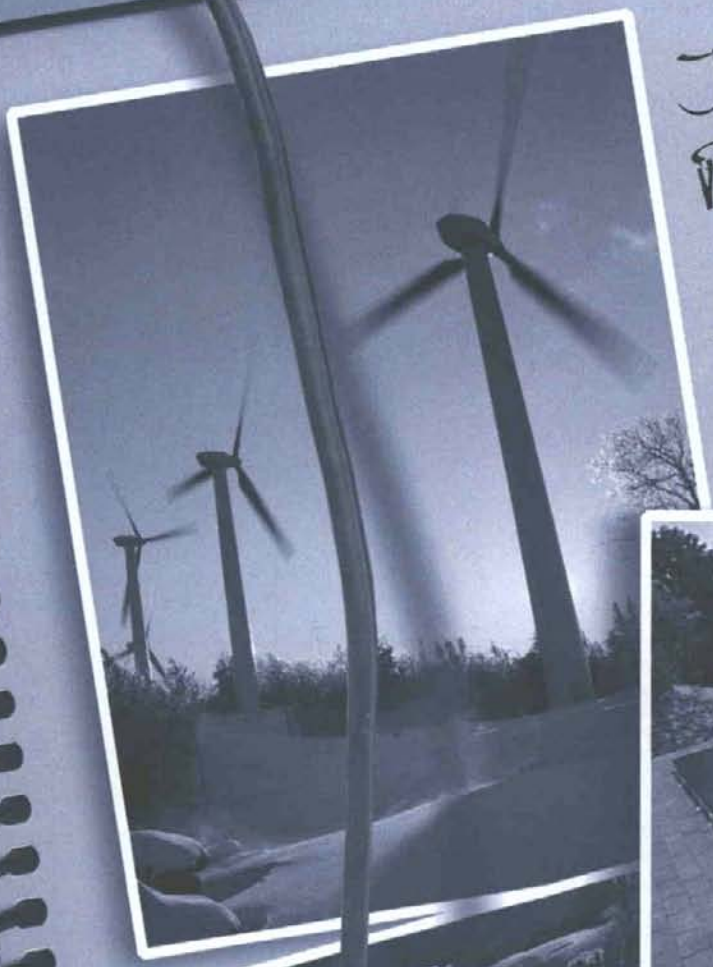
VNRC

Vermont Environmental Report



Is Vermont Plugged In?

A LOOK AT ALTERNATIVE ENERGY

Published by the Vermont Natural Resources Council, Inc.

Winter 2001

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NOT ALL DAMS ARE CREATED EQUAL

BY ELIZABETH COURTNEY
Executive Director

A firehouse burning down is a perfect example of true irony. Similarly, it might seem like true irony when VNRC dedicates an issue of the Vermont Environmental Report to energy issues while at the same time continuing with our 8 year long campaign to fight for removal of the Peterson Dam. Hydropower, after all, is a relatively clean source of renewable energy. However, not all dams are created equal.

Some dams have outlived their usefulness. Others have become legal or monetary liabilities to the owner. Still others, like the Peterson Dam, have been built in locations that have severely degraded our rivers and lakes.

VNRC's river restoration campaigns and advocacy to remove a handful of dams across the state are not a blanket indictment of hydropower. Our work focuses on the fraction of dams whose environmental costs far outweigh the corporate savings in the "cheap power" equation. Removal of the Peterson Dam is a necessity if we are to engage in long-term solutions to restore the Lake Champlain fishery, the lower Lamoille River, and water quality.

Vermont's lakes, rivers and streams belong to the people of Vermont. Decades ago, we let utilities build dams on our waters because we needed the electricity, and because we did not know all the many negative impacts the dams could have. Now we realize the adverse impacts on Vermont's waters and on Vermont's economy. Not all of the four dams in the CVPS Lamoille River Project present insurmountable impediments to water quality. But we now understand that placing the Peterson Dam at the head of Woods Falls gorge has blocked a legendary salmon, walleye and Lake Sturgeon spawning run and it was a mistake.

In correcting that mistake, we must make sure that consumers are not adversely affected in either the quality or cost of electricity service they receive. Even though State and Federal law establishes that water quality standards must be met for the relicensing of the CVPS's Lamoille River Project, it will take some time to remove the Peterson Dam. During this time, with willing stakeholders, we have a unique opportunity to develop better load management practices as well as replacement power that is clean and renewable, and will not degrade our waters and pollute our air.

Vermont policymakers have lacked the clear vision needed to remove the existing barriers that enable Vermonters to produce alternative clean power. With 1,500 to 2,000 dams already in our rivers and streams, there's not much more room left for hydropower development. And unlike other states, Vermont has no state budget for development of alternative sources of renewable energy.

Across the nation, and in Vermont, growth in summer peak electric demand is advancing very rapidly. Over the past four years, the nation's summer peak demand increased by 56,000 Megawatts. This is the equivalent of adding the entire six states of New England every 18 months to the US electric grid.

Many experts agree that at least half of the demand growth that Vermont will be experiencing over the next decade could be met through modest improvements in energy efficiency and load management which is designed to decrease energy consumption. The Peterson Dam generates 5 megawatts of power, far less than 1% of Vermont's total energy uses. Powerful evidence suggests that all of the lost power from decommissioning the Peterson Dam could be replaced by energy efficiency and load management alone.

Studies by national experts show that

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WHAT AM I DOING HERE?

BY JOE BONGIOVANNI

About twenty-eight years ago my wife, Helen, and I, and a few neighbours formed the Concerned Citizens of Albert County up in the Atlantic Provinces of Canada. During the Fleetwood Mac decade I worked on the Maritime Energy Coalition's Energy Policy Committee, spending a large part of my otherwise productive life developing economic policy alternatives to nuclear power. In that process, we actively opposed a government crown corporation promoting nuclear power. I spent my last two years in Canada working as an energy policy analyst for the province's Liberal party. (I donated my time to the Small Party and the New Democrats.)

On my first visit to Vermont, I drove past the Washington Electric Cooperative offices. Part of my other life in Canada was spent forming consumer co-ops. I thought it was a great idea to have the consumers owning their own electric utility. After moving here, Wes Hemmet of Cabot and I sued the co-op to prevent them from investing in the Seabrook and Millstone nuclear plants. Thankfully, we won. The lessons I have learned are that neither public ownership, as in the Canadian nuclear industry, nor consumer ownership, as in the case with WEC, assure an environmentally friendly energy policy.

After a half dozen years doing mostly community development work with the Regional Planning Commission in Montpelier, I was hired on as General Manager at WEC. Thus began my downfall. From the beginning, we attempted to "do the right thing" with energy efficiency. But I slowly realized that our goals in this area could not be met. No matter how hard we tried, i.e. commitment and money, and no matter how logical the programs seemed, we just could not achieve our ambitious goals. I accept some of the responsibility, as I was the person in charge. The lesson I learned here was that even with semi-intelligent good intentions and an adequate budget, it is often very difficult to translate paper policy goals into real results. People keep getting in the way. You can lead a horse to water-kind of thing.

Joe Bongiovanni, manager of the Hardwick Electric Department, which owns the Jackson Dam.

I've said all of that to set a context for the following discussion of the problems in meeting environmental goals through real energy policy actions. I realize that in Vermont at the turn of the century, the focus for environmental action appears to be on removing dams from our rivers. But first I want to say that, to my limited way of thinking, the real energy policy issue is less one of dam environmentalism and more one of consumerism, or the consumer being damned. I'd prefer to write this whole article about retail competition and electric industry restructuring. I think retail competition will have the most disastrous economic effect on consumers and our communities that this state and country have ever seen, making the nuclear debacle of a generation ago look like child's play.

I am concerned that the environmental community has abandoned consumers on this issue, and that this is a wrong strategic action. For instance, some glibly proclaim that higher energy costs are in the interest of the environment. I say perhaps so. It depends on where the money goes. If the higher costs produce revenues that go towards developing the resources you want, then fine. That's why at Hardwick we support the renewable energy portfolio standard and a sustainable energy institute in Vermont, without retail competition. That's what energy policy is about.

But in a free market reality, those higher prices will ultimately support a half-dozen combined-fuel megalopolies, i.e., controlling fossil fuels and electricity for all future energy uses. If anyone thinks that this flow of consumer wealth to the most giant, and still growing, global corporations will be good for the environment, educate me, please. I see these higher prices supporting greater investment in much less controllable degradation of the planet. And I'm agin' it.

OK. That's not the issue. Today in Vermont, dams are the energy policy issue. Though formerly touted as a valid alternative energy option, and praised to high heaven during the last national energy crisis, hydropower production is now more recognized for disrupting fish habitat and despoiling water quality. As a result, many believe that we must get the dams out of the rivers that we all own. I do not necessarily agree with that assessment. I still strongly favor hydropower as an energy resource.

As a friend of the earth, I also want to be a realist. Advocates of policy options still have to answer the same questions. What are the cost-effective alternatives that do not pollute, or pollute less? I hear the decentralization drum a-beating: distributed generation, micro-turbines, off-grid resources, energy conservation, fuel-cells, biomass and other renewables. They're all great. All they need to do is be cost-effective and less polluting and we should substitute them as a policy option. Unfortunately, we rarely count the pollution effects of these technologies, unless they fall in our back yard.

continued on next page

Neither active solar conversion nor fuel-cells are non-polluting. Yet today we all want volumes of these little chemical reactors because they are decentralized energy resources. As environmental stewards we sometimes fail to apply a full accounting to our favored technologies. Witness the shift for hydropower.

Some say that dam removal is in the public good, regardless of the impacts on the utilities and consumers. This is a dangerous and self-defeating approach to its proponents, as it promises to isolate environmentalists from their traditional allies. Most of us want to protect the environment. But all of us pay bills.

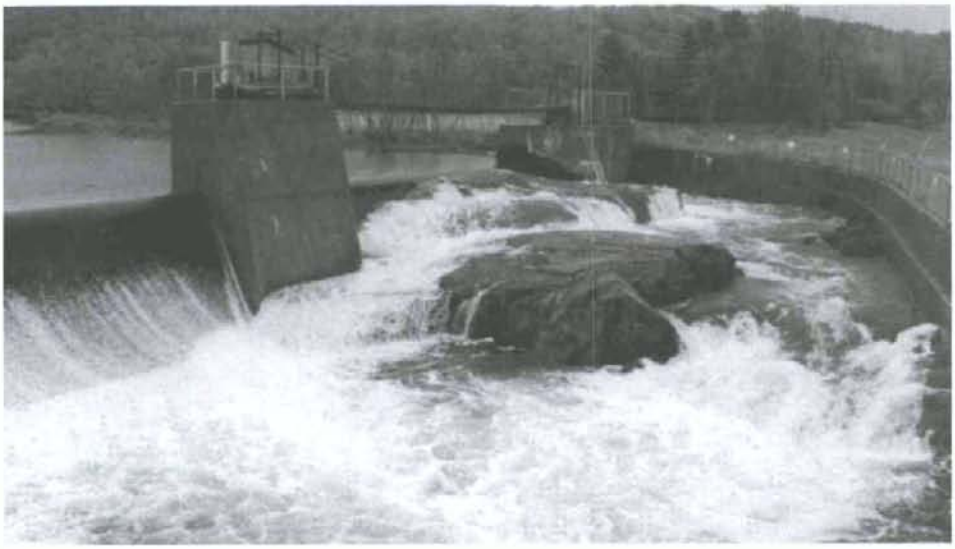
Rebuilding an existing dam or maintaining an existing dam often constitutes sound energy policy. Under the right circumstances, I may favor building new dams or other in-stream generating systems. Rivers are solar resources. But we cannot get their potential out of the earth and put to social use without a certain level of human intervention, or pollution, however you define that term.

What level of pollution or commitment of the earth's resources is necessary to get the energy potential to provide its benefit to society? And, is it worth that investment? And what are the options? Those questions should be asked for each dam that a party wants to build, or to take down. Or for every energy policy option put forward.

My basic disposition toward dams and their potential removal is that as a public resource, the removal decision must be made through a full accounting for any benefits derived (cleaner rivers, fisheries, etc.), or for any costs imposed on the owners or users of the resource. Most importantly, if we are going to give up a socially important renewable energy resource, we must involve a full public participation process where all of the values relative to that resource are on the table.

A public utility operating a hydroelectric generating station should be no worse off after the decision is made to remove a dam than they were before the decision. Just as importantly, the reliability of the overall electric system and the current consumers using the facility should be no worse off either.

If the general public deserve the benefit of dam removal, then we should be prepared to pay the cost of replacing that dam. Certainly demand-side policy options can be substituted for the supply of electricity, so long as all of the players understand the economic effects of that action on consumers.



Jackson Dam in Hardwick at high flow.

The money for dam removal and making the system whole should come from the people that gain from the deal — the public. A combination of federal, state and private funding sources can be brought together in each case. How do we agree on the price? We need some guidelines here, but it has been done before. Arriving at that replacement value is probably the most difficult of these devil's bargains.

If we can agree to these principles, then the process of identifying dams to be considered for removal, the compensation issues and cost related there to, can begin. With such a process, it is likely only those dams that either provide substantial unique environmental restoration potential, or very little in terms of cost-effective renewable energy resources will be the ones that come to the surface quickly. I presume it is the opinion of VNRC that Peterson Dam falls into the former category and the Jackson Dam at Hardwick into the latter.

In the case of the Jackson Dam, we are willing to consider its removal on this basis. We are working with VNRC to fund a consultant's study that would identify these potential benefits and costs, both to the public and to the town. I commend my Board of Commissioners and the Select Board for keeping an open mind toward the outcome of this study. We plan to involve the whole of the community in the discussion, with the hope that we establish a model process for these undertakings in the future in Vermont. It is because we have the understanding with VNRC that we will only proceed on a win-win basis that we have agreed to explore the potential for the Jackson Dam removal.

In the case of the Peterson Dam, I believe that environmental advocates must come to the table with an understanding that there is a "replacement" value that must be met for removal of that dam. If that happens, then I think VNRC can be successful.

In both cases, I wish VNRC good luck.

