never be conducted as it has been in the past.

Q. What are the key topics before the gas industry now? Obviously you've touched on some.

We've just talked about deregulation and, springing from that, new relationships between and among our own industry members. We'll also be looking at the institutional relationships between the Canadian markets with the new economic structure being established for trade between our country and Canada.

New technologies are of great interest in our industry. We're obviously interested in the breakthroughs in research and exploration technologies that are going to extend the lifetime of our reserves and which will make us increasingly able to compete in the market. Natural gas-powered transportation is a near certainty. We'll soon have competitive natural gas cooling systems.

And I think that the emerging issue of least-cost planning will be a topic. It is one that has had its genesis in the electric side of the energy business, but we have to assume that that same kind of interest will eventually be applied to the natural gas industry, and we're planning to accommodate that.

I guess we'd also have to say that a greater role in regional planning is a key issue. And it seems to us that we have a responsibility and an ever greater role to play. How that is going to be worked out is still unclear. We see that working with the Council is an absolute key, and we're pursuing that in a variety of different ways.

Managing our future rather than allowing the future to happen is something I think will benefit all of us.

Q. What do you see as the most important role for the Council and what should it be doing?

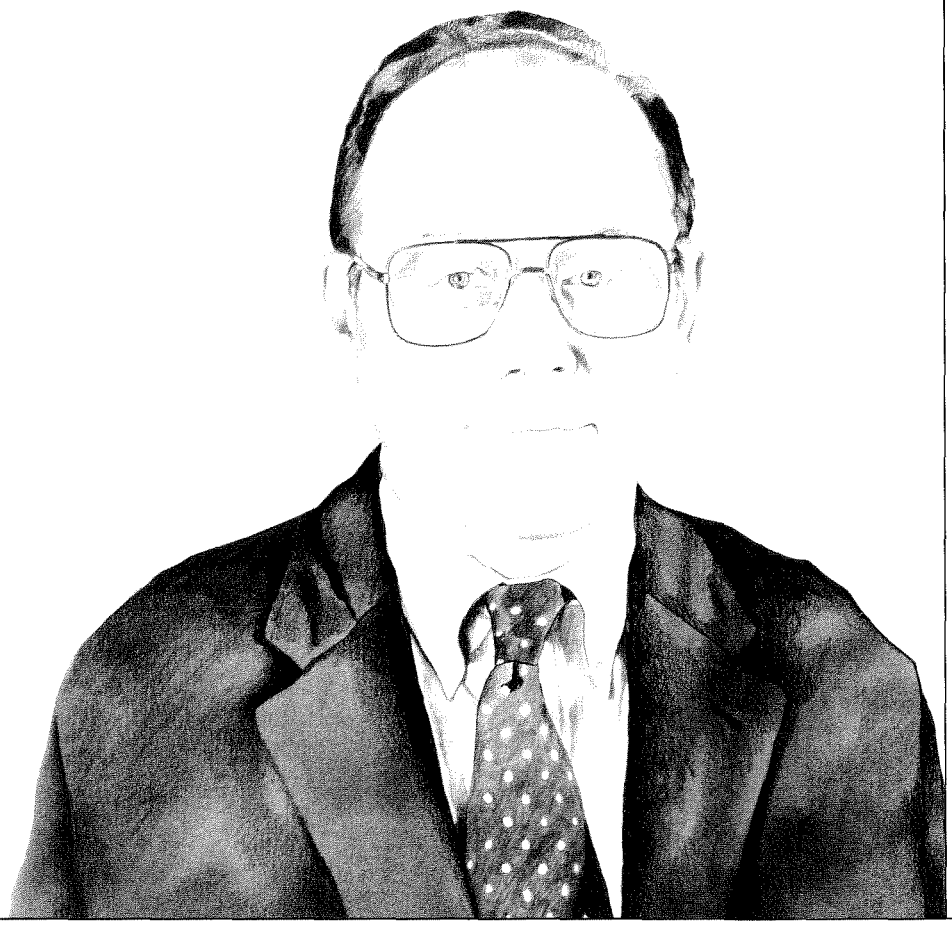
First of all, I think it is absolutely true that had the Power Council not been formed, it is unlikely that the diverse and varied energy, industry, public and environmental interests in this region would have come together. As a result, the constructive forum for dialogue on the many major issues in this region would not have taken place. Or if they had taken place at all, they would have been piecemeal, and the coordination and consolidation of those issues into a reasonable and prudent plan probably would not have occurred. The Council's existence may minimize the potential for notable planning failures such as we have experienced in the recent past.

