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WOOD RESIDUE RECOVERY IN THE NATIONAL FORESTS

GOVERNMENT

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HEARING

BEFORE THE

SUBCOMMITTEE ON ENVIRONMENT, SOIL
CONSERVATION, AND FORESTRY

OF THE

COMMITTEE ON AGRICULTURE,
NUTRITION, AND FORESTRY
UNITED STATES SENATE

NINETY-SIXTH CONGRESS

FIRST SESSION

ON

S. 1996

A BILL TO AUTHORIZE THE RECOVERY OF WOOD RESIDUES IN
THE NATIONAL FORESTS FOR USE AS FUEL, FOR CONVERSION
TO USE AS PETROCHEMICAL SUBSTITUTES OR WOOD PROD-
UCTS, AND FOR OTHER PURPOSES

NOVEMBER 30, 1979—MISSOULA, MONT.

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WOOD RESIDUE RECOVERY IN THE NATIONAL FORESTS

FRIDAY, NOVEMBER 30, 1979

U.S. SENATE,
SUBCOMMITTEE ON ENVIRONMENT, SOIL
CONSERVATION, AND FORESTRY OF THE
COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY,
Missoula, Mont.

The subcommittee met, pursuant to notice, at 10 a.m., in the Missoula Federal Courtroom, Hon. John Melcher (chairman of the subcommittee) presiding.

Present: Senator Melcher.

STATEMENT OF HON. JOHN MELCHER, A U.S. SENATOR FROM MONTANA

Senator MELCHER. The subcommittee will come to order. This morning we are meeting in public hearing on S. 1996. We have a rather long list of witnesses. I hope to be able to group some of the forest products people together and see whether that won't help in expediting the hearing. We will try to be brief. I have an opening statement. I will try to set a good example by being fairly brief.

I think it is fair to say that up until the past 3 or 4 years, wood has been such an inexpensive commodity that it has been more economical to waste it than to spend the money to get maximum use from it.

Typically, the large trunk portions of the trees have been hauled away for sawtimber, and the remainder—50 percent or more of the tree—has either been left on the ground to rot, or has been pushed into piles and burned. There is a great amount of salvageable material left after the logs are removed. The material for firewood or for woodchips or other forest products now has value that should be recovered, not only for economic benefits, but to enhance esthetics and speedup reforestation.

The ugly sight of slash lying on the ground after a clearcut has caused many problems for the Forest Service from a disturbed public. The burning of slash, given the potential of wood for fuel, is like the burning of natural gas at the wellhead in some of the Arab nations. It is a waste.

We have already provided the Forest Service with the authority to go back after a timber sale and sell the slash for such things as pulp and paper products. The purpose of my bill—S. 1996—is to establish a system of credits to see if it can be made economic to go back after a timber harvest and sell the wood residues for energy purposes. It would set up wood collection centers, where the wood could be conveniently

brought to one place. The number of permits issued by the Forest Service for free firewood has dramatically increased during the past 2 years. This bill should not inhibit those citizens who obtain firewood from the forest; rather, it should broadly expand the opportunity for citizens to secure firewood. The bill should systematize the wood residues available for firewood. Rather than haphazard utilization of part of the wood available, the bill will provide the method of avoiding waste by making it more available and easier to obtain by the establishment of collection points.

The bill would not affect the payments to counties. As a matter of fact, it sets up possible partnerships with State and local governments in the event that these governments want to participate in running the collection centers.

The bill also makes it clear that in clearing slash, the Forest Service must take into account the need to preserve wildlife habitat and to consider other environmental impacts that the removal might have.

Finally, we do not intend that wood for energy drive up the price of wood for lumber and other conventional purposes. The credits offered to buyers are intended to pay the price of slash and dead tree removal until such time as markets are established for wood for energy. In other words, we want to protect cooperating firms from having to pay the cost of slash removal until such time as there is a value attached to the slash that would justify its removal under normal market conditions.

As I see it, this bill will accomplish three basic purposes: It will remove slash from the forest floor that has traditionally been a fire hazard, and in this regard, it will remove the eyesore of slash on the ground; it will reduce air pollution because this material will no longer have to be piled up and burned in large fires; and it will move us in the direction of more energy independence, as potential users of wood for fuel see that they have reliable supplies at specified points of collection.

At present, we in Montana have thousands of acres of trees that have been killed by insects. The Forest Service harvests these trees as quickly as possible to make the land productive again. Markets for the dead trees are available, and I believe the Forest Service should expedite the harvesting of these dead trees before rot, wind, or fires further diminish their value. Removal and reforestation of the dead trees has been at such a very slow pace that I have found it maddening.

Hopefully, we can use these dead trees, expedite their harvesting—eliminating this vast fire hazard—put the wood to useful purposes, and get our national forests back into production once again with new growth.

Our first witness this morning is Doug Leisz, who is the Associate Chief of the U.S. Forest Service. I think it's very fortunate, Doug, that you are attending the conference at the university and that we are able to have you here as our leadoff witness this morning.

STATEMENT OF DOUGLAS R. LEISZ, ASSOCIATE CHIEF, FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE

Mr. LEISZ. Thanks very much, Mr. Chairman. I am personally very pleased to be here to appear before the subcommittee and present the views of the Department of Agriculture.¹

¹ See p. 63 for the prepared statement of Mr. Leisz.

The bill, as we understand it, would authorize two new approaches to enhance our current programs of wood utilization. We strongly support the basic objectives of the bill.

The first approach, called a residue removal incentive would, in effect, pay national forest timber purchasers for their costs in the processing and removal of wood residues from timber sale areas to a point of use for conversion to a fuel or to other wood products. Wood residues are defined as including logging slash, down timber material, and standing live or dead trees that are presently unmerchantable. Point of use may be wood concentration or distribution centers, either Government or commercially operated, or a wood manufacturing facility. The incentive would be a part of the contractual agreement governing the timber sale. It would be earned by the purchaser when he removes wood residues and delivers them to the specified location.² The bill would prohibit requiring residue removal where it would cost more to remove than its value as fuel or products, except where removal is necessary for fire prevention, site preparation, or wildlife habitat improvement; thus accounting for market conditions that vary over time. The bill prescribes that the incentive would be considered as moneys received by the Government so as not to impact the payments received by State and local governments.

The second approach would establish a 5-year pilot program to pay for removal of wood residues from National Forest System lands. This approach has, as a primary objective, the development and evaluation of new and innovative means of wood residue utilization.

I think it's particularly appropriate to indicate at this time that for some 5 years now, we have had research work going on in the northern Rocky Mountains and the just completed symposium on Harvesting and Utilization Opportunities for Forest Residues in the northern Rocky Mountains has brought together the results of that research work. It's a very encouraging set of circumstances in that we're ready now to test some of those research efforts in field applications.

The economic efficiency and commercial viability of these means needs to be determined in actual application now. Areas where this program would operate, in addition to active timber sale areas where a residue removal incentive was not received or was insufficient, include completed and closed sales, reforestation and timber stand improvement areas, fire control clearings, fire prevention cleanup areas, and other areas where wood residues have accumulated. Within these areas, the program could fund National Forest System wood residue utilization demonstration areas, fuel wood concentration and distribution centers, and construction of access roads needed for wood residue removal. The bill authorizes, and we would seek to encourage, the involvement of State, county, and other governmental agencies in carrying out the provisions of this program. An annual appropriation of \$50 million is provided in this bill to carry out this program.

It has been estimated that 150 to 250 million tons of wood and wood residue are left on timber harvest areas annually. A major portion of this material is left following the harvest of old-growth timber on the western national forests. The residue is often a fire hazard and often impedes efforts to reforest the cutover areas. It costs money to dispose

² The earned incentive would be applied as credit to the purchase price of the timber harvested from the sale area.

of this residue. Much of this material has potential for use as solid wood products, as chips for fiberboard or pulp products, or for the production of energy. We believe these residues can significantly contribute to meeting the Department of Agriculture's goal of net energy self-sufficiency for agriculture and forestry by 1990. The two approaches set forth in this bill would aid us in identifying, handling, and selling these residues.¹

The residue removal incentive provides greater flexibility in the pricing of timber over the conventional appraisal allowance procedure, and very frankly, we need this tool. In timber sale preparation, it is difficult now to estimate the volume of residues which might be generated in a sale area. Furthermore, if markets for sawtimber are strong, the purchaser may remove more of this material than anticipated, and, therefore, deliver less residue volume than would be anticipated to a concentration yard. We, of course, encourage this economic allocation of wood products to their highest use. But under the current normal sale procedures, the amount of compensation to the purchaser would be fixed, and he could be overcompensated or undercompensated for residue removal, depending upon the situation at the actual time of sale operation. Under the residue removal incentives approach, the purchaser would be compensated for the volume actually delivered.

A major problem facing potential users of wood residues is the logistics of accumulating adequate quantities of fiber from many scattered, often remote, areas, where it is located. Timber purchasers operate on harvest schedules dictated by their own particular market circumstances. This makes it difficult for a potential user of wood residues from those sales to arrange dependable sources of supply. In this regard, we think the bill would be very helpful. Part of the testing of new approaches would examine various methods of accumulating residues at concentration yards or points of use, ways to assure a continuous supply, and various methods of marketing those residues. A primary objective of the tests would be to determine the costs of handling residues. The program would fit closely with our research and provide a means to implement new research findings.

As I mentioned earlier, the current research effort that is being summarized at the symposium has now gone into a new phase. We are moving into the application testing part of those research findings. This effort would tie in very nicely with the provisions of this bill.

These programs to encourage wood utilization could provide more benefits to the Nation than just added wood supplies and energy. They can provide needed opportunities to intensify management of the forest resource at reduced costs. Accelerated residue removal can also be used to reduce hazards to new forests from destructive fires, such as have been common in the northern Rocky Mountains in past years. They can help to reduce the potential for insect and disease infestations, help regenerate harvested areas, encourage thinning of overcrowded stands, and reduce the need to dispose of the wood by burning. We support the thrust of the bill to accomplish these objectives.

¹ The two approaches would provide several other advantages to the Department as we seek to improve utilization on the national forests.

We do, however, have some concerns with the bill, and we wish to suggest several technical and clarifying amendments.

Because the residue removal incentive approach is untested, as are some of the other new approaches to wood utilization, we would recommend that the bill clearly indicate that both sections authorize pilot program efforts. It would be our intent to carefully monitor the two programs to determine the appropriateness of continued operation. We would like to get started in the wood utilization program, we would like to do so cautiously, and test them thoroughly before getting into more widespread operation.

For that reason, and after review with the Office of Management and Budget, we recommend that the appropriation authorization be \$7.5 million instead of \$50 million.

Senator MELCHER. That review with the Office of Management and Budget isn't in your written testimony.

Mr. LEISZ. No, sir, it's not.

Senator MELCHER. When did they get to you?

Mr. LEISZ. We continually work with them, sir.

Senator MELCHER. We try to in Congress—we try. Go ahead.

Mr. LEISZ. We further recommend that the \$7.5 million be applicable to both provisions of the bill. This means that the amount generated by the residue removal incentive, that is, the credit on timber sale purchases, be included in the \$7.5 million ceiling on pilot testing. We believe this arrangement will permit development of an appropriate pilot program. This recommendation would require a separate section in the bill.

We also recommend under subsection 1(b) that the consideration of the incentive as money received for purposes of distributing receipts to the States be clarified. We believe that any receipts by the Government from the eventual sale of the residues should be considered as moneys received only to the extent that they exceed the incentive or direct Federal payment to the purchaser. We recommend subsection 1(c) be deleted as, it appears to have no direct connection with this bill.

Senator MELCHER. I am sure we will work with you on that. Have you discussed this at all with the National Association of Counties?

Mr. LEISZ. We have not had a chance to do that, but I would anticipate that with the provisions that are in the bill regarding receipts, that they would be strongly supportive, because this bill would help with employment, and by encouraging better utilization, help in meeting wood needs.

Senator MELCHER. We think they will be very much in support of divvying up the money. I just wondered if you had talked to them at all.

Mr. LEISZ. We haven't on this one, and of course, they were quite pleased on the final action in terms of the road credits and timber sale credits that a few years ago were no part of those county receipts.

Senator MELCHER. OK.

Mr. LEISZ. In summary, Mr. Chairman, we believe this bill can be an important element in our efforts to improve the utilization of the timber resource of the National Forest System and thus gain sub-

stantial benefits for the Nation. We recommend enactment of the bill if amended as we have suggested.

I have with me, and would like to enter in the record these five publications that are quite timely for this bill. One of those is a synopsis of the harvesting and utilization opportunities for forest residues for the northern Rocky Mountains. It's the symposium synopsis.¹ It's very much on target with the direction that is provided in this bill. It is quite responsive to the concerns that we and others have about nutrient changes from more intensive utilization of the wood resource.¹ Fortunately, because research work started some time ago, we have a publication that deals directly with nutrient changes associated with timber harvesting in a Douglas fir forest, and also, a third publication on forest soil biology and timber harvesting relationships¹ and last a publication of the role of forest fuels in the biology and management of soil.

The completed research work gives us enthusiasm for the pilot testing of an intensive residue utilization program.

Senator MELCHER. First of all, you're convinced, I take it, that the removal of the slash under methods that would be followed under this bill, would not lower the soil productivity, the soil fertility?

Mr. LEISZ. Mr. Chairman, let me try to respond to that, and then I would like to turn to Roger Bay, the director of the Intermountain Forest and Range Experiment Station. Research results indicate that this is a matter to be considered carefully for certain individual sites. For example, a complete removal of all woody material could be a problem for some dry sites but it is not for wet sites. We need to leave some biomass, but fortunately, with the research work that has been done, we can be quite specific about how much should be appropriately left for individual sites.

Roger, do you want to expand on that?

Senator MELCHER. Also, Roger, would you identify what we're talking about leaving—needles, small branches, and what have you. I always assume that we're not raking this up. We have a lot of the small branches and the needles. What does that mean in terms of what the soil needs for replenishment?

Mr. BAY. OK, Mr. Chairman, our research has been going for about 5 years now, and it is compatible with results from other parts of the country, too.

The needles, the fines that are left, contain many of the nutrients in the forest, and are recycled back into the soil and through the system.

We have also found it's important to leave some larger pieces of woody material, branches, and 3- and 4- and 5-inch pieces, because those are the sizes that various soil fungi do develop and colonize on. We think, though, we can provide some guidelines to the resource managers as to how much of this should be left on various sites.

As Associate Chief Leisz mentioned, the drier sites are somewhat more critical, but we know that now, I believe, and we can relate to

¹ See p. 65 for the symposium synopsis, p. 75 for the information on nutrient loss impacts, and p. 76 for the summary on forest soil biology and timber harvesting relationships.

those sorts of problems. Moisture sites, which are generally true of the northern Rocky Mountains, are not that much of a problem. Recycling does take place, and those are the sites in which much of the work will be going on.

Importantly, I think we have some preliminary guidelines that we can recommend to managers, and our future research will attempt to zero in more tightly on some of those guidelines.

Senator MELCHER. I take it this will be not only proper removal of the slash. Keeping in mind that the needles, the fines, and whatever you leave of the larger branches are left to renew the soil, it makes a lot more sense as far as soil nutrients go than just piling it up and burning it, or am I wrong there?

Mr. BAY. No, Mr. Chairman; you are correct. We have found on some of the sites that we have been studying that piling and burning can be a problem, because of intense heat in certain areas. Leaving slash scattered and then broadcast burning can be helpful, because some soil fungi require charcoal to colonize on. Piling and burning in slash piles can be a problem in some areas; yes.

Senator MELCHER. Some critics of the bill say that purchasers should not be required to remove the slash. How do you respond to that, Doug?

Mr. LEISZ. I think we probably have the full scale of opportunities. There will be some cases where I expect that it would be foolish for us to force marketing, where the opportunities don't make sense. But there are situations where we would like a chance to analyze specific opportunities and get into a pilot program. We need to search out those situations where we have a good opportunity, and where the industry also feels very positive about it. We need the two parties working very closely together to bring the total program into a satisfactory operation. We can't force this to occur and not give attention to the economics of the situation.

Senator MELCHER. I was provided some information from Lewis and Clark National Forest. I don't know whether I have it here with me this morning or not, but I was very interested in it, because it showed that from 1970 to 1979—in 1970, there were 11,000 cords of free firewood made available to applicants in the Lewis and Clark National Forest; in 1979, there were 43,000 cords made available in free firewood. Now, that's really a dramatic increase in these permits, and the last 2 years, it seems to me, were the greatest.

Now, for any of you, Tom, Doug, or Roger, is there any reason to think that the bill as it's drafted now would reduce the amount of firewood available for home use? Is there any reason at all to think that there would be a reduction?

Mr. LEISZ. Let me try to respond from the national standpoint on that, and then I would ask Tom to respond from the local standpoint. He is the person who has the responsibility for the management activity here.

I don't think so. I think it's clear to us in the language of the bill that we're expected to look at the total situation. We recognize that in many sections of the country, now, firewood, fuel wood, for home heating, has become very important. It has been brought to our attention that con-

tinued burning of slash, while people are needing wood for home use, is unacceptable socially. People expect us to be able to move that wood resource to a point where it can be reasonably available. One of the provisions of the bill, as I recall, talks about concentration yards.

Senator MELCHER. Yes.

Mr. LEISZ. Part of this could make more fuel wood accessible at less individual cost. People are now going long distances in pretty energy inefficient hauling devices, a pickup truck, for example, to remove firewood for their purposes. If we could get some of that wood closer, we could reduce the energy required to bring it to the home. I think your bill incorporates that philosophy, as we understand it.

Mr. COSTON. I might just add, Mr. Chairman, that I will agree with Doug.

We have problems, or the potential for problems, with wood for heating. I think most of those problems probably revolve around the fact that we really have not tried to administer those free-use permits. The historic pattern has been to grant a free-use permit and then a person goes and cuts wood wherever he can find that type of material.

On some forests, we don't bother with the administrative problem of issuing the free permits. That's something we need to look at, and we, through administration, I think, can avoid most conflicts.

Your use of the Lewis and Clark, as an example, is probably the best one we have. I have another figure that we use. Last year, more wood came off the Lewis and Clark for heating purposes than was cut for timber; or for lumber purposes. I see no reason for a conflict to develop if we do the job of administration that it will require.

Senator MELCHER. Is there a lot of slash that is left that is fairly inaccessible or really inaccessible for an ordinary person with a pickup? There is, isn't there?

Mr. COSTON. Yes.

Senator MELCHER. So maybe it would be available with a 4-wheel drive?

Mr. COSTON. Could be.

Senator MELCHER. Well, we want to be clear that the bill is to make more firewood available for home use. If it isn't clear, we will make it clear. We will redraft it and make that for sure. I personally think that the collection points make more firewood available for the ordinary home use. I would want it that way.

Mr. LEISZ. I think the provision regarding concentration yards, gives the opportunity to sort appropriately, for such uses, to a much better degree than we are able today.

Senator MELCHER. Yes. Now, let me say that regardless of the Office of Management and Budget, I would find it difficult to pass this bill, with reduced authorizations, very difficult. We work with the Office of Management and Budget, too, and I will communicate that to them and make it very clear that it will be difficult to pass the bill if we reduce the authorization so it would just be pilot programs. The reason that makes it difficult for me to pass it is because other Senators, as well as House Members, will say, "Well, where do we come in? There will be half a dozen pilot programs and our areas, our forests, won't have any," so they won't like it.

The second thing is, if you have a ceiling of \$7.5 million, if I understand your testimony, Doug, that would also be a ceiling on what could be allowed in a timber sale, right?

Mr. LEISZ. That's correct.

Senator MELCHER. All right. Frankly, it would be harder to pass the bill that way. We are at the stage now where people rightfully say, "Congress acts too slowly," not that we act too fast or too hastily on energy matters. They're saying we act too slowly, and we do. I agree, we do. Our record is poor, and so if they're going to vote for something dealing with a question of energy, they don't want it slowed down. They want to see that the \$50 million is a minimum. The tendency will be to go up from that, not to go down, and I will communicate that to the Office of Management and Budget. I'll bet a nickel against a dollar that they shift. The domestic counsel in the White House has been extremely upset on a number of points about what we are doing and why we're not getting anywhere. Part of the reason is because the White House hasn't been running its own shop. They ought to be telling the Office of Management and Budget what their goals are and communicating directly to them, as they have been communicating more recently in the past 6 months with Congress on just what their goals are. We're more in tune now, between the White House and Congress, than we were 6 months ago.

The Office of Management and Budget, at least on this point, hasn't caught up. I don't believe they have reviewed this properly in its role as providing energy resources.

Now, there is one point you didn't touch on, and I didn't dwell on it at all in my opening statement. Do we have enough wood residues available at a certain point that it could play a role in gasohol, alcohol production out of wood fiber?

Mr. LEISZ. It's my understanding at present that we need to do some more basic wood chemistry research to bring that into a positive relationship with energy production. Our first step would be to target research work for wood chemistry. At the present time, alcohol production from wood fiber consumes more energy than is produced. Researchers tell us that more basic research is required to get the answers.

Senator MELCHER. Well, maybe we can use that as pilot.

Mr. LEISZ. Yes.

Senator MELCHER. But on the rest of it, I don't think we want pilot programs. We want action.

Thank you very much.

Joel Nelson is next—St. Regis Paper Co. Is Joe here?

Mr. NELSON. Yes.

Senator MELCHER. Now, Joe, would it be all right if we put you and Howie McDowell, Inland Forest Resource Council, and Lloyd Stahl and Ernie Corrick on together? Would that be all right with you fellows, as one panel? Is Ernie here?

Mr. CORRICK. Yes.

Senator MELCHER. And Lloyd Stahl?

Mr. STAHL. Yes.

Senator MELCHER. Let's see—Joel is first—let's hear from Joel first on our list here.

**STATEMENT OF JOEL NELSON, AREA FORESTER,
ST. REGIS PAPER CO., LIBBY, MONT.**

Mr. NELSON. First off, my name is Joel Nelson. I'm a professional forester, area forester, for St. Regis Paper Co., at Libby, Mont. I might add at this point, this is all new to me, the first time in the ballpark, so if I'm a little bit nervous today, I probably will show it quite obviously. Also, I have inherited a cold sitting over at the university's wood utilization symposium. That place is cold, so I hope this bill goes through, so we can get some heat over there, at least.

Hon. Senator Melcher, we, at St. Regis Paper Co.'s Libby, Mont. operations, feel that your proposed Senate bill 1996 leaves many questions unanswered and many areas of gray. Before we could support such a bill, the following questions must be addressed and possibly answered.

Maximum utilization of forest materials and residues is something most of us want and in the future will need, but in order to expend money and valuable fuels today, we must know the following: Has the consuming end been identified and developed for wood residues? If so, how will the residue be used? Who will use it? Where and when will it be used, and finally, is it timely or economical?

The above questions are important to us for two reasons. At present, only our daily chip production can be shipped the 600 rail miles to that Tacoma plant. The other major problem is our log landing residues. Landing waste is composed of bark, limbs, broken log chunks, and dirt. The dirt makes it impossible to burn this waste in our present hog-fueled steam generating power system, so we bury it. Burying sites are limited. Because of these problems, it seems impractical to us to create more residues at this time.

We ask, too, what will the effects of this bill have on appraised timber values? We feel this cost should be credited to slash disposal and not a direct logging cost. Residue removal should be a separate program and funded by a separate slash disposal fund. Deficit sales are an everyday occurrence now which we do not need any more.

Can the program carry its own weight? The initial investments of \$50 million per annum for the next 5 years doesn't sound all that bad, but where is the payback? Is it 10, 15 years down the road, or is it there at all?

What types of specialized equipment and additional manpower will be required to remove these wood residues? As an operating company, additional capital outlays concern us.

What about our small business logging contractors? With today's economic conditions, they cannot afford another equipment unit, because the residue is not a separate economic unit.

What will be the percentage of usable wood residue versus the percentage of available wood residue? With constant land withdrawals and special land allocations today, such as RARE II, we wonder if this will get like the timber supply, ever on the decline.