Joe Bongiovanni is manager of the Hardwick Electric Department, which owns six dams in three counties in Vermont. He is the former manager of the Washington Electric Cooperative. He serves on the Board of the Vermont Public Power Supply Authority and also serves as Vermont's representative to the Board of the National Rural Electric Cooperative Association, and is a member of NRECA's Regulatory and Energy Policy Committee. He also serves as Chair of the Town of Marshfield Planning Commission.

The Updated *Vermont Environmental Directory* is Now Available!

Pick up VNRC's *2000 Vermont Environmental Directory*! The newly updated *Vermont Environmental Directory* is a valuable resource which gives you access to Vermonters working across the state on a broad spectrum of environmental issues.

Order your copy today and meet others in Vermont who share your commitment to protecting and preserving the earth's natural resources.

To obtain a copy, call Jimmy Fordham at VNRC (802-223-2328) or email (vnrc@together.net). Directories cost $10.00 each, plus postage.

The *Vermont Environmental Report* was printed with assistance from the Vermont Community Foundation.

VNRC helps farmers get funds and technical assistance for water quality

VNRC has developed a proposal for Governor Howard Dean and for legislators to consider this session. The proposal, if funded, would provide assistance to small and medium-sized farmers to implement nutrient management practices and conserve riparian buffers around streams. Most state funding is currently spent on manure pits. As Guy Choinere, a dairy farmer from Highgate, says, "the manure pit is only as good as the manager." Guy, along with Rural Vermont and the Sierra Club, assisted VNRC in developing the proposal. Guy is pointing out that a manure pit alone cannot protect water quality. Farmers need to know how to apply manure and chemical fertilizers to meet both goals of plant fertility and water quality protection. Buffers are the necessary safety factor treating the nutrients and bacteria in runoff before they enter the stream.

VNRC's proposal would also provide technical assistance to farmers to implement the AAP's, Accepted Agricultural Practices. These are the minimum practices that all farmers must follow. Since the AAP regulations were put into effect in 1996, state agencies have lacked the resources to work effectively with farmers to fully implement and enforce the practices. Based on the current impaired state of many agricultural streams, it is important that Vermont provide the funding and technical assistance that farmers need to become environmentally viable.

Green Taxes: A Solution for Pollution?

The Vermont Fair Tax Coalition, founded by VNRC, Friends of the Earth, Vermont Businesses for Social Responsiblity, and Vermont Public Interest Research Group, is exploring a range of environmentally friendly tax reform options for Vermont. These options were presented as part of a major conference entitled "Are Green Taxes a Solution for Pollution? Can Vermont Shift Taxes Toward a more Efficient Economy, Healthier Environment, and Fairer Tax System?" The conference was co-sponsored by the Coalition and the Environmental Law Center and the Environmental Tax Policy Institute at Vermont Law School on December 8, 2000. For more details on the conference and the following "Overview", contact Stephen Holmes at 223-2328 or sholmes@together.net.

• Encourage Clean Affordable Energy

Sales Tax Exemption for Renewable Energy Equipment

To encourage the purchase of renewable energy equipment, this program would provide a sales tax exemption for all equipment for solar, wind, biomass, and pellet stoves. In addition, it would provide a five-year exemption for Energy Star labeled home appliances.

Renewable Energy Investment & Production Tax Credits

This solution would create a tax credit for investments in renewable energy systems and a credit for producing renewable energy. The investment credit would be based on the cost of the renewable energy system and would be guaranteed for a specified number of years at a decreasing level each year. The production credit would mirror the federal wind production tax credit, but would also include solar, biomass and methane.

• Reduce Transportation Problems

Employer-Based Transportation Benefits

This solution would encourage employees to use public and alternative transportation by offering tax credits to both employees and employers. This would match the federal program to provide greater tax credits and more publicity. This program would support use of public transit, vanpooling, and pedestrian and bike transportation.

Encouraging Alternative Fuel Vehicles

This program would provide income tax credits for the purchase of or conversion to an AFV. In addition, it would provide income tax credits for the purchase, conversion, and/or installation of alternative fuel infrastructure

• Encourage Downtown Development

Fee Exemptions for Downtown Development

This program would allow downtown projects to receive an exemption from paying some or all of the fees of the District Environmental Commission (Act 250) and the Department of Labor and Industry, both of which have been cited by the development community as adding significant costs to projects.

Make Downtown Development a Priority for VEPC

This alternative would require Vermont Economic Progress Council to use evaluation guidelines to give priority to those businesses that locate in existing downtowns or that use existing infrastructure.

Enable Designated Downtowns to Use Land-Value Tax

This solution would allow municipalities with designated downtowns the option of using land-value taxation in their downtown districts or a portion of the districts. It would permit municipalities to levy in any year separate and different rates of taxation on all real estate classified as land, exclusive of buildings on the land, and on all real estate classified as buildings and other improvements on land.

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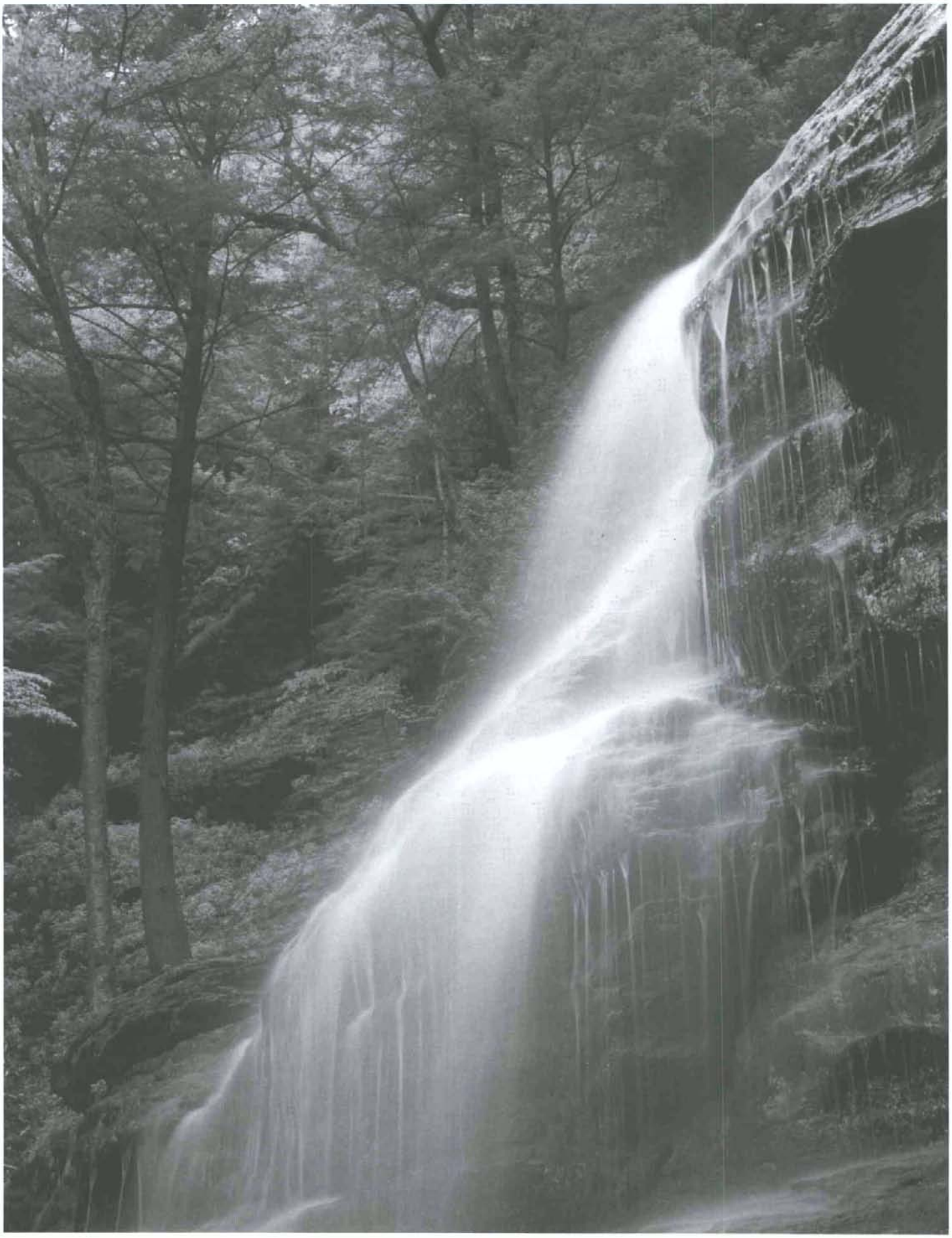
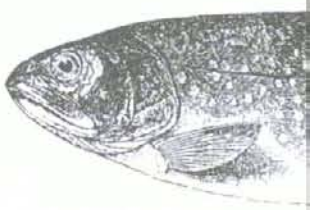


Reversing An Ancient Tradition

River Conservationists Cast A Critical Eye Upon DAMS



By Will Lindner

Much was made, in the media and in regulatory hearing rooms, of the statement Vermont's Clyde River made in its own behalf on April 30, 1994, when it stormed Citizens Utilities' Newport No. 11 dam and carved a channel around it, rejoining the river bed on the other side and rendering the concrete obstruction impotent, obsolete and ineffectual.

Anglers and conservationists had never liked that dam anyway. When it commenced operation in 1957, as a hydroelectric peak-power producer, the dam and its associated powerhouse and diversion canal choked the life out of the Clyde, which had been famous for its spring feeding and fall spawning runs of landlocked Atlantic salmon from Lake Memphramagog.

In March of 1994 Trout Unlimited, VNRC and other advocates for river ecology were pressuring the Federal Energy Regulatory Commission (FERC) to deny relicensure for the dam, and Citizens Utilities was pressuring the commission for the opposite. But once the dam was breached, the dye was cast. FERC eventually ordered the structure totally removed and the riverbed reestablished. It was the first time the federal commission had ever ordered a dam removed entirely for environmental reasons.

But the truth is, rivers rarely speak up for themselves. There are dams all over the world that obstruct fisheries (imperiling local economies), threaten aquatic species, degrade water quality, spur coastal erosion and displace indigenous people. Yet the rivers remain silent, subdued by the obstructions placed upon them.

Therefore it falls to advocates to challenge the credentials and continued existence of dams that do more harm than good – and yes, dams have done good, so much so that it's hard to imagine civilization developing without dams. For thousands of years they have created reservoirs for community drinking supplies, irrigation and recreation. They've captured water to run saw mills, grist mills, textile mills. Hydroelectricity has been the primary renewable source of power, and flood-control dams have spared thousands of communities from devastation.

But river advocates need to point out when the social and ecological price of dams is too high. Their cause is aided by the fact that as years go by more and more dams are becoming antiquated and decrepit, sometimes posing threats to the communities downstream. Jeff Reardon, in Trout Unlimited's New England office in Auburne, Maine, adds that the recovery of formerly "dead" rivers under the 1972 Clean Water Act has rekindled public interest in the waterways.

"Once, a lot of rivers were so polluted there basically weren't any fish, so people didn't worry about habitat," Reardon said. "Now, the combination of people becoming more focused on river restoration, and dams' structures having lived to their useful age, has coincided."

Throw in some success stories, like removal orders for Newport No. 11 and, in 1999, for the Edwards Dam in Augusta, Maine (extremely significant because it was the first time FERC condemned a functioning hydroelectric facility), and the previously unthinkable suddenly gains respectability.

"Dam removal is now perceived as a viable option for restoration, whereas 10 years ago it was (considered) a radical notion," said Steve Higgs, a conservation assistant at American Rivers in Washington, D.C. "Society has outgrown a lot of uses for dams. There are alternative technologies for many of the things dams have been used for: taking water for irrigation without constructing a dam, providing electricity through low-impact generation from turbines you can submerge in-stream.

"We want our rivers to be living bod-

ies again," Higgs said. "People are turning back to their local rivers and celebrating them, rather than turning away from them."

In fact, river restoration borders on – dare one say? – the mainstream. On October 18, 2000, the *Wall Street Journal* published this post-mortem on the Kennebec's Edwards Dam:

"Having a hard time revitalizing your downtown? You may want to consider knocking the dam down. At least that seems to be working for Augusta, Maine, whose downtown has been struggling for years. Life is beginning to stir there... (and the dam removal) has created a running river and 17 acres of new public spaces where a stagnant mill used to be. Real estate speculators already have begun to show up..."

SLIM PICKINGS....

Of course, there's dam removal... and there's dam removal.

VNRC and Trout Unlimited have teamed up again, fighting to eliminate the Peterson Dam in Milton, Vermont. The Peterson is a five-megawatt hydro facility perched at the critical juncture of the Lamoille River and Lake Champlain, one of four dams that Central Vermont Public Service Corporation owns on the western Lamoille. CVPS' federal license for operating the dams expired in 1988, but the utility has received yearly short-term extensions while it seeks a 50-year license renewal from FERC. Thus far, however, VNRC and TU have blocked that from happening. They contend that CVPS cannot meet state water quality standards along the river as long as the Peterson remains. Their primary complaint is that the dam presents a barrier to migrating salmon, walleye and the ancient, endangered lake sturgeon. In part because the Peterson is used for short-term, peak-power production, the dam also plays havoc with water levels, temperatures and dissolved-oxygen supply. The Lamoille, with its flow of current stymied, often violates bacterial standards.

But in going for a knockdown of the Peterson, VNRC and TU are tackling a tough issue. There is a profound difference between going after troublesome, potentially dangerous, old structures (the "low-hanging fruit," as TU's Jeff Reardon calls them, of dam removal), and hydroelectric dams that serve vested interests.

The demolition of the Edwards Dam in July 1999 has arguably provided the river-restoration movement its most exhilarating pick-me-up. But certain factors helped the campaign waged by the "Kennebec Coalition" succeed.

"The Edwards was still producing power, and its owners (the Edwards Manufacturing Company and the City of Augusta) wanted to continue," said TU's Reardon. "If that dam had generated 10 times as much power as it did, ours would have been a hard case to make."

Fairfax Dam on the Lamoille River: VNRC is advocating for appropriate flows for fish and aesthetics.