So I think that the bottom line is that, although we may disagree from time to time with individual things that are done at the Council, citizens of the region do have a forum that all of us can use. The Council is an opportunity to inform ourselves and try to make sense out of how we're going to manage our future. Managing our future rather than allowing the future to happen is something I think that will benefit all of us. Right now the Council is the pin holding the fabric together. So we see the Council as an extremely important element in this region. The public process that the Council has insisted on is, we think, probably the hallmark of its existence.

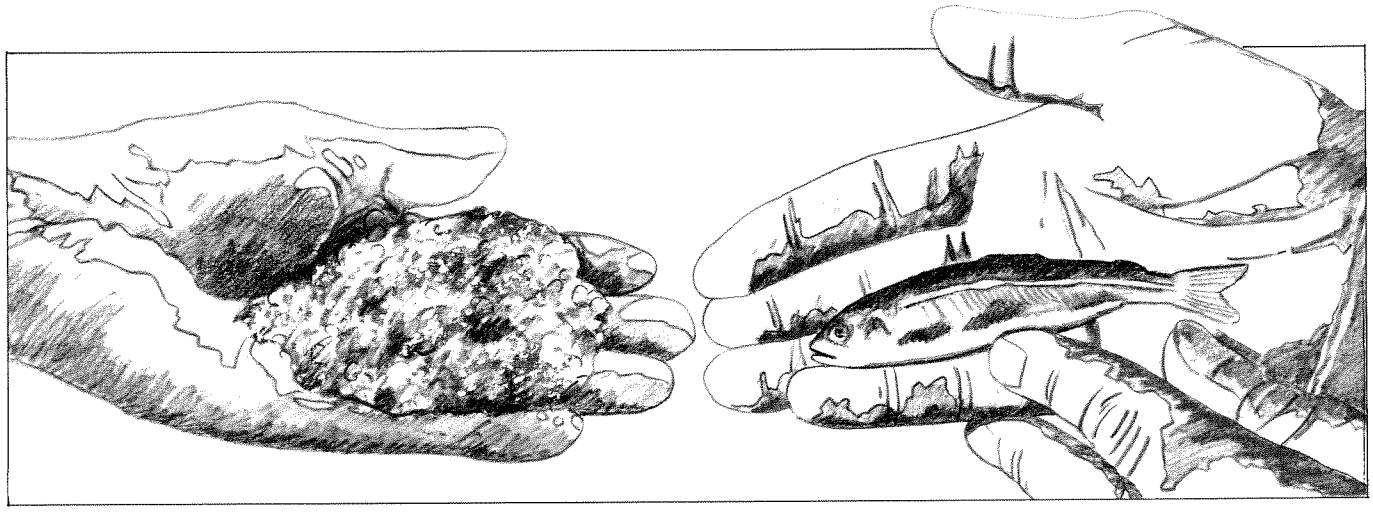
We would have to oppose fuel-blind codes because they are not in the best interests of either the consumer or the region. Fuel blind is really fuel dumb.

If I were to guess about the long-term future, I would suspect that the Council will have made a major contribution to the restoration of our fish resource, and it will have re-established and reconfirmed our regional commitment to environmental integrity. The Council will probably be held up in great esteem for the work it has done. And we in the gas industry are going to, for the benefit of the Council and for that long term, insist that we be part and parcel of the process.