What will the definition of wood residues be? Will it be large cull wood materials, stumps, limbs, and foliage? We would suggest only large cull materials. In the long run, it might prevent soil nutrient problems and eventual site degradation.

In cost estimations for collection of wood residues, the following items are very important and must be considered: tons of residues per acre, size of residue materials, method of collection, haul distance to the collection point, terrain, safety, and the effects on the residual stand and the site.

Senator, your bill's intent is good. The economics, timeliness, and unanswered effects are what we question. In order to support the bill, the above-stated problems must be addressed and answered.

Thank you for hearing me, and good day.

Senator MELCHER. Well, Joel, I think those are very good questions. I think the questions you have raised are exactly the reason that we are establishing the program. The bill seeks to answer those very pertinent questions you have raised. The residue removal program that the bill establishes is for the very purpose of having the Forest Service address those questions and determine the economics, timeliness and other effects.

The bill provides the funding can be in the sale, or, if the value isn't there, we authorize the Forest Service to give the credits of the sale. We also have the Forest Service come back in and remove residues on their own, on their own funds. In those instances, where the Forest Service comes back in and removes, instead of burning the slash, we think the economic gains will be in terms of getting some value out of the residues, and, also, there will be gains in more prompt reforestation.

Mr. NELSON. OK, my statement, Mr. Chairman—

Senator MELCHER. Your statement doesn't conflict with that at all?

Mr. NELSON. No; it addresses a local situation. That's what we're addressing.

Senator MELCHER. Yes; and I am disappointed to hear that the chips for St. Regis—I think you said both because of lack of transportation and lack of market—are not all that good a property right now. That's it?

Mr. NELSON. That's the situation now.

Senator MELCHER. If the transportation part were satisfied, would the market still be all right? Would the market be worthwhile? I gather it doesn't make much difference to worry about the transportation bottleneck if the market isn't there for the chips?

Mr. NELSON. Well, Mr. Chairman, we're still suffering back from the 5-D program in 1974-75. A lot of these chip piles have been there for going on 3 years now. There is not much chip value left in them.

Senator MELCHER. I see.

Mr. NELSON. I guess, too, it's just as has been stated at the symposium up at the university, that market seems to fluctuate, and I'm sure that it's going to come back, but our main problem will still be in that 600-mile rail haul to our plant, and we also have a problem of trying to get—if Hoerner Waldorf, say, were to take our chips, we would still have rail problems getting it from Libby to Missoula. It has to go into Idaho and come back.

Senator MELCHER. Have you consulted with the Department of Transportation task force on transportation which has been in operation now for the past 6 months, which is slowly gaining a little momentum, and a little credibility and a little practicality? Have you consulted with them about the possibility of some innovative ideas on transporting these chips?

Mr. NELSON. I can't answer that question, Mr. Chairman, because that's kind of out of my field, but I am sure that if it hasn't been done, we can take a look at that, and I can't say at this time that it has.

Senator MELCHER. Let's make sure the Agriculture transportation task force gets in contact with you, or whoever is appropriate at St. Regis.

This seems to me to be the type of problem they were set in motion within the Department of Agriculture to solve. It's timely now to let them review this as part of their projects.

All right, Howie, are you next?

STATEMENT OF HOWARD G. McDOWELL, EXECUTIVE VICE PRESIDENT, INLAND FOREST RESOURCE COUNCIL, MISSOULA, MONT.

Mr. McDOWELL. I guess so. Mr. Chairman, I want to thank you for this opportunity to present the statement of the Inland Forest Resource Council.

I am Howard G. McDowell, and I am a professional forester and executive vice president of the Inland Forest Resource Council, headquartered in Missoula, Mont. The council is a regional association of forest products manufacturers in Montana and northern Idaho. Our members produce a wide variety of forest products, including lumber, plywood, particleboard, pulp and paper, posts, poles, and prefabricated log homes.

The council's primary objective is a sustained timber supply from public and private forest land, and we are committed to the principle of multiple-use management.

Now, since many of our members are highly dependent upon the national forests for their timber supply, the council has a deep interest in S. 1996. I'm not going to read some of my statement, because it has been repeated before.

The bill has a twofold goal, to reduce the amounts of slash remaining after logging or thinning operations and to add to the Nation's internal supply of energy resources; in this case, one which is renewable.

The council endorses these goals, and in fact, the forest products industry is continually active in the increased utilization of the timber resource and subsequent reduction of residual material, and many of its internal energy needs are being met by the conversion of wood waste to fuel. Most recently, Potlatch Corp. has announced plans for a wood waste fired energy cogeneration plant to be constructed in Lewiston, Idaho. Washington Water Power has made a similar announcement for a plant in northeastern Washington. There is no need to dwell on the Nation's desperate need for additional energy sources. It is a national priority.

In terms of the bill, there needs to be a clarification of the word "processing," which appears frequently in context with "removal," as a requirement of the timber sale purchaser. There is the implication that the solid wood residues—the logs—will be converted to some other form, probably chips, prior to leaving the sale area. The normal procedure is to deliver the whole log to the prospective use point, where it is processed at the plant or operation site.

The bill recognizes that total utilization may have some environmental drawbacks, and warns about soil depletion and wildlife considerations. The need for forest residues for these purposes and as a necessary aid to regeneration, has only recently been assessed in this region, and that knowledge is slowly being accumulated. More research is needed before any large-scale program of intensive residue removal is implemented. Preliminary research indicates that certain wildlife and regeneration needs are best met by leaving at the site the larger sized material, the type most economical to log and haul, and most eagerly sought by woodcutters for fuel. This raises the question of the need for better inventories of the residuals. The symposium on wood residues, which has been discussed previously, revealed that current inventory systems need improving. Those interested in investing in wood energy processing plants must know the raw material base currently available. What can they anticipate in terms of future supplies as we move from defective old growth wild stands with heavy volumes of large-sized residuals to sound young stands with considerably lighter volumes of residues very small in size and extremely costly to remove and process. The bill should call for adequate inventories prior to the implementation of large-scale programs.

Now, along with the biological concerns, there are two socioeconomic questions that should be addressed in the bill, energy trade-offs and economics.

It is important that we all know how many energy units of diesel, gasoline, electricity, et cetera, will be used to log, transport, and convert the residues to produce the Btu's in the stove, furnace, or conversion plant. It is possible that the energy trade-offs may be negative for some residues requiring high energy use logging systems and located long distances from the processing center or concentration yard. The bill should contain language to require an energy cost benefit analysis prior to initiating a program.

The question of economic efficiencies is important. At the residue symposium one of the speakers remarked that the reason the residues are still out in the brush is that their value is less than their cost. We recognize that the Forest Service to appraise for values and costs and authorizes them to require the purchaser to remove the residue to the point of prospective use. Although the language says that this cannot be required where costs are greater than values, this proviso is waived if the removal is for a land management purpose, and provision is made for payments to purchasers on timber sales where the residual values are insufficient to provide the incentive.

There are two items of concern to us here; the pricing systems used, and the volatility of the markets. The Forest Service appraisal systems recognizes costs and values that at best would be valid on the appraisal date, but the residues would be delivered during the sale term, generally 1 to 6 years later, with attendant cost increases and value changes. Our experience with residue removal for pulpwood chips, for example, indicates an extremely volatile and unpredictable market. There are pulp logs from the 1974 market surge and 1975 collapse that were sitting in log yards and railroad sidings 3 years later because there was no market for them at the time of removal and because they were required removal under the Forest

Service contracts. We believe that provision should be made to relieve purchasers of the responsibility for removal of residues when market demands cease or become severely restricted. Provision should also be made, with the use of suitable indices, to reflect changes in values and costs between the date of appraisal and period of removal, and while no mention is made in the bill of profit and risk margins, it is assumed that it will be a part of the appraisal process.

Because of the uncertainties involved with markets, values, and costs, we suggest that a trial period of removal by agreement be instituted in place of the current language whereby the purchaser is required to remove the residuals. This would give the agency and the timber purchaser an opportunity to assess the markets, determine costs, and make needed revisions in procedures to attain the bill's objectives.

Finally, and somewhat paradoxically, we look to forest managers implementing management regimes and techniques that will reduce the amount of residues resulting from insects and disease, and increase the solid fiber available for conventional wood products. More intensive management can increase the total woodpile, making portions available for energy sources.

The National Forest Products Association only 2 weeks ago adopted a policy on wood energy which I believe is very appropriate for this hearing, and I would like to submit it for the record. I have a copy of that, and it is very brief, and if you would permit me to, I would like to read it for you.

Senator MELCHER. I think it would be all right. I think we would be interested in having it read at this point in the record. Go right ahead.

Mr. McDOWELL. "The National Forest Products Association's Policy on Wood Energy." The forest products industry recognizes the value of the greater use of wood residues from logging, thinning, and product manufacture for producing energy. Utilization of these residues also relieves the environmental problems their disposal might otherwise create, provides more complete use of timber growth, and offers opportunities to increase growth through more productive forest management—the very things you are searching for in the bill. Under some circumstances, timber may have greater value when used for fuel than when used for other products, but such situations should be developed with caution, because misallocation of timber could result in harmful impacts on product supplies and employment.

Market forces should be the primary stimulant for increased use of wood energy. The primary role of government should be to remove the barriers to free market operations so that market-directed optimum uses of food energy can be achieved. Wood usage responds and readjusts to any rapid rise in energy prices and to increasing timber prices. Market forces, by themselves, stimulate greater use of wood for energy in all forms.

The potential of more energy from wood is so well recognized there is a danger it may be overpromoted through government intervention in the form of excessive subsidies and mandated programs requiring removal of burnable but frequently unused materials from public and private forests, without regard to costs. Such overpromotion

could also cause misallocation of wood resources among competing uses, with the end that shortages of wood and wood fiber products could occur, as could undesirable impacts on employment, investments, housing costs, and community stability.

When in the interest of national goals, appropriate incentives will tend to stimulate the use and improve the efficiency of use of wood for energy, but those uses should not be excessively or preferentially subsidized. Tax credits will accelerate the construction of wood energy facilities, but such credits should be equally available to all energy wood users so as not to give unfair competitive advantages to any user class. The level of tax credits or other incentives should be held at levels that will not unduly distort the allocation of wood resources among competing producers. No producer should be required to incur the costs of making energy wood available for the use of others from whom he may not be able to recover those costs.

Wood is a large and readily available biomass resource. It is in the Nation's and the industry's interest to increase the supply of timber for all uses, including energy, through more intensive application of growth increasing, and full utilization practices on forest lands.

In summary, I would like to conclude my statement by stating that we support the goals of S. 1996, better utilization of wood residues to improve the management of our national forests and to provide an additional energy source. We do have some concerns about the language and content of S. 1996, and would be pleased to cooperate with you and your staff on this important issue, and I very much appreciate the opportunity to present this statement on behalf of the council.

Senator MELCHER. First of all, Howie, with respect to the word "processing," as it's used in the bill, isn't it possible that in many cases it would be cheaper to chip the material in the field rather than bringing it in whole?

Mr. McDOWELL. In some places that has occurred. In fact, during that surge in the market there was quite a lot of chipping in the woods. In most cases, because of the condition of most forest roads and the grades and alinement, the types of chip trucks that are usable are not the kinds that you see on the highway. Their load limits are much smaller.

Senator MELCHER. At present, there is little market for wood for energy. We see this rapid growth in home users going out and getting some free wood on a permit basis, or we see people who get in the business in the fall and as long as they can in the winter or late summer and fall, going out and selling some, and selling it by the cord or a couple of cords, or whatever their truck holds, and that's fine, but that's a rather limited market. We know that, but the purpose of this bill is to see if these markets can't be developed, and perhaps in doing so, in developing those markets, stabilize the pulp market to avoid the waste that does occur, and to avoid the boom and bust cycle that we have been discussing here, Joe, and you, too. Don't you see some likelihood that we can develop better markets if more supply is available and we know it's going to be there?

Mr. McDOWELL. I'm certain that the markets will be there.

Senator MELCHER. Oh, you are?

Mr. McDOWELL. I'm certain that there will be markets available.

Senator MELCHER. They're coming? The markets are coming?

Mr. McDOWELL. Yes; how fast—

Senator MELCHER. Yes, how fast, we don't know. All right, now, what would you suggest as an appropriate level for incentive? You know, you talked about tax credits; you talked about how we work this into the whole process—can you give us any indication at this time of what is an approximate incentive?

Mr. McDOWELL. Well, tax credits would be one of the appropriate incentives. For the timber purchasers, we have been considering some numbers, and I am very reluctant to discuss them, because only two of us were involved in this kind of discussion, and there are a lot of people in industry who are going to be very much involved in this.

Some of the numbers that have been kicked around include 90 percent, that the residue should provide at least 90 percent of the value, and that the other incentive payment should only include 10 percent of the total value. That is a starting point; that is a number that has been discussed.

Senator MELCHER. Do you believe that if we pass this bill, say in the next 90 days, which I hope we can do—do you believe, then, in the process of drawing up the regulations by the Department, or by the Forest Service after the passage of the act—and that would probably take them 6 months—do you believe that that would be enough time to work with them on this question of incentives, and the mix that it would be wise for the Forest Service to have in determining when they put wood residues as a factor of a sale? It would be 1 year from now.

Mr. McDOWELL. Ninety days before the bill—

Senator MELCHER [continuing]. Passes.

Mr. McDOWELL. How much time would we have for consultation on the bill? Would we have 30 days?

Senator MELCHER. Well, you will have, obviously, 90 days; and I may be optimistic on passing of it within 90 days; I don't know. That may be optimistic. I think we can pass it in the Senate within 90 days. Does that give you enough time?

Mr. McDOWELL. I expect that that will give us a sufficient amount of time. I'm extremely reluctant, again, to respond to the question of the regulation, because while the Forest Service is always very gracious in asking for and receiving our comments, they don't always act upon them in the manner we feel is properly responsive. That does create for us some problems, because they are the dominant selling agency, and timber purchaser who desperately need the raw material source for their mills, must then accede to whatever other demands are made in order to get to that raw material.

Senator MELCHER. Well, my experience on how regulations are drafted by Federal agencies is similar to yours, and I feel that Congress must take a more active role in the process of drafting regulations. I think we have been negligent there. I don't think it does us any good to pass a bill and then find out that the regulations don't carry out the intent of Congress and those of us who have worked very directly in the passage of the bill. If our intent is scuttled after the passage of the bill by the regulations, then I think we have only done

half of the job—Congress has only done half of the job—so I anticipate that what you are seeing, or what you will be seeing evolving in Congress, and what I can detect evolving in Congress already, is a more firm hand in how the regulations are drawn. I wouldn't want to indicate to you that the subcommittee, if we pass the bill, will be through with it. I don't think that will be the case.

I think the subcommittee will be part and parcel of the consideration of the regulations proposed by the Forest Service. I think the consultation at that stage, then, would be three-way. It would be the public that is interested in commenting on the regulations, and that would be one part of the triangle. The Forest Service would be another part of the triangle, and the third part of the triangle would be the people in Congress. In this case, it would be the subcommittee that would be directly involved as far as the Senate is concerned. I am sure that Congressman Foley in the House Agriculture Committee would probably—well, I am sure that I can say he would be interested in the regulations, too, so I think your consultation would not end with the passage of the bill. I think we would want to have the consultation continuing during the drafting of the regulations to implement the bill, too. Maybe that's not reassuring to you, but—

Mr. McDOWELL. I should tell you that I was very encouraged by Doug Leisz's remarks.

Senator MELCHER. All right, thank you, Howie. Now, whom have we next? Lloyd, are you next? No, Ernie, I skipped you. You're next.

Mr. CORRICK. The further we get down the list, the less I have to say.

Senator MELCHER. Don't let me discourage you from making your point. We need your point.

STATEMENT OF ERNIE CORRICK, CHAMPION INTERNATIONAL CORP., MISSOULA, MONT.

Mr. CORRICK. Well, I want to just talk briefly on my statement, and then, some of the questions came up here this morning, and I would kind of like to talk about them.¹

My name is Ernie Corrick, and I appear here today representing Champion International Corp., and we do appreciate the opportunity to discuss residuals with you, because in Champion, our use of residuals in our pulpmills is a great part of our raw material requirements.

Locally, the department that I manage, I'm in charge of getting the residuals for the pulpmill, so we are trying to maximize wood utilization on our own lands. In this respect, last winter we had a cooperative program of the local forest science laboratory, the school of forestry's forest and range experiment station, and Mr. Bill Potter, a rancher in the Blackfoot and Champion, and in this, we made thinnings on a second growth of ponderosa pine stand. Of course, some of the trees were merchantable, which we used. We marked it selectively and left the best trees, but there were a lot of trees that weren't merchantable and never would be merchantable, because they were just too small, so we logged all those. We had special equipment;

¹ See p. 77 for the prepared statement of Mr. Corrick.

we had a chipper and put the chips into a chip truck, and we ran experiments on the value of the chips for the pulpmill.

We checked the chips at the pulpmill and they were not suitable for making paper. There was too much bark in them. These trees were so small, the proportion of the bark in the chips was too much for making paper, but we did use them for hogfuel.

We're going to try this again this winter. We have a few more ideas on this particular situation. We realize this is a very limited type of residuals. You're talking about residuals left from logging. This particular experiment is utilization of trees that are too small to be used for lumber, so we are working on methods, along with the Forest Service and the school of forestry and trying to utilize residuals, because there are some problems with the technology involved and the machinery to get the residuals out, particularly the small trees.

The large cull logs, which we use periodically whenever the sawmills are restricted in their lumber production like now, due to the lumber market—we'll probably have to use large cull logs, roundwood logs, to run through our chipper out at the pulpmill.

I think, in my judgment, the concept advanced in your bill is very good. I don't think there is any doubt in anybody's mind that we're looking at a major energy deficiency in this country, and while some of the economics of it are not possible, possibly, right now, it's very difficult to look ahead a year from now, and particularly with our dependence on foreign oil, as to what might be required for energy.

Washington Water Power, at the present time, is making application to build a powerplant in northeast Washington that will use hogfuel as a basis for energy, and I guess they are working on the feasibility studies now. I don't know that it's a 100-percent set fact, but it does look like it's going to go through, and this would be the first large powerplant in the Northwest to use strictly wood residuals.

The St. Regis Paper Co. has a small plant at their plant that they pump power back into the local power system there.

Senator MELCHER. Joel, how big is yours?

Mr. NELSON. Oh, boy! I can't tell you right now. I couldn't give you the exact output, but we're totally self-sufficient energywise at our operation there, and we also sell power to the——

Senator MELCHER. So it's big enough for your self-sufficiency?

Mr. NELSON. Right, we're self-sufficient. We buy no power whatsoever.

Senator MELCHER. Whom do you sell your extra power to?

Mr. NELSON. We sell our extra power when we run full generation to Pacific Power & Light. It goes into the BPA grid. We have power steam generation. We also have the hydrodam at Lake Creek at Troy.

Senator MELCHER. So it's a mix?

Mr. NELSON. Right.

Senator MELCHER. Your power supply is a mix of hydro and the wood?

Mr. NELSON. Right, but the hydrodam at Troy is Montana Light & Power, which provides the power for Troy, the city of Troy.

Senator MELCHER. Ernie, do you know how big this Washington water powerplant would be?

Mr. CORRICK. No, I don't, Senator. Was it 80 megawatts? I'm not sure.

Senator MELCHER. The Potlatch one has been described to me as an 80-megawatt plant. Do you remember what Dick Lloyd said when he was discussing this with us?

Mr. CORRICK. I don't know.

Senator MELCHER. We brought up some of the questions that were raised with us by the Potlatch people about the problems they foresee with the regulatory commissions on those smaller plants, the cogenerating plants using wood residue, and I have directed that to Geoff Abadian.

All right, go ahead, Ernie.

Mr. CORRICK. There has been another company that has been making preliminary studies on the feasibility of putting a pulpmill in northern Idaho. This is Toyopack, which is now Washington-Idaho Forest Industries, and they're making a feasibility study right now on another pulpmill in that area. The champion mill here will increase production 50 percent by next fall. They're in phase II, the construction stage now, and by fall, it should be operable, so I think, looking down the road, there definitely will be requirements for more residuals.

In this area, where we also have lumbermills and a plywood plant, we're also worried about the timber supply for those mills. Part of the timber supply comes from our own lands and much of it comes from timber purchases, so we don't want to see anything that would cause more timber sales to go in deficit which they could say, "These lands are not feasible to manage timber on, because they're in deficit, and the economic return to the Government is not enough, and it takes it out of the timber base," whereas there's the possibility if we didn't have the residual requirements on those particular sales, they wouldn't be in deficit. It's kind of guessing at the future, and I really couldn't say, but we would suggest one change, and that would be:

In cases of wood residual removal for fire prevention, site preparation for regeneration, wildlife habitat improvement, or other land management purposes, the Secretary may require the removal of such residue upon agreement to pay the difference between the expense of removal and the fair market value.

In other words, to do all that, to remove all that residual, you are using expensive equipment to do it, and we would feel that it would be only right that if we do all those things, we should be given the fair market value of those residuals if we are required to move them.

Senator MELCHER. You don't want to just break even?

Mr. CORRICK. If you do that, all you're doing is helping the equipment companies out.

Senator MELCHER. Yes, I know.

Mr. CORRICK. We realize, you know, that anything we do in the use of residuals in the way of fuel effort is going to be very small compared to the total fuel requirements, but it does look like even a small percentage, like 10 percent, would be sufficient to make it worthwhile, and we really see, looking down in the future, that residuals probably will be used—residuals will probably be used more in manufacturing processes in the forest products industry than will be for fuel. I think in order for us to operate—not just this company, but all companies, the full industry, in order to keep advancing—we're going to have to change our technology, and I am sure these technologies are going to require the use of more residuals in some kind of

pressboard, particle board, or some such nature as this, particularly since, with our timber supply, the trees get smaller and you have to do something to break them down further to put them into particle board or something to make a useful product.

Now, on the transportation, the pulp companies in the northwest area have contacted the Department of Transportation plus the railroads, and they are in the process now of a 3-year program of building more chip cars for the whole northwest area which we're included in. The problem will be how fast they build them and whether it will be enough after they finish, but we are working on this problem, and St. Regis is doing it, too.

The 5-D logs—we still have 55,000 cords of 5-D logs left over from 1974; however, we feel that the plywood and residual chips from sawmills are decreasing, due to the fact that the lumber market is poor. They have laid off shifts, so we feel we will be pulping these logs, part of them, this year, and looking into the future, we feel 5-D logs will definitely have a definite part in our program. We can't say exactly how much, at this time, but we don't think there are enough residuals to run the mill on plywood and sawmill residuals. It will require some roundwood production to fill it in. Of course, we have our own fee lands and we would probably utilize these logs first, but it will probably require other residuals to operate.

One thing on the storage of residuals, particularly residuals with bark in them, they're very prone to catch on fire, and when they do, they're real difficult to put out. You have to turn those piles over, hogfuel piles, quite frequently. I know at Bonner, in the days gone by, particularly under Anaconda, we had large piles of hogfuel, and they caught on fire several times. It's really difficult to put them out, so there has to be some kind of process so you can utilize them and keep them turned over or else you have to turn them over and just move them back and forth, but you have to use them, because they are prone to fire. I am sure the Forest Science Laboratory has a lot more data on that than I would, but it would be something to check into.

I think on one other question, on the processing, I think there the cull logs, the cull 5-D logs, are cheaper to bring into a shipping plant. The smaller material is cheaper to chip in the woods, because you have to load that small stuff, and your equipment is all big, and there just isn't any way to handle tops and short chunks, so I think that it's cheaper to chip the small material in the woods. That's all I have, Senator.

Senator MELCHER. Thank you, Ernie. Now, Lloyd.

**STATEMENT OF LLOYD STAHL, MANAGER, ROCKY MOUNTAIN
FOREST RESOURCE AFFAIRS, FEDERAL TIMBER PURCHASERS
ASSOCIATION**

Mr. STAHL. I am Lloyd Stahl, a licensed forester, and manager of the Rocky Mountain Forest Resource Affairs for Federal Timber Purchasers Association, and I heard earlier this morning that apparently there are two Federal timber purchasers associations. We're the one that is located in Denver.