It generated 3.5 megawatts of electricity – one-tenth of 1 percent of Maine's power supply. The Coalition argued that the lost generation could be negated simply by replacing 75,000 light bulbs with energy-efficient fluorescent bulbs. Not only that, but the power sold under contract to Central Maine Power was overpriced.

Additionally, the ecological case for removing the Edwards was compelling. It blocked access to upriver spawning areas for American shad, striped bass and alewife, pretty much destroying long-ago commercial fisheries on the lower Kennebec near its outlet to the sea. And because it figured into the industrialization of the region a century before the Clean Water Act, pollution had brought the shortnosed sturgeon to the brink of extinction.

Many of those same conditions prevail at the Peterson Dam.

"It's important for people to know we are not against hydro power," said VNRC staff scientist Kim Kendall. "Hydro is a renewable, clean source of power – though it's not necessarily "green." We are chiefly concerned about dams that are in a critical place in the watershed. That's why we have a problem with the Peterson, while we don't have the same problems with the other CVPS dams upstream."

Brayden Fleming of the Central Vermont Chapter of Trout Unlimited, agreed.

"Dams need to be evaluated on a case-by-case basis," he said. "Does the amount of power produced justify a dam's (environmental) impacts? It often does. Trout Unlimited National believes only about 1 percent of hydro dams fall into the category where removal should be considered."

But the Peterson, he asserted, was one of those.

"Restoring the fishery to its condition before the dam was built in 1948 would offer tremendous recreational and environmental benefits, and bring substantial dollars to the area. Plus, it's only a five-megawatt generation plant, which is very, very small. Our economic study indicated that if the expense of replacing that power were transferred to the ratepayers, it would only be a one-tenth-of-one-percent cost increase for them, plus a similar cost to pay for the removal itself – and that would only be for two years.

"So there would really be almost no impact," Fleming concluded, "especially because the utility could choose not to pass these minor costs onto the consumers."

(For a more in-depth look at the economics of power-replacement, see VNRC's interview with Richard Cowart on page 12 of this issue.)

... EASIER PICKINGS

Human beings have been building dams practically since the species crawled out of the water (Egyptians constructed the earliest known dam on the Nile River around 2800 B.C., though dams surely go back much farther in time). This ancient imperative means there are dams

all over the place – even in Vermont – that no longer serve important purposes.

"Are there a ton of these things out there?," Jeff Cueto, state hydrologist with Vermont's Department of Environmental Conservation (DEC), asked rhetorically. "You trip over them every day. A lot of them are obsolete in terms of their initial purposes. They were built for mills and granaries and water supplies. Mostly they are a legacy from the 1800s. A lot were hydromechanical installations. There aren't many people using streams for hydromechanical purposes anymore."

Vermont – tiny Vermont – has about 2,000 dams or dam remnants across its waterways.

Pete Barranco, senior engineer in the DEC's Dam Safety Division, explains that his department wears two hats.

"We are the owner and operator of about 90 dams," Barranco said, "and we regulate about 450 dams. The Public Service Board regulates 100 or so hydroelectric dams in Vermont (although the board primarily defers to FERC for inspection of those facilities). In total in Vermont, there are about 550 what we call 'regulatory sites.'"

As defined by statute, those are dams that impound at least 500,000 cubic feet of water. The Department of Fish and Wildlife, the largest single dam owner in the state, owns about 60, constructed in the 1950s and '60s for wildlife management and fisheries. The Dam Safety Division owns another 14 dams, and Forest and Parks owns a like number.

It's surprising who owns dams in Vermont: some of the state colleges, the Department of Transportation, even the Department of Corrections. Municipalities own dams. Some dams are in the hands of private landowners, including independent power producers who generate hydroelectricity that Vermont's utilities are required to purchase under a statute written to encourage energy independence during the oil crisis of the 1970s and '80s.

Aside from these regulated structures there are an estimated 1,500 more dams, in various states of disrepair, dotting waterways large and small.

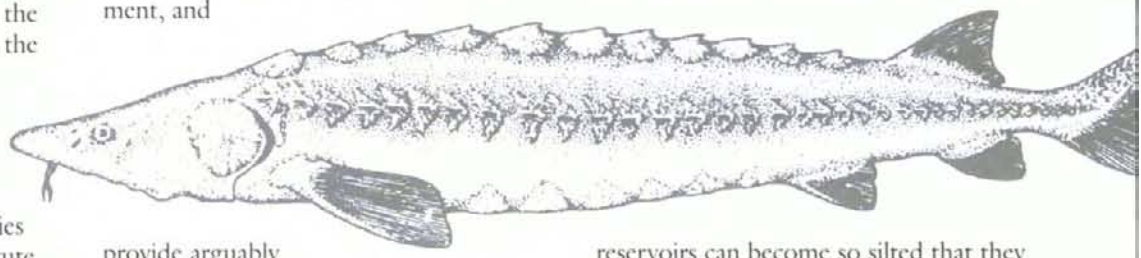
"Over the years the Dam Safety Division has removed about 10 dams," Barranco said, adding that sometimes owners are ordered to take their dams out to avert potential failures that could wipe out roads, damage property and conceivably endanger lives.

"Restoring the fishery to its condition before the dam was built in 1948 would offer tremendous recreational and environmental benefits, and bring substantial dollars to the area."

— Brayden Fleming

Two new developments might increase the pace of dam renovations and/or removals in Vermont. One is a bill recently introduced in the U.S. Congress by Sen. James Jeffords, R-Vt., the Vermont Dam Remediation and Restoration Act, which would provide $50 million for the U.S. Army Corps of Engineers to rehabilitate dangerous structures or get rid of them.

Another project, just getting off the ground, is VNRC's program, Expanding Fish and Wildlife Habitat Through Nongovernmental Partnerships to Decommission Dams. With this program, VNRC is beginning to work cooperatively with communities, utilities and other stakeholders to eliminate 10 Vermont dams which are harmful to the environment, and provide arguably minimal benefit to their owners and users. Most are hydroelectric facilities. The list includes dams on the Clyde, the Passumpsic and the Mississquoi rivers.



First up, though, is the Jackson Dam in Hardwick, which is owned by the Hardwick Electric Department. VNRC, the department and Hardwick community leaders have begun to examine the value and benefits of the dam to the community and consider whether Hardwick would glean greater benefits from removing the dam and redeveloping the waterfront for recreational purposes.

"This is a different model for dam removal," said staff scientist Kendall. "Part of the idea would be to compensate the electric department for the loss of the dam's value and identify how that value can be replaced. We want to engage people, to find out what their image is of a healthy river and how it can contribute to their town."

Hardwick rose to the forefront of this new effort partly because the waterway is not healthy now. The dam blocks off a part of Alder Brook to form an impoundment called Hardwick Lake. It releases water to a generating station downstream capable of providing 800 kilowatts of power – about 10 percent of the department's load – during the part of the year the dam and power plant are in service. One reason Hardwick has been receptive to VNRC's approaches is that, as Hardwick Electric General Manager Joe Bongiovanni put it, "We have a situation." ("Houston, we have a problem.")

"Last year we released silt into the river when we drew the lake down, which we do as a preventive measure before each winter because the river has a long history of floods. Now we're dealing with a mitigation remediation required by the Agency of Natural Resources."

(This is not a problem unique to Hardwick and the Jackson Dam. Dams disturb a river's natural sedimentation processes by blocking the flushing of silts and soils downstream, just as they block the migration of fish upstream. Eventually reservoirs can become so silted that they lose their water-containment capacity. That increases the risk of a sudden harmful wash of silt into the riverbed.

There can also be other repercussions. When a dam traps soils and sediment behind its walls it increases erosion downstream because there is less soil moving with the water and replacing the soil dislodged from the river bed. With major rivers and large installations, like the Hoover Dam on the Colorado River, that pattern deepens the river bed and lowers the surrounding groundwater table,

necessitating costly irrigation to save crops. Egypt's Nile River once carried 124 million tons of sediment to the sea each year, but the Aswan High Dam has largely stemmed that flow, reducing soil fertility at the once-rich floodplain. And when rivers like the Nile and the Volta in Ghana reach the sea without a sediment load, the coastline begins to erode. Since the construction of the Askosombo Dam on the Volta, Togo and Benin have reportedly lost 10 to 15 meters of coast each year.)

Those problems far exceed Hardwick's "situation." But the electric department's obligation to mitigate the environmental damage comes on top of other concerns.

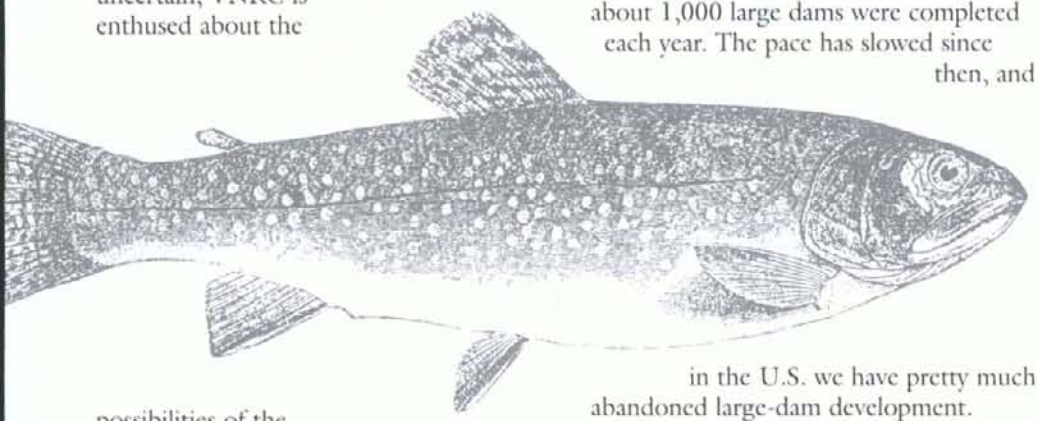
"There are certain risks and costs for us in owning and operating the dam," said Bongiovanni. "There's insurance, O&M (operation and maintenance) and liability."

Department commissioners have therefore agreed to participate in a study of the dam's value to Hardwick and the potential value of an undammed waterway (which could still generate electricity in a "run-of-the-river" mode).

"We do gain economic benefit from being able to store water," Bongiovanni pointed out, "and we would want the waterfront to continue to be a nice place."

Though the project is at its very beginning, and the outcome uncertain, VNRC is enthused about the possibilities of the Partnership program.

"We think this is a good, collaborative model where everyone wins," said Kendall. "If it can work in Hardwick we may be able to replicate it in other communities and restore more rivers in the state."



Cultural icons

Of course we could tear down every obsolete dam in Vermont, and every dam that's doing more harm than good to our environment and economy, and the world would be no better off. On a national and global scale, as well as a local and regional one, the environment is a system. What happens beyond our borders is as critical as what we accomplish within.

"We knew the river would restore itself, but we had no idea it would happen so quickly."

— Elizabeth Maclin

The concern over ecological harm caused by dams is national and international in scale. The International Rivers Network (IRN) lists China and the U.S. as having the most "large" dams (defined as a dam higher than 15 meters, approximately the height of a four-story building; there are also "major" dams, which might be 10 times that height). China has 19,000 large dams, and the U.S. 5,500.

In total, there are about 40,000 large dams worldwide. They impound an area the size of California – 0.3 percent of the world's land mass.

The great dam-building era was the middle decades of the 20th century, when about 1,000 large dams were completed each year. The pace has slowed since then, and in the U.S. we have pretty much abandoned large-dam development.

But we still have its effects to deal with, as well as the effects of less-imposing structures. According to American Rivers, there are about 75,000 dams higher than six feet in American waterways, plus many thousands of smaller, sometimes unproductive, abandoned and dangerous dams. Because the average useful-life expectancy of dams is 50 years, the majority of those dams should be reviewed, renovated or removed over the next 20 years.

FERC's periodic relicensing requirement presents an opportunity to examine the nation's 2,400 hydroelectric facilities. And increasingly those might be subject to challenge on economic grounds, with changes occurring in the structure and regulation of the nation's electric industry. Technological changes like "distributive generation" could alter the marketplace drastically. (Whereas now, most of the power we receive through the electric grid is generated in large, centralized facilities which then send it to consumers over hundreds of miles of high-voltage transmission lines. With distributive generation utilities and even individual users – primarily industrial and large-commercial users – power could be produced at smaller, more localized facilities, perhaps even on-site, employing an array of newer, more efficient technologies.)

Yet the impact of electric industry restructuring on facilities like Vermont's Peterson Dam is hard to predict. Said Trout Unlimited's Jeff Reardon, "Changes in the power market could create a premium for small hydro. Or it could go the other way."

So dam removal must be contemplated on a case-by-case basis. American Rivers reports that campaigns waged by local coalitions, frequently with national assistance, have accomplished the removal of more than 465 dams in the U.S., with over 100 others being considered for removal. Projects can be found in nearly every region of the country. Some of the most significant removal projects under consideration are:

- the Embry Dam in north-central Virginia. Built to create a municipal water supply for Fredericksburg, the Embry is the only dam on the main stem of the Rappahannock River. Its removal would allow the state to re-establish river herring and other fish;
- two dams on the Elwha River in Washington's Olympic Peninsula. These are hydro dams, but the Clinton Administration, persuaded by citizens, activists and members of Washington's congressional delegation, has allocated some $86 million for their removal, in hopes of restoring once-abundant runs of trout and Chinook salmon;
- the Matilija Dam in Ventura, California, one of the largest dams on the target list. The Matilija provides an example of the complexities of dam

removal. Constructed for flood control and water supply, its reservoir once contained 7,000 acre-feet of water storage. Now, silt behind the dam has reduced that to less than 500 acre feet, making the dam virtually useless for either of its original purposes. However, removing it, while preventing enormous degradation downstream, will be a costly and difficult engineering feat.

The most politically charged dam-removal proposal, however, centers on the Snake River in Washington. The Snake, the Salmon (Idaho) and the Columbia (Oregon) comprise a 500-mile corridor that was once perhaps the most fertile ground for salmon in the U.S. At the time of the Lewis and Clark expedition (1805), some 16 million adult salmon returned through this corridor to spawn and feed. Today, that number is about 5,000, and the returning ocean fish have difficulty navigating past the first 50 miles on the Columbia.