Maybe natural gas has a key role to play in this time of transition. It will be interesting to look back and see whether anything we suspect is right in the long term. But we can only do what we can dream about and what we can know. I think the Council is an ideal place for that to take place. We in the gas industry would like to see the Council broaden its scope and become a little bit more neutral, understanding full well that the politics of that situation may be difficult to accomplish. But then again, most things worth doing are difficult. ■



Water conservation may help both irrigators and fish runs.



Wise Use for Western Water

by Barbara Taylor
and Carlotta Collette

The wide open spaces between the Mississippi River and the bony spine of mountains stretching from Canada to Southern California were an irresistible temptation to hopeful farmers arriving in post-Civil War America. For a string of years, beginning in 1865, there was abundant rain in the previously arid West. The deep-rooted grasses of the plains greened up, prompting farmers to suppress their doubts about working a land that had little else growing on it. While there were no trees for fence posts, there were also no trees to cut down and no stumps to dig. There was even a theory, shared like religious doctrine, that the act of farming itself would bring continued rainfall.

The Homestead Act of 1862, which authorized the sale of 160-acre plots of land to migrating Americans and immigrating Europeans, nurtured the dream of the tillable prairies. In two decades, the open spaces had diminished and small towns had appeared in the middle of what had been and was already becoming again a vast desert. In the 1880s, the West's more common weather reasserted itself. For nearly two more decades, drought conditions were the rule, not the exception.

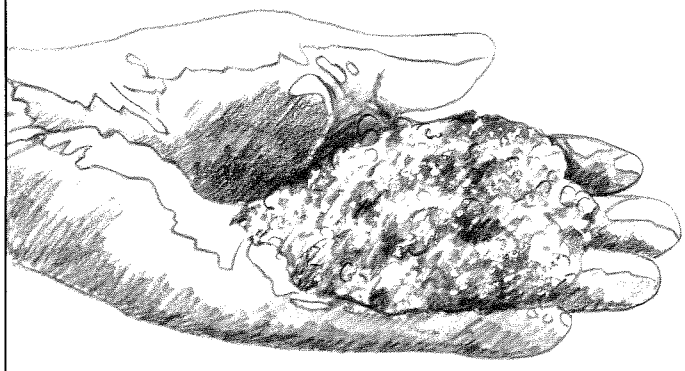
In recent years, droughts have pushed conflicting water demands onto the front pages of newspapers.

It was one thing to be a farmer with access to one of the streams crisscrossing the desert. They had a chance to make a go of it, unless the stream dried up. Water law in the West was pretty straightforward; first in time, first in right. But downstream and newly arrived users had precarious claims to the water they needed. Water rights were described in terms of "senior" appropriators and "junior" appropriators. Throughout most of the West, that basic tenet of water law and the assigned status of users still dominates. Indian tribes have reserved rights to water that supersede most other distributions.

But the simple fact of the western United States is that this vast landmass, about 60 percent of the lower 48 states, has only 25 percent of the nation's precipitation. And that falls between autumn and spring. Most of the West has very little summer rainfall to slake the thirst of parched plants during their fastest growing periods.

By the turn of the 20th century, there was an obvious if somewhat late realization that there would be no farm belt on the nation's frontier without irrigation. And irrigation carried out at the local, privately financed level had already failed, in most cases, miserably. The hopes and dreams of so many people, and the larger plan to actually make the western lands productive despite the limited moisture, required coordinated development. Water was fundamental to the West's survival as a region, but too costly to manipulate on the grand scale envisioned to be financed by individuals and local governments.

Illustration by Lyn Nance



But the simple fact of the western United States is that this vast landmass has only 25 percent of the nation's precipitation.

In 1902, the federal government created the Bureau of Reclamation, whose mandate was to use proceeds from public land sales to finance a series of diversion and storage dams and canals that would eventually result in millions of acres of desert bursting into bloom. Western water development since 1902 has been the most ambitious and elaborate federal construction program ever conceived. Grand Coulee and Hoover dams are just the two biggest projects. Hundreds more dot the region, pulling water from the three major western watersheds—those of the Columbia, Colorado and Missouri rivers—and pumping it out across thousands of miles of dry land.