Senator MELCHER. You're the Denver one?

Mr. STAHL. Right. Our membership is in eight Rocky Mountain States. Our members operate wood products manufacturing facilities and are more than 90 percent dependent upon Federal timber for their raw material supplies.

The concept of generating energy from a renewable resource has been enjoyed by foresters and land managers for many years. It is refreshing to us to see that now this concept has moved into the public conscience.

Where there is a commitment to long-term timber management, wood residues are now being used to generate energy. I think you have heard this earlier. It is important to know this, because we are concerned that this legislation is premature. Let me explain.

This bill, S. 1996, authorizes only one thing which is not currently available to the Forest Service. It authorizes appropriations not to exceed \$50 million in any 1 year for 5 years. This would be an incentive to have purchasers of Federal timber remove more material in the harvesting of forest crops.

The bill states, if I am correct, that it is the intent of this legislation to remove only positive valued material with a few exceptions. The exceptions are so broad in nature that very little imagination is necessary to envision the \$50 million incentive used up in just a relatively few timber sale offerings. Rather than a short-term minor subsidy to a few timber operators, we would like to suggest a grand scale subsidy to the American people.

Currently, the Federal Government controls many acres of land with known energy reserves. The technology for its extraction and use is in place. Our near future energy could best be served by careful development from these energy sources.

The Federal Government controls over 50 percent of the softwood timber supply of this Nation. This has a tremendous potential to provide greater supplies of wood for products and energy, but there is a problem. The timber base of the National Forest System is not stable.

It is our belief that a commitment to managing the national forests must be made. Until the wilderness issue is settled and industry can depend upon a continued supply of raw material, it will not be able to make the necessary investments in plant modernization for greater utilization, pollution control, or energy generation. The inventory of potential residues has not been done at this time. Some attempts toward developing a system of inventory have been started, but are still in the infancy stage.

We learned this at the symposium. They're measuring it in all kinds of ways, and I don't know what lands they're measuring it on, and there were a few questions at the symposium as to "What area are you talking about?"

Before we plunge into a new program of moving wood residue from one place to another in an inefficient manner, we should examine closely what is needed to produce more from the same base.

The forest base must be established and maintained. An inventory of the established wood products base must be made and the future available material must be predicted. Knowing there is a commitment to manage the national forests for continuous crops of wood products will lead to the necessary investments for better utilization of the available raw material for wood products and energy.

We have many other concerns with this bill. The appraisal becomes ineffective because the sale term should be at least 3 years in areas where there is only Government timber available to the industry. This means that the \$50 million may not be needed until the third year, at which time \$150 million may be needed. During the same period, it is possible that market conditions will have made a positive value negative and inflation will have made the incentive nonexistent.

Extracting residues for wildlife, recreation, esthetics and/or range values and charging these costs to timber management creates a situation where productive forest lands will be classed as unsuitable for wood production under the provisions of the National Forest Management Act of 1976.

We envision energy efficient operations to be those using the least amount of fossil fuels in the production of energy. At a very minimum, there should be a saving of fossil fuel by the use of its replacement. Current technology indicates home fireplaces to be very inefficient. Extensive use of wood in individual homes may create an intolerable condition in air pollution.

We are requesting that you reconsider the necessity of this bill at this time. Legislation to provide for long-term, stable management of the national forests would accomplish greater utilization and more efficient manufacturing. The assured raw material supply will be the incentive to invest in capital improvements. This will return more money to the Federal Treasury and maintain employment in the wood products and allied industries.

We would be most happy to work with you, your staff, and the committee, in the development of a healthy National Forest System, which would in turn provide more goods and services for the American people.

Thank you, sir.

Senator MELCHER. Lloyd, I can tell you that I have asked the Library of Congress to give us an evaluation of the quality of the inventory, and that will go directly to the point you make on whether or not there has been adequate inventory. We will probably have this study by the Library of Congress on that particular question, "how good is the inventory so far," and we'll probably have that within 60 days. That will give us some insight.

Mr. STAHL. The other question that occurs to me is, we're looking at residues in old growth stands, you know, that's cull material for sawmills and plywood, and these are large pieces of material, and there is going to come a point, there's a management plan that says that we're going to be through in the old growth stands, we're going to get into the young growth managed stands at a certain point down in time, and then it's a whole different piece of material. It's going to take all different kinds of equipment and things like this, and we don't know what that land base is. You know, what we thought was the land base today that was inventoried, changes tomorrow, and it's either no longer available, or it has been put into another category, or something like that, so then our inventory isn't assured out there for the investment need.

Senator MELCHER. I don't know whether it's general throughout the intermountain area, but it's sure disturbing here in several of our

national forests in Montana that the lodgepole pine bark beetle infestation makes it absolutely mandatory that we start to move rather promptly on whatever management we're going to have, whatever management practice we're going to pursue. In those areas, where the infestation is not only bad, it is rapidly getting completely out of hand, so I don't know how long we can delay on starting to make some prudent moves.

We don't know when the review of wilderness areas here in Montana, particularly in the statutory study areas which involve almost 1 million acres, will be completed. We can't see when that would be completed, and we can't wait through the completion of that to make some moves that need to be made, so we're not going to know the inventory here in Montana for a long time for the very point you make; is it, or is it not going to be wilderness. We would have to wait until that process is completed to make some prudent moves on parts of the forest that is not going to be wilderness. We would have to delay and I think we would be derelict in our duty in not proceeding, so—

Mr. STAHL. Then, from the other side, what I see is, I can't get any money from my banker when I say I need to make this capital investment for this energy efficient thing, or to produce this energy with wood, and the first question he asks, "What is your raw material supply?" and I say, "The national forest," and he says, "Oh, well, in that case, I can't loan you any money because you don't have an assured timber supply," and we get caught in a—you know, it's kind of a Catch-22.

Senator MELCHER. It's not that I don't understand that Catch-22. I very much do. I just want to caution you that I don't believe that we can wait until we have all the inventory finalized to make the moves that the conditions demand we make. One of them just happens to be these bark beetle infested lodgepole pine areas, so we're going to have to do the best we can, as we can.

The points all of you make are valid points. You don't necessarily reach, even among yourselves, the same conclusions, and we anticipate that. Now, we do want the bill to be flexible. I think as it's drafted, the intent of flexibility is clear, but we will work with you. The committee will work with you on any portions of the bill that you have suggestions on as to the language and the intent, and as I told you, we will work on the regulations also, if the bill does become law, and see that during that process, we maintain the purposes and the goals of the bill and that the clear intent of Congress be carried out in those regulations.

As to deficit sales, our intent in the bill, is to avoid deficit sales. That's a point that isn't well-explained or well brought out in the bill. We will certainly work with you on that point.

Now, Howie, I have a question. It has nothing to do with the bill. Is Larry Blasing back in Washington?

Mr. McDOWELL. He is back in Washington.

Senator MELCHER. For the rattlesnake hearing?

Mr. McDOWELL. For the rattlesnake hearing.

Senator MELCHER. All right, if you're in communication with him, will you inform him, in case he doesn't know, that the Senate Energy and Natural Resources Committee will hold a hearing Monday after-

noon to follow the House hearing on the rattlesnake so that the witnesses that come from Montana don't have to use up too much additional, unnecessary energy getting there to testify on the Senate side. We will dovetail—we will have an afternoon hearing on the Senate side on the rattlesnake so that the witnesses that are present there can get a double shot on the bill and won't have to be called back later for a Senate hearing.

Mr. McDOWELL. He's a good communicator, and that's the first thing he called us about this morning.

Senator MELCHER. All right, fine. We'll try to get word to all the other witnesses, too, from Montana.

All right, thank you all very much.

I would like, first of all, to read the witnesses on this list, and see whether they are here.

Bellusci?

Mr. BELLUSCI. Yes.

Senator MELCHER. Dr. Knight and Bob Raisch?

Bob, do I say your name right?

Mr. RAISCH. Yes.

Senator MELCHER. Wayne Wilcox?

Mr. WILCOX. Yes.

Senator MELCHER. Mary Curnow?

Ms. CURNOW. Yes.

Senator MELCHER. McGregor Rhodes?

Mr. RHODES. Yes.

Senator MELCHER. Dick Vinson. Dick, are you here?

Mr. VINSON. Yes.

Senator MELCHER. All right, Chris Stobie?

Mr. STOBIE. Here.

Senator MELCHER. John Badgley?

Mr. BADGLEY. Yes.

Senator MELCHER. Doug Smith? Doug will be here this afternoon. Ervin Malnarich?

Mr. MALNARICH. Yes.

Senator MELCHER. And Duane Anderson?

Mr. ANDERSON. Here.

Senator MELCHER. Now, are there any of you that have any time constraints so it would be better for you to testify now?

All right, Dr. Knight, and Bob, why don't the two of you testify right now, because we would like to accommodate any of the witnesses that have any time constraints.

Proceed, Dr. Knight.

STATEMENT OF DR. ARTHUR KNIGHT, DIRECTOR, STATE DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES, HELENA, MONT.

Dr. KNIGHT. Senator Melcher, it's a real privilege to be here to testify in favor of this bill. I think it's something that has been needed for a long time, and it's a real indication of your responsiveness to the people of the State. Nothing has been more disconcerting to me than to see huge piles of wood burned in the forests. I'm not talking about

those small pieces. I'm talking about nice big pieces of firewood. I see it go up in smoke when it could be used for energy. Time and again, I have seen this happen. I have seen times where roads have been blocked off where you can't get into this source of energy. The erosion produced by blocking the road off is far more serious than the small number of cars that would come in to pick up this wood.

In some of these fragile areas—I have seen the ski area up by Echo Lake, where bulldozers have been used, and even 6 years later, none of the topsoil has come back.

The amount of concentrated pollutant that goes up into the air, I think is far worse in this kind of situation than if it was disseminated where people are allowed to come in and take the wood and use it for home use, and at least, you're getting some use out of the energy.

I have heard that they need the heat to burst the seeds, and so on and so forth. I think there are plenty of seeds that get burst in our dry summers here when we have forest fires, as this last year.

I think your program will also help the fire danger by getting this wood out of the forest such that it can be used in a way that's going to be productive.

In testifying for the Department of Health and Environmental Sciences, I would just summarize by saying that we support the bill for the following reasons:

The bill will promote conservation of energy.

The bill will reduce the amount of slash burning necessary for site preparation and wildfire protection.

Slash burning is probably the largest source of respirable particulate in Montana. Wood smoke has a particle diameter that allows it to be carried deep into the lung. Western Montana does have a high mortality rate for emphysema and bronchitis, and reducing the slash burning will probably benefit health in our State. Reducing slash burning will also help protect visibility in Montana.

The department is worried about the consequences of S. 1996 because the bill may make it more economical to remove slash materials from the woods and convert it to hogfuel than to take hogfuel from existing sawmills. If the sawmills lose their hogfuel market, they will be forced to burn their waste material in tepee burners. Tepee burners are a major air pollution source in Montana. The department hopes that S. 1996 will not destroy the existing or potential hogfuel market for Montana sawmills.

I don't see any provision in the bill to encourage the access for the little guy who wants to get wood for home heating purposes. It appears as though the Forest Service has, in the last year or so, developed better programs to allow access for people who want firewood; however, I think the Forest Service should be encouraged to expand its program as much as possible and make sure not to cut off access by the public to good supplies of firewood by bulldozing roads and blocking them off to these areas. It not only doesn't allow access for removal of this wood, but it definitely creates an erosion problem.

The Department would be happy to work with any of your staff or people if there are any significant problems as far as the one part that I brought out in regard to the possibility of this being too much of an incentive whereby they would go back to the tepee burners.

Thanks a lot.

Senator MELCHER. What is the State law on tepee burners right now? Don't you have quite a little power on that, where tepee burners can be used?

Dr. KNIGHT. Bob can answer that.

Mr. RAISCH. Yes, we do have several regulations on tepee burners. Generally, there's an opacity regulation, which is a visible emissions regulation. There's also a mass emissions regulation, which is almost impossible to enforce due to the fact that to sample exhausts from tepee burners is very close to impossible. To get up near the top, it's too hot, and the gas volume is so large that it makes it very difficult, so that particular standard, the mass emissions standard, is very difficult to enforce.

The opacity regulation, we do, in fact, enforce, and we do have a considerable amount of problems with tepee burners throughout the State; in fact, probably a major amount of our enforcement action does revolve around tepee burners. Even at best, with optimum operating conditions, a tepee burner in good physical shape, which is being taken care of and operated in a proper fashion, it's still very difficult to operate such tepee burners in compliance all the time, and even if they are operated in compliance, they are allowed an hour every morning for building a fire, at which time they can put as much smoke into the air as they want.

Senator MELCHER. I see. Please proceed, Bob.

STATEMENT OF ROBERT W. RAISCH, MONTANA AIR QUALITY BUREAU, HELENA, MONT.

Mr. RAISCH. Well, thank you for the opportunity to be here to represent the Montana Air Quality Bureau in this hearing.

The Montana Air Quality Bureau wishes to express its support for Senate bill 1996. It is our opinion that this legislation will result in an overall benefit to Montana's air quality; however, I will also take this opportunity to point out certain air quality problems which this bill may aggravate or neglect to address.

Each year, over 100,000 acres of Montana forest land are burned. Reasons for burning include wildlife habitat improvement, fire hazard reduction, and silvicultural practices. Combustion of this material releases somewhere between 30,000 and 150,000 tons of particulates into Montana's atmosphere. Smoke resulting from forest residue combustion consists largely of particulates less than 1 micron in diameter. Particulates in this small size range are capable of penetrating deeply into the human lung, and are often suspected of creating health effects, especially among individuals already affected by chronic respiratory diseases. Particulates in this small size range are also largely responsible for visibility impairment.

During the fall season, the Montana Air Quality Bureau and the various forestry agencies and industries expend considerable amounts of money and manpower to minimize the impact of smoke from forestry burning. Through the Montana cooperative smoke management plan, these organizations gather daily meteorological, air quality, and planned burning information so as to schedule and perform necessary forestry burning in a fashion that causes the least possible air quality degradation.

Enactment of this legislation would undoubtedly reduce the emissions of air pollutants from forestry burning. Naturally, on some sites, prescribed burning would be discontinued entirely. Even in those situations where the forest manager still required fire as a tool, fuel loadings would be drastically reduced. Of course, less fuel means fewer emissions. It is also true that these sites will be characterized by very fine fuels, since the larger material will have already been removed. Fine fuels tend to make fast-burning hot fires, with significantly less particulate emissions. In addition, the short duration of these fires makes them more compatible with the principles of smoke management.

On the other hand, the air quality bureau has at least two major concerns:

One: The removal and subsequent utilization of forest residues will result in at least a partial transfer of air pollution emissions from our forests to our communities. In our inversion-prone valleys, such pollutants can remain for days. Of course, uses of forest residue can vary drastically; for example, a large electrical generating plant, on one hand, or a residential fireplace on the other. Montana air quality regulations require industrial facilities to meet strict emission limitation. On the other extreme, a residential fireplace or wood stove are little better than open burning when it comes to air quality.

It is apparent that large-scale use of forest residues will require a market in the industrial sector. With highly efficient air pollution control devices currently required on these facilities, the Montana Air Quality Bureau anticipates that the overall impact on air quality will be beneficial; however, a rapidly expanding firewood market could reverse this trend.

Two: The bureau's second concern involves the wasting of another wood resource. At present there are 39 tepee burners operating at sawmills throughout Montana. In addition, numerous other sawmills and other wood industries are stockpiling, landfilling, and open-burning mill wastes. Hundreds of thousands of tons of wood waste are being squandered each year with the only result being a degradation of our air resources. Certainly, large-scale changes are taking place in the market for these materials, but it is doubtful that many of the small sawmills or post- and poleyards will have the capital to install the necessary wood handling and loadout facilities to ship this resource. The Montana Air Quality Bureau recommends that Congress also address this problem.

In summary, the Montana Air Quality Bureau believes this bill should be enacted. We caution, however, against the relocation of air pollution emissions from the forest to our communities. We also suggest some attention be directed toward stimulating the beneficial use of currently unutilized sawmill wastes. Thank you.

Senator MELCHER. Thank you both very much. When we are talking about home heating, particularly with a stove—I don't think you get much heat out of a fireplace—I love them, but I don't think they heat much of the house—but with regard to home heating with stoves, the market is already here, is it not? It's going on right now?

Mr. RAISCH. Yes, sir.

Senator MELCHER. And may dramatically increase this winter, compared to last, and next winter, compared to this winter, but the market is really here, is it not?

Mr. RAISCH. Yes.

Senator MELCHER. As to the question of transferring a problem from the forests—that is, air pollution from the forests to communities here, your testimony, both of you, seems to be rather firm that we have to quit this slash burning in the forests?

Mr. RAISCH. Absolutely, slash burning should be reduced; however, total elimination is doubtful if not undesirable at least in the near future.

Senator MELCHER. Then we will just have to work it out in the transfer. I recognize this problem, Doctor, that the log-fuel would become so much increased that the sawdust wouldn't be burned—

Dr. KNIGHT. Yes.

Senator MELCHER. And then would have to be burned in a tepee burner. I think that's up to the State to control, though.

Mr. RAISCH. Right. However, it will be foolish for the Congress to enact legislation without considering its impact on States like Montana.

Senator MELCHER. Your testimony doesn't indicate you want any Federal control on that, and I don't think you should.

Dr. KNIGHT. I don't, either.

Senator MELCHER. I think it works best under State control.

Dr. KNIGHT. I would like to make a comment about that. In Montana, it's amazing to me the number of people who now live out in areas like Seeley Lake, and how much that has changed in the last 20 years. The Echo Lake area is another example where a tremendous number of people live out in remote areas, and a lot of those people do get their wood from that area. It's economical to get their wood nearby. It's really not economical to haul a load of wood for a long distance, but these people are only hauling their wood for a short distance.

Now, it's certainly more logical to me for them to haul that wood into their homes and use it for energy, and this gives a better dispersion, as I see it, in the Echo Lake area, and the Seeley Lake area—than burning that whole pile and then the whole thing goes up into the air, with more concentration and less dispersion and nobody gets any benefit out of it.

Now, when it is hauled, say, into an area like Missoula, where we do have the air quality problems, there is no doubt that we are going to have to get a lot of cooperation from the people in the area when air alerts are imminent, and when there are air quality problems. When it looks as if we're going to run into significant air pollution, we can tell this by our monitors, and then at this time, we're going to have to get a lot of cooperation, and not just from people burning wood in their fireplaces but also we're going to have to get a lot of cooperation as far as mass transit is concerned, because that's a significant problem, particularly with carbon monoxide. Better transportation schemes may be needed, maybe people should walk more. We are going to have to face this problem, no matter what, and I don't really

think that this bill is going to have much effect upon that problem. I don't think people will be flooding the place with a lot of firewood that they aren't getting right now.

Senator MELCHER. Yes. OK, thank you both very much. Just so everybody will know, I have one more witness before we recess for lunch, and we'll recess, and when we do recess, we will recess until 2 o'clock.

Dave Kesheimer, of Seeley Lake, chairman of the Seeley Lake Planning Organization, cannot be here today, but he wanted to express his support for the bill, and the reason I am making that announcement at this time is to get that on our record.

Wayne Shatto would also like to express support of the bill, and Harley Carlson, chairman of the Green Mountain Conservation District, Thompson Falls, also could not be here, wanted to express on behalf of his group 100 percent backing of the bill.

Sam Silverthorn also has sent us a message that he cannot be here today and will be sending us some recommendations on specifics in the bill that he thinks would be constructive.

The next witness is Al Bellusci, Energetics, Inc., of Missoula.

**STATEMENT OF ALBERT V. BELLUSCI, ENERGETICS, INC.,
EAST MISSOULA, MONT.**

Mr. BELLUSCI. Senator Melcher, I wish to thank you for the opportunity to appear before your hearing for testimony in support and on behalf of Senate bill 1996.

I operate an engineering firm, engaged in energy system engineering and research and development.

As you well know, we are currently experiencing an energy revolution. We operate smaller automobiles, we set back our thermostats, we are tapping the Sun for heat and electricity. The wind, coal gasification, and wood fiber are being looked upon as making real contributions to our energy needs.

It is with this in mind that I believe this legislation can make an important contribution. I have submitted the following development proposal for your consideration.

This letter is intended to provide support of your legislation and to encourage your support of the technical development described in the attached exhibits A, B, and C.¹

Briefly, this proposed development, first introduced in 1972, is designed to utilize waste logging residues as a fuel source to generate onsite electric power. The generated electricity will replace diesel power equipment to supply energy to electric-driven equipment employed in the handling of these forest residues. Once perfected, this power source could serve as an energy source for a host of forest management functions.

I believe that a system utilizing the available energy from forest residues, to recover and process these residues, could play an important role in the economical and successful accomplishments introduced by this legislation.

¹ See p. 80 for the prepared statement of Mr. Bellusci with attached exhibits A, B, and C.

It is estimated that the cost and time frame of this proposal would span a period of 5 to 10 years at an annual cost of \$10,000 per year.

That pretty much concludes my testimony. I want to thank you for the opportunity to present this proposal to you.

Senator MELCHER. Have you talked to the forest research people about this?

Mr. BELLUSCI. Yes; in 1972, at the time I was employed in the development center of the Forest Service, I first made this proposal. Subsequently, I have made two different proposals, both through Senator Mansfield and also through the engineering department of the Forest Service. The feedback I received does not really seem to address the logic of the proposal. It seems to present questions as to the amount of residue that might be available for such a development.

Senator MELCHER. How recent was this? You mentioned Senator Mansfield. How recently have you had contact with research people?

Mr. BELLUSCI. In 1973. I did not, really, receive a reply from research.

Senator MELCHER. Well, you know, there has been so much that has changed in the last several years, particularly, the last 2 to 3 years. I would think that this is something that should be presented fresh, and we will work with you, to make a fresh presentation.

Mr. BELLUSCI. I would appreciate that. I believe there is room within the legislation that you propose to do this. Now, without specifically referring to it—

Senator MELCHER. We don't need any new bill for that.

Mr. BELLUSCI. No; that's what I'm saying.

Senator MELCHER. The bill will help—

Mr. BELLUSCI. Right.

Senator MELCHER [continuing]. Carry out whatever advantages there might be for your proposal.

Mr. BELLUSCI. Right.

Senator MELCHER. But we don't have to wait for passage of this to have consideration of what you are proposing.

Mr. BELLUSCI. Very good.

Senator MELCHER. And I think it's very appropriate that we repropose it to the research people in forestry, and I think the assistant chief, Doug Leisz, will want you to do that, and we will work right with you.

Mr. BELLUSCI. Very good. I thank you.

Senator MELCHER. Thank you very much. Now it is 12 o'clock. I will remain here for a while, but we will recess the hearing at this time until 2 p.m., and those individuals that want to see me now, let's do it, and then we will resume at 2 o'clock.

[The hearing resumed at 2 p.m.]

Senator MELCHER. We will continue our hearing on S. 1996. Our first witness of the afternoon will be Wayne Wilcox, president of Fibre Inc., Missoula, Mont.

STATEMENT OF WAYNE A. WILCOX, PRESIDENT, FIBRE, INC., MISSOULA, MONT.

Mr. WILCOX. Senator Melcher, thank you very much for allowing me to speak at this hearing, and I would like to read my talk here.

I am Wayne A. Wilcox, president of Fibre, Inc., a Montana corporation. Fibre, Inc. is the licensee to manufacture and sell Woodex, a pelletized fuel made from processed biomass, in the State of Montana. Woodex is a clean, nonpolluting sulphur-free fuel with a heating value of approximately 9,000 Btu's per pound. In Montana, the primary source of raw material for Woodex is sawmill waste or hogfuel with a high percentage of bark. The manufacturing process consists of cleaning the biomass, controlling the moisture content in a dehydrator, grinding the fibre to the desired particle size, and subjecting the material to extreme pressure and rapid temperature rise in a pelletizing die. The result is a material that is referred to as "instant coal," but does not have the attendant problems of coal.