There is little disagreement that the cause for this decline is four federally owned hydroelectric dams on the Snake River. There is much disagreement, however, over a solution for the problem. Explains Justin Hayes of American Rivers, "We're talking about a big action, a dramatic action (in removing those dams). Also, it moves us fundamentally away from a heartfelt Western paradigm, where dams equal progress.

"Some politicians have dug in their heels. Sen. Slade Gorton (R-Wash.) has said the dams will come down over his dead body."

Such is the controversy over the Snake that George W. Bush, in one of this fall's presidential debates, expressed inflexible opposition to dam removal there. But proponents are not giving up. They recognize there would be regional economic impacts to losing the four power dams, which should be alleviated in any dam-removal scheme. But they also point to studies that predict notable economic benefits from the restoration of habitat.

"These are salmon we're talking about," says Hayes, "the cultural icon of the American Northwest."

"Learn from your experience"

Others love their fish and fish habitat just as much as Americans. The International Rivers Network reports that Atlantic salmon have disappeared from most large rivers on the European Atlantic coast, including the Rhine, the Thames and the Elbe. Yet in 1998 a French organization called the SOS Loire Vivante ("Living Loire") won the removal of two dams – one of which was owned by the government utility – to protect the remaining Loire salmon. Another French dam was destroyed because sedimentation had ruined its water-storage effectiveness.

IRN also cites ongoing dam-removal efforts in Canada, the Czech Republic, Thailand and Colombia.

Picture taken in 1909 of an area referred to as Milton Falls on the Lamoille River — before damming took place.

"Dam removal is pursued mostly by environmental groups in France and the Czech Republic," said IRN River Revival Coordinator Elizabeth Brink. "In Thailand opposition to dams is very much a social movement because people have been displaced. (Two Thailand dams) were finished in the 1990s and people have not stopped struggling" to regain their communities and depleted fisheries.

IRN quotes a spokesman for indigenous people in Colombia, who met with Swedish engineers who had built a large dam in their country.

"We didn't come to pose moral questions for you," said the spokesman. "We came to let you know that the construction of the (Urra dam) signifies the slow death of our culture. What we are asking is that you learn from the experience of Urra and reform your environmental policies so you don't make the same mistakes in other parts of the world."

The Colombians also requested guidance when the time came to decommission the dam. If that comes to pass they might see for themselves the remarkable powers of the earth to heal itself – the same poignant and inspiring outcome Vermonters hope to see played out on the Lamoille River, post-Peterson, just as it was on the Clyde, where this much at least has been accomplished: There is water flowing freely in a mile-long stretch that used to be encumbered by the Newport No. 11 dam and a 3,000-foot-long penstock that diverted the Clyde from the riverbed and its natural occupants, and used instead for mankind's allegedly better purposes.

And in Maine, 17 miles of the Kennebec River, confined and polluted for more than 150 years, have rebounded vigorously in the year since the Edwards Dam was destroyed. Migratory fish have returned, natural sediment patterns have resumed, and the river has been brought into compliance with drinking water standards.

"We knew the river would restore itself, but we had no idea it would happen so quickly," said Elizabeth Maclin of American Rivers. "Within a couple months of removal there was hip-high vegetation on the sides of the river. Two million alewife have moved up the river, and every one of the seven migrating species we were concerned with has already been seen above the dam site. The people are back, too, canoeing, kayaking and fishing."

Perhaps our centuries-long fascination with dams is coming to an end, to be replaced by an appreciation of living rivers, flowing freely in their natural state.

Where Energy And The Environment Meet

VERMONT'S RICHARD COWART ON EFFICIENCY, RESTRUCTURING AND RENEWABLES

For seven years VNRC, along with Trout Unlimited and other advocacy groups, has pursued a vigorous campaign for the removal of the Peterson Dam in Milton, a five-megawatt hydroelectric facility owned by Central Vermont Public Service Corp. VNRC's chief concerns are the dam's proven negative effects on fish habitat and the once-thriving aquatic ecosystem that is now in a state of debilitation in the western reaches of the Lamoille River.

Yet opponents of VNRC's decommissioning efforts, particularly CVPS, have raised a valid concern. The Peterson provides "peaking" power for energy consumers (power produced specifically to meet times of high electricity demand), and after a summer characterized by price spikes and power shortages in many parts of the country some Vermonters wonder whether the dam can safely be sacrificed for environmental concerns.

In truth, hydroelectric generation is only one of many points where environmental and energy policy meet, and often appear to clash. And with the nation's electricity system in the throes of change ("restructuring"), energy policy looms as an environmental issue of the greatest importance.

Fortunately, Vermonters have a singular resource for helping us understand the issues involved in energy policy, and the choices and alternatives that policy makers and industry leaders have before them. Richard Cowart of East Calais is a former chair of the Vermont Public Service Board (1987-1999). He is now Director of the Regulatory Assistance Project (RAP), a non-profit organization that assists state regulators, federal agencies and national governments around the world (such as China, India, Brazil and Egypt) to analyze and develop sound energy policies.

Formerly a professor of environmental law and counsel to the state Environmental Board, Cowart was appointed to the Public Service Board by Gov. Madeleine Kunin in 1986 and became its chair the following year. In 1993, Cowart was reappointed by Governor Howard Dean. He has now carried to the national energy-policy debate values that many Vermonters would recognize as their own, including protections for low-income electricity consumers, and comprehensive investments in energy conservation by electric utilities. His thinking and leadership have been felt at the highest levels of the restructuring and energy-policy debate.

"This is someone who has had immense influence both on environmental and equity issues," Ralph Cavanagh, energy program director for the Natural Resources Defense Council, told The (Barre-Montpelier) Times Argus early this year. "Pieces of Rich Cowart are now in every serious restructuring bill pending in Congress."

For this interview, Richard Cowart (RC) was joined by VNRC Executive Director Elizabeth Courtney (EC) and VER contributor Will Lindner (WL). The interview has been edited due to space considerations.

EC: Basically, the issue before us is removal of a five-megawatt hydroelectric facility on the Lamoille River, and the company that owns and uses it is saying, "What will be done to compensate for the loss of that power if the dam should go?" We're interested in exploring the possibility of reducing demand, especially the peak demand that this dam provides, by working with the (utility's customers) – the Huskys, the IBMS. I don't know if many are doing that kind of work, but it sounds like you (the Regulatory Assistance Project) are.

RC: We should talk about demand-and-supply *balance* as one of the key, undeveloped issues of energy policy. I haven't studied the Peterson Dam debate, and can't comment on it specifically, but we should discuss the trends and choices that are now driving power plant siting decisions all across the nation.

EC: Yes. If you're looking at it from the sustainability mindset, it's not just the responsibility of the power company to supply demand. Solving the statewide reliability issue seems to us to have a lot to do with raising the users' awareness of their responsibility in reducing demand.

RC: I would state it a little differently. I would say it's the responsibility of government to create *opportunities* for consumers to lessen their demands on the electric system. When presented with these opportunities in a way that values them properly, users will quite rightly modify their electric demand, lower their bills, and lower the total cost of providing energy services on the grid.

WL: In Vermont utilities have been required to help users, encourage users, to bring their usage down. It was you who

initiated that policy if I'm not mistaken. But in the scenario Elizabeth poses, another party – VNRC – comes in, going to the Huskys and IBMs to work with them. Is that a feasible dynamic? And how would the regulators and the utilities respond to that?

RC: It is feasible, and ultimately necessary, for us all to create both market and non-market mechanisms so that consumers are able to take advantage of cost-effective energy savings and demand-management opportunities. We need to create systems in which the value of those new opportunities is revealed through both regulatory and pricing systems.

EC: Can you give us an example?

RC: You mentioned the peak load problem. Peak load is a terrific problem in the United States today. The national growth in summer peak demand is advancing very rapidly. Over a recent four-year period, the nation's summer peak demand increased by 56,000 megawatts. Now, to put that in perspective, 56,000 megawatts is 56 Vermonts. That's the equivalent of adding to the U.S. electric grid the entire six states of New England every 18 months. This is a pattern since the mid '90s. It's not a blip. The U.S. Department of Energy now projects that, at current growth rates, the U.S. will need to build new plants equal to the entire electric capacity of Germany *and* Japan in the next twenty years.

Meanwhile, we are experiencing some power shortages, power warnings, occasional blackouts, brownouts, across the country – in California, New Orleans, Chicago, New York and New England. Events in the last two or three years are reflecting a real lack of balance between supply and peak demand. The conditioned response to this on the part of most decision makers, and in fact for the people in the street, is to simply assume, "Oh. We're having a power problem. That must mean we need more construction. People assume that what we need is a wires-and-turbines policy."

Here's a very important point: Reliability in the electric grid is about maintaining a balance of supply and demand at all moments. For us to look at an imbalance and immediately assume the correct intervention is on the supply side is ignoring many proven technologies and policies that would just as easily resolve the balance on the demand side— and while we're at it with lower environmental impacts and lower costs. Very sensible, conservative studies demonstrate that at least half of the demand growth that the nation is experiencing and will experience over the next decade could be met less expensively through modest improvements in energy efficiency and in load management.

Richard Cowart

EC: And what are these studies?

RC: This is not new news. Many studies—from the national energy labs, utilities, the Electric Power Research Institute, and others—support this conclusion. Last summer ACEEE (the American Council for an Energy Efficient Economy) identified at least 100,000MW of potential low-cost energy savings in just four program areas: "tuning-up" heating and cooling systems in existing buildings, improving building standards for new construction, improving commercial lighting systems, and setting higher efficiency standards for residential air conditioners. Air conditioners are driving summer peak loads in almost every region of the country, and they could be much more efficient than they are today.

EC: Does the technology exist, and is it on the market?

RC: The technology has been demonstrated and there is no question it can be made available on the market if the Department of Energy sets the standards. The DOE has just announced its intention to set a higher standard. We think it should be higher than the one they've announced, but what they announced would be an important improvement.

EC: Is this sort of equivalent to the tier-two air quality standards that are being set by the EPA right now?

RC: It's not even close to that. The really high-end stuff that you just alluded to is not what we're talking about with these air conditioners. We're talking about just getting basic efficiency installed in new air conditioners.

WL: I'm surprised. Considering this endless economic growth we keep hearing about, I would have thought that – with the equivalent of adding New England to the grid every 18 months – demand was driven by technology and manufacturing. That's not the case?

RC: Manufacturing is not the principle driver. In California last summer, about 30 percent of peak load was air conditioning. Of course, a lot of it is commercial and industrial air handling—new WalMarts as well as new office buildings. There's such a huge installed base of air conditioning load that a program that's targeted to air condi-

tioning can have enormous impact.

There's a new "urban myth" that rapid load growth is being driven by computers and the internet. Yes, server farms and some high-tech industrial parks are very electricity-intensive, but in many cases, e-commerce uses less electricity than the buildings and services it replaces. The real effect of the "digital economy" is in its demand for greater electric reliability and power quality. These are needs, by the way, that are advanced quite well by the sort of energy efficiency and load management programs we've been discussing.

EC: Where is the growth happening?

RC: In almost every region of the country. One of the unintended consequences of the move to competition in electricity has been the dismantling of our nation's programs for energy efficiency. Since 1994, when the movement toward restructuring began, national utility spending for demand-side management programs has been cut in half. One of the consequences of the decline in attention to efficiency has been rapid increase in growth and demand.

What's tragic about it is that we learned during the prior decade that these programs were effective. In total, the energy efficiency programs that more than 500 utilities delivered across the country saved the nation about 30,000 megawatts of power – that's one and a half New Englands – at a cost of about somewhere between 2 and 3 cents a kilowatt-hour saved. So consumers were getting a heck of a good deal from the utilities' demand-side management programs.

EC: How do we regain that ground?

RC: Through a series of concentrated actions. Number one, we continue to promote standards that will build efficiency into the nation's infrastructure – such as the appliance efficiency standards for air conditioners, and the Energy Star programs for light bulbs, computers, refrigerators. That's the least expensive way of delivering savings to the customers and also lightening the load on the entire grid. For example, the average refrigerator sold today uses half the electricity – or less – of the average refrigerators consumers bought 20 years ago, with no decline whatsoever in the quality of the unit you put in your kitchen.

WL: What other standards should we improve?

RC: We still need to make improvements in refrigerators. Air conditioners are the biggest bit of unfinished business in this area. There are newer washing machines that are far more efficient, and actually do a better job of cleaning and less damage to clothes than vertical-axis washing machines. We need to do a better job of managing the so-called vampire energy losses from televisions, VCRs, and computer terminals. Consumers think are turned off but they are actually drawing power all the time; they could power down to something like a tenth of what they're drawing now. Those are some practical things.

In the commercial and industrial sectors, there are enormous opportunities: variable-speed drives in industrial facilities, proper design of commercial buildings, the use of combined heat and power applications in industry, where electricity that's generated on-site also generates heat that is used in industrial processes or to heat the building. This is not science fiction. These technologies exist today and have been proven in many applications. But we have not developed the policy infrastructure to deliver those savings to customers.

EC: How do we do that?

RC: (laughs) You're saying, "Rich, what is your job?" This is what I do.

In most places in the US we have not established the energy market mechanisms that deliver the right price signals to utility customers. Nor have we given the proper profit incentives to utilities to invest in efficiency. Let's get back to the peaking issue. In a peak hour electricity prices are spiking phenomenally, and it helps to understand the reason for this. Electricity, unlike other commodities, can't be stored. Electricity at midnight can't be stored up for use at noontime tomorrow. This means that shortages can develop on an electric system like that (snaps fingers). And because everybody is interconnected simultaneously, a shortage that develops on a grid potentially affects every single consumer. So reliability managers are under strict instructions to do whatever it takes to balance supply and demand at that instant, pretty much regardless of cost.

What do they do? They go into the market and purchase new supply, at rates that might be 100 or 200 times the normal market price. You end up in a situation where reliability managers are paying whatever the market will bear. Now, this isn't because these units cost that much to run. You have units that cost maybe $50 a megawatt hour to run selling their power for $500 or $1000 per megawatt hour to the grid managers in order to keep the lights on.