There is no question that much of what the Bureau of Reclamation (and with it the U.S. Army Corps of Engineers) did to the West was remarkably positive. Here in the Northwest, about 75 percent of the region's agricultural production comes from the arid land east of the Cascade Mountains. In Washington's Yakima Valley, agricultural products earn between $300 million and $400 million annually. From the shifting sands of the Umatilla River Basin in northeastern Oregon, a much smaller valley than the Yakima, farmers bring in more than $50 million each year.

But citizens of the region are also well aware that the price paid for such success and for the simultaneous development of the rivers for hydropower production may be more than anyone bargained for. Today, agriculture accounts for 88 percent of the West's water consumption. In most states, it is perfectly legal to draw *all* of a stream's flow for irrigation. Under certain circumstances, farmers can block streams off, diverting the flows into their fields. Until recently, few states regarded as critical the need to keep water in rivers for fish, wildlife and other purposes.

In the Northwest, one effect of such management is that river basins that once supported vital runs of salmon and steelhead, such as the Yakima and Umatilla basins mentioned above, now only host remnant runs, if any at all. Whole communities that depended on the fisheries for their sustenance have been unsettled. This is particularly true for Indian communities.

Furthermore, the West's voracious appetite for water has not been quenched. Some agricultural areas in the region are slated for expansion. At the same time, urban areas are growing and industries are moving in from across the continent and from Pacific Rim nations. This places extra burdens on the region's water, both to generate the hydroelectricity that supplies about three-quarters of the Northwest's power needs and to lubricate economic growth.

On top of all of this, today's Northwesterners have another waterborne dream—to recover, or at least attempt to double the Columbia River Basin's salmon and steelhead runs depleted by 50 years of hydroelectric dams. The Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program includes over 200 activities aimed at that goal. And this dream, too, will require the coordinated efforts of federal, state and local governments, Indian tribes and individuals, and the steady rush of water.

In recent years, droughts have pushed these conflicting water demands onto the front pages of newspapers in every state. The states are responding with new legislation and water conservation programs. In Idaho, Montana, Oregon and Washington, actions are being taken to encourage more efficient use of existing water supplies. Policies, programs and even water laws are changing. In Oregon, a new law permits irrigators to sell, lease or use some of the water they are able to salvage through irrigation improvements. A quarter of the water saved through such efficiencies must be returned to the stream for fish, wildlife and other instream uses.

In Washington, a similar law was passed. The new legislation also established a Joint Select Committee on Water Resource Policy to review existing state laws and recommend new statutes.

Both Idaho and Montana are evaluating their state water laws and needs in the process of developing statewide water-use plans. Idaho is expected to designate certain streams for specific uses and adopt actions to protect or improve conditions to support the desired uses. Idaho is also engaged in a general adjudication of water rights in that state's Snake River Basin.

Most of the state actions incorporate plans to make more efficient use of irrigation water. These plans generally suggest: 1) lining irrigation canals and other distribution

Fast-growing willows and other plant matter protect streamsides from erosion and provide shade to keep water temperatures cool.

systems to reduce water loss in transit; 2) improving irrigation management so the required moisture is applied at the time and depth required by the plants; 3) altering cultivation and tilling practices to reduce water needs and minimize erosion; and 4) replanting and restoring stream channels to improve water storage within the riparian (streamside) zones.

In the Umatilla Basin, farmers following some or all of the above procedures have reduced their water use 20 percent to 30 percent, depending on the crops. The Umatilla work, funded and coordinated by the Umatilla Electric Cooperative, which serves some 200,000 acres of irrigated land in Umatilla and Morrow counties, has been in progress since 1982. Approximately three-quarters of the cooperative's electrical load comes from agricultural uses: 40 percent from irrigation; 30 percent from food processing.

Farmers in the Umatilla project are finding they not only save water and consequently lower their electric bills, but they also increase crop quality and yields because of reduced stress on plants. Since there is less leaching of fertilizers, applications of these chemical soil improvements can also be cut.