My reason for appearing before the committee today is to support S. 1996 and urge its passage into law. I do not see forest residue on our logged areas; I see energy, a renewable, nonpolluting energy that I feel can be a significant factor in reducing our reliance on imported fossil fuels and also extending the life of our own nonrenewable energy sources.

We are all aware of the rapidly escalating costs of energy. As these costs continue to rise, the economics of recovering and utilizing forest residue will soon dictate that the present methods of disposing of forest residue be changed. We feel the economics are at this point now.

I am as skeptical of a panacea as the next person, and what I am about to suggest is not offered as a solution to forest residue on all logging operations, but if it could be implemented on only 50 percent of the sales in Montana, the problem of forest residue removal would be greatly reduced.

We suggest that the entire tree, tops included, be brought out of the sale. Bring out all species, whether they are merchantable or not, if the determination has been made that they should be harvested. Cut lower stumps. All of this timber should be brought off the sale to a central point near an all-weather road. At this point, the timber can be sorted, merchantable timber cut to sawlog length, and reloaded. The remaining timber can be sorted and some sold for other types of lumber, some sold as pulpwood or particle board material, and some can be sold as firewood. All the remaining material would be run through a hog or grinder and sold as biomass.

This approach adds considerable cost to the logging operation, costs which must be recovered. The majority of these costs must be the responsibility of the Forest Service, but to offset these costs, what potential savings are available by changing the present methods? What are the attendant costs involved in piling and burning slash? What are the costs in administration, advertising, et cetera, in going back to a logged area to contract the cleaning up? What are the costs to the Forest Service in monitoring burns, and what savings in lost timber and manpower are available in avoiding the fires that occasionally start from slash burning? There are more intangible costs associated with the present methods of residue removal. For instance, are there savings available by making firewood available at centralized points rather than opening up the forests? What would be the savings in not putting heavy equipment on the same sale twice, since most of the soils are quite fragile? Are there also savings involved in

not having to delay reforestation operations? We are not professional foresters, and I cannot assign dollar values to these questions, but there are people available who can.

I do know that in 1978, region I of the Forest Service, spent \$11 million on residue disposal. How much more could have or should have been spent if it was available?

Let us examine some potential profits available in disposing of residue, once it is at a central location. The Forest Service could contract with a private concern for the disposal, or the material could remain the property of the buyer of the sale. The point is that it is marketable product in the form of lumber, firewood, chips, or biomass. I want to assure you that we are in the market for biomass and are willing to pay a fair price for it.

As I have stated before, we see biomass as an energy, an energy that can play a significant role in our efforts to be energy independent. Another use for our forest residue or biomass that I have not mentioned, and which will gain more importance as the Nation's synthetic fuels program is enacted, is in the production of alcohol. Our forest residues and other biomass will provide an abundant supply of raw material.

I thank you again for the opportunity to appear before the committee and to add our support for the passage of Senate bill 1996. Thank you.

Senator MELCHER. Well, I want to thank you very much, Mr. Wilcox. I think your testimony is excellent. Is your company associated with Pullman Woodex? I take it you are?

Mr. WILCOX. Yes, sir; Pullman Woodex has the license for both North and South Carolina. We are all brothers in this operation of trying to be the junkmen of the industry.

Senator MELCHER. Well, now, I am going to object to that term. I think you are entrepreneurs that are forming part of our energy supplies that are of a renewable nature.

Mr. WILCOX. That's what we feel, too, sir.

Senator MELCHER. I don't think that's junk. I think that's very commendable. Who is using your product now?

Mr. WILCOX. We are in the process now of getting financing to build our first mill here in Missoula, but in the interim, we are buying pellets from Mr. Madill's outfit in British Columbia, and are shipping them in here and selling them on the retail market for stoker-fired homes residually here in the area, and we can ship these pellets from Canada into here and still sell them at a considerably less price than coal.

Senator MELCHER. 9,000 Btu's—you're getting up into a range that is not real good coal, but it isn't too bad, either?

Mr. WILCOX. That's correct.

Senator MELCHER. It's about the upper limits, I think, in Btu's per pound, as Colstrip coal?

Mr. WILCOX. Correct.

Senator MELCHER. Now, tell me about the pollution, because you're in the right spot to avoid pollution here in this town.

Mr. WILCOX. We are. We wear the white hats. Both the Forest Service approves of us, the ecologists, and the people who will poten-

tially use the fuel, and can use it at a lesser cost than any other energy form that they have now. It's renewable and absolutely nonpolluting. We have the tests in the information I gave you from the Bureau of Standards testing. We can burn this material in large boilers that produce steam, and do it within the acceptable standards of the air pollution quality control with no back-end material at all.

Senator MELCHER. Now, what does your company feel is a fair price for biomass right now, today?

Mr. WILCOX. We use, of course, any biomass. It's the widest distribution of costs imagination. We can buy material now for as low as 58 cents a unit up to about \$3.50 a unit from the different sources now. We feel that we can and will have to pay considerably more than that as these programs are implemented, because we understand and realize that the costs will go up, but we feel that very shortly, the costs are going to come together because of the cost of energy prices but we can live with \$7 to \$10 a ton.

Senator MELCHER. When you said a unit, are you talking about a ton?

Mr. WILCOX. I'm talking about 2,000 pounds; yes.

Senator MELCHER. So you can live with paying \$7 to \$10 per ton for biomass?

Mr. WILCOX. That's correct, and still be more than competitive with any other fuel.

Senator MELCHER. Very good, very encouraging.

Mr. WILCOX. Thank you. We feel it's a very good program and we really appreciate the opportunity to talk to you, as we know this is where it has to originate, and we appreciate what you are doing as far as the Senate bill, and we think it's the right direction.

Senator MELCHER. Thank you very much, Mr. Wilcox.

Mr. WILCOX. Thank you, sir; we appreciate it.

Senator MELCHER. Mary Curnow, Kalispell?

STATEMENT OF MARY J. CURNOW, KALISPELL, MONT.

Ms. CURNOW. Hon. Senator Melcher, and everyone else that is present here today, I want to thank all of you for letting a citizen come in and just speak, you know, and listen, because this is my first time at a hearing, so it has been very enlightening, and I'm enjoying it, and I'm learning a lot.

Well, my thoughts on this bill are as follows. I'm just a housewife. I stay home and listen to the radio and do my dishes, you know, and then I occasionally go out in the timber and pick up wood for our fireplace, so I was interested when I heard the bill mentioned on the radio, so I wrote in about it, I read the bill, and I'm not accustomed to reading these bills. I don't understand everything they're talking about. It has helped me to come here today and hear it verbally, but my thoughts on the matter are as follows:

I have mixed emotions because, realizing there is good in removing slash from our national forests, I am troubled that more slash than necessary will be created in order for it to be profitable for removing.

I think the bill should have a stalling time on the slash posted and dated to allow local wood gatherers to obtain their wood for home use.

Converting residue to petrochemicals will cause more pollution. I am in favor of returning some of the slash to the forest, scattering, and allowing some decay for future growth of the forest, and I did learn today that they do this.

I think someone should check the logging sites periodically to make certain the growth of the forest is ensured for the future.

Thank you for listening, and I hope our leaders will recognize that we who burn wood are concerned about saving energy and not using oil or gas or other fuel, but one more thought on the matter is, I don't think they should go and recover residue on expired contracts of 2 or 3 years past. Mainly, just in looking at the picture, I would suppose that the new growth would be destroyed.

Senator MELCHER. Well, yes and no, I guess. Sometimes a new growth has started. Generally, it's going to take reforestation to be assured of a new growth very promptly.

I think what we're looking at mostly, though, in S. 1996, is adopting a policy for the future of removing the slash. I don't know that we address the problem of old sales, do we? We're attempting in S. 1996 to allow the Forest Service plenty of flexibility in determining in future sales how they should handle the slash.

We have granted authority in the past, in broad areas, for handling slash. We are advised by the Forest Service and even by the testimony this morning of Mr. Leisz that more specific authority is needed to expedite the type of procedures that we envision in S. 1996—whether they want to look back at some older sales, and how they would handle that slash, would be there, but the thrust of the bill to see what we do from now on.

The point you make about the necessity of part of the slash remaining on the forest floor is a very excellent point and is borne out by the testimony this morning of Roger Bay, of the Forest Service, in discussing the very point on how much slash would have to be left, both in the form of needles and fines and in the form of some logs to permit the fungi that are necessary to grow so nature can take its course in maintaining soil fertility and providing proper soil nutrients.

As to the question of individual needs for wood for home burning, we think and we intend that the bill will both expedite it and make it more efficient, more available, and cheaper for people to get at collection points.

Ms. CURNOW. I see.

Senator MELCHER. Now, I don't know what your experience is in obtaining the necessary wood for your own home. I take it it has been all right and successful?

Ms. CURNOW. Yes, it has been good. We always get a permit, and go out and get some wood in our own truck.

Senator MELCHER. We would hope to accomplish in the bill the opportunity of that wood being utilized either for home uses or for biomass such as the process that Mr. Wilcox just testified to. It would be better afterward from collection points, because some of these logging areas are very remote and are not likely to be accessible for anybody's use, but could become accessible if there is a systematized method of collection points for the residue.

Ms. CURNOW. Yes. I was just trying to have a little foresight, you know, because of our fuel crisis and everything escalating so high for the homeowner, that these are important issues.

Senator MELCHER. They certainly are. We appreciate very much the fact that you have come here from Kalispell today, Mary, and I want to thank you for that.

McGregor Rhodes, from Libby?

STATEMENT OF MCGREGOR RHODES, LIBBY, MONT.

Mr. RHODES. Senator, my name is McGregor Rhodes. I am from Libby, Mont.

I am a partner with three other men in a small business concern, and we make our living from thinning and slashing and tree planting. We bid on Forest Service contracts, and we're a small business concern, and I have some points that I will go over in my testimony here.

I think that the bill is a good bill and it's a step in the right direction. It's something that we need. I have some concerns. I think the salvage operations gear themselves to smaller and less technical type operations than logging the saw logs. I think that possibly you might want to consider in your bill that before the timber sale purchaser is required to remove the logging slash, small business concerns be given an opportunity to bid on the salvage rights, and I think that that would help the small operator, because oftentimes, we just don't have the capital or the bid bonds to bid on the big sales, so I think that would be a plus in the right direction.

I think that the salvage material should be available or should be priced at the going rate for salvage. What I think it is is about \$2 a thousand, and I don't think it should be priced any more than that, just because of the nature, as it is now, all that is currently wasted, so I think, you know, that would provide the Forest Service with a fair return.

My biggest question about the bill is the market for the wood residues. I know for years in Libby, they have struggled with that, because you know, we know that the stuff is there and we can get it out. There are no technological barriers against getting it out of the woods, but it's just a matter, you know, of what do you do once you get it out. So, if the language or the regulations regarding the bill once it is passed can be clarified in that regard, I think it would be a step in the right direction, and I also think the Forest Service should seek the public input from the local people on, you know, ways to utilize the wood residue and harvesting methods, and that, because, you know, I feel that small gyppos and local loggers, they have a pretty good feel for what's going on in their area like that, and that they could possibly offer some solutions.

The part of the bill that talks about construction of access roads needed to facilitate wood residue removal, I think that it might be a good idea to clarify that, because I don't think many people really like the type of road that the Forest Service builds nowadays. I think you ought to make sure they aren't the high standard roads that there is so much disagreement about.

The supplement on biomass I gave you kind of gives you a run-down on the costs of different residues, logging residues, and all that,

and you know, you can see how favorably the logging residue does compare with other forms of energy, and I think it is a good bill.

I was over at the steamplant at the St. Regis mill 2 days ago talking with the foreman over there, and he had some ideas about adding existing generation facilities to plants that are already under construction, and that's quite a cost-effective way to go about that when you have already got your setup there. It's just a matter of having more fuel for your boilers, and somebody—well, I guess it was Joel today—mentioned that they had a lot of waste in their log yard that has dirt and rocks and this other stuff in it, and Bob Petricci, who is in charge of the powerhouse there, said that they have technologies such as a fluidized bed, where they can burn all this, if it has rocks and dirt and stuff in it, and they can actually burn this in new technology type energy systems, so that's definitely a possibility.

The other part of this details that 40-megawatt wood waste generation station in Washington that they're going to build, and you can kind of get an idea of the attractiveness of waste for electricity, because for their investment of \$46 million, they're going to realize 40 megawatts of electricity, and compare that to other costs of hydroelectric dams and things like that, and it's on the average—or, of one-third the cost of, say, a hydroelectric dam.

Now, you do need fuel to run the plant, but you do have benefits, both environmentally, socially, and economically in the harvesting of the wood for fuel, because it does provide jobs, and it does make the forest management—you know, it makes reforestation efforts better, so even though you have a fuel cost, it's actually, in its own way, a benefit.

I guess those are the major points I had to address. But I think, you know, you probably should consider making provisions in your bill for a small business concern to have access to this residue removal, because like I said, the small guy, you know, he's got a better chance of harvesting that smaller stuff and utilizing it than possibly, you know, just firms with huge machines.

Senator MELCHER. I was just noticing that small business set-asides on timber sales are actually not getting to the point that you're making, because a small set-aside timber sale is pretty big, and now we're talking about, really, something in the nature of, how do you allow the opportunity, really, for subcontractors?

Mr. RHODES. Something like that.

Senator MELCHER. A subcontractor to remove the slash while somebody logs a sale?

Mr. RHODES. Yes.

Senator MELCHER. Because of the nature of slash removal, don't you think it's likely that the timber purchasers are going to look for subcontractors such as yourself for handling the slash?

Mr. RHODES. I think they might want to do that, because they might not want to be bothered with having to remove it—like a big company doesn't want to have to hassle that.

Senator MELCHER. When you remove the slash now, does any of the slash you remove go for energy? Does any of the residue go for energy?

Mr. RHODES. No. When we thin, you know, or clearcut, it just all stays on the ground. That's another part. When we're in a slashing

area—well, what that is, is clearcut, a stagnant area, we clearcut it and then they will go in there and burn it and then they will plant again, but depending on the terrain, you can average clearcutting anywhere from half an acre to an acre a day or more a person, but if you were able, then, to utilize that slash, you would prolong, you know, your employment at the site.

Senator MELCHER. It would be a much more efficient operation, would it not?

Mr. RHODES. Yes. You know, it's going to create a lot more employment. We just finished clearcutting some units that we actually—well, we were on one 22-acre unit, and we probably cut at least 5 or 6 logging truckloads of 8 inch to 12 inches nice standing trees, and they're out there on the ground, and they're just going to stay there. There's a lot of wood out there.

Senator MELCHER. There's a lot of other residue that could be used for energy?

Mr. RHODES. Yes; so you know, you would be increasing your employment, and I think it's a good deal, but I think you should make sure that the small operator and the gyppo are given a chance to reap some of the benefits of this.

Senator MELCHER. We will discuss that with the Forest Service, on how that could be arrived at. I think it's an excellent point.

The point you bring out about the bill on page 4, the authorization to construct access roads needed to facilitate wood residue removal, and the type of road that it would be, properly a point to be brought out in the regulations themselves. I think your point is right. It's something that you flag for us, and we will pay some attention when regulations are drawn on what type of roads they would actually be.

Mr. RHODES. For the most part, once your logging operations, once they're in there, they construct, you know, the roads that they need to get the sawlogs out, so basically, I think almost all your roads would almost be intact for salvage.

Senator MELCHER. Perhaps they would. I think what we're thinking of there is, a forest, where it's dead trees, and we need to make sure that the authority to make the roads to get at that residue is clearly authorized here in the bill.

Mr. RHODES. OK, that's a good idea.

Senator MELCHER. Well, thank you very much, McGregor, for your testimony, and I appreciate your coming down here from Libby today. It's very helpful.

Mr. RHODES. OK. I guess the only thing I could add is that for years we have known there is a potential for this, but you just have to provide the market.

With the \$50 million that the bill would appropriate, would that go, then, to cover the costs of the harvesting and delivering the wood to the concentration areas and that?

Senator MELCHER. Yes; that's exactly right.

Mr. RHODES. Well, I think it's a good idea, so I want to thank you.

Senator MELCHER. I think that's a minimum, too. If you were here this morning, I think you heard the testimony that maybe we just ought to pilot this for a while and hold it down to a maximum of \$7.5 million. I don't really think that gets us very far nowadays. I think the

\$50 million that we have in the bill will be looked at as a good starting point; a good, logical starting point. Where we go from there, we don't know. That's what it would be to start with.

Mr. RHODES. OK. Thank you.

Senator MELCHER. Thank you. Dick Vinson and Chris Stobie?

**STATEMENT OF DICK VINSON, VINSON TIMBER PRODUCTS,
TROUT CREEK, MONT.**

Mr. VINSON. My name is Dick Vinson, of Vinson Timber Products, at Trout Creek, Mont.

I have a small mill there, and I am in the pulp business and have been since 1974, and I have shipped to date about 5 million dollars' worth of pulp out of Montana to west coast markets. We have shipped every year since 1974. We now have about \$3 million to spend this winter, and we haven't been able to obtain the wastewood. This is why this is very interesting today, that we're here to talk about appropriating \$50 million to get rid of this, you know, do something with it.

I also have—the money has been appropriated by the Georgia-Pacific Co. to build a small breakdown mill at Troy, Mont., for me to build it. I postponed a meeting with them a week and a half ago, to meet here with the regional forester, trying to obtain wood, and I haven't done any good so far.

I am wondering why we can't have this wood and turn it into jobs. I'm wondering about the administration, actually. It has been about 5 months ago that we really started pressing for pulp in the Trout Creek, Troy, and Sylvanite Districts, and for instance, in the Trout Creek District, where my mill is, we have one sale is all we have been able to buy, and on that sale—now, this is supposedly a million feet of pulp that was going to be burned and they didn't get around to burning it, so they sold it to me, and we paid \$2,300 for the right to bring that woodwaste out. We weren't paid to go in and take it out; we paid that right, and then, we have had to run a pilot car in front of each logging truck, and this is something—this road has been there 29 years, and it has never been done before, and to my knowledge, there has never been a serious accident on it—but now we're running a pilot car in front of each logging truck.

There were two other loggers using the same road and did not do this, but when I go in and try to get this wood, this wastewood, I come up with problems just like this.

In June I went to the Kootenai people—Kootenai Forest—and said, "We have white pine dying, going to waste all over our country up there and of course in Idaho." I said, "I am looking into buying a helicopter, a small helicopter that's suitable for taking this stuff up." They said, "Great, buy it, and we can keep you busy in this area." Well, I bought it and have made five payments on it so far, and I have not bought one tree. That's why I'm talking about administration. I haven't been able to buy one tree yet from them. We're logging in Idaho and hauling clear around, which is about \$350 a truckload freight just to get it to our mill, and right in our backyard, we have it dying and going to waste every day.

Another thing about administration—the last sale that we did buy, the Forest Service appraisal on it, the crews were off over 100 percent.

Senator MELCHER. Let's see—we have two things, the dead——

Mr. VINSON. White pine and the hemlock pulp, or any kind of pulp.

Senator MELCHER. The hemlock?

Mr. VINSON. Well, we're taking hemlock, spruce, white fir and also the dark woods now.

Senator MELCHER. Is there any of this that you would bid on that has been burned?

Mr. VINSON. Definitely.

Senator MELCHER. In the last few months?

Mr. VINSON. Yes.

Senator MELCHER. How big a burn?

Mr. VINSON. I—you know, when it's burned, I'm not going to say how much was there. Bob Powell, of the St. Regis Paper Co. in Libby—I went to Bob and said, "Bob, can I come in behind you on some of your sales?" He said, "Any time you want to." He said, "Our best one is Iron Grouse." I went over there and it had already been burned. Bruce Dougall, with Louisiana-Pacific, I talked with Bruce a while back, and the best one he had had already been burned.

Senator MELCHER. How long ago had it been logged?

Mr. VINSON. This summer.

Senator MELCHER. This summer?

Mr. VINSON. Yes. Same way with Iron Grouse.

Senator MELCHER. Do I take it that you would have bid on either one of them?

Mr. VINSON. I didn't get a chance to see them, you know. They had been burned before I saw them, but from what the other fellows tell me, I would have, the fellows that logged them.

Senator MELCHER. You see value, and the Forest Service did not see any value, was that it?

Mr. VINSON. Apparently, yes.

Senator MELCHER. Who is in charge of these sales?

Mr. VINSON. Different administrators in these different districts that I mentioned.

Senator MELCHER. Are these all in the Kootenai?

Mr. VINSON. Yes, sir, that I mentioned.

Senator MELCHER. That's something we will want an answer on.

Mr. VINSON. We're talking about a permanent thing. The Georgia-Pacific people have already bought the siding at Troy, had the powerline increased so that we could run a chipper there, spent \$65,000 just doing that, and we're talking of year-round employment there, and we're not able to get the wood for it.

Senator MELCHER. And you're convinced that wood is available?

Mr. VINSON. The Georgia-Pacific people did a study, spent a lot of money, and they came up with Troy, Mont., as the pulp capital of the inland empire. That is why they bought that siding and increased that powerline, quite a few hundred million feet at Yaak, and in this area.

Senator MELCHER. We will want answers on this from the Kootenai supervisor and from the region I forester, and we will get them.

Now, as to the white pine, the dead white pine to be recovered by helicopter, was there any explanation why there aren't some trees marked? I suppose that would be the process? They mark the trees and tell you where they are, or what?

Mr. VINSON. Well, it takes a little while to explain on this one. On a helicopter appraisal, these things come out about base rates if the timber is green, you know, especially, this is small scattered stuff, that the big helicopters can't even afford to take. The way we run ours, we have three sawyers and they have radios on, and they hook their own trees, so they go over here and fall four or five and one over there, and the helicopter—you know—and it's beautiful. They all think it's great, but they're so bound up in—

Senator MELCHER. They being?

Mr. VINSON. The Forest Service. They love it, but with the regulations they have, they claim they're just tied up to where they—well, they have three sales now in the works, and they did have one sale here a while back that they would let me have. It was an area on Smith Mountain that part of it is roadless and 30 acres of it wasn't, and a fire went up and burned 1½ million feet up there, and it was all just above this road, but part of it was supposed to be maybe a primitive area and maybe it wasn't, but you can't log it, so they're going to let that 1½ million stand there, and rot and fall over and do just what you're trying not to do, and yet I could have taken it out and put about \$250,000 into the community there, you know.

Senator MELCHER. What area is that, do you know?

Mr. VINSON. In the south fork of Callahan Creek.

Senator MELCHER. Yes; but what area of the wilderness review is it?

Mr. VINSON. Oh, I have no idea.

Senator MELCHER. Is it Mount Henry?

Mr. VINSON. Smith Mountain.

Senator MELCHER. Where is Ten Lakes?

Mr. VINSON. I have no idea.

Senator MELCHER. It's neither Mount Henry nor Ten Lakes? Is it in Scotchman Peak?

Mr. VINSON. Near it. We looked at another, about 6 million of white pine in another little area right up at the head of Emmerson Creek that they thought they could put up, and then it's in one of these messes, too, but it didn't burn yet. It's just dying.

Senator MELCHER. I think the only three areas that are under those restraints in that area are Mount Henry, Ten Lakes, and Scotchman's Peak.

Mr. VINSON. I will sure find out for you.

Senator MELCHER. Now, we can't blame the Forest Service for what they can't do in those areas. I guess we can blame Congress.

Mr. VINSON. Well, this one was sort of a borderline thing, because 1 week ago Wednesday when I met with Mr. Coston, he thought they were going to sell it.

Senator MELCHER. Maybe it would have to be ascertained where the line was, but on areas that are not involved in wilderness and there is some white pine, and you have the helicopter, and sales could be made, that doesn't even have to be put up for bid, does it?

Mr. VINSON. If you just take the entirely dead ones it wouldn't, but if there was one green limb on one—in fact, the fellows that we went out and looked at this one area, and they said, "No, there's a green limb on that one. Now, when that one dies and cracks and is no longer any good for anything, then you can come back and take it," which would be next year.

Senator MELCHER. I wonder whose law that is?