So ask yourself a question: What would it be worth, to all of us, for someone who had a load management opportunity in the region to get a signal from the independent system operator (ISO–the central dispatcher) saying "We're approaching a price spike. How would you like to be paid to reduce your demand for the next hour?" You could cycle your air conditioning. There are programs now that take, say, the air conditioning in an office building and adjust the thermostat for the next three hours by three degrees. If you do that with enough office buildings you've just bought online the equivalent of a power plant. In a New Jersey program tens of thousands of residential air conditioners receive a radio signal and cycle off for 17 minutes during peak hours. Comfort in the house isn't really affected. Customers hardly notice it. But across tens of thousands of air conditioners, you have solved the reliability problem without having a power plant sitting there, 99 percent of the time doing nothing so you can turn it on 10 hours or 20 hours a year.

EC: Or you don't have a power plant sitting there—specifically, a hydroelectric facility that has the power to meet those peak loads because of the water impoundment behind it.

RC: Right. The principle applies to any peaker, regardless whether it's a dirty diesel in downtown Chicago…

EC: Or a hydro facility that happens to be sitting on a sturgeon hole.

RC: Well, the principles are the same. The nation's reliability problems are worsened by a fundamental flaw in electric markets: the demand-side is not yet actively bidding against supply on the regional trading floors. Here's the challenge: how can we create a market that creates incentives for entrepreneurs to talk to the owners of office buildings, residential air conditioning owners, the owners of shopping centers, and say to them, let's use a little software and some interactive communication capabilities and turn you into a peak load power plant, so that when prices are spiking, when supply is short, we can interactively connect with you and cycle equipment in your building in a way that reduces peak demand.

EC: Do you build in benefits to the user to cycle down?

RC: You pay them to do it.

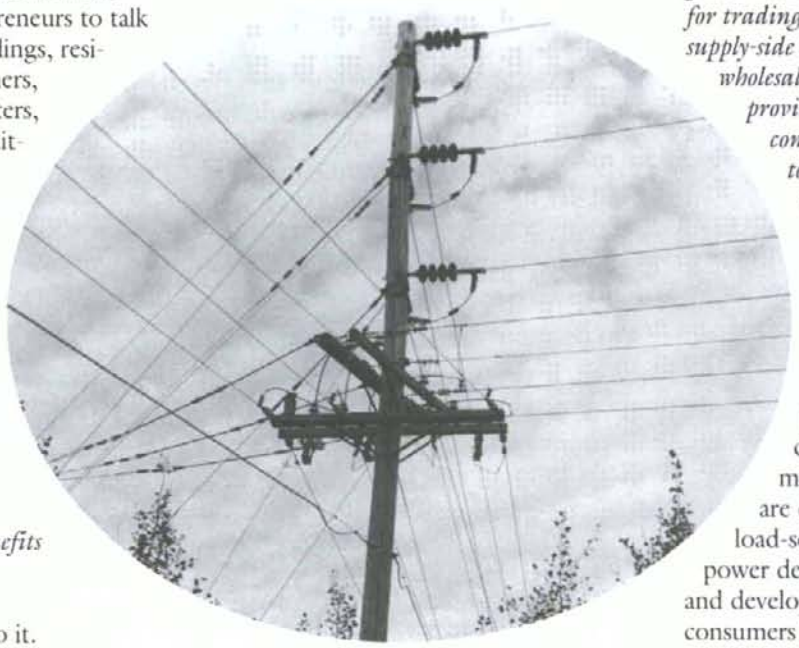
EC: Its cheaper to pay the user to cycle down than it is to pay 200 times the normal price for electricity.

RC: When we're paying $6,000 a megawatt hour (that's $6 a kilowatt-hour), as we did in New England last May, to produce electricity from some peaker, we would all be better off to pay somebody 10 cents a kilowatt hour to avoid demand during those peak periods.

Sometimes people think this is going to require enormous investment in infrastructure and modification of our consuming habits. Good news: in New England, 9 percent of the generating capacity is used less than 1 percent of the hours of the year. If we can manage load during 1 percent of the hours of the year, we could reduce our peak demand by 9 percent. If we did that we could lower our annual spot market power costs by 16 percent.

And it's more extreme in other places. In Florida, 15 percent of the generating capacity in the state is used less than 1 percent of the time.

We also lower all the environmental consequences of the wires-and-turbines approach to energy demand. And I emphasize that this is a market mechanism; it's market driven and optional to consumers, to manage load cost-effectively, provide savings to the system and



achieve a more reliable system. Such a market will attract entrepreneurs because they're going to make money doing it. This is a great business opportunity.

WL: Who pays the users who sign up for this?

RC: You and I pay them. Everybody on the grid pays them, just as they would pay for the cost of going out and paying that peaker.

WL: So, it's built into the pricing mechanism, in the rates or something?

RC: Depending on where you locate this, it's either paid in wholesale rates that utilities pay, or in retail rates that utilities charge. Ultimately consumers would pay less because demand is being managed on the system, rather than paying more for peak power because it's not being managed. The California Public Utilities Commission just released a report concluding that, this year alone, California consumers have paid *$4 billion dollars* in extra power costs due to the generators' ability to charge higher prices when supplies are tight. Better market structures, incorporating energy efficiency and load management programs, could have avoided much of that pain at much lower cost.

(Here, Mr. Cowart describes a regional power market, similar to the stock market, for trading "demand-side" bids, as well as supply-side bids among utilities and other wholesale traders. This market would provide opportunity for energy service companies that work with customers to install efficient equipment, and to manage load when prices are high. At the wholesale level, these regional markets are regulated by the Federal Energy Regulatory Commission (FERC).

My message to state regulators is to make sure FERC creates the trading floor, and make sure business opportunities are created for utilities and other load-serving entities to get in the power demand management business and develop business relationships with consumers in a way that allows real-time, interactive trading to occur.

EC: Is this happening anyplace?

RC: Yes. At the wholesale level, such markets are now being launched in the Mid-Atlantic states, and in New England; we have been working with state regulators and with FERC to promote their adoption elsewhere. At the retail level, responsive load programs are an adaptation of "interruptable contracts" that many utilities have used for years. For example, nearly every ski area in Vermont has a snowmaking contract with its utility which has been supported and approved by the PSB for years, in order to compensate ski areas for moving their snowmaking load off-peak. That's one of the reasons Vermont's peak load growth has been significantly less than it otherwise would have been over the past decade. And our overall capacity utilization of the electric system has improved quite significantly, which leads on average to lower bills.

Earlier, I gave an example of a utility in New Jersey using radio signals to air conditioners, and customers being paid a monthly fee allowing their air conditioners to be controlled in that fashion. In Vermont we have long had timing and cycling controls on electric hot water heaters.

EC: What is your long-range vision of a clean and sustainable energy mix?

RC: First, you have to consider electricity and other fuels somewhat separately. We do need to understand that electricity is essential as the underpinning and driver of the digital economy, and as a state policy it's important to have a vision for Vermont that includes the provision of an adequate supply of high-quality electricity. The good news is that with the application of realistically available technology, we can have a sustainable and environmentally sound electricity supply, as well as an economically affordable and high-quality electricity supply.

That's the vision. How do you get there?

In Vermont it's a little different from the rest of the country. We think of the Industrial Age as being coal driven, and we're now in the Information Age. Well, guess what? The Information Age is coal driven in most of the United States. Fifty-seven percent of the nation's electric supply comes from coal, and our national reliance on coal is not declining, mostly because the policies we're pursuing as we increasingly electrify the economy do not fully reflect the environmental costs of our supply choices.

That's a national policy issue, one that Vermont can't solve by itself. Of course Vermont's congressional delegation deserves a lot of credit for its work on energy and environmental issues.

EC: But we of course are suffering the consequences, environmentally, of the decisions made elsewhere.

RC: Part of Vermont's policy agenda is to continue to hammer at these issues at the national level; part lies in aggressively pursuing opportunities for demand management and energy efficiency, and part of the solution is creating more efficient energy markets.

Let me add another thing to that vision: a set of regulatory policies that deliver the right incentives to wires companies and energy-service providers—so that the profit signals we send are not signals that simply reward brute strength—pushing electrons down a wire— but rather reward smart energy policies, interactive software-driven energy polices that meet consumers' needs at lower costs. We don't have that system.

One model that Vermont has recently embarked on, which stands as a model for the nation, is the Energy Efficiency Utility. The Vermont Energy Efficiency Utility (see page 21 for more information) is a very important breakthrough because it's an institution that exists solely for the purpose of saving customers money. It is not encumbered by the disincentives that the owners of wires and the owners of generation have with respect to energy services. We are being asked about the EEU in many places, from Brazil to California.

One problem you're seeing across the country is that the generators of electricity have an interest in selling more power, particularly at peak because they're making huge windfall profits. Wire companies charge for delivery, and the more power they deliver the more money they make. In many states, legislators have given the conservation programs to the wires company, on the theory that the wires company will still go out and aggressively pursue conservation. Well, if you look at the way they make money, they have no incentive whatsoever to pursue conservation. They have incentive to *look like* they are pursuing conservation, but not actually to achieve very much. The Energy Efficiency Utility solves this problem by giving the job to somebody whose goal in life is to save customers money.

So that's part of the message: You have to fix regulation to achieve desired goals.

EC: I want to talk about renewables, and whether you think there is a significant potential for the use or the creation of in-state renewables. And in relation to that, the hydroelectric issues. Have we in Vermont adequately studied other renewable energy alternatives?

RC: First, it is helpful for Vermonters to understand a couple things about the situation. Vermont in recent years has received about 15 percent of its total electric supply from in-state, small-scale renewables. The national average is closer to 1 percent. In Congress, when they talk about creating a renewable portfolio standard for the nation, a number of the bills talk about 2 percent as the starting place. So it's helpful to understand that Vermont is already one of the nation's leaders.

EC: What percent of that is hydroelectric?

RC: Probably about half. We have tow medium-sized wood-chip plants (McNeil and Ryegate), the GMP wind turbines, and a few samll methane generators. The rest is hydro. But the place we start from is significantly less fossil-based than the rest of the country.

There is significant good news here for Vermonters. Over the course of the past twenty years, we have met 100 percent of our peak load growth associated with our growing economy through energy efficiency and small-scale, in-state renewables projects. Since 1980, Vermont's gross state product has grown by nearly 75%. Meanwhile, up to the time I left office in 1999, our electric peak demand had grown by less than 20%, from about 850MW to about 1000MW, while we had added over 160 MW of in-state, small-scale, renewable generation. For twenty years, we have met all of our peak-load growth through demand mangement and local renewables. There isn't another state in the nation that can say this. It's little known, but it's a great success.

EC: If we're so successful in supplying that kind of energy, why is it that we ran into the problem last year when a phase-angle regulator crashed. What was that all about?

RC: This is another very important reality about electricity, which is that no state is an island. In an increasingly regional wholesale market with a regional transmission grid, events outside of Vermont have dramatic effects within Vermont. Vermont is part of a significant

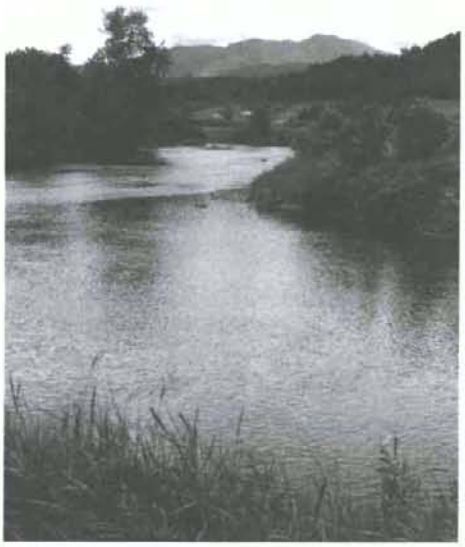
export/import market. Vermont Yankee has always sold a very large fraction of its output out of state, and we have always relied on imports from New York (Niagara and St. Lawrence) and Hydro Quebec ever since the system was developed.

The answer to your question is that the regional transmision grid and Vermont's generation mix are two separate things. There are instances where generators in particular locations must be run (or not run) to maintain balance on the regional transmission network, and these requirements cannot be ignored. However, for the most part, the regional network is not greatly affected by the output of small, dispersed generators. The operation of the regional network is driven by the power needs of New York, Boston, and Hartford, and the output of Seabrook, Hydro-Quebec, Vermont Yankee and other large power plants; it isn't driven by the output of Vermont's small generating units.

WL: Perhaps we can talk about potential of other renewables; the potential of wood, the potential of wind.

RC: If you want to talk about energy generally, as opposed to electricity – the point I made about Vermont not being an island is true in spades for oil and gas. It's apparent to all of us right now that we are price takers in the world energy market with respect to gasoline, heating oil, propane and natural gas, and that the best way for Vermont to control its own destiny in this area is to manage our demand effectively so that we get the best bang for the buck on the energy dollars we are exporting to import fossil fuel.

Act 250's high-performance standards with respect to energy efficiency in new construction have delivered untold millions of dollars in savings to Vermont consumers. The fact that for the past 30 years the building standards in Vermont have utilized something close to the best available technology for use of energy in new construction has meant that the built environment in this state is helping to stem the outflow of dollars that we would otherwise be paying in high energy costs. Hundreds of millions of dollars have been saved due to those standards, if you consider how much construction has occurred since (Act 250) has been in place.



Lamoille River

So, building codes, weatherization programs, the Weatherization Trust Fund, the fact that we have in Vermont an ethic about practically and sensibly saving energy instead of throwing it out the window – (these are) important parts of our energy policy. That's the part we can control. We can't control what OPEC does.

EC: I just want to make sure we address the potential of wind, biomass and energy.

RC: Renewable resources in Vermont are used in other areas besides generating electricity. We have, for example, a terrific, viable, vibrant use of wood chip-based heating systems in public buildings and schools. That's an indigenous resource that is renewable, it's efficient....

EC: Can it be clean?