The Umatilla irrigators are part of that basin's collaborative attempt to recover wild spring chinook runs that once flourished there. This year, the first adult spring chinook,. released as fry in upper basin streams over the past years, returned to the Umatilla to spawn.

Such success is leading other water-constricted basins to follow Umatilla's example. But water conservation comes with its own set of physical, legal and institutional complexities that need to be addressed before the region will be truly making the most efficient use of its most valuable resource.

In the first place, western water law discouraged water conservation. In the West, it's considered wasteful to *not* use up the resource. Traditionally, if a farmer increased the efficiency of his or her irrigation system, the water saved could not be applied to new lands or sold. It had to remain in the stream for the next user in line. Furthermore, if farmers conserved water and thus did not use their full entitlement, they faced the possibility of having the entitlement reduced by the amount of water conserved.

There was also no economic rationale for conserving water. Many

Photograph by Carlotta Collette

irrigation distribution systems were built when construction costs were subsidized substantially by the Bureau of Reclamation or other government agencies. From the farmer's perspective, these systems were inexpensive, and the water and power to pump it were apparently abundant. Efforts to make the systems more efficient were considered uneconomical. Now, the costs for improvements are increasing and may outweigh any immediate benefits from the efficiency measures.

Moreover, water conservation can affect users further downstream. In many cases, water that currently is "wasted" by returning to the stream is taken up by junior appropriators. If the senior user makes better use of less water, the downstream user could have less return flow to draw on.

It's also difficult to create water savings that can then be counted on for fish or other needs in specific locations, because much of the water poured out on the land seeps in and travels underground some distance before it re-enters the stream.

Some water conservation actions may even have negative effects on fish and wildlife. In some cases, water from over-abundant applications creates wetlands, springs, small streams and other habitat where runoff collects or groundwater emerges. These areas may provide important habitat for fish and wildlife, such as waterfowl, which rely on the resulting vegetative growth. These areas could dry up if more conservative amounts of water are dispersed. It is estimated that when the delivery system for the Yakima-Tieton Irrigation District was converted from a system of open canals to enclosed pipes, approximately 30 percent of the wetland acreage on the project was eliminated. Such problems likely can be reduced by incorporating the need for the wetland in any conservation plans.

Western water use is changing. In Idaho, farmers "deposit" unused water appropriations in a "bank," typically a reservoir. Other users borrow the water at a price set by the Bureau of Reclamation.

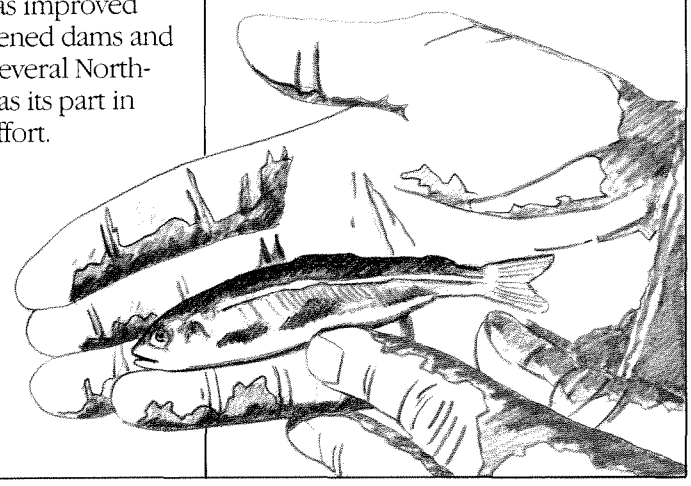
Despite these complications, western water use is changing. In Idaho's Upper Snake River Basin, a "water bank," long used informally, has been sanctioned legally to allow farmers to "deposit" their unused water appropriations in a "bank," typically a reservoir. Other users may then borrow the water at a price set by the Bureau of Reclamation. Idaho's model could serve many other areas where farmers' water allotments are in excess of their need.