Mr. VINSON. Well, that's exactly what they said, but then, if it were appraised, it would only come out to \$2 anyway, so that's why I say, in this case, why can't you go ahead and sell it, but no—the Government. These local fellows in that one district are trying, but they're just so bound up in this bureaucracy that they can't do anything.

Senator MELCHER. Well, we'll try to unloosen the bureaucracy, Dick. It seems to me if a tree is dead but has a single green branch on it, it's still dead; is it not?

Mr. VINSON. Well, it's not very far from it.

Senator MELCHER. Well, it's not going to live, is it?

Mr. VINSON. No way.

Senator MELCHER. So I'm not just aware of how they're put in that kind of position, but we will find that out, too. Check back with Geoff in about 1 week. We'll give him a week to get a little more input into this.

Mr. VINSON. I'm supposed to have this meeting rescheduled for next Wednesday in Seattle about this breakdown mill.

Senator MELCHER. I will check back on Tuesday, then.

Mr. VINSON. I think some of these things should be pursued before you get ready to give \$50 million some of these things that will stand on their own, you know, like the things we're doing.

Senator MELCHER. Well, we don't need legislation for what you're talking about. We just need some action.

Mr. VINSON. I have been 5 months trying to get something done.

Senator MELCHER. When do you go out to Seattle?

Mr. VINSON. Next Tuesday night.

Senator MELCHER. Well, check with Geoff before you go out there and maybe we will have some answers for you.

Mr. VINSON. In the meantime, on this pulp thing, we have the money sitting there waiting to spend, the people, the machinery, the management, and all we're lacking is the material, and it's there, and in the meantime, there are a lot of people out of work just because of this, so that's why I am talking about this management thing, managing your program or whoever's.

Senator MELCHER. Chris, do you have points on this?

STATEMENT OF CHRIS STOBIE, MONTANA STATE REPRESENTATIVE, THOMPSON FALLS, MONT.

Mr. STOBIE. Yes; thank you, Senator. I'm Chris Stobie, a member of the Montana Legislature, and I'm representing my constituents, Dick being one.

As I study the bill and read it over, I think I kind of agree with some of the former witnesses, that it might not be necessary to grant the Forest Service authority to require that this residual be cleaned

up in sales, but I think maybe the thrust of the bill should be to make it simpler and more speedy to make this same kind of material available that Dick is talking about, set up a system where possibly there are sites of old hemlock stands that could be blocked out and planned ahead for an increase in pulp prices, for example, but you know, you have to do it now. You can't wait for the machinery to grind through, and by the time they get the sale up, the price has gone down on the pulp. You know, the Forest Service tells me, when I talk to them about why they don't have these things up, they say, "Well, we put some up before and went to a lot of expense and work, and then people bought them and about that time, the price fell, and they never were logged, and they got halfway through," and then, you know, they have a lot of costs in it and they didn't recover those costs because the pulp was never logged, and they are even attempting, you know, to prosecute those people that defaulted on the contract.

This is why the timing is so crucial to get the pulp sales there and available and ready when the market is up for our inland empire to be able to market these on pulp, to be manufactured into some kind of a pellet like this other fellow was talking about.

Senator MELCHER. Mr. Wilcox?

Mr. STOBIE. Yes, and used to heat these various schools and court-houses and whatever you have, and maybe some of the money would have to be used as kind of startup money on some of that.

Senator MELCHER. Well, we do authorize the Secretary to cooperate with State, county and other governmental entities, which could be a school board, by making payments to such entities which would cooperate in the operation of these activities. That's pretty broad. It's broad enough to cover what you are proposing.

Mr. STOBIE. It might have to be specifically written into the regs, though, with an idea of how to get this thing started off the ground right away, because we don't want to make a whole bunch of wood-chips and not have any market for them.

Senator MELCHER. Absolutely.

Mr. STOBIE. Someway, we have to get the school boards or county fathers or something off their duff and get started, by converting some of these heating plants into woodfired, and I think you would have to do that with some kind of incentive or startup money, or something like that.

Senator MELCHER. Well, you know, which is first, the chicken or the egg. It's the same with the product or market. They both have to be developed at the same time, and both be reliable.

Mr. STOBIE. Yes. Then, the other thing, as soon as industry—my store downtown uses propane and you know, another one uses oil, and those kinds of things. I fill up my oil barrel 1,000 gallons, and it costs me over \$800. You know, I would be probably looking at the way to convert my furnace to wood fiber if I knew it worked and knew it was feasible and knew it was economical.

Senator MELCHER. Well, I think without a doubt, a year from now, if you're going to fill that 1,000-gallon tank up, it's going to cost you way over \$1,000 to fill it up, and that's a sad truth. That isn't speculation. That's where we're at. We're looking at \$30 oil right now, and \$35 oil in a few months.

Mr. STOBIE. One other thing I want to mention is, we're talking about cleaning up the residuals from logging sales, and there's a—I don't know what it is, but loggers don't like to do that kind of work, and I don't think you will ever get them to do that kind of work, but there are a lot of people who do like to do that kind of work, and I think it's kind of a specialized thing, like gardening or something like that, but you might consider talking to the Forest Service about combining salvage, slash disposal, and site preparation work. They're spending a lot of money on site preparation, you know, and piling brush, and all those things, and that money, combined with the money from the sale of the wood fiber that they are going to get from this operation, could make it a very economically nice operation.

Senator MELCHER. It's a very good point. You have just added another dimension to what we have just previously heard from McGregor Rhodes.

Mr. STOBIE. This kind of all fits together, and these people are just like gardeners. They go out and kind of clean things up.

Senator MELCHER. A very good point, Chris.

Mr. STOBIE. That's all I have to offer, and we really thank you.

Senator MELCHER. We thank both of you. I think you have given us a lot to chew on, and Chris, those are very good suggestions.

Mr. STOBIE. Thank you.

Senator MELCHER. John Badgley, of the Bitterroot R.C. & D.?

STATEMENT OF JOHN BADGLEY, BITTERROOT R.C. & D., HAMILTON, MONT.

Mr. BADGLEY. I am John Badgley. I am with the Institute of the Rockies, and I am here as a volunteer.

A number of us are with the R.C. & D. program, which is a Department of Agriculture-sponsored program, also sponsored by the county commissioners and the conservation district.

Senator MELCHER. It is also under the jurisdiction of this subcommittee?

Mr. BADGLEY. And this subcommittee has done us a good favor by assuring that the R.C. & D. program continues, and we appreciate that. You will be hearing more from us on how we think it ought to be run.

Senator MELCHER. Good. We need it.

Mr. BADGLEY. I am here representing Ken Wanner, who is chairman, of one of our committees, the forestry-industry committee, and what I am about to say are his ideas. Then I will talk a little bit on my own later.

As chairman of the Forestry-Industry Committee of the Bitterroot Resource Conservation and Development Area, I am pleased to see recognition of the potential of woodwaste and efforts to expedite its extraction from our forest lands.

For more than 10 years we in the R.C. & D. committees, made up of citizen volunteers from Mineral, Missoula, and Ravalli Counties, have not only lobbied for more efficient use of material which might be wasted, but have invested our personal funds to see woodwaste put to use.

As you will remember, we acted 8 years ago to begin what is now the Bitterroot Bark Co., a corporation originally made up of ranchers

and a millowner, which still transports hog fuel to Missoula, and delivers ground woodwaste to gardeners, landscapers, and farmers.

At that time, we began cooperation with the research arms of the U.S. Forest Service and influenced them to begin the studies brought forth in the conference on woodwaste at the University of Montana in the last couple of days. Through such cooperation, a map showing the supplies of dead and down timber in the Bitterroot National Forest, was completed, together with details on amounts and quality of the material. We then engaged Dr. Kent Adair, of the University of Missouri, to develop a study of alternatives for a wood concentration yard, into which small operators now mainly excluded from any meaningful market, could bring in material from logging sites and receive cash for the products.

By 1975, we had cooperated in the development of a considerable body of information. We are grateful for the assistance of the Bureau of Business and Economic Research, the forestry school of the University of Montana, the forest sciences laboratory, the Intermountain Forest and Range Experiment Station, the State division of forestry, and the many other agency people, private firms, and individuals, who have contributed so much in this effort.

Highlights of the woodwaste efforts of R.C. & D. since 1966 are attached.

Now, in cooperation with the Bureau of Business and Economic Research, the Five Valleys Regional Council, and the forest sciences laboratory, we are hoping to complete a study of the marketing of woodwaste materials by September 1980.

The third and final study will delineate markets for all possible materials salvaged from the forest without threatening the fertility and characteristics of the soil. These materials may find markets as posts, poles, houselogs, sawlogs, alcohol feedstock, pulp, chips and fiberboard, compost, and other uses.

These three studies and the material developed from many other sources, will be used to study the feasibility of opening a wood concentration yard, the facility to which people who have been turned away from other markets, can go and sell at an advantage to all parties. As unemployment increases, we feel there is special importance in opening these opportunities, and particularly, to reduce the bureaucratic barriers, contracting obstacles and economic problems which prevent these people from having easy access to forest materials at one end and a feasible market at the other.

The many independent souls, now underemployed or not employed at all—I guess that includes you, McGregor—who can thin, glean, clean up trash and cut, haul and deliver material which should be made reasonably available to them, will exhibit the same 18-hour-per-day ambition which has allowed the American farmer to fill the food pipeline. Under present contracting and legal conditions, they are discouraged from coordinating with the Forest Service and other forest owners, logging contractors, or anyone else. As with farmers, the economic incentives need not be large or even certain. They just need to be able to overcome the artificial obstacles which have kept them out of the woods and away from the gates of uninterested buyers.

We especially emphasize that a large number of individuals with trucks and chainsaws await your action to clear roadblocks at the supply end to create an open and dependable market. We of course recognize that problems of roading, watershed protection, administration, changes in contracts and with contractors, development of new markets and new forest product uses, and the health of the forest, must be considered.

However, after more than 10 years of struggle to acquaint the public and the agencies with the potential of woodwaste, we are glad to find that we are no longer alone.

I guess basically, we are saying that you're doing the right thing, and we back it 100 percent.

Senator MELCHER. Thank you. I'm encouraged by the actual progress that you have made on this particular subject. The bill is really tailored for the very points that you make. I hope that your studies, which are coming out at a most fortunate time for guidance of the Forest Service in developing their regulations, if we're successful in passing this bill in the next 2 or 3 months, will just fit hand and glove. Your studies will be completed, I take it, by September 1980?

Mr. BADGLEY. Right.

Senator MELCHER. And if we're able to pass the bill during the next 2 or 3 months in Congress, and the regulations are being promulgated after that time, they will have the advantage of your studies in developing their regulations. I think that is most fortunate, if Congress is able to follow through, in adopting the bill.

Thanks very much, John, for all the work R.C. & D. is doing and for cooperating with the university here, and with the Forest Service.

Mr. BADGLEY. I would make just one last point. I had the opportunity this week to look at some results of some new equipment that the Forest Service has developed at their equipment development laboratory out here, specifically, a yarder and a scaler, which really lends itself to what was the gyppo logger, the person who has largely gone out of business because of the scale of forestry, and while I can't speak with any expertise to the long-range significance of that, what looked impressive to me with the economic data they put together is that once again, a family can go into this, and as was suggested with the last couple people who spoke, this is really important to western Montana in the next few years. There is a lot of underemployment and unemployment, and it can be tragic, and if we can move into this, I think it will have an immediate impact on hundreds of people, so the bill—and we're really backing it as much as we can.

Senator MELCHER. Thank you very much.

Doug Smith, legislative assistant for Senator James McClure?

STATEMENT OF DOUG SMITH, LEGISLATIVE ASSISTANT FOR SENATOR JAMES A. McCLURE OF IDAHO

Mr. SMITH. Mr. Chairman, ladies and gentlemen, my name is Doug Smith. I am legislative assistant for Senator James McClure. I live in Falls Church, Va. My background is as a professional forester with a bachelor's and master's degree in forest utilization and forest management.

My testimony today is going to center on the Targhee National Forest and the mountain pine beetle. I am submitting for the record some information and clippings bearing on this subject. I am also submitting a paper given at the program on harvesting and utilization opportunities which was just concluded in Missoula which has a real bearing on what we are discussing today,¹ Senator Melcher's bill.

I believe that if you can get copies of all the papers that were presented, it would be very helpful for your purposes.

There are many factors affecting the lifespan of the lodgepole pine—because lodgepole pine is one of the most widespread tree species in western North America; it grows under adverse conditions, at a great range in elevation, and a wide range of moisture conditions. Because it is a fire species, it is generally even aged; however, at elevations above 7,000 feet, the stand, if undisturbed by wildfire, can become uneven aged, with older trees reaching 400 years of age. This, however, is the exception rather than the rule. By 400 years of age, these trees have dead tops or are weakened by dwarf mistletoe, and on their last legs. An unusually dry year generally is the final straw, from which these weakened trees cannot recover.

Stands growing below 7,000 feet elevation are more even aged and live to a maximum of 200 to 250 years before various factors determine their final age. These factors include wildfire, beetle epidemics, and succession by more shade-tolerant species. Before man's fire suppression efforts, overmature, partially dead lodgepole pine stands were converted to young stands by uncontrolled wildfire. An example of a dead forest can be found in the Targhee, where thousands of acres of lodgepole pine snags, can be found with a residual of live trees infected with growth-debilitating dwarf mistletoe.

Forest Service experts see the utilization of these dead stands as an opportunity for utilization through energy conversion of fiber not suitable for lumber. Private industry is looking at a residual root fiber for energy production.

I am now going to read from a brochure prepared by the Targhee National Forest entitled "Targhee Lodge Pole, Tragedy or Opportunity."

The Comptroller General reported to the U.S. Congress on October 5, 1973, that more usable dead or damaged trees should be salvaged to help meet the demand. As a result, the Forest Service was requested to (1) require its regional forest to assure an aggressive salvage program, (2) increase the use of damaged and dead trees, and (3) simplify sale procedures.

This is a report on the Targhee National Forest program to utilize mountain pine beetle-killed lodgepole pine. It identifies the dollars needed to implement a 5-year action plan and is in keeping with the USDA directives above.

This is an unusual opportunity to retain a substantial area of decadent commercial timberland production and at the same time, realize significant benefits from the wood that is harvested in the removal process. The immediate benefits from increased availability of wood fiber to help reduce costs of products derived from wood fiber appear to be worth the investment. The long-term value of providing increased wood fiber for future generations is great. To delay seems tragic. The opportunity to act is now.

¹ See p. 87 for the paper given at the program on harvesting and utilization and pp. 89-99 for the above-referred to newspaper clippings.

Much of the northern Rocky Mountains is naturally forested with lodgepole pine. Its common uses include 2 by 4 stud lumber, corral and fenceposts, potato cellar and mine timbers, and fireplace wood. On the Targhee National Forest in southeast Idaho, about 1.1 million acres, or about 67 percent of the forest's total acreage, is forested land. Of this, about 44 percent is lodgepole forest, with about 70 percent classified as sawtimber size.

What is usually considered as one of the forest's greatest enemies, wildfire, has been a major factor historically in establishing and maintaining lodgepole pine as a climax or dominant tree cover in the area. Lodgepole out-competes the larger, slow-growing Douglas fir in reforesting open bare areas, following forest fires. Lodgepole seedlings thrive with exposure to raw soil and open sunlight. They seldom can survive between the shade of taller parent trees. With little undergrowth or branches beneath the dead shade of its crowded stands, lodgepole pine forests are quite free of fire during most of their life cycles. "Asbestos forests," they are sometimes called.

Its life cycle is short, however, and beyond 100 years of age, lodgepole stands become decadent and subject to insects and disease. Toward the end, the combination of standing snags, fallen logs and young tree needles has become ideal for fires to sweep the area into the start of a new life cycle again; consequently, foresters often call lodgepole "a fire species."

Now I will discuss the bark beetles. Targhee lodgepole forests are now in the advanced stage of a growth cycle. In the early 1960's, a naturally occurring population of mountain pine beetles increased to epidemic proportions in response to the increased numbers of overmature lodgepole pine. The beetle infestation then swept north and eastward through the Targhee Forest over the next 15 years. It is currently progressing into Yellowstone and Grand Teton National Parks, as well as neighboring national forests in Wyoming and Montana.

The Targhee officials first attempted to stop the bark beetle epidemic with an extensive program of chemical fumigants sprayed annually on each newly infested tree trunk. Later a combination of spraying and logging was applied in an effort to slow down the beetle until logging could get out ahead and take away its food supply. Neither method could keep up.

Further control was canceled in 1970 after spending \$10 million.

Other mortality factors: In addition to the bark beetle, numerous other natural disasters such as ice, snow, and windstorms have broken off or completely uprooted thousands of forest trees in many locations in the Targhee Forest during the 1960's and 1970's.

Today, out of a potential 3 billion board feet of merchantable lodgepole timber on the Targhee, an estimated 2 billion board feet of it is dead wood. With half of its merchantable-sized stems and two-thirds of the merchantable volume dead, much of the Targhee lodgepole forest appears visually to be sick, half-dead forest.

Many areas contain over 5,000 board feet per acre of live wood with up to 10,000 board feet dead.

As far as the industry situation is concerned, high demand for woodchips for paper manufacture, as well as recent technological advancement in the fiberboard, particleboard industry, is creating an

optimistic utilization situation at the present time. This situation is very tenuous because of the change in cost of money and other factors that affect housing starts each year. We have gone from 2 million housing starts in the past few years to an estimated 1 million starts predicted for next year by some experts.

The brochure notes several processes can utilize forest residues that are now being wasted, both from natural causes in the woods and from logging operations. There are no fiberboard or particleboard plants in southeast Idaho today. Targhee chips could be shipped to an existing paper or fiberboard plant outside the area or a local fiberboard plant could be constructed. Whole logs, dead or green, could be trucked to a local mill site where they could be sorted as to their best use. Poles, posts, lumber or fiber products, could be processed accordingly.

I am going to skip over the rest of this and make this pamphlet available to the committee for their use as this bill is further considered, and there are quite a number of pictures in here that indicate the problems associated with this condition.

In summary, to the forest manager, opportunities approaching total utilization of commercial timber is an environmental dream come true. Mature lodgepole pine forest areas are rapidly decaying, losing valuable growing time and productivity, and becoming inaccessible for continued use by livestock, big game, and outdoor recreation.

These forests can be converted to healthy and reasonably free of fire risk condition again through an orderly management sequence. This opportunity for intensive forestry puts man in his proper role, working in harmony with nature rather than reacting defensively to a process after it is too far advanced to control or coordinate.

All timber sales will be designed to harmonize with the environment and to complement other legitimate forest uses.

The authors of the brochure talk about the problems associated with no action and very graphically point this out with pictures, and then the opportunity for a young forest to come in and be something that is growing rather than something that is dying and nonproductive.

A few other comments: The fiber report required by section 3 of the 1976 Forest Management Act, gives a strong direction for discussing and analyzing the fiber conservation of the whole forest; such things as costs, access to the land base, such as RARE II, and the economic return on the basis of investment, which is a question being raised by the Office of Management and Budget.

Now, one of the problems I have heard discussed with industry in terms of their wanting to make an investment, is the long-range available fiber source when they are planning a conversion center. There ought to be a recognition of the wide variety of the forest types in terms of addressing additional conversion and additional investment of money.

Fiber opportunities include timber sales that are now closed, active timber sales, the obligation of the sale purchaser vis-a-vis special fiber cleanup operators who could perform additional cleanup. I noticed in some of the earlier testimony today these points have been addressed. There should be adequate allowance for profit and risk if we're going to get into this phase of fiber utilization as well as consideration of other forest uses and protection of other values.

A question that ought to be addressed is, does the timber sale contract meet the test of total fiber management opportunities? Right now, there are lots of dollars invested in brush disposal, slash, fire suppression, fire prevention, roading and other things now being spent for management.

The total management package needs to be re-examined in light of where we are going in terms of the 1980's and forest fiber management.

Thank you.

Senator MELCHER. Doug, have you personally examined the possibilities of using this dead wood for energy purposes?

Mr. SMITH. I have visited the Targhee National Forest and spoken with the forest supervisor, and I have also spoken with people in the energy field who are interested in this utilization opportunity, yes.

I have spoken with Idaho Power people and put them in touch with the regional forester, and suggested they talk about the possibility of the fiber potential and the investment for energy development. To date, I have not had any indication that they are that far along in pursuing this.

Senator MELCHER. We have a lot of dead and dying lodgepole in Montana, also in several of our national forests, and so your remarks about Targhee are very much appreciated, and your expertise in the field lends a lot of weight to your testimony.

We are grappling with the types of programs that will allow us to rid ourselves on our national forest lands of the dead lodgepole without having to wait for fires.

Mr. SMITH. Right.

Senator MELCHER. It seems like a big waste. The problem we have before us in this bill is one of whether or not Congress views it as most of the witnesses have today, as a necessary step. Would it be your judgment that we could have a good chance of passing it within 2 or 3 months?

Mr. SMITH. I would say that if this opportunity can be viewed as helping to meet our long-range energy needs, and focusing more on this as part of the national wood bank for our energy needs, and the realization was put together in terms of Congress understanding what the potential is. Part of a paper that I gave this morning quoted the Society of American Foresters as indicating about 20 percent of our energy quad needs could be met through an intensive total utilization of our forest resources. This is a significant amount.

It's too bad that the Department of Energy has not seen wood in terms of its energy potential to the extent that some feel it should have been given.

I think that focusing on this as one of our needs, with the increasing uncertainty of our foreign sources of energy, makes it worthwhile to make a strong push for passage of this.

Senator MELCHER. Bill Nicholson, who is Potlatch energy engineer in San Francisco, has been in contact with the Federal Energy Regulatory Commission staff members in Washington, one of whom is Jack Hinman. Hinman told him that wastewood from logging and manufacturing will not be considered biomass under the Public Utility Regulatory Policy Act in 1978 for qualification as a biomass energy small cogeneration plant, and those plants are up to 80 megawatts.

It seems like we are at cross purposes, then, with the understanding between how we view the potential and how the Federal Energy Regulatory Commission views it. I suppose it's important that we review the Public Utility Regulatory Policy Act of 1978 to see why wastewood would not be considered a biomass energy for small cogeneration plants.

Mr. SMITH. From your comment, and what is happening from Vermont on down through the Tennessee Valley Authority, where I have seen examples of people using wood fiber, some people are ignoring the fact that it is an energy source and there is, in fact, quite a bit of the wood being used in rather small and unrelated ways to heat homes.

As people approach \$1 a gallon for fuel oil, the law of supply and demand is going to, in large part, take care of this ignorance of the potential for wood. It's incredible to me that the bureaucracy in Washington, D.C. makes statements when people are going out and on their own using wood for fuel.

Senator MELCHER. I noted in a Today program presentation on TV earlier this week that some of the distributors of home heating fuel oil have found that their sales are down in the Northeast 20 percent from what they were last year, and those business people selling the fuel oil attribute it to the large amounts of firewood that was being utilized in homes in New Hampshire and in Vermont, so their apprehension all this year, particularly from March on, to stockpile enough heating fuel oils, seems to have resulted in not only a plentiful supply, but perhaps it may work out to more than would be necessary.

I think that's very encouraging to us, because the 80-cent fuel oil cost right now per gallon is bound to be way over \$1 within a matter of months. When all the price of oil is averaged out as it continually climbs, at 42 gallons in a barrel, it doesn't take any great arithmetic to figure out that with crude oil at \$30 a barrel—and \$30 may well be cheap in a matter of months—heating oil is going to have to cost way over a buck, and so the utilization of wood is here for home heating, and it's going to stay, and it's going to increase, it seems to me, despite what the slow bureaucracy and the Federal Energy Regulatory Commission viewpoint. It's something we had better tie into all of the existing legislation as being available, and if this energy regulatory bill for biomass doesn't recognize that, and it is thwarted by present law, maybe we had better correct that when we pass the bill.

Thank you very much, Doug.

Mr. SMITH. Thank you.

Senator MELCHER. Ervin Malnarich?

STATEMENT OF ERVIN MALNARICH, SLASH, INC., HAMILTON, MONT.