RC: Reasonably clean. It's easier to make it clean in large applications—such as for commercial buildings and in schools—than in smaller applications. My point is that that's an application for renewable resources that's far more efficient than it would have been to generate electricity with those wood chips and heat the school electrically. In the generation of electricity generally two-thirds of the heating value of the fuel is lost in waste heat. Burning the fuel directly in the building gives you the opportunity to save a very large fraction of potential waste heat.

Now, the cost curves on wind power have been improving dramatically, and (wind) nationwide is the fastest-growing renewable resource. Unfortunately, as a fraction of our nation's electric supply it's still very small. And it's going to take some doing to really capture the enormous potential that exists nationally.

EC: Is that potential enormous in Vermont?

RC Vermont is generally thought to have ample but not extraordinary wind resources, and because of our settlement patterns and aesthetic traditions the opportunities aren't as great as they are in Nebraska and Wyoming and West Texas.

WL: Does wind fit into a scheme that you think is marketable?

RC: It does fit into an overall plan, for a host of reasons. The problem with coal isn't that it's too expensive; the problem is that it's too polluting. We have plenty of coal available – we're the Saudi Arabia of coal, as I heard a coal generator say last week. Now, do I see a future in which renewables play an increasingly significant role, along with demand management and energy efficiency? And we can then decrease our reliance on fossil fuels? Yes, that future is perfectly realizable if we have the will to do it. Among other things we have to quit subsidizing fossil fuel extraction and consumption. The subsidies that are provided to oil, gas and coal—and nuclear—exceed by factors of 10 the subsidies and tax supports that are available to renewables. So renewables are fighting an uphill battle in the market, financially, from the beginning.

Moving to an environment in which the rest of the nation meets most of its load growth through renewables and efficiency would require a change in policy. Would it be possible to do it? Yes. We could save money by meeting half of our

load growth through energy efficiency; if we cared to, we could apply the savings to pay for the renewables and meet at least a majority of our load growth through a renewables-and-efficiency policy with almost no increase in cost. Some of the restructuring plans introduced in Congress would do that. But I frankly don't expect Congress to enact that package anytime soon.

EC: How would you imagine these cost and pricing factors apply to a company's—CVPS' —operation of the Peterson Dam?

RC: I don't know enough about it to take sides. I wouldn't be surprised if (the facility) is a fully depreciated peaker. If that's the case, it costs very little to maintain and it's providing power into these energy markets where peaking power is receiving really high prices. So from a financial point of view it's a valuable asset. That has to be understood.

In terms of finding a way to avoid five megawatts of peak demand, I hope I've made it plain there are so many megawatts of demand management in the region and in the state, that it is a real shame for us all to be running after supply-side solutions – expensive supply-side solutions or environmentally harmful supply-side solutions – without first examining the less expensive demand-side options.

WL: Can the company make a claim that there's a direct correlation between Husky and IBM, or summer peaking demands, and their electricity generation? It's regional. It's not like they turn on Peterson and it directly feeds IBM.

EC: Peterson can respond to IBM and Husky's demand.

RC: That's partly right, but there is an overlay on this. Electricity managers have to consider both physics and regulatory law. Power flows across the electric grid according to the laws of physics, and it doesn't matter who owns a generator, or who owns an industrial facility. We are all interconnected across the region, and power will flow to users like water would flow across a network of interconnected pipes. But by regulatory law, the utilities in Vermont have an obligation to serve their customers' load. And when the accounting is done down at the ISO it looks to see whether the load that exists within the service territory of CVPS is balanced by generation that is either owned or purchased by CVPS. That's how the system allocates responsibility. So they do have a responsibility to meet all the load that exists in the service territory, even though the power flows serving that load are regional in nature.

WL: Then is there a correlation that if the ISO determines that CVPS' load has gone down, through the intercession of whomever, a case could be made that therefore they could decommission a certain amount of generation?

RC: Sure. If they manage their peak to the tune of five megawatts or whatever, their physical and financial obligations to the pool are reduced by that amount. Whether they decommission the unit or not is a separate question.

EC: As this collaboration moves along I'm interested in somehow making that point to the IBMs and Huskys of the region, because they are obviously important players. CVPS perhaps has a vested interest in their being users at a high rate, but we have a vested interest in their reconsidering how they manage their demand.

Rich, this has been terrifically informative, and I thank you. I feel as though I'll have more questions soon.

RC: Just let me know.

How Green Is Hydropower?

by Patrick Berry

In the middle part of the twentieth century, "green" power wasn't exactly on the radar screen. Power was produced for power's sake.

Washington State's Grand Coulee and Bonneville Dams on the Columbia River, many historians agree, played a critical role in the United States victory in World War II. The US had the raw power producing capabilities that no other World War II foe could match. Grand Coulee kept the aluminum producers in the Pacific Northwest cranking out hardware and machinery at a superior rate. Simply put, US enemies were out-gunned, out-shipped, and out-planed.

With such heroic, historic impact from power production, and in addition to flood control, irrigation, and, of course, a renewable energy labeling, dams are often put on a pedestal. Throughout the twentieth century dam construction has been considered the bench mark for peace-time conquering and industrialization. The cost of the "civilized" dam building culture, however, has sometimes been dear. So dear, in fact, that American society is now faced with the question of whether or not "renewable" hydropower has been worth the environmental price that's often been paid. Siting and operation of the Peterson Dam on the Lamoille River, for example, has tallied an immense environmental cost.

Ecologically, many scientists view the impacts levied by a lot of dams similar to a chronic illness. The problems can sometimes become worse over time until the dam becomes obsolete, the impoundment fills with sediment, and the river bares a scant ecological resemblance to its former self.

None of this, of course, happens over night. In due time, the nature of the riverine system changes: the species assemblages within the river become smaller, fish are precluded from accessing spawning, summering and wintering reaches, the

river itself becomes channelized and armored as fine gravel and rocks are washed downstream without the possibility of replacement, the dearth of a natural flood regime stunts development of riparian vegetation such as cottonwoods, and water chemistry becomes altered.

Even a small hydroelectic facility can create these chronic problems if not sited and operated appropriately. In this light, how can all hydropower get lumped into the category of renewable or green? Ironically, under federal hydropower legislation passed in the mid-1980s, any facility that produces less that 30 mW of power is considered renewable—regardless of documented impacts or the variety of ecological malaise caused by imprudent siting and operation.

There is, however, one solution to ensure that hydro can better meet green and renewable standards. The Low Impact Hydropower Certification Program has been developed so that facilities are operated in the most environmentally benign, sustainable, and renewable manner as possible. The Low Impact Hydropower Institute (LIHI) in California has "established [the program] to certify hydropower facilities that are well sited and well operated in accordance with objective and scientific environmental standards." The facility must pass muster for a variety of provisions including river flows, water quality, fish passage and protection, watershed protection, threatened and endangered species protection, cultural resource protection, and recreation.

Clearly part of the intent is to maintain ecological integrity in the face of a massive concrete structure built in the middle of the river, but part of the intent is also to create a program so that utilities can market their power on the open market as environmentally friendly.

This type of program is critical in redefining what it really means to be renewable. Hydroelectric power has the potential to be a true piece of the sustainable, renewable puzzle, but there's a long way to go before many facilities reach that ultimate goal.

By comparison, the Peterson Dam would receive a failing grade on almost every provision outlined in the program—even though its power could be marketed out of state as "green power." This moniker is dubious in light of the true efforts by the LIHI to determine what green power is really all about.

Ultimately it's up to consumers, however, to care enough to pay for accredited green power to make a difference. In Vermont, ratepayers do not choose among power sources, but the program at least outlines appropriate measures for hydro to legitimately receive the green, renewable label. In states where choice is available, the program's success relies on consumer consciousness. Hopefully that consciousness has changed enough since World War II so that the true value of hydropower is derived from believable and laudable renewable standards.

Information on a few of Vermont's Energy Groups

In researching alternative energy sources, VNRC found helpful information from many different governmental organizations, businesses, and non-profits. The following is a sampling of a few of these groups which are located in Vermont. We wanted to give our readers a clearer understanding of what these groups are focusing on, so we asked each of them to write a brief description of their work. If you have any further questions, please contact VNRC or the groups directly.

Vermont Department of Public Service: Energy Efficiency Division

By Scudder Parker
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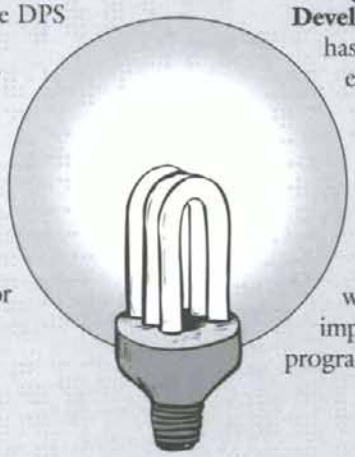
The Energy Efficiency Division of the Vermont Department of Public Service (DPS) is a resource for Vermonters interested in all forms of energy efficiency and renewable energy.

The DPS is Vermont's energy planning and advocacy agency and plays many roles in developing and implementing Vermont energy policy, including:

- **Planning for Efficiency and Renewable Energy:** The DPS periodically publishes Vermont's "Twenty Year Electric Plan" and "Comprehensive Energy Plan." These documents contain a wealth of information about Vermont's energy use and policy options for improving efficiency and renewable energy use.



- **Energy Efficiency Program Development:** The Department has overseen utility energy efficiency programs, helped create Vermont's unique new Energy Efficiency Utility, Efficiency Vermont, (EVT) and is in charge of evaluating the performance of EVT as well as working with it to improve and expand its programs.

Information on a few of Vermont's Energy Groups

- **Renewable Energy:** The DPS works on numerous renewable energy development projects, including Solar, Wind, Biomass and Methane energy.
- **Codes and Standards:** The DPS has for years reviewed the energy efficiency of proposed developments under Act 250's energy efficiency criterion, 9 (J). The Department took the lead in getting a residential energy efficiency standard developed, and is in the process of developing a commercial building energy standard.
- **Public Information:** The Department provides energy-related information to consumers. Call the toll-free number listed above for information and free materials on energy questions and a chance to talk to a staff person about specific energy problems and choices. The DPS web page listed above provides additional information. In particular, click on bullets labeled "Keep Warm" and "Renewable Energy and Energy Efficiency."

NRG Systems, Inc.

by David Blittersdorf
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davidb@nrgsystems.com

Vermonters have a proud history of working the land and making use of natural resources such as water, wood, wind and sun in our daily lives. Our use of these resources, however, has dropped quite dramatically from what it was 100 years ago.

Until the 1940s, almost all of our electricity was generated from falling water. The sun provided passive heating and dried our crops. Our forests supplied building materials and lumber for furniture, tools, wagons and firewood for heating. Windmills dotted the landscape, pumping water for our farms and powering our radios.

Today, in-state water sources provide only 12 percent of Vermont's electricity. Nuclear power supplies about a third of our power and hydro power from Canada provides another third. Wind power supplies less than one percent of our electricity. Oil, natural gas, propane and coal heat our homes and businesses and power our transportation system.

Vermont now imports more than 70 percent of its total energy, which accounts for about $1 billion flowing out of state each year, placing us at great risk of fuel shortages, additional price increases, long-term depletion and recession. The economy in Vermont and elsewhere is driven by cheap, available energy. Without an adequate energy supply at a reasonable price, our economy simply cannot run effectively. Only renewable energy sources offer a sustainable path to a strong energy future.

Renewables versus fossil fuels

When we speak of renewable resources, we are referring to sources that are sustainable over the long term (for hundreds or even thousands of years). Burning fossil fuels such as oil, coal and natural gas is not sustainable. By burning these sources, we are using millions of years' worth of stored solar energy over a short period of time (200 to 300 years).

Our current demand for oil is expected to exceed supply no later than 2010 and possibly even sooner. One hundred years from now, we will have used 90% of the oil the world ever had. When our use of fossil fuel sources outpaces the supply as it does today, we are not on a sustainable path.

In addition to being a finite fuel source, fossil fuels have been linked to global warming. They also increase the pollution levels in the atmosphere and cause acid rain. Vermonters need only look at their own Green Mountains to see the toll pollution is taking on its mountains, forests and streams.

Renewables, on the other hand, are clean and non-polluting. Energy from the wind, sun, water and earth is abundant and available naturally through Mother Nature. Wood as an energy source can also be sustainable when harvested according to sound forestry practices.

To be included in Vermont's energy future, renewables must be local and, therefore, a visible part of our working landscape. If we want to gain the benefits these sources offer, we must learn to adjust the not-in-my-back-yard attitude that sometimes plagues these resources and hampers their deployment.

Where we must go

Vermont's renewable energy industry provides good jobs in our state. A stronger industry will create more good paying jobs, cleaner air and water and a strong energy and economic future. It will also require a change in Vermont's existing energy policy. Such a change will not be easy. It will require strong leadership and a shift in tax policy.

Policymakers need to develop legislation that provides incentives for individuals and businesses to make greater use of renewable energy sources. As we establish these incentives, we need to tax the polluting sources we want to use less of. Policymakers also need to remove existing barriers and streamline the regulatory process to enable Vermonters to produce their own clean energy.

As environmental advocates and associations, we need to forge a united base and support the development and use of clean energy sources in Vermont and

work to educate others on their many benefits.

Mother Nature has provided us with a wealth of renewable resources. Unfortunately, existing policies make it difficult for us to make use of these clean sources. Fortunately, here in Vermont we have the ability and knowledge to shift our direction to a better, cleaner energy future. It's up to us to start charting that course.

NRG Systems, Inc., located in Hinesburg, Vermont, is the world leader in the design and manufacture of wind energy assessment systems. Since the company's formation in 1982, Blittersdorf and his team of engineers, technicians and production employees have made sensors, instruments, towers and software that measure and analyze wind speed, direction and other environmental data crucial to siting and operating wind energy systems.

Nearly all of NRG's customers are located outside of Vermont; almost two-thirds are located in other countries. NRG wind energy assessment systems can be found in more than 60 countries worldwide, serving electric utilities, wind farm developers, research institutes, government agencies, universities and homeowners.

Although NRG has a predominantly international client base at this time, Blittersdorf expects that as U.S. electricity markets open up and consumers can choose clean energy sources to power their homes and businesses, more of NRG's business will be a little closer to home.