The Bureau of Reclamation has even changed its primary mission. In 1987, the Bureau announced that its years of building giant water systems were over. The new mission stresses improved resource management. Future Bureau projects are likely to be much smaller and designed to optimize existing facilities. Efficiency is the Bureau's new guiding principle. Working with local irrigators, Indian tribes, state and federal fish agencies and others, the Bureau has improved fish ladders and screened dams and irrigation outlets in several Northwest river drainages as its part in the fish restoration effort.

In addition, the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program has resulted in more than 80 streamside enhancement projects that have increased water storage capabilities in affected floodplains. These projects, designed to improve conditions for wild runs of salmon and steelhead, combine actions to stabilize stream banks, revegetate riparian areas, control erosion, increase the number and size of resting pools and provide protective fencing to keep cattle from grazing on fragile stream banks. Water quality is also improved.

In 1931, before any federal dams had been built across the Columbia, Justice Oliver Wendell Holmes said, "A river is more than an amenity, it is a treasure. It offers a necessity of life that must be rationed among those who have power over it." Now, more than half a century later, farmers, fishers and ratepayers in the Northwest are listening to that lesson and beginning to abide by it. ■

Barbara Taylor is a planner in the Council's fish and wildlife division.



CALENDAR

November 12-13 — "Northwest Rivers Conference — Citizen Involvement in River Protection Programs," in Seattle, Washington. Sponsored by the Northwest Rivers Council. For more information: Northwest Rivers Council, P.O. Box 88, Seattle, Washington 98111, 206-932-6587.

November 18-19 — "Celebrate America's Rivers," a national conference in honor of the 20th anniversary of the national Wild and Scenic Rivers System, in Alexandria, Virginia. For more information: Suzanne Wilkins, Kevin Coyle or Ken Olson, American Rivers, 202-547-6900.

November 18-19 — "The Public Trust and the Waters of the American West: Yesterday, Today and Tomorrow," a continuing education conference at Lewis and Clark College in Portland, Oregon. For more information: Laurie Mape, Northwestern School of Law of Lewis and Clark College, 10015 S.W. Terwilliger Boulevard, Portland, Oregon 97219, 503-244-1181, extension 629.

November 29-December 3 — "Housing for the 90s" at the Sheraton Tacoma Hotel, Tacoma, Washington. Sponsored by the Energy Business Association. For more information: Patricia Anderson, Energy Business Association, 420 Maritime Building, 911 Western Avenue, Seattle, Washington 98104, 206-622-7171.

December 13 — "1988 Electricity Futures Symposium" at the Jantzen Beach Red Lion Inn in Portland, Oregon. Sponsored by the Northwest Power Planning Council, the Bonneville Power Administration and the League of Women Voters of Oregon. For more information: Bonneville Power Administration, P.O. Box 12999, Portland, Oregon 97212, 503-230-3478, 800-452-8429 in Oregon, 800-547-6048 in other western states.

December 14-15 — Northwest Power Planning Council meeting at the Council's central office in Portland, Oregon.

A more detailed calendar of Council committee meetings and consultations is carried each month in Update! See order form on back cover.

Compiled by Ruth L. Curtis

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Art Director: Stephen Sasser
Editorial Board: Ruth Curtis, Gordon Lee, Dulcy Mahar
Production: Marty Todd

COUNCIL PUBLICATIONS ORDER FORM

Please send me a copy of the following publications of the Northwest Power Planning Council. (Note: not all publications are available immediately, but they will be sent to you as soon as possible.)

Publications

- ☐ 1987 Columbia River Basin Fish and Wildlife Program
- ☐ (88-10) Wildlife Mitigation Planning Issue Paper
- ☐ (88-23) Salmon and Steelhead Research and Monitoring Issue Paper
- ☐ 1986 Northwest Power Plan

Mailing Lists

Please add my name to the mailing lists for the following newsletters. (Note: do not check if you already are receiving them.)

- ☐ *Northwest Energy News* (this bimonthly magazine)
- ☐ *Update!* (monthly public involvement newsletter that contains the Council meeting agenda and a more detailed publications list)

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