Mr. MALNARICH. Senator Melcher, I wish to submit for the record the following statement in support of Senate bill 1996.

My name is Ervin Malnarich, owner and manager of Slash, Inc., Hamilton, Mont., a small business concern developed and devoted to the removal and recovery of deadwood residue from prelogged areas of western Montana.

Two years ago, I had the opportunity to work for the USFS Equipment and Development Center here in Missoula as an operator for a

light compact skyline yarder they developed in cooperation with Harry Cummings, fire control officer, Clearwater National Forest in Idaho. The purpose, I believe, at that time, was for fire control, reduce the amount of slash and deadwood residue from logging operations in such a manner as to cause the least amount of damage from very steep and fragile terrain. This material was pulled up and piled on the edge of the road and then burned, a very clean and efficient method for that purpose.

It was then, on this first experience in Idaho, that I could see the potential for this type of removal of residue; however, I also was very dismayed to see it being burned on the spot at the first opportunity, weather permitting. There were thousands of tons of good usable wood products going up in smoke, but at that time and place, there was no market for this material.

From there, I went to the Salmon River National Forest in northern California, Klamath National Forest, of Oregon, and back to the Bitterroot Forest in Montana. In each forest, we demonstrated and proved the feasibility of removal of wood residue from previously logged areas.

During these operations, I have seen deadwood of all type slash operations, natural dead trees, et cetera, in amounts of up to 200 tons per acre. In my opinion, there was and is nearly as much volume being left on the ground as there was standing.

In the past, there was no market. Now the market potential is here. Logging, especially for the small operator, at today's prices and expenses, is no longer practical or profitable. I can see more demand, more need than ever before in our history, to utilize this renewable deadwood natural resource.

Our machines are sitting idle, waiting. We have the manpower drawing food stamps, welfare, and unemployment. Senate bill 1996 is long overdue, but let's not spend any more money for duplicating research and studies of how to get it removed from the forest and to a yard. This has been done. More money must be appropriated for the actual work, but this must come now so that we can get the job done. Don't wait until October 1981.

In the Bitterroot Valley alone, we have the available concentration points on private land, the willingness, the machinery and the know-how.

Let's all hope that Congress does not drag its feet on Senate bill 1996. Thank you.

Senator MELCHER. Thank you, Ervin. Duane Anderson?

STATEMENT OF DUANE ANDERSON, STEVENSVILLE, MONT.

Mr. ANDERSON. I am going to lay upon this rostrum some literature. It comes from a company in Oregon, a company that I do not represent. As a matter of fact, they are not aware that I am appearing before this group today. I have no connection monetarily, personally, or otherwise with this group other than that I know them and am familiar with them for about the last 10 years.

Recently, the U.S. Forest Service in Washington—if you don't mind, I am going to change the posture of how I am sitting. I have already talked to the lady and I want to thank her before I start, lest I forget

later. I do not have a prepared statement, and I can get wound up and shoot a little bit faster from the hip or from the lip or whichever it is, and if she gives me some signals you will understand that we have some prearranged ways by which either the tape recorder is not catching up or burning up or she can't keep her pencil writing fast enough, so I would like the permission of the Chair to address at this posture.

Senator MELCHER. Go ahead.

Mr. ANDERSON. The secondary reason for asking this, and pardon me, as I honk my horn, I asked to be last for two reasons, Senator Melcher, and thanks again for a chance to discuss something with you that we have talked about a little over the past year or so, because I felt certain I wasn't the least bit letdown by the conversations of today, that there would be so many topics brought up that if I was to try to cover them all from my viewpoint, I would have to write a book, and I don't have the abilities, the staff, or whatever, to do that kind of a thing.

This literature which I suggest you take a look at will be constantly referred to by myself in what I hope will be answering questions from Senator Melcher, I would hope, from the floor, or I can address myself to questions that I have made notes on as a result of conversations and positions taken today before this hearing.

The Forest Service, if I can just make a couple introductory comments, in dealing with its management, must necessarily deal with reality. Now, a big, profound statement, I am sure, but the tools that the Forest Service works with are the tools of industry, and to a degree, the tools that Congress provides in terms of moneys which, of course, become usually hiring of manpower or the purchasing of tools for both.

Recent statements from Washington that I have read in the papers—and I cannot quote the person, but they were U.S. Forest Service people—were stating that we do need technological advances in the many areas of concern to forest service management, and I submit to you that every single issue today that has been raised with a question mark above or around it or that should have a question mark above or around it is answered in part or in total by the application of this tool in one of its many and varied techniques and methods. It is the biggest kept secret in the forest management and forest product utilization field that we have had in our country, I am convinced, since the day that Gifford Pinchot first started the concept of national forest management.

We have spun our wheels for the last 15 years on forest management controversies, forest management suggestions, largely to arrive at a date in which we have primarily just inflated forest management costs. I doubt seriously if we can point to any single program in the forest management field that is markedly advanced in either abilities or proficiencies today, than it was when we first had the first columns written in the Missoulian or wherever they were started, that generated the deluge to the Government and the forest service about its forest practices.

We have spent 15 years, and in that 15 years, we have had this tool in its basic current form available to us, proven, also, that if we did, in fact, want to know the solution, it was, in fact, there all the time.

That which we today have largely talked about has been technology and/or position and/or philosophy and/or these abilities that are antique, largely, and I make no apologies for that statement.

Without going further to any of the specific statements that were made today—and those are the only ones I would care to address myself to unless there are other factual matters that have other importance that we're talking about—I would like to have some questions thrown. I don't know, honestly, where to start. I have 63 points that I have checked that are very specific, either inadequacies of statement, inaccuracies, or statements that were avoided on context from other comments that were made.

I find that almost every solution that has been proposed would be inflationary of costs, complex in administration, and were we to look back at it in 5 to 10 years, as futile as many of the things we have tried.

Our country cannot stand a continuing spiral of cost complexity. This tool is so simple, and the application of it is so basic and simple, that I cannot state that which applies without sounding like the fool of fools.

I take no position of adversity with individuals as they have appeared today. Most of them I do not even know. Some I do. I will name names, dates, and places to give example to any of the things which I would try to give as answers, not merely opinion, and I would encourage one thing further—do not believe what I say. Check. I can suggest then wherein you can find, if you wish, most of the answers I would relate to, from studies, from sources, individuals, or whom-ever, that will verify that which I would give you as the reasons by which this tool in its manifold applications does, in fact, translate our national forest resources, the dead as well as the green, the current, as well as the future, into the single best, basic and economically sound answer to our energy crisis, to our building crisis, to our job crisis in our local areas, as well as otherwise, and I am at a loss to go beyond that. I think you gather I can go on for hours and hours. If you don't believe me, ask Geoff. That little smirk over there tells of the hours and hours Geoff and I have spent discussing somewhat what applies.

If there are particular questions, I would surely welcome those, because I don't know just which ones are more important to be answered by me if I can, and I believe I honestly can, those that have been related today.

Senator MELCHER. Well, I only have one question. The type of machine that is in this brochure has been available and has been utilized and can be acquired by anyone that wants to. What's your point in relationship to this bill?

Mr. ANDERSON. OK. I should perhaps answer that, if I might, in two ways. First, these machines, which were brought out in 1963 or 1964—I don't know the exact year—are found in the brochure itself, have been sold throughout the year and were found successful in every place that they have ever been used, which includes many places that were scoffed at as places where consideration of either wood products harvest or manufacturing of same was practicable, the most primitive countries of the world, the most adverse climates, the most marginal timber, the most ridiculous, by current standards of circumstances.

These machines have been, without exception, each one sold before it was ever started as a unit to be put together. The result is that there has never been any advertising campaign by this company. It has not been given any national send-offs. There has not been any need for the purchase of TV ads, and only very infrequently, anything in lesser magazines. I have seen it in the *Good Earth* or *Whole Earth News*, or whatever it is. I have seen it there once or twice, but the gap of public exposure to those who should be aware that a new tool is available to us has left people and the Forest Service—and I continue to find people today yet, in this courtroom, who didn't even know that this tool exists. I won't name the gentleman. It's not necessary. I'm sure it wouldn't embarrass him. He's from Kalispell in the Forest Service there and wasn't even aware that this machine existed. Let's not put the man down. I'm sorry if I put you on a spot, Mr. Peterson, but I thought I would use this as an example.

I have found this continuously, year after year. It would be the same as the chainsaw never being known to the Forest Service in its management choices, and we are continuing to manage as if we only had the crosscut, and the Swede-saw to work with, or that we only had old skip-plows, et cetera, to build roads with instead of bulldozers. That which we plan to, that which we do is left in arrears because of the nonfamiliarity of this tool, but it has not become familiar because the manufacturer has not required a publicity campaign that reaches, if you will, the channels where decisions are made, on the Forest Service and its lands and its problems.

I don't know if that answered the first half of your question.

Senator MELCHER. I only have one question. What does it have to do with the bill?

Mr. ANDERSON. OK. Yes. That was the second half. I believe in past conversations personally, as well as what I have given to you in print at various times, I have indicated that these tools will never become an advantage of consequence to the National Forest program if we do not see these tools used in numbers and in ways whereby those numbers affect management in positive ways.

They are scattered throughout the Nation and the world and as such, do not give any forest management person in a local range or district, a local sale or whatever, the logistics by which to apply the better solutions.

This tool takes those dry, dead products that you refer to in your recovery program, which I highly laud, and instead of making them marginal products of marginal value that may have to be subsidized by Federal funds directly or indirectly, suddenly makes them profoundly as valuable or more valuable because of this tool's ability to transform that raw material into useful products, an ability that other technology does not share, such that those raw materials we are speaking of have more value through this system of remanufacture and utilization, and the logistics that follow than does the current system and its use of the green, choice trees give us today.

Your question about energy—in the Missoula area, yes, we are arriving at a time in which the Forest Service is having problems administering firewood sales. They try to send people to slash disposal areas where they know that they can go to one place and not scatter themselves harumscarum somewhat around the forest and without

knowledge and control. This is not a practicable solution, because they do not have these areas identified nor can they plan that next year they will have the same, other than Stevensville or just out of Stevensville.

Just east of Stevensville is a drainage called Ambrose, Ambrose Road, Ambrose Creek. Up in that area there are two men that are logging dry dead for houselog sale, which is a very valuable product right now, removing from some stands of dry dead. The big problem they have been having is that in that very same area is the firewood area that is suggested and they cut in each other's laps, so to speak. They haven't yet arrived—and as Mr. Costin commented earlier today, they needed to get to administrative identification insofar as firewood technique, but as you are aware, firewood is growing by leaps and bounds and should have 10 years ago, because then, 10 years ago, when oil was 25, 28 cents a gallon, firewood and the cost of getting firewood was like \$12, \$15 a cord. That is being proportional.

Firewood can and would be the relief to not only this area and continue to be such through your program, but it is the great hope, I would hope, of your program, and I sense in your opening comments that this is one of the items which you particularly want to see preserved.

I challenge you that Mr. Big—and pardon me, if Mr. Big is around—I am talking about large industry—has not historically had sympathies with the little man's problems. The cedar controversy of the last 5 years, which particularly has happened around this Missoula area—was one in which those large volumes of cedar were being wantonly wasted by a combination of the indifference of the logging entity, which was largely large milling interests, and the Forest Service's nonidentification that in fact, these logs were of high value. Those same logs now today which are either left to be cut later or are cut and stacked aside, are bringing \$200 per thousand delivered value at the sawmills and have, because they were made continuously dependably available, promoted a strong, sound, and growing industry in the Missoula area, the western Montana area, that has before been made impossible, not because the product wasn't valuable, not because it wasn't there, not because it wasn't in demand, but because the logistics of requiring that it be set aside was not previously a part of the management of the Forest Service.

Now, I use the Forest Service because it's the one we primarily speak of in Government terms. The area that cedar grows includes much landholdings by private industry; Burlington Northern, et cetera, had likewise in the past largely wasted their product because they didn't want to mess with it. Through their existent business, they did not see a value, and for that reason, they weren't willing even at a break-even basis—as you asked one man earlier today, “Would you participate at a break-even basis?” They would not make it available at those prices.

I personally, 12 years ago, attempted to go into the cedar processing business, and I can speak, as a result, very accurately of the 2-year frustration time period in which I tried to negotiate adequate cedar to obtain something with which to work to get the few tools that one would need with which to process. This is just as probably true with your bill today if we make it an either/or recovery choice, and so far as your bill, I want to apply one direct comment to it.

I believe that the sale program must not have an either/or recovery proviso. The Forest Service must identify with whatever techniques, tools and decision capacities that they wish to use, whether, in fact, a sale area should have a dead—if you will—unusable otherwise stem recovery program.

My personal feeling is that if there are 10 sticks—no, I shouldn't say 10—100—100 makes approximately 1 truckload of small-sized logs—if there are that many pieces identified with any geographical sale area, there is no reason they can't be brought out, if they are taken out at and during the time of primary harvest.

I believe we're all talking today, and have been talking, of stems that are not limbs, needles, and broken up pieces. Limbs and needles, if left in the woods, yes, are the nutrient stock primarily, as I understand the nutrient people.

Additionally, those small, broken up pieces largely result from the logging of the other primary products and then, after you go back to salvage log, the mess is an unbelievable mess. I have tried salvage logging, wading through the bream piles, over the tops of stumps. Unless you have high clearance equipment as the normal larger logging effort has, your efforts at salvage logging in much of the acreage—I'm sure the gentleman—no, they're not here—from Libby who were referring to their salvage efforts would concur. Some sites become receptive to post-logging salvage, but if that salvage work is done within the same context as the logging, neither has to cause a major problem to or hindrance to the logging effort.

To drop a tree, limb it up, whether it's green or dry, with a sawyer walking past a dry tree, only to have to come back and refall it 6 months later for salvage purposes, doesn't make much sense, but if this is all done and skidded at the same time, the separation is simple at the landing where the logs are loaded in the woods. To leave behind, if the company does not have usability to this salvage material, at a site where there is already a truck that can drive up and pick it up, is no major problem or cost today.

In 1972, at the time in which it was referred to earlier today, that there was this interest in dry dead harvest for the sake of chip processing, Hoerner Waldorf—I believe I can say accurately—went to about 125 to 135 million feet of accrued material before they realized that that was a nonpaying program, but in that time period, when this was sort of a vogue—and everybody got stampeded into it—the Forest Service included—a fairly large sale in the East Fork of the Bitterroot was let. The successful bidder on that sale was Champion International. At that time I believe their name was something different than that. This sale was only completed last year for the reason that one of the provisos was that the dry dead was necessarily to be removed or at least stacked.

Champion International did everything they could to get out of that sale. They finally were rebuffed by the Forest Service in that it was a specific sale requirement, and this was not a unique sale, but this is one I specifically and physically know of, but it's not just one. It has happened more than just once. They finally had to hire a family by the name of Standell from Darby, who went in then on subcontract with Champion and relogged that which was the contract's original

intent. Those men made very good on the subcontract in the terms of just that, but additionally, and more importantly, those stems that they took out have set up that group of men with the raw material with which to become independent financially on that one sale unit. Those stems were anything but waste.

They were anything but loss of value, except that Champion's entire system, even as of last year, which included Hoerner Waldorf, gave them nothing to recover of value from that that they could identify, but those of us who have used, and are geared to use, and the Nation which could gear to use those products, would find from all sale areas, regardless of whether the volume was large or small, that firewood we talk about—and the reason I say firewood is that I do not believe pelletizing is the answer—if that dry wood is met at its use destination by this machine, be it Kansas City, be it New York—although I think New York is beyond the shipping necessities of our region, but it wouldn't have to be, particularly when we include what the gentleman here related to us a few minutes ago about the Targhee, or what I call the Yellowstone Complex—the unbelievable problem and amount of material that's in that area alone—that those amounts of fuel and primary products which are contained in those logs, could and should be shipped to the use destination where this transportable milling system allows that area and its people to transform that raw material into those finished products that today are most sellable, usable, and needed.

If it's a hard winter, we cut up more into firewood. If it's a building crush, we cut more of it into building material. Ideally, you take as much building material as you can, and the firewood is the residue.

This machine has been shown around the world to be 50 percent to 75 percent energy-conservant. Per thousand feet or per product made by any other system—and there are many studies of this—this saves 50 to 75 percent of the expended fuels and energies necessary to process those same products.

Additionally, this machine allows us to transform our forest product, if you will, green or dry, into almost twice the volume of usable product. Now, I'm getting into things that sound as though I can't prove them. There are things that I have asked be proven by people who would be supposedly nonbiased.

The U.S. Forest Service has been addressed to this question for 8 years, and they continue to do charades and handstands to avoid a confrontation with the issue of multidimension saws.

At the current time, there is a multidimension saw under ownership by the University of Montana. I have for 8 years, along with the resident forester there, Hank Goetz, tried and tried to get Bay to have such a tool, not only to manage better their own forest, and in the process, to supply some of their own building needs at that institution, but also to give a familiarity and a base for some independent research that could be geared specifically and ideally to research goals.

Finally, this last summer, such a tool became available. They have had for years an old carriagemill—not so old, actually, quite a good carriagemill, but it has been found to be very useless insofar as either product use, land management, or studies. If, in fact, I am anything besides half crazy, this is the tool that affords us our solutions. If we

haul a train carload or an entire train, if you will, then here goes Milwaukee's solution, which I have said over and over again, "Give them something to transport so then they have something by which to pay their bills to build their future," and right through the middle of this dry, if you will, country, goes the Milwaukee, incidentally, and we transport to Kansas City a train carload of these logs, and in Kansas City, perhaps, we have 2 or 3 dozen of these mills—who is we? Whoever owns them. The owner owns the machine, even as the chainsaw is owned by the owner and operator.

Your bill, Senator Melcher, would accomplish the beginning of the country's garnering, if you will, of the forest products that we now squander, waste, and disregard, but without this tool, we will not get what we're after unless we are willing to pay, 20, 30, or 40 percent more ultimately for the products that are involved in that we are actually trying to sell.

Senator MELCHER. Well, the bill, as previous legislation dealing with this, does not dictate the type of machinery that is utilized. We leave that for the marketplace.

I take it that you feel the bill might set the stage for the marketplace to utilize this equipment, this type of equipment?

Mr. ANDERSON. People such as Mr. Vinson who does, in fact, need this type of product to make his business, if you will, go, or perhaps Kansas City with a number of these machines there available to then process for their needs, would necessarily compete, obviously, ultimately, and thus the price of these materials would establish its level, and this tool will be the backbone, however, of a large-scale sustained program based upon the context or intentions of your bill.

Without this tool, you will not have a sustained program. I am very familiar with the Targhee. I saw it with my sawmill, my sawmill on the Targhee, the first one that was ever there, in 1975 and 1976.

I was asked to attend the National Forest Pest Conference in West Yellowstone in October 1976, in which they discussed the very things in the booklet which the gentleman gave you, "Tragedy or Opportunity." Incidentally, I might comment, there is a new booklet out from the Targhee that should give you further information that you might inquire about. I was there at the time it was being put together.

That story is a story of management disaster in that they did not pay any attention to the fact that this problem was coming.

We have had in the wing immediately around this corner, entomologists in region I here who have, since 1962, pleaded, pleaded, and pleaded with the Congress, with the Forest Service, to address what was going to happen.

My other briefcase is not with me, but in it, I have a continuing series of reports that they predicted the bark beetle infestation. We should have been on it 18 to 20 years ago. It was absolutely, totally predictable by logical circumstances that the Forest Service should have been addressing. Their professionals identified it.

When the Targhee Forest in the latter 1960's and early 1970's went through the program of attempting, if you will, to suppress the bark beetle, I, in the mid-1970's, could find only a rare Forest Service person outside of that specific area who even knew of that problem.

Where is the communication about this?

The Targhee and the Yellowstone complex are under a disastrous situation each fire season. For three consecutive fire seasons, they have not had one dry lightning storm in that area, and as a result, they have had to contend with isolated fires.

If we are going to talk about returning that ecosystem to a natural state of wilderness classification, which I personally espouse in and out of the parks, we have got to do something to break up the massive ability of fires to, if you will, sweep that area.

They have held their breath, and if you doubt me, ask the fire control people. They know they will never hold a fire if it gets caught in that kind of circumstances. The fuel breaks that one would necessarily put into an area that you want for either visual or wilderness or landscape appreciation, parks or whatever, must not be trammled by logging techniques.

The cost of putting a helicopter in, as I'm sure Mr. Vinson is aware, particularly one that hauls out any volume of material, is extremely costly. The low value that is normally considered in these products we're talking about normally would never allow us to put this kind of a sale effort or removal effort in an area where a helicopter is involved. It's too costly.

Yet with this machine's unique ability, we can pay the costs of helicopter logging to put in fuel breaks, and fuel breaks aren't 2 feet wide in lodge pole stands like we have talked about. I am sure if you inquired about this, you are aware, it takes a half to three-quarter mile wide fuel break. That doesn't mean all the trees are removed. It means the fuel trees are removed.

The second story, if you will, these shade-tolerant species that are referred to, upland fir, spruce, these types of species that are in these stands, are left to become next year's trees and tomorrow's view.

Senator MELCHER. That fuel break might be possible if it wasn't going into a wilderness.

Mr. ANDERSON. I think in lands yet previous to wilderness classification, so that when they are in wilderness, they, in fact then do have a protection they now don't give them and haven't given them.

Senator MELCHER. Well, most of the study areas are dictated by law to be maintained for the wilderness qualities which prohibits going in and logging even a fuel break area.

Mr. ANDERSON. Senator Melcher, I wish to beg that point with you. This has been done in the national parks to create that very circumstance, and the Teton is one. I was there in that case with Superintendent Carr. He was very concerned, and they did, in fact, do this with fire crews, in which case they cut the pieces up into 4-foot lengths and packed them out at extreme expense, in which case there are now stumps in Teton National Park as a result of trying to present some kind of a front to widespread fire spread. It was done, if you will, under an emergency proviso which the parks have, and Mr. Everard, who was the park director at that time and perhaps still may be—I'm not familiar with the present circumstances—was in the Teton Park, and I personally met him and talked to him about this.

Senator MELCHER. The National Park System does have an emergency proviso for removing logs in the national parks on an emer-

gency basis. The 1964 Wilderness Act forbids logging in its broadest sense, even for fire protection. Now, if you want to advocate changing the act, fine, but the act is very explicit. It says the wilderness is an area where the signs of man are not evident, and where the signs of man's intrusion is like a shadow on the land, and when man is gone, the shadow is gone.

Mr. ANDERSON. Unfortunately, the shadow of man and his Smoky Bear is very heavy on the wilderness, and now the problem is to release back to nature.

Senator MELCHER. I'm not arguing the point. I'm just stating what the law is, and I view anybody's recommendations on how to avoid the fire situation which might arise in a wilderness area with some interest, but the law is clear. The Forest Service tussles, I think, almost annually and continually with what they are going to do about fire prevention plans within a wilderness area.

It's a tough situation, I can tell you, in a study area. The law is pretty clear that it does not envision your going in and cutting swaths of trees to remove the threat of fire. Whether that's right or wrong, I'm open for suggestion on it, but that is the situation.

Mr. ANDERSON. I wasn't wishing to complicate the hearing by discussing the wilderness question except as it applies in perhaps the Gallatin or the Targhee. Many of these areas are de facto wilderness and are not even identified in what we now are talking about as the RARE II areas. Much of the Targhee, for instance, very particularly, was not planned to be logged by the people who are in decisionmaking, and it's not in RARE II now, but if it's going to continue as sort of everybody's concession that it would be, as back country, recreation, et cetera, it has to be protected against wildfire.

Senator MELCHER. I totally agree. I think where we're constrained because it is a wilderness study area, that's one thing, but where it is not a wilderness study area, I think we're derelict in not going in and prudently removing the dead trees.

Mr. ANDERSON. Many of these areas that we would like, if you will, next to wilderness areas, perhaps, in such areas as the bark beetle has had its impact, to put fuel breaks, not have roads close to them.

Senator MELCHER. Yes; I totally agree with you.