EFFICIENCY VERMONT

BY BARRY LAMPKE
888-921-5990
www.efficiencyvermont.com

Shopping for energy efficient products? Building a home? Efficiency Vermont, the state's new energy efficiency utility can help. The Vermont Public Service Board ordered Efficiency Vermont's creation in response to a request from the Department of Public Service, all of the state's twenty-two electric utilities, and a dozen consumer and environmental groups. Now Vermont consumers, businesses, manufacturers, and farmers around the state can lower their electric bills by taking advantage of Efficiency Vermont's energy efficiency services.

EFFICIENCY VERMONT USES STREAMLINED APPROACH

For the last eight years, Vermont's electric utilities have offered a range of energy efficiency services to their customers. After careful consideration, the Vermont Public Service Board, Public Service Department, utilities, and consumer and environmental groups agreed to develop a consistent, comprehensive, and integrated delivery system. Efficiency Vermont is the result of this effort.

Efficiency Vermont operates independently from the state's electric utilities and offers energy-saving programs, technical advice and financial incentives throughout Vermont. It consolidates and enhances most of the programs previously offered by the state's electric utilities and provides a more streamlined and coordinated approach to energy efficiency. The Board selected the Vermont Energy Investment Corporation (VEIC), a Burlington-based not-for-profit energy services organization, from a field of six competitors to operate Efficiency Vermont.

SERVICES HELP VERMONTERS

Efficiency Vermont offers instant coupons and cash rebates when you buy ENERGY STAR® labeled lighting and appliances. If you buy an ENERGY STAR® washing machine, Efficiency Vermont will provide a $75 rebate. They also offer discounted prices when you buy ENERGY STAR® bulbs and fixtures. Now you can buy energy efficient lighting three easy ways:

- Purchase at your local retailer: call Efficiency Vermont at 1-888-921-5990 or visit www.efficiencyvermont.com for a list if participating retailers
- Call 1-888-921-5990 for a free mail-order catalog
- Order on the web at www.efficiencyvermont.com

Building a new home? Efficiency Vermont offers design assistance and cash incentives for energy efficient products to help you build a comfortable, durable, and efficient home. Efficiency Vermont also provides technical advice and financial incentives to help businesses build energy efficient facilities and install efficient lighting motors, and ventilation equipment. Dairy farmers can take advantage of rebates and assistance for equipment that reduces energy costs and improves animal health.

PROGRAM FUNDING NOW APPEARS ON ELECTRIC BILLS

Efficiency Vermont is funded by an "energy efficiency charge" (EEC) that appears on your electric bill (except in Burlington Electric Department's service territory). The EEC causes little or no increase in monthly electric bills for most Vermont customers. In the past, energy efficiency programs were funded by charges included in electric rates.

SAVING ENERGY BENEFITS VERMONTERS

We all benefit by saving energy. When Vermonters use less energy, we need fewer power plants operating, reducing

greenhouse gases. Also, the more we save, the less power our electric utilities must buy. This helps keep electric rates down for everyone and lessens our reliance on out-of-state energy providers or foreign imports of oil.

Efficiency Vermont projects it will save Vermonters 88,755 MegaWatt hours (MWh) of electricity annually, an amount equal to the energy consumed by approximately 13,000 Vermont homes. Greenhouse gas emissions will be reduced by nearly 66,000 tons per year. Reductions in other harmful emissions will result in less acid rain and smog. The impact of these reduced emissions will be the same as if Vermonters drove their cars 135 million less miles per year.

To learn more about Efficiency Vermont please call or visit their website.

VERMONT METHANE PROJECT

BY JEFF FORWARD
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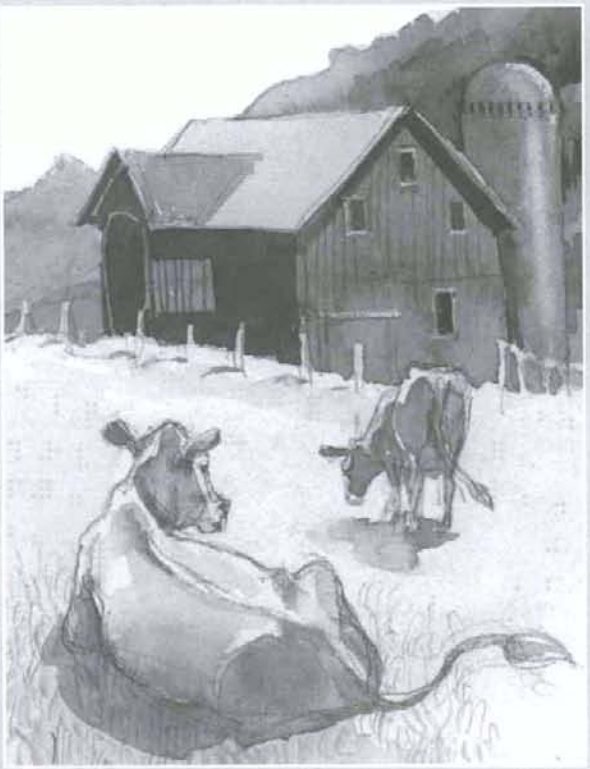
The Vermont Department of Public Service (DPS) and the Vermont Department of Agriculture (AGR) received a $300,000 appropriation from the FY 2000 federal budget to promote the use of methane recovery technology on Vermont dairy farms. This technology has the potential to help farmers with their nutrient management plans and at the same time provide additional on-farm income. The goal of this project is to identify and help overcome key strategic hurdles to widespread adoption of methane recovery technologies by Vermont farmers.

The project was designed to consider methane recovery in a broad context, taking into account its potential benefits as a component of a comprehensive nutrient management system, as a renewable energy source and as a strategy for greenhouse gas reduction.

The project activities include:

- experimenting with methods to reduce costs and increase the efficiency of methane recovery technologies and use;
- developing partnerships with experts in manure management and water quality protection;



- assessing the potential of dairy manure and other organic wastes in Vermont that could be digested on farms to produce methane and electricity;
- establishing sites to demonstrate the viability of the technology; and
- publicizing the progress of the project to stimulate demand.

Much of the preliminary work on this project is nearing completion. The following is the current status of project activities:

- The project has conducted experiments on reducing retention time of manure in an anaerobic digester. If the retention time is reduced, a smaller digester vessel can be used which would reduce initial capital costs.

- Research has been completed on the available organic resources in Vermont that could be digested to produce methane. This research suggests that dairy manure is by far the largest source of organic material that is available for methane recovery and that trucking other materials to an on-farm digester will only be cost-effective in limited circumstances.

- The project has completed preliminary feasibility analyses on fifteen Vermont farms that have expressed interest in this technology. Several of these farms show a positive cash flow. We will proceed with engineering analysis and site design for farmers who think anaerobic digestion may be beneficial to them. For farms that choose to install methane recovery, the project has some cost share monies available.

- The project has established a research and demonstration facility on a working dairy farm that has 15 years of experience with methane recovery. Construction on the site was completed in October, 2000. We will be performing several experiments at this

facility and will use it as a demonstration site to show Vermont farmers and others how this technology works.

Once we have completed our work with individual farmers, we will begin to explore ways to educate the rest of the farming community about the costs and benefits of methane recovery. We will establish links with the various compost efforts in the state; we will explore the feasibility of fueling micro-turbines or fuel cells with methane; and we want to think about the applicability of what we are learning here about methane recovery and electrical generation to other situations locally and internationally. *Please call or e-mail for more information.*

SOLAR WORKS

BY LEIGH SEDDON
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As we enter the next millennium, it is important to consider what steps each of us can take to increase the use of renewable energy resources, thereby reducing our reliance on imported oil.

In 1947, our country became a net importer of oil for the first time. By the time of the first Earth Day celebration in 1970, our country was importing 25% of its oil. The oil embargo of 1973 made us realize how vulnerable we were to disruptions and price fluctuations in imported oil. Yet today, we import over 53% of our oil, over 18 million barrels of oil per day, enough to fill the Exxon Valdez over fourteen times.

Our dependence on oil affects far more than just our economic security. Air pollution due to the burning of fossil fuels has contributed to an epidemic of respiratory problems, including a significant rise in childhood asthma. Acid rain is slowly killing our forests, streams, and lakes. Continued global warming, caused by the burning of fossil fuels, has been contributing to highly irregular weather patterns that have resulted in extensive storm damage, crop and property losses, and erratic avian migratory patterns.

There are, however, a number of encouraging developments that make me optimistic about a solar future.

- The President's Million Solar Roofs Initiative is committed to placing 20,000 solar energy systems on Federal buildings and a combined 1 million solar energy systems on residential, commercial, and public sector buildings by 2010.

- The retail market for "green" power is growing rapidly in states where electricity has been deregulated. In California, Rhode Island and Pennsylvania, hundreds of thousands of customers have signed up to secure a portion of their electricity from renewable resources.

- Over 30 states, including Vermont, have now adopted "net metering" regulations that ensure that customers who purchase solar electric systems will be able to sell any excess power back to their power companies at retail prices.

- Improvements in photovoltaic technologies, including the introduction of roof tiles and other building-integrated photovoltaic elements, have increased the efficiency and versatility of solar systems while also reducing their cost.

Each of us has important energy choices to make. We can become part of the solution by investing in solar energy and energy efficiency, freeing our country from its reliance on fossil fuels and helping to sustain our communities and environment. With the latest technology and the availability of federal and state incentives, there has never been a better time to go solar, or a more important one, given the state of our world.

News & Notes

continued from page 5

• Reduce Sprawl

Increase Gas Tax & Reduce Vehicle Registration Fees

This alternative would raise the price of gasoline to encourage more compact development and reduce sprawl over the long term. The tax could fund road construction and maintenance, and eliminate vehicle registration fees for automobiles.

Increase the Land Gains Tax

This program would offer landowners a stronger incentive to hold land for two or three years rather than just one year by restructuring the capital gains tax rates so that they do not decrease as quickly during the first two or three years.

Extend Vermont's Current Use Program

This solution would expand Vermont's current use legislation to include land used for preserving threatened and endangered species; recreational land; land with flood plains and wetlands; riparian buffers and other unproductive land.

• Stop Environmentally Destructive Corporate Subsidies

Eliminate the Sales Tax Exemption on Non-Agricultural Pesticides & Fertilizers

This solution would amend the Vermont tax code to remove the sales tax exemption for agricultural chemicals and fertilizers for all non-agricultural use.

Currently, the exemption is overly broad and extends benefits intended for farmers to commercial lawn applicators, golf courses, ski resorts and industrial interests as well as to the homeowner buying these products off the shelf. The use of these funds would be dedicated to specific programs for specific uses.

The Inside Word

continued from page 2

the cost of the dam in place far exceeds the cost of removal, if a full accounting of costs were taken. Public dollars have been wasted on fishery recovery efforts that don't work. Water-based recreation generates $109 million annually, creates up to 3,600 jobs, and produces approximately $5.5 million in tax receipts per year. A recent University of Vermont study shows that a majority of Vermonters support removal of the Peterson Dam and restoration of the Lamoille even if it entails a rate increase—and a rate increase is not necessary!

The citizens of Vermont own the Lamoille River. It's time to restore an outstanding public resource while implementing sound measures to deal with Vermont's energy needs. VNRC envisions a whole systems approach to problem solving, designed to ensure no rate increases, guarantee system reliability, and the use of alternative sources of clean, renewable energy.

Join VNRC for the Annual Tracking Workshops!

Come and look for signs of bear, bobcat, moose and other forest creatures with nationally recognized wildlife habitat and tracking expert Sue Morse of Keeping Track. If you have always wanted to attend one of Sue's workshops, or you are interested in learning more about animal signs, this is a perfect opportunity. This year, we will offer both a full day and half day session. Workshops fill up fast, so please pre-register.

Friday, January 19, 2001
12:00 to 4:00
Richmond: This workshop will only last for half the day, and will be on mostly flat trails. Be prepared for cold weather with warm clothes, good boots and a drink. Please bring snowshoes if there is snow. Fee: $10.00

Friday, February 23, 2001
9:00 to 4:00
Richmond: Be prepared to be outside all day hiking over some steep trails. Please dress accordingly: warm clothes, good boots and extra clothes. PLEASE BRING LUNCH, water, and snowshoes if there is snow. Fee: $15.00

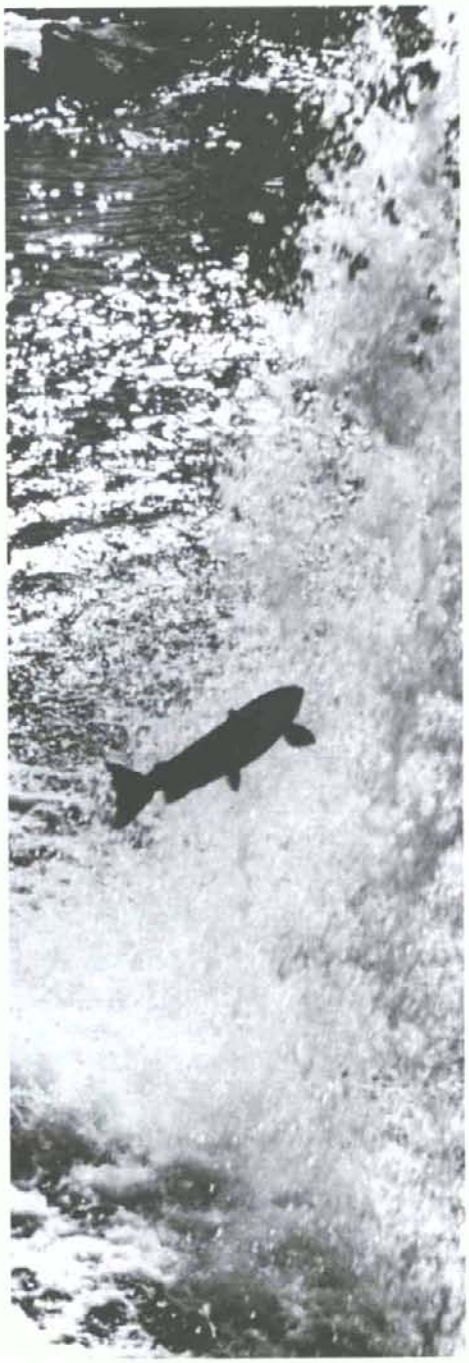
RIVER REVIVAL

Restoration of the Clyde River Continues

BY LENNY GERARDI

Winter 1994 boasted a hefty snowpack. The spring was relentlessly moist. The peak of spring runoff seemed to go on for weeks in the rivers and streams of Vermont's Northeast Kingdom. In the little city of Newport at the head of Lake Memphremagog the buzz among its citizens for months had been the federal relicensing of the Citizens Utilities Company's (CUC's) hydroelectric development on the Clyde River. CUC's hydro development consisted of a dam and powerhouse at West Charleston, the Clyde Pond Dam and its Newport #1, 2, 3 powerhouse on the Newport/Derby line, and the Newport #11 Diversion Dam and powerhouse a short distance downstream in Newport City. The #11 dam and the diversion of the Clyde's flow into a canal around a long stretch of the riverbed had been completed in 1957 amid great controversy in this region where hunting and fishing are not a pastime, but a religion. No sooner did hydro operations begin at Newport #11 than carcasses of stranded fish were littering the dry riverbed, among them walleyes, trout and the legendary landlocked Atlantic salmon that made Newport a regional fishing venue. Now, in the relicensing proceedings, the locals were making impassioned pleas to the state and federal regulators for the removal of the despised Newport #11 Dam.