Mr. ANDERSON. My reason for being so concerned here is because the Yellowstone complex is in worse trouble than most people have any idea of. If we want to leave this—as most everybody seems to want to, and I completely concur—it's not an area that to me or anyone else is an area that's jealously looked at as a logging area—that's why there isn't more logging there. It's why the Targhee has had almost no removal program either before the trees were dead as a result of the bark beetle or even after. At the meetings in 1976, and I'm sure it's still currently available, you could get 50 million feet as a starting contract for dry dead removal for nothing besides putting your signature on a piece of paper.

For those who would like to go into pelletizing and try their thing, it has all been there. Now, people with pelletizing aspirations have talked many times to people in the Targhee, and they keep coming up every time with the same question, that other energy isn't high enough yet to where we can afford to compete, but their costs go up

as the energy costs go up, and as a result, the gap doesn't get closer together, as I see it, and I personally think it's a panacea.

Senator MELCHER. Now, your testimony, I take it, is to the effect that economically, much of the dead timber can be removed profitably by the use of such machines as described in this brochure?

Mr. ANDERSON. This is not a harvesting tool. It's a processing tool.

Senator MELCHER. Well, I mean to be removed and processed.

Mr. ANDERSON. Right.

Senator MELCHER. Because the processing will be more economic.

Mr. ANDERSON. The reason I belabor this point, Senator Melcher, is because throughout the day, we have primarily talked about two or three methods of large-volume disposal. Pelletizing has come up more strongly today than at usual meetings I have been a part of. Chips have always been there, and yet chips are always a very, very inexpensive bought item that hardly ever come even close to paying just the cost of logging, much less the processing after logging.

Senator MELCHER. But this could?

Mr. ANDERSON. This does.

Senator MELCHER. This does make it economic?

Mr. ANDERSON. Absolutely, because it takes the product as it is and makes those products which we currently need already and affords us logistics that we have never had before, by taking the log directly to its use destination, such that the Senator from Kansas looks and says, "Well, hey, if this tool is in Kansas City, we get firewood at a price we can afford," and then we start using, as you project, 20 percent less fuel this winter, and that 20 percent less fuel for those who are familiar with the processes of distilling and so forth, as oil refineries process, means that you make either diesel or home heating fuel of the same fraction.

If we save 20 percent, then, home heating fuel across the country, that means we have 20 percent more diesel, and there went our diesel crisis.

Senator MELCHER. Absolutely.

Mr. ANDERSON. It means that if we hold the dry dead logs in a continuous sustaining volume, and the Forest Service provides this through a management program that continues to direct it, regardless of whether big companies like it or not, as long as they break even, what can be the complaint?

That means the sawyer got paid; that means the local gas man got paid. The only person that didn't make anything is the company executive or the stockholder. Everybody else that had a hand in it made their money. The taxes went to the Congress, the local counties got their money through revenues and assets that the local people provide through their own entities. All of these people benefit, but the decisionmakers are not the ones that would benefit, and until they are relieved of a choice in the decision, they are not going to harvest this any more than they harvested the cedar before, and you cannot harvest these products after you have harvested the others without it being an absolute mess.

If they are harvested together, it's minimally expensive, it's minimally difficult, and if the Forest Service becomes the owners of those products after the sale, they can be sold. Competitively, in time the

price will come up to more than pay the \$50 million you speak of and which, basically, I regard as seed money, not a continual punching down a rathole that some people would not like to consider, but something has to start, and it's beyond the capacity of the little people with these machines, the little "me," and the rest of the people, and for that reason, when I was asked whom I represented today, I said, "I represent 'the little people and their needs.'"

Senator MELCHER. Thank you very much, Duane.

Mr. ANDERSON. Thank you, Senator Melcher.

Senator MELCHER. This completes our hearing on S. 1996. The hearing record will remain open for 15 days for anybody who wishes to submit written testimony to us.

The hearing is adjourned.

[Whereupon at 4:15 p.m., the subcommittee adjourned, subject to call of the Chair.]

APPENDIX

STATEMENT OF DOUGLAS R. LEISZ, ASSOCIATE CHIEF, U.S. FOREST SERVICE,
U.S. DEPARTMENT OF AGRICULTURE

We are pleased to appear before this Subcommittee and present the views of the Department of Agriculture on S. 1996, a bill to authorize the recovery of wood residues in the National Forests for use as fuel, for conversion to use as petrochemical substitutes or wood products, and for other purposes. The bill would authorize two new approaches to enhance our current programs of wood utilization. We support the basic objectives of the bill.

The first approach, called a "residue removal incentive" would, in effect, pay National Forest timber purchasers for their costs in the processing and removal of wood residues from timber sale areas to a point of use for conversion to a fuel or to other wood products. Wood residues are defined as including logging slash, down timber material, and standing live, or dead trees that are presently unmerchantable. Point of use may be wood concentration or distribution centers, either Government or commercially operated, or a wood manufacturing facility. The incentive would be a part of the contractual agreement governing the timber sale. It would be earned by the purchaser when he removes wood residues and delivers them to the specified location. The earned incentive would be applied as a credit to the purchase price of the timber harvested from the sale area. The bill would prohibit requiring residue removal where it would cost more to remove than its value as fuel or products, except where removal is necessary for fire prevention, site preparation, or wildlife habitat improvement, thus accounting for market conditions which vary over time. The bill prescribes that the incentive would be considered as "moneys received" by the Government so as not to impact the payments received by State and local governments.

The second approach would establish a 5-year program to pay for removal of wood residues from National Forest System lands. This approach has a primary objective the development and evaluation of new and innovative means of wood residue utilization. The economic efficiency and commercial viability of these means will be determined. Areas where this program would operate, in addition to active timber sale areas where a residue removal incentive was not received or was insufficient, include completed and closed sales, reforestation and timber stand improvement areas, fire control clearings, and fire prevention cleanup areas, and other areas where wood residues have accumulated. Within these areas the program could fund National Forest System wood residue utilization demonstration areas, fuel wood concentration and distribution centers, and construction of access roads needed for wood residue removal. The bill authorizes, and we would seek to encourage, the involvement of State, county, and other governmental agencies in carrying out the provisions of this program, particularly with regard to the establishment and operation of fuel wood concentration and distribution centers. An annual appropriation of \$50,000,000 is provided in this bill to carry out this program.

It has been estimated that 150 to 250 million tons of wood and wood residue are left on timber harvest areas annually. A major portion of this material is left following the harvest of old-growth timber on the western National Forests. The residue is often a fire hazard and often impedes efforts to reforest the cut-over areas. Presently, substantial costs are incurred to burn, or otherwise treat, or dispose of this material. Much of this material has potential for use, as solid wood products, as chips for fiberboard or pulp products or for the production of energy. We believe these residues can significantly contribute to meeting the Department of Agriculture's goal of net energy self-sufficiency for agriculture and forestry by 1990. The two approaches set forth in this bill would aid us in identifying, handling, and selling these residues.

The two approaches would provide several other advantages to the Department as we seek to improve utilization on the National Forests.

The "residue removal incentive" provides greater flexibility in the pricing of timber over the conventional appraisal allowance procedure. In timber sale preparation it is difficult to estimate the volume of residues which might be generated in a sale area. Furthermore, if markets for saw-timber are strong the purchaser may remove more of this material than anticipated and, therefore, deliver less residue volume than anticipated to a concentration yard. We, of course, encourage this economic allocation of wood products to their highest use. But under normal sale procedures the amount of compensation to the purchaser would be fixed and he could be over-compensated for residue removal. On the other hand, if the volume of residues actually delivered to the concentration yard exceeds estimates, under present sale procedures, the purchaser could not be compensated for delivery of this additional volume. Under the residue removal incentives approach, the purchaser would be compensated for the volume actually delivered.

A major problem facing potential users of wood residues is the logistics of accumulating adequate quantities of fiber from many scattered, often remote, areas where it is located. Timber purchasers, operate on harvest schedules dictated by their own particular market circumstances. This makes it difficult for a potential user of wood residues from those sales to arrange dependable sources of supply. In this regard this bill would be helpful. Part of the testing of new approaches would examine various methods of accumulating residues at concentration yards or points of use, ways to assure a continuous supply, and various methods of marketing those residues. A primary objective of the tests would be to determine the costs of handling residues. The program would fit closely with our research and provide a means to implement new research findings.

These programs to encourage wood utilization could provide more benefits to the Nation than just added wood supplies and energy. They can provide needed opportunities to intensify management of the forest resource at reduced costs. Accelerated residue removal can also be used to reduce hazards to new forests from destructive fires and insect and disease infestations, to help regenerate harvested areas, to encourage thinning of overcrowded stands, and to reduce the need to dispose of wood by burning. We support the thrust of the bill to accomplish these objectives.

We do, however, have some concerns with the bill and wish to suggest several technical and clarifying amendments. Because the "residue removal incentive" approach is untested, as are some of the other new approaches to wood utilization, we recommend the bill clearly indicate that both programs are pilot efforts. It would be our intent to carefully monitor the two programs to determine the appropriateness of continued operation.

For that reason, we recommend that the appropriation authorization be \$7,500,000, instead of \$50,000,000. Further, we recommend that the \$7,500,000 would be applicable to both provisions of the bill. This means that the amount generated by the residue removal incentive, i.e., the credit on timber sale purchases, be included in the \$7.5 million "ceiling" on pilot testing. We believe this arrangement will permit development of an appropriate pilot program. This recommendation would require a separate section in the bill.

We also recommend subsection 1(c) be deleted as it appears to have no direct connection with this bill because the references made in the section refer to provisions of another Senate bill on energy. While we agree that the incentive should be considered as "moneys received," we believe that any receipts by the Government for the eventual sale of the residues should also be so considered only to the extent they exceed the incentive or direct Federal payment to the purchaser. We recommend clarifying language. The consideration of the incentive as "moneys received" for purposes of distributing receipts to the States is unclear.

In summary, Mr. Chairman, we believe this bill can be an important element in our efforts to improve the utilization of the timber resource of the National Forest System and thus gain substantial benefits for the Nation. We recommend enactment of the bill if amended as we have suggested.

USDA RECOMMENDED AMENDMENTS—S. 1996

1. Amend the title to read as follows: "To authorize the Secretary of Agriculture to establish a pilot program in order to examine the economic efficiency

and commercial viability of methods to recover wood residues in the National Forests. . . ."

2. On line 21, page 2, delete the word "of" and insert "where" and insert "is determined to be necessary." after the word "removal".

3. On line 25, page 2, insert the word "anticipated" before the word "value."

4. On line 11, page 3 insert the words "to the extent they exceed the amount of the incentive or any direct Federal payment to timber purchasers" after the word "residues."

5. In subsection (b), page 3, delete all material from line 17 through the word "for" on line 24 and substitute the following: "(b) The Secretary of Agriculture is authorized to establish a program of pilot projects and demonstrations involving . . ."

6. Revise sentence beginning on line 12, page 4, through the word "for" on line 13 to read as follows: "Activities which may be carried out under this subsection include, but are not limited to . . ."

7. Delete subsection (c) and designate subsection (d) as subsection (c).

8. Add a new subsection (d) as follows: "(d) There is hereby authorized to be appropriated annually not to exceed \$7,500,000 for fiscal years 1982, 1983, 1984, 1985 and 1986 for the purposes of this act. Funds appropriated shall be available until expended for the "residue removal incentives" authorized by section 1(a) and the costs of establishing pilot projects and demonstrations authorized by section 1(b)."

[The following material was supplied by Mr. Leisz, see p. 2 for his oral presentation.]

HARVESTING AND UTILIZATION OPPORTUNITIES FOR FOREST RESIDUES IN THE NORTHERN ROCKY MOUNTAINS—NOVEMBER 28-30, MISSOULA, MONT.—SYNOPSIS OF PROGRAM PRESENTATIONS

UTILIZATION TRENDS—PAST AND FUTURE

(By Ernest Corrick)

The full utilization of residual material left in the woods following logging and thinning operations, and disease, insect attack, and wind-throw has long been a source of concern and frustration to the forest manager. Recently there has been tremendous interest in increasing the use of residuals to combat projected energy and raw material shortages.

There are still many questions to be answered before we commit ourselves to greater use of residuals. What are the biological limits of residual removal? If more of the biomass is removed during logging operations, what effect will this have on site quality and site potential? Should a portion of all residuals be left on the area to return to the soil? Will the removal of more logging residuals have a detrimental effect on future growing capacity?

The economics of harvesting increased levels of residuals must receive careful scrutiny. While many recovery ideas may be technologically and biologically possible, all utilization ideas will have to undergo thorough financial evaluation and will have to measure up against alternative uses of monies.

THE FOREST RESIDUES UTILIZATION RESEARCH AND DEVELOPMENT PROGRAM

(By Roland L. Barger)

A major challenge in the intermountain area is the need to achieve more complete and efficient use of our available wood resource. Although utilization practices have improved dramatically in recent years, the aggregate volume of unused residues and potential salvage material is still very large. There are two immediate and related needs—(1) to improve the recovery and use of more of the wood resource, leaving less as residue, and (2) to define and understand the economic and management consequences of alternative harvesting practices.

Since 1974, the Intermountain Station has directed an integrated program of research toward developing methods to achieve more efficient utilization, consistent with responsible management of the forest ecosystem. This research combines the efforts of scientists in utilization, engineering, economics, marketing, and the biological sciences. Research in residue characterization has defined the volume, character, and product potential of residues in a number of timber

types and harvesting situations. Research in products, processes, and markets has included work relating to solid wood and chip and fiber products. Particular emphasis has been given the processing and use of dead timber, by far the largest residue component in the intermountain west. Other research has explored the feasibility of achieving closer utilization with conventional cable and ground skidding harvesting systems under a number of silvicultural and management prescriptions. Related research is developing new harvesting system concepts and practices, with emphasis upon systems that can function more efficiently in handling small timber, residue material, and small volumes per acre. Utilization research underway has placed major emphasis upon improving efficiency as a means of extending utilization to extensive volumes of unused material. Determining the management consequences of more intensive utilization has also been recognized as a significant need. Although more intensive utilization of logging residues, small stems, and dead timber is physically desirable, neither the economic nor ecological effects of such action are clear.

More efficient utilization of our wood resource can substantially extend the available wood fiber resource, providing a base for industrial expansion and economic growth. It is the most effective way to add to timber supply in the short run. Improved utilization practices can also contribute to resolving some of the more difficult environmental and management problems associated with timber harvesting. It is toward these goals that the Intermountain Station Research and Development Program has been directed.

RESOURCES EVALUATION AND RESIDUE WHERE WE'VE BEEN AND WHERE WE'RE GOING

(By Dwane D. Van Hooser)

In the past, analyses conducted by regional Resources Evaluation (Forest Survey) Units have considered forest residues only in passing. Recent political and economic developments have caused more attention to be focused on forest residues both for conversion to forest products and as a source of energy. This will undoubtedly lead to improved methods of assessing the forest residue situation and improving its utilization potential.

VOLUME AND CHARACTERISTICS OF FOREST RESIDUES IN THE NORTHERN ROCKY MOUNTAINS

(By Robert E. Benson and Joyce A. Schlieter)

Each year approximately 450 million cubic feet of logging residue is generated in the three northern Rocky Mountain states of Idaho, Montana, and Wyoming. This residue is made up of dead standing and down trees, green unmerchantable trees, broken pieces, and the tops and branches of those trees removed from the area.

Intensive studies in old growth stands of the principal forest types indicate that from one-fourth to one-third of the total wood volume may be dead material. In lodgepole pine stands about half of the dead trees may be sound enough for use as sawlogs or roundwood products. However, in other forest types such as grand fir the dead trees may have little value because of rot.

In conventional logging only about half of the total wood volume is merchantable. The remaining volume, consisting of cull and small trees, chunks, and the top portion of merchantable trees, can be utilized if economical harvesting and processing methods can be developed.

Forest residues constitute a large reservoir of potentially valuable material. The utilization of this wood will benefit the public, the wood products industry, and the land manager.

UNIVERSITY RESEARCH IN RENEWABLE RESOURCES: THE COMING OF AGE?

(By A. A. Moslemi)

Alfred North Whitehead once said that "... the task of the university is the creation of the future." Whitehead referred to the "task" not only to the educational function which is widely known, but also to the university's scholarly endeavors—including research. The research element in the university is one of

three principal functions which include teaching, research, and service. Some academics and others add a fourth option—international programs.

In the more established universities, research is a vitally important function impacting the quality of the instructional service functions. Some institutions of higher education are also commonly referred to as the "research universities" such as MIT, Harvard, and the like.

Renewable resources research including a variety of research on forest residues is now being carried on extensively by many universities. Such research usually is done in forestry schools and allied departments (botany, zoology, biology, etc.). A number of factors have contributed to significantly increased research in renewable resources. The passage of the McIntire-Stennis Act of 1962, increased enrollment in graduate schools, heightened environmental awareness, and anticipated heavy reliance on renewable resources, have all played a role.

How is that research done? A variety of scenarios exists in carrying out university research ranging from the professor who is fully committed to teaching but still manages to "steal" some time for research, to the faculty member who commands substantial amounts of resources and staff. The latter, sometimes referred to as the "bio-politician," heads a group of one or more research associates, technicians, and half a dozen graduate students with adequate budget for travel, supplies, and services.

Funds come from a variety of sources. Substantial proportions (over 90 percent) originate from the state and federal governments. What happens at the state legislative session and the Congress of the United States has a lot to do with the dollars available to the university researcher dealing with wood residues or for that matter a large variety of other subjects.

What will happen to university research in the face of declining enrollments in the 1980s and possible declining faculty numbers?

Continued demand for research could still be met by allotting a greater proportion of the existing faculty time to research. It is also conceivable that industry and government will take a yet greater share of the responsibility in conducting research within their own facilities.

The universities, especially those with forestry schools, have been active in residue research for the last two decades. This interest has intensified in recent years as we have firmly recognized the vital importance of reducing waste and stretching our raw material resources. This interest ranges from the economics of residue recovery to the viability of biomass for chemical feedstock. To tap the university's interest and talent, support from the federal government and especially industry will be needed more than ever before to keep our universities the "creators of the future."

APPLICATIONS OF A COST MODEL TO NORTHERN ROCKY MOUNTAIN RESIDUES

(By Richard P. Withycombe)

Whenever decisions are to be made concerning the possible use of forest residues, questions always arise about the costs of collecting and transporting them to a place where they might be used. The residue cost model consists of a series of nine tables, which allow the estimation of the collection costs of the types of residues common to the northern Rocky Mountains.

The cost tables were developed from published studies of both conventional logging and residue collection. Whenever possible, the tables were simplified by using average values for many of the variables that affect the cost of collection. Before using the tables, the user must determine the type of yarding to be used, either ground skidding or cable yarding, and must determine whether the material is to be chipped in the woods or hauled in as whole pieces. The other variables included in the tables are the average piece size, the haul distance, and the skidding distance for ground skidding.

The most important of the variables that affect the cost is the piece size or the diameter of the tree for standing residues. As the size of the residue pieces becomes smaller, the costs of all the operations involved in collection and transportation go up. The cost increase with smaller sizes is not linear; it goes up dramatically for smaller sized residues. Because of this, it is recommended that average piece sizes not be used for estimating costs. Instead, the residue resource should be categorized with several size categories so that the cost tables can be used independently to estimate the cost for each. The haul distance

and the skidding distance also have a considerable effect on cost, but the relationship is close to linear, so that average distances can be used without causing difficulties.

All of the cost tables give the cost in dollars per cunit of residue. A cunit is 100 cubic feet of solid wood. Residues are often measured in other units such as cords, tons, and units. A table of conversions is also given, so that the cost estimates in the tables can be converted to whatever units the user may want.

ECONOMIC AVAILABILITY OF RESIDUE MATERIAL

(By Charles E. Keegan III)

The Bureau of Business and Economic Research and the Intermountain Forest and Range Experiment Station, Missoula, are involved in a cooperative research project to estimate the cost of harvesting and transporting forest residues to processing centers in the northern Rocky Mountains. Regionwide estimates are to be made based on detailed analyses of the volumes and types of forest residues available to selected individual manufacturing centers. The results of the analysis of the first manufacturing center are presented in this paper.

Bureau researchers have developed a model which combines forest residue data developed by Benson and Schlieter with a cost model developed by Withycombe (see the preceding abstracts). The model, with the input of timber harvest data, will calculate the estimated volume of forest residues which can be delivered to a designated supply area for various cost levels.

The initial study area selected was Lincoln County, Montana, with Libby, Montana as the processing center. The emphasis was placed on that forest residue material which can be removed in conjunction with conventional logging operations. The delivery cost for the residue material examined averaged \$39 per cunit with individual per cunit costs varying from \$15 to several hundred dollars per cunit. It appears from the analysis that substantial volumes of logging residue material would be available at a cost which would allow for its use in fuel and reconstituted wood fiber products as well as solid wood products.

INTENSIVE UTILIZATION WITH CONVENTIONAL HARVESTING SYSTEMS

(By Roland L. Barger)

There is an urgent need to achieve more complete and efficient utilization of the available timber resource in the Rocky Mountain area. Forest residues, including dead timber, small stems, and cull material and slash, represent a major potential resource that is available to extend the resource base. A primary barrier to increased utilization, however, is the cost of harvesting residue material.

A promising approach to residue utilization is through closer timber utilization at time of initial harvest; i.e., improved technical efficiency in the total harvesting job. Program research in harvesting systems and practices has taken two directions—evaluation of the efficiency of existing systems when used to achieve close utilization standards, and the development of new harvesting concepts and equipment better suited to smaller, low-value material. The subject of this discussion is limited to the first of these—practicing intensive utilization with conventional systems.

Field evaluations have included the use of in-woods chipping systems in gentle terrain; the use of crawler skidder systems in gentle terrain; and the use of skyline systems in steep terrain. In each situation, the system was used to achieve utilization standards ranging from conventional sawlog utilization to near-total utilization of available fiber. Evaluations have included relative cost of fiber recovery; increase in fiber (or other product) recovery; and implications for modifying the tested system to improve capability and efficiency.

In general, all systems can be used to achieve intensive utilization. Costs increase in a relatively predictable fashion as utilization level drops, principally as a function of piece size, yarding or skidding distance, and character of cut defined by silvicultural prescription. Techniques such as whole-tree yarding and bunching improve efficiency.

LOW CAPITAL INVESTMENT LOGGING MACHINES

(By John R. Host)

Importance of production costs are shown via a forest residue utilization model. Productivity per different levels of capital investment is compared for skidding and yarding operations. This productivity is then related to production costs based on various production measurements: Number of pieces per day, cubic foot volume per day.

OUTLOOK FOR NEW HARVESTING TECHNOLOGY

(By Michael J. Gonsior)

Assuming increased emphasis on utilization of residues and smaller timber, rising energy and labor costs, and more severe environmental constraints pertaining to logging and road construction, the criteria for harvesting systems in the future will demand both technological and institutional innovation.

This paper analyzes harvesting *per se* as well as its role in the total forest management picture. Models are presented for testing the sensitivity of total management cost and the harvesting components of cost to alternative silvicultural, utilization, and other forest management objectives. These models are used to discern opportunities for new harvesting technology.

OUTLOOK AND OPPORTUNITY FOR WHOLE-TREE CHIP QUALITY IMPROVEMENT

(By John A. Sturos)

In the future, the forest industry will be faced with a dwindling supply of raw material, energy, and forest land base as it strives to provide for the increasing demand for wood and fiber products. Two actions which can help meet this increased demand are more intensive forest management and more efficient utilization. More intensive use of forest residues and low value timber stands has long been the goal of forest managers. An estimated nine billion cubic feet of residue is left in the woods annually in the U.S. Of this amount, an estimated six billion cubic feet could be converted to pulp, particleboard, fuel and other uses.