Then a remarkable event occurred. On the morning of April 30, 1994, the high flow of the Clyde River could no longer abide by simply pouring over Newport #11 dam. Instead it began seeping through the earthen embankment at the right end of the concrete dam. The saturated embankment started to dissolve, allowing the river to carve a path through it. Throughout the day the power of the flow gradually downcut the embankment until the entire river flow was doing an end run around the dam. This went undetected by plant operators until 2 a.m. the next morning, when the Newport #11 generator shut down due to low water in the canal. On Monday, May 2, 1994 The *Caledonian-Record* headline read "Clyde River Dam 11 Breached on Sunday, Useless for Now". It took another two years of legal wrangling and brinkmanship before CUC would acknowledge that Newport #11 was not only useless for now, but should be useless forever. On August 28, 1996 the breached dam was finally reduced to rubble by a few well-placed dynamite charges and its traces were removed from the river channel for good.

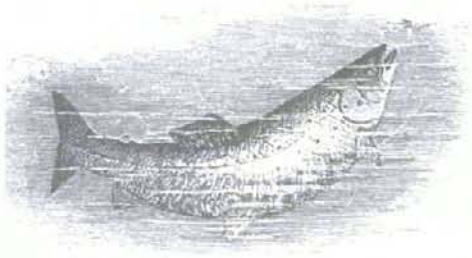


The failure of the Newport #11 dam marked a major milestone in the history of hydropower on the Clyde. The breach in the dam accomplished several environmental improvements, setting the stage for restoration of Newport's cherished salmon: it drained the impoundment that was flooding 1000' of prime salmon habitat; it removed the obstruction that blocked access by salmon to this habitat; it redirected the flow of the Clyde back over 3000' of natural riverbed that had been deprived of its lifeblood by the #11 diversion canal; and finally, it de-coupled operation of the upstream Clyde Pond / Newport #1, 2, 3 station from that of Newport #11. Because of the Newport #11 design, Newport #1, 2, 3 had to operate as a peak power facility, alternating between shutting off and turning on the flow of water in the Clyde for hours to days at a time. The demise of Newport #11 created the opportunity for a fish-friendlier flow regime all the way from the Newport #1, 2, 3 powerhouse to Lake Memphremagog.

Serious salmon restoration efforts have been underway on the Clyde for over a decade, in anticipation of a favorable outcome in the federal relicensing of CUC's hydropower facilities, i.e., a flow regime supportive of all life stages of Clyde River

fishes, (a measure which would allow fish to migrate upstream and downstream past the dams.) The landlocked Atlantic salmon is a species that lives part of its life in freshwater lakes, and part in rivers that flow into them. Adults spawn in the river in the fall, burying their eggs in the riverbed. The eggs hatch in the spring. The young salmon spend one to three years in the river, growing to a size of about 6", before they migrate downstream to the lake. They then spend one to three years in the lake until they mature and return to their river of birth to spawn. Unlike Pacific salmon, Atlantic salmon may survive to spawn in multiple years. Vermont Fish and Wildlife Department staff have been stocking salmon fry (1.5" juveniles) in up-river areas annually since 1993, to use the abundant nursery habitat to produce smolts (6" juveniles with the urge to migrate downstream) that are adapted to life in the wild and identify the Clyde as home. VTFW also stocks distinctively marked smolts in the Newport #11 reach, ready for out-migration to the lake after a short interval of imprinting. VTFW monitors the status of the juvenile fish by electrofishing (temporarily stunning them with electricity to catch them). Survival and growth of the stocked fry have been very encouraging, resulting in most of the juveniles reaching the smolt stage in one year's time. In September 1995 VTFW documented that adult salmon from the lake had spawned the previous fall in the rewatered Newport #11 reach. Their eggs had successfully hatched and their young-of-year offspring were reveling in the restored habitat, advancing the process of rebuilding a naturally self-sustaining population.

Although wild fry have been observed nearly every year since, numbers have been disappointingly low. Likewise, anecdotal reports about salmon fishing in the lake and river have been less than stellar. That is, until last fall. A droughty summer of 1999 was ended by Hurricane Floyd, which pushed up river flows in late September to levels attractive to salmon in the lake. The buzz in Newport turned to fishing, as some very nice salmon were being caught. Things got even more encouraging this past spring, with a stretch of respectable salmon fishing.



The strength of the autumn 1999 run was confirmed in September 2000 when VTFW's sampling turned up healthy numbers of wild salmon young-of-year. They also handled some adult salmon preparing to make their contribution to the gene pool and the restoration effort. Angler excitement level jumped another notch throughout the fall as anglers tangled with a decent run of salmon, giving everyone hope for a return of the good old days.

But all is not settled on the Clyde. The FERC license which expired the last day of 1992 has not yet been reissued. The project has no 401 Water Quality Certificate from the Vermont Agency of Natural Resources. The CUC's hydroelectric development, minus the Newport #11 component, is operating on annual license extensions. There is talk that the project will be sold to undisclosed buyers. Hanging in this limbo are many issues that need permanent treatment to assure the long-term success of the restoration – among them, a legally guaranteed fish-friendly flow regime, release of flow over the natural riverbed between Clyde Pond and the Newport #1, 2, 3 powerhouse, and, most urgently, safe and effective measures to enable salmon smolts searching for the lake to pass downstream past the Clyde Pond dam and turbines and amorous adult salmon to move upstream to their spawning beds. It's going to take sustained pressure to make the dream of a fully restored Clyde a reality.

Lenny Gerardi is a fisheries biologist with the Department of Fish & Wildlife in St. Johnsbury.

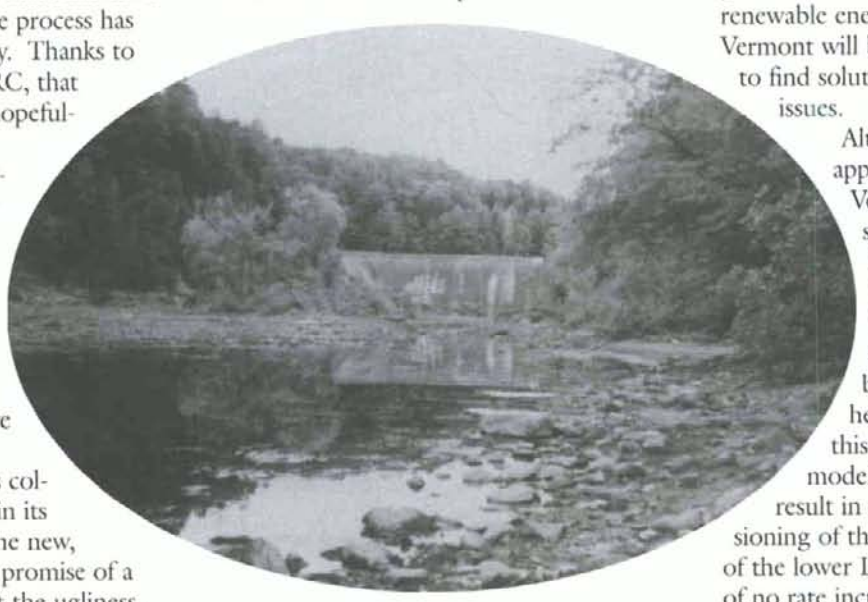
STANDING UP FOR *The Lamoille River*

VNRC CONTINUES TO FIGHT FOR THE REMOVAL OF THE PETERSON DAM

BY PATRICK BERRY

Many folks are familiar with the phrase, "Two things you never want to see being made are sausage and laws." In both cases, the process can be ugly, even if the product is palatable. Thus far in the 13-year relicensing marathon for the Lamoille River Hydroelectric Project, the process has often been equally as ugly. Thanks to the current work of VNRC, that unfortunate truism will hopefully be coming to an end.

VNRC, now in its seventh year of engagement in the fight over the restoration of the lower Lamoille River, has catalyzed a process that works outside of the box to guarantee that the needs of all parties are met, and that the river is ultimately restored. This collaborative process is still in its burgeoning stages, but the new, expanded talks show the promise of a win-win solution without the ugliness.



At the heart of the disagreement so far has been the fate of the Peterson Dam, the lowermost facility in the project that cuts the Lamoille River off from Lake Champlain. In order for the Central Vermont Public Service Corporation (CVPS), owner of the project, to receive a new 50 year license, operation of the Peterson must guarantee that state water quality standards can be met, a condition that hasn't occurred in the dam's 52 year history. VNRC continues to hold the position that water quality standards cannot be met, and the historic salmon, walleye, and sturgeon fishery cannot be restored with the dam in place. VNRC feels that it's important to note that this particular case is not an indictment of all hydro—it's about one dam built in an awful place. A growing number of individuals and organizations wholeheartedly agree.

For the past two years, VNRC, the Central Vermont Chapter of Trout Unlimited (TU), and CVPS have been engaged in a closed-door negotiation process that was designed to avoid conflict and litigation in the relicensing process. The issue of meeting water quality standards, a clear loser for CVPS, was the only topic that could be explored in the talks. The narrow scope of the negotiation, coupled with CVPS's unwillingness to discuss critical water quality matters, caused CVPS to leave the table.

Faced with the desire to continue practicing responsible environmentalism and the need to address issues beyond the scope of the standard relicensing process, VNRC crafted a plan that is now underway to come to an expeditious and integrated solution. The expanded collaboration proposal will not only explore water quality and river restoration, but also electric system reliability, consumer rates, replacement power, dam purchase possibilities, and use of energy efficiency programs and alternative sources of clean, renewable energy. Experts from around Vermont will be engaged in this process to find solutions that address the many issues.

Although this collaborative approach is novel for Vermonters, it has been very successful beyond the state's borders. Guy Philips, the leading national expert in hydroelectric relicensing and river restoration, has been retained by VNRC to help develop and implement this tried and true cooperative model. The final goal would result in purchase and decommissioning of the Peterson Dam, restoration of the lower Lamoille River, a guarantee of no rate increase, a stabilization of system reliability, and the use of alternative sources of renewable energy.

Where does CVPS stand on the issue? It's no secret that CVPS does not want to retain ownership of the Peterson Dam. In fact, CVPS has diligently been trying to divest all of its generating assets. Instead, CVPS would like to play the role of electricity distributor rather than owner and producer. So why would CVPS, if they want to get rid of their dams anyway, have battled so vigorously over the fate of the Peterson Dam? Like the ingredients in sausage, folks may never know the answer.

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JOIN VNRC'S 1,000 FRIENDS OF ACT 250!

Recent campaign promises and pre-legislative session rhetoric would suggest that Vermonters should be concerned about the potential threat to the integrity of the state's landmark environmental legislation, Act 250. Vermonters have for many years been aware of the growing interest in "streamlining" Act 250. But, many of the so-called "streamlining" recommendations have been nothing more than self-serving ideas promoted by business interests to take the "public" out of the public process in the name of efficiency. This fall we witnessed a more blatant expression of the intention behind the "streamlining" Act 250 effort, with the appearance of re-election placards reading "GUT ACT 250". With a majority of the Vermont House poised to seriously damage the Act and the environmental lobbying effort outgunned financially, eight and a half to one, we have our work cut out for us.

For over 30 years, Act 250 has been recognized as a national model for managing growth and development while maintaining environmental integrity. It has helped Vermonters protect their environment while strengthening the economy by improving the quality of major developments and producing generally secure financial investments. Act 250 has been the mainstay of our state's environment while allowing for measured growth. This legacy was once again acknowledged in The Institute for Southern Studies' Green and Gold 2000 report which recently ranked Vermont at the top of performers for its showing in the dual categories of best environmental record and best economic opportunity. Vermont owes this recognition, in large part, to the success of Act 250.

Yet as good as Act 250 is, there is room for improvement. VNRC's 1,000 Friends of Act 250 is committed to strengthening Act 250's ability to guide smart growth in Vermont. The 1,000 Friends of Act 250 supports strengthening Act 250 through such changes as:

- creating stronger provisions for Master Plan review of major development projects, taking into account their cumulative impacts on natural resources, the economy, infrastructure (such as roads, sewage disposal and water supply), and communities,
- leveling the playing field for all citizens in the Act 250 process by granting the same rights of appeal to all parties,
- establishing an Office of Act 250 Public Advocate, to help new applicants as well as other parties to better understand and expeditiously work through the permitting process,
- providing ongoing, mandatory training for District Environmental Commissioners and Environmental Board Members,
- creating a study group to find ways to simplify Act 250 procedure and rules,
- creating a study group to find ways to allow for environmental innovation in the Agency of Natural Resources and Act 250 permitting processes.

For more information about how to become one of The 1,000 Friends of Act 250, please contact Elizabeth Courtney or Steve Holmes at the VNRC office.