Field chipping of whole trees and residues coupled with an effective system for removing the bark from the chip mass, is a means of increasing the utilization of our forest residues. Significant progress has been made in developing the technology to improve the quality of whole-tree and forest residual chips. The USDA Forest Service, Forestry Sciences Laboratory at Houghton, Michigan has developed three methods: namely, steaming-compression debarking followed by an optional ballmilling process, vacuum-airlift segregation and photo-sorting. These have potential both individually and in combination with each other. The St. Anne-Nackawic Pulp and Paper Co., New Brunswick, Canada, in cooperation with the U.S. Forest Service has designed, built, and evaluated a steaming-compression debarking plant for four years. The Pulp and Paper Research Institute and the Forest Engineering Research Institute of Canada, Pointe Claire, Quebec have developed a method in which whole-tree chips exposed to microbial action during six weeks of storage are subjected to heavy attrition motion in water in a device resembling a pulper for separation and breaking off of bark. In Finland, Kone Osakeyhtio in cooperation with Enso-Gutzeit Oy has developed a whole-tree chip upgrading process based on ball-milling. Application of these chip upgrading technologies along with integrated utilization of the various output fractions for fiber and fuel should decrease the quality and economic barriers to increased utilization of whole-tree and forest residual chips. The value of the bark rejects as a fuel may approach two times the processing costs exclusive of raw material costs.

EVALUATING INWOODS CHIPPING FEASIBILITY

(By George R. Sampson)

Feasibility of inwoods chipping is dependent on environmental effects and economic factors. A careful analysis of both environmental and economic data is necessary to determine feasibility of a given inwoods chipping chance.

The Rocky Mountain Forest and Range Experiment Station, NFS Regions 2 (Rocky Mountain) and 3 (Southwestern), and Southwest Forest Industries, Inc. cooperated in a demonstration test of inwoods debarking-chipping in Arizona and Colorado in 1973. Preliminary analyses before the demonstration test indicated that the major obstacle to inwoods debarking-chipping would be environmental problems—namely large landings in the woods and bark disposal problems. While it could be determined that actual inwoods debarking-chipping would cost more than debarking-chipping performed at a permanent installation, it was believed that this increase would be more than offset by savings in the functions of falling, bucking, limbing, skidding, and loading.

Results of the demonstration test indicated that environmental factors would not limit inwoods debarking-chipping in most circumstances. In ponderosa pine type, natural openings could be used for landings resulting in little or no problem with landing size. Also, disposal of bark on and around landings appeared to have no harmful effects. In the spruce-fir type landing size could conceivably be a problem, but only slightly greater than for conventional sawtimber harvests. Economic analysis of data taken during the demonstration test showed that inwoods debarking-chipping was, at best, only marginally competitive with conventional systems of harvesting wood for pulp chips. The major factor causing high costs for the inwoods operation was the low production rate per unit of time for the machine. High moving time between log decks or landings was also a contributing factor.

The wave of the future for inwoods chipping is whole tree chipping. The resulting barky chips are a lower value product than bark-free chips, however, chipping costs are lower and more intensive utilization is permitted than where only stem wood is debarked and chipped. Value of treatment should be added to product value in the feasibility analysis. Environmental effects may be more severe for whole tree chipping than for chipping only stem wood due to nutrient problems resulting from the increased volume of material removed.

PARTICLE AND FIBER PANEL PRODUCTS FROM RESIDUE MATERIAL

(By Tom Maloney)

Considerable research has been conducted on the use of dead trees of western white pine (*pinus monticola*) and lodgepole pine (*pinus contorta*) for use in various composition board materials. Much of this raw material is normally unacceptable for solid wood products such as lumber and plywood. It can, however, constitute an important resource for wood construction materials in the form of composition board materials. These composition board materials include: underlayment grade particleboard, furniture grade particleboard, structural flakeboard, hardboard, and medium density fiberboard. The material would also be acceptable as core material for composite made of particleboard cores and veneer faces. Experimental boards have been made which meet the commercial standards for the above named composition panel materials. Economic analyses have shown that there are no particular penalties in cost associated with the use of the dead material in comparison with standard green material once the raw material has been delivered to the plant site. Current work is underway directed at assessing the markets for such panels from the Intermountain area and determining the costs associated with the residue raw material.

EXTENDED USE OF RESIDUES FOR CONVENTIONAL SOLID WOOD PRODUCTS

(By David P. Lowery)

Forest residues have been overlooked as a potential source of solid wood products. Historically, residue created or exposed by timber harvesting has been considered a deterrent to land managing activities and has either been left in the woods to deteriorate naturally or has been burned. However, the changes in harvesting methods, environmental constraints, a steadily reduced commercial forest land acreage, constantly changing economic conditions, and a growing demand for wood by the forest products industry are forcing a reevaluation of the residue components.

Dead timber is often the major residue component in the northern Rocky Mountains. As a result, our research has been directed at developing the information necessary for improving its utilization. Studies have been made to deter-

mine the basic chemical, physical, and mechanical characteristics of dead tree wood. In addition, dead tree wood has been evaluated for specific solid wood products. The results of these investigations indicate that dead tree timber is a neglected resource that can be used for many diverse products.

PRACTICAL CONSIDERATION IN THE UTILIZATION OF LOW-QUALITY WOOD

(By Jack H. Markley)

The initial practical consideration in using low-quality wood is how we view it.

Beyond this psychological point, which some may argue isn't "practical," very real problems do exist. Looking at some solid-wood product families—

Composites—Potlatch produces one product which distinctly uses only low-quality or residue trees, by intent—Plystran plywood. The size range of the resource, moisture and decayed wood content of the logs, and the variability of bark coverage are inherent variables magnified in this effort. The plant contends with these on a continuing successful basis.

Plywood—The use of what is usually considered low-quality wood is very limited in ordinary plywood production, due to the standardized processes used in making veneer and plywood. Plystran type plywoods exemplify the process changes required to escape this limitation.

Lumber—Low quality logs, by traditional standards, enter most sawmills today to at least some degree. Internal operating systems necessary for the "average" product may impede or obscure the optimum solutions to maximizing the recovery from the lower quality material.

Laminated Lumber—This secondary product enables higher use of certain types of traditionally downgraded wood.

Cedar products—Probably the oldest product line based on a raw material traditionally a residue in northern Idaho. Integrated logging is generally advantageous but introduces offsetting problems that should be recognized. The production residue from cedar products can be a bigger problem than the forest residue.

UTILIZING RESIDUE MATERIAL IN PULPING OPERATIONS

(By Marvin D. McMichael)

The pulp raw material shortage in 1973 and 1974 provided incentives for using whole tree chips at a number of pulp mills in the U.S., particularly in the south. Since 1974 pulp raw material supplies have returned to more acceptable levels. As a result, whole tree chips are being used only on a limited basis.

With the 1973-74 experience for justification, the industry, along with land management agencies, educators and equipment suppliers, have defined problems associated with the use of whole tree chips, developed solutions to many of these problems, and continued to use whole tree chips in pulp and papermaking.

Benefits from whole tree chips include:

1. Increased fiber utilization,
2. Increased landowner acceptance of harvesting,
3. Reduction of site preparation costs,
4. Reduced hazard reduction costs and disturbance to top soil.

Problems in pulp and paper manufacture with whole tree chips include:

1. Abnormal wear on mill processing equipment from sand and grit,
2. Rapid deterioration of whole tree chips in storage,
3. Increased fire hazard in chip piles,
4. Increased calcium scaling in digesters and evaporators,
5. Increased cooking time and alkali consumption,
6. Increased bleach consumption,
7. Digester feeding problems,
8. Low chip yields.

Processes for upgrading whole tree chips include:

1. Bark separation, chip screening and washing systems,
2. Morbark dual-spout chipper,
3. Morbark class "A" fiber system,
4. Whole tree forwarding to eliminate impacted grit.

Energy shortages during recent years have provided incentive for the utilization of whole tree chips and waste fuel boilers. Currently, projects are underway in Montana, northern Idaho, and eastern Washington which will increase the

demand for waste fuel by 750,000 units (1,350,000 tons) per year. Most of this increased requirement will be supplied by sawmills and plywood plants. However, current economics indicate that whole tree chips from thinning residuals, log yard cleanup, and road right-of-way clearing slash will compete for a limited amount of this supply.

Champion does not currently plan to use whole tree chips for pulp and paper-making at Missoula due to the large amount of capital required for cleaning and processing equipment. Champion does, however, plan to use a limited volume of whole tree chips as furnish for their new waste fuel boiler at Missoula. These whole tree chips will probably come from thinning residuals, road right-of-way slash, and log yard cleanup on Champion fee land.

SAWING LUMBER FROM LOW QUALITY LOGS

(By Remington Kohrt)

The sawmill is an integral part of the sequence of trees to solid wood lumber products. Unfortunately the sawmill is usually a steel, concrete and wooden structure of expensive permanence that neither controls the raw materials delivered to it nor the demands for or prices of the finished products it produces. The sawmill then is a functional tool that can be changed or adapted, but by itself is really a pass through process.

The success of the sawmill then is not only one of quality or quantity of production, but of the quality of the log brought to it, and the demand for the finished product.

The sawmilling of low quality logs, often old and dead, is usually more difficult than for green high quality logs. Machinery and processes can be adapted to accommodate low quality material efficiently, but the ultimate products must be saleable. The challenge of sawing lumber from low quality logs then becomes a problem of raw materials, regulations, agencies, public needs, costs and politics.

It is obvious that the sawmill challenge has as much to do with the social, political, environmental and economic aspects of life as it does with mechanical performance. Too often people in the academic and political worlds suspect that behind the grease, sawdust and mechanical wizardry of a modern sawmill lurks the evasive solution to old and dead forests, shortages of petrochemicals and the national debt. Folks, it just ain't so.

What an efficient sawmill can do is manufacture low quality lumber from low quality logs efficiently. Our objective should be to grow sound sawlogs and adapt the sawmill to produce lumber products that satisfy public needs.

CHEMICAL CHARACTERISTICS OF WOOD RESIDUES AND IMPLICATIONS FOR UTILIZATION

(By Rick G. Kelsey and Fred Shafizadeh)

Wood and woody residues are chemically heterogeneous substances, being composed of carbohydrates in the polymeric form of cellulose and hemicelluloses, phenyl propanoids in polymeric lignin, extractable hydrocarbons, ash, and extraneous substances. Fresh green softwoods contain about 43 percent cellulose, 28 percent hemicelluloses, 29 percent lignin, 7 percent extractives, and minor quantities of ash and extraneous material.

In the Northern Rocky Mountains, where dry or cold conditions predominate, woody residues remain sound without visual signs of decomposition for many years. The chemical composition of this weathered material does not change significantly and it can be utilized like greenwood.

Since wood and woody residues are heterogeneous there are two basic approaches to its chemical utilization: (1) whole wood processing and (2) separation of the heterogeneous components followed by processing.

The whole wood processes include direct combustion, pyrolysis, gasification, and liquifaction to produce both fuels and simple chemicals such as CO and H₂ that can be used as feedstock for the synthesis of many substances.

Separation and refinement of the woody components can lead to a wide variety of products. Extractives (volatile oils, fatty acids, and resin acids) find uses in solvents, soap, paper sizing, and adhesives. Cellulose, a polymer of glucose, can be converted to foods such as: glucose, proteins, vitamins, or simple organic compounds like ethanol. Hemicelluloses, polymers of xylose and mannose, can be refined into dietetic sweeteners or compounds that may be synthesized into poly-

mers and resins. Lignin, a heterogeneous polymer of phenyl propane units, will yield a mixture of phenolics that can also be made into resins and polymers.

The chemical utilization of woody residues is almost limitless, the major barrier being economics rather than technology.

TECHNICAL AND ECONOMIC ASPECTS OF HARVESTING DEAD LODGEPOLE PINE FOR ENERGY

(By John W. Henley)

An experimental logging operation, using mechanized equipment for falling, yarding, delimbing, bucking, sorting, and loading was conducted for three months this past summer in the dead lodgepole stands of eastern Oregon. Costs, production rates, recoverable wood volumes, wood fuel characteristics, and environmental effects data were obtained. The research and demonstration effort will provide current cost and production data, an analysis of the economic feasibility of producing fuel and other products from dead lodgepole pine, and contribute knowledge on the effects of mechanized whole-tree logging on nutrient balances, soil compaction, and other environmental concerns. This presentation discusses technical and economic aspects of harvesting dead lodgepole pine for energy based on preliminary analysis of study results.

THE INTERMOUNTAIN REGION WOOD ENERGY PLAN

(By Richard E. Leicht)

There continues to be a high level of interest nationally in accelerating the use of wood residues as an energy source. On September 15, 1978, the U.S. Forest Service initiated a National Wood Utilization and Wood Energy Application Program to focus attention on application of existing and developing technology. The mission and goals of this program are discussed.

On March 20, 1979, the Regional Forester, Region 4, approved a Wood Utilization Wood Energy Application Program for the Intermountain Region. Highlights of the program are reviewed, including mission and goals, planned wood energy symposium, firewood programs 1976-79, conflicts between home and industrial use, forest residue inventory, priorities of forest residues utilization.

Problems that are needed to be faced, such as access, economic feasibility, and long-term guarantees are discussed.

The benefits and hazards of utilizing forest residues are summarized and the paper closes with mention of the U.S. Forest Service and Regional commitment and the future opportunities for wood energy.

REVIEW AND STATE-OF-THE-ART OF BIOMASS AIR GASIFIERS

(By James D. Kerstetter)

The interest in biomass gasifiers closely follows the availability and cost of alternative energy sources. Today as the price of fossil fuels is increasing dramatically we are again looking to renewable resources such as wood. Economics will probably control the end-use of our silviculture resources and that means, at the present time, that energy generation from wood is lowest on the list of priorities. The forest residues represent one potential source of raw materials for energy production.

We will present a basic background of the biomass air gasification process and look at the factors that determine the efficiency and heat value of the gases that are produced. A brief historical overview will be presented to put the entire subject in perspective. The various configurations that are used for gasifiers will be discussed and the advantages and disadvantages of each will be pointed out.

There are several applications of gasifiers and these include close-coupled gas retrofit situations, as well as electrical generation or just shaft horsepower. The manufacturers of gasifiers cover most of these applications and we will discuss several commercial or near-commercial products.

Finally the bottom line of economics will be presented in broad terms. The life-cycle costing method will be used and the competition between fossil fuels and forest residues will be examined. The factors which are most sensitive to the economics will also be presented.

ALLOCATION OF RAW MATERIAL TO ALTERNATIVE PRODUCTS

(By Henry L. Goetz)

This paper discusses the utilization of ponderosa pine residue created by a locally severe outbreak of mountain pine beetle in the Blackfoot River drainage northeast of Missoula. In traditional timber harvesting operations, the allocation of raw material to alternative products is most often made at the mill. However in western Montana, because there are no processing facilities equipped to utilize the full range of residue material, the landowner or landmanager must make the allocation decision. The allocation process should also be an integral part of sale preparation and not occur as an afterthought at the conclusion of harvest.

To effectively utilize a range of forest residue, it is necessary to use a co-ordinated logging system. An efficient full-tree method developed for the terrain and stand conditions in our area consists of the following steps:

1. In the preparatory phase, trees smaller than 5 inches DBH are hand felled and piled into bunches for removal to a central landing by a grapple equipped tractor.

2. Dead and designated trees 16 inches and smaller at the ground line are harvested with a Melroe Bobcat Feller-Buncher. The full trees are processed at the landing and sorted into separate decks based on their size and condition.

3. The remaining large timber is then directionally felled by hand into prepared openings, skidded to the landing and manufactured into the appropriate sized logs.

This method of logging not only results in the concentration of raw material, but also in a residual stand which may be easily re-entered for future harvest.

The residue from these stands has been allocated to various products:

1. Dead trees from 9 to 12 inches DBH are used primarily for houselogs, and on a limited basis for dimensional lumber.

2. Stems in the 5 to 9 inch DBH range are marketed for posts, which are bucked at the landing or hauled tree length to the post yard for manufacture.

3. Usually trees less than 5 inches DBH and the tops of larger trees are burned at the landing. However in a study which tested the feasibility of using a small full-tree chipper at the landing, we recovered an average of 47.6 tons of material per acre. All the residue unsuitable for houselogs or lumber was processed.

4. Older dead material in all size classes is marketed for firewood in tree length loads.

Presently the allocation of residue is determined primarily by the limited markets for the various types of material. However as the costs of traditional energy increase, the utilization of residue by whole tree chipping may prove to be the most profitable.

THE IMPLICATIONS OF IMPROVED RESIDUE UTILIZATION ON TIMBER SALES ACTIVITIES

(By John G. Robatcek)

Improved residue utilization on timber sales requires the use of new concepts and strategy sensitive to economic reality. We must learn to deal with this material in a fiscally responsible manner, but still acknowledge that residue sales may not be profitable to the government.

Residue sales usually depend on high-value components for support. Utilization standards must be flexible to accommodate a wide variety of uses. Complete utilization is seldom practical.

Road construction and reforestation costs are often fatal to residue utilization proposals. Financing these items from appropriated government funds or perhaps providing tax incentives for intensive utilization is suggested.

Residue sales also present many dilemmas in their integration with regular sales programs, silvicultural systems, other resource needs, and fuels management.

The seller and the buyer must regard one another as teammates in making significant advances in residue utilization. Optimism and persistence are essential to meaningful change.

WOOD PRODUCT AND MARKET TRENDS INFLUENCING RESIDUE UTILIZATION

(By Richard P. Withycombe)

The potential uses for forest residues can be classified broadly into four groups: reconstituted panel products such as particleboard, solid products such as posts or house logs, paper products, and fuel. The demand for residues to supply these needs is dependent on the demand for the end products, which in turn is dependent on general economic conditions and the price and supply of competing products. As an example, residues can be used to produce structural particleboard, the demand for which is largely determined by the strength of the new housing industry and by the price of plywood.

By far the most significant outside influence on the demand for forest residues is the cost of energy. Rising energy costs will obviously increase the demand for residue fuels, but it will also affect the demand for the other products, since the cost of energy to collect, transport, and process the residues is a significant part of their total cost.

RESIDUE UTILIZATION AND THE REGIONAL ECONOMY

(By Maxine C. Johnson)

In recent years the forest industry in Montana has experienced rapid growth. In 1978, employment in the industry was 31 percent higher than in 1975 and the highest since 1969. The growth, inspired by heavy national demand for wood products, was made possible by a large increase in the harvest from private lands. Estimate of the timber harvest in Montana in 1978 indicate that the cut from private lands was 73 percent above 1969 while the harvest from public lands declined 42 percent.

Significant changes also occurred in the structure of Montana's wood products industry during the seventies. The proportion of total employment in logging camps, sawmills, plywood and millwork plants declined from around 93 percent at the beginning of the decade to from 86 to 89 percent in recent years. The other segments of the industry—mostly pulp and paper and board plants—have increased their share of total employment to from 11 to 14 percent. This growth is significant because these activities use mill or forest residues.

In the future, there may not be enough sawtimber harvested to maintain the industry at its present level in its present form. The harvest on private lands will begin to decline and it may be unrealistic to expect any significant increase in public timber harvest. Some projections of the demand for timber in Montana in 1985 and 1990 indicate that the supply may begin to fall short during the coming decade. Over the long run, increasing the use of forest residues may prove to be Montana's best hope for maintaining the forest industry at or near its present level of activity.

[Reprint from USDA Forest Service Research Paper Int-231]

NUTRIENT LOSSES FROM TIMBER HARVESTING IN A LARCH/DOUGLAS-FIR FOREST

RESEARCH SUMMARY

(By Nellie M. Stark)

Studies of the total amount of biologically essential nutrients removed in logs and water through clearcutting, shelterwood cutting, and group-selection cutting were conducted in a western larch (*Larix occidentalis*)/Douglas-fir (*Pseudotsuga menziesii*) forest at the Coram Experimental Forest near Glacier Park, Montana. Nutrient removal by species was investigated under three intensities of harvest. Results show that with the most intensive logging method (clearcutting) less than 0.25 percent of the total content of eight biologically essential cations in the effective root zone were removed with wood and bark. This means that intensive harvest took away an equivalent of $\frac{1}{4}$ of 1 percent of the nutrients stored in the soil and rock of the root zone. In theory, it would require 28,000 years of clear-cutting on a 70-year rotation to exhaust the total nutrients in the present root

zone. Soil development will slowly extend the root zone downward. Far more important than total nutrients are those nutrients available in the soil. Harvest of wood and bark removed an equivalent of less than 14 percent of most of the available elements in the root zone. Harvest is a one-point-in-time removal of nutrients that have been accumulated in the wood and bark of trees over 70 years time. Removal of only 14 percent of what is at one moment available in the soil is a small loss. Unfortunately, we cannot yet measure the weathering rate so we cannot estimate how rapidly the removed nutrients will be returned through weathering. Harvest did remove from 14.8 to 91.7 percent of the available zinc in the soil (accumulated over +70 years). Although zinc is scarce in the parent material, this loss is not serious because sufficient zinc is still available for seedling growth. In most cases bulk precipitation alone will return all of the nutrients removed in harvest within 70 to 100 years. Nutrient losses from harvest on this relatively young, fertile soil is not a problem to management in the absence of erosion.

Nutrient levels in an intermittent stream were virtually unchanged by all logging treatments. The skyline system did not cause erosion. Because the area does not have a permanent stream or impermeable bedrock, it is unsuited to typical watershed study methods. Water samples taken below the root zone did show nutrient losses as a result of harvest, but these were at levels not significant to management. The most severe treatment studied, clearcutting by skyline and light burning, did not cause serious nutrient depletion from this forest ecosystem.

[Reprint from USDA Forest Service General Technical Report INT-69]

FOREST SOIL BIOLOGY—TIMBER HARVESTING RELATIONSHIPS

RESEARCH SUMMARY

(By M. F. Jurgensen, M. J. Larsen, and A. E. Harvey)

Timber harvesting has a pronounced effect on the soil microflora by removing essential woody food supplies and by changing soil chemical and physical properties. Greater activity of micro-organisms following logging operations may affect site quality because of increased availability of soil nutrients and accelerated nutrient movement through the soil profile. Soil micro-organisms that function in the cycling of nitrogen generally are stimulated by timber removal, particularly if fire is used as part of postharvest site preparations. The effect of harvesting on the incidence of disease is a potential problem, but seems to be more related to the levels and types of logging residues on the site than to changes in soil properties. Decayed wood, as both a physical and chemical component of soil, appears to be an important factor in stand development and productivity on dry sites in the northern Rocky Mountains. The long-term implications of reducing the amounts of woody materials returned to the soil by increasing residue utilization is unknown. At present, no detrimental impact on site quality can be directly attributed to harvesting effects on soil micro-organisms; however, this may change as forest management goals emphasize more intensive use of existing stands.

[Reprinted from USDA Forest Service General Technical Report INT-65]

ROLE OF FOREST FUELS IN THE BIOLOGY AND MANAGEMENT OF SOIL

RESEARCH SUMMARY

(By A. E. Harvey, M. F. Jurgensen, and M. J. Larsen)

Microbial activities are the principal biological determinants of forest site quality. The energy source or substrate for most microbes is derived from soil organic matter (fuels). Microbial activities most critical to site quality are nitrification, dinitrogen fixation, decay, ectomycorrhizal symbiosis, and pathogenesis. Research on these subjects supports the following conclusions.

The end product of nitrification, nitrate, is subject to leaching loss. Nitrification is increased by forest disturbances, particularly clearcutting and burning. In most cases, losses of nitrogen are small and short lived.

The quantities of nitrogen fixed in forest soil by symbiotic associations are dependent on the presence of host plants. Such hosts are sometimes scarce.

Nonsymbiotic nitrogen fixers depend only on organic matter. Soil humus, decaying and decayed wood, are important sites for nonsymbiotic nitrogen fixation, particularly during dry periods or on dry sites.

Soil humus and decayed wood are also the principal substrates for ectomycorrhizal symbionts during dry seasons and on dry sites.

Decay of wood and other organic material contributes to soil development by cycling carbon and minerals. Products of decay provide sites for nitrogen fixation and ectomycorrhizal activity. Decay of newly formed residues to a point where they function in these capacities, is a long-term process.

Removing or burning forest fuels can lead to increased feeder root disease. It can also create wound entry sites for decay in living trees. In some instances this provides active centers of nitrogen fixation. Infected wood in root disease centers is a potential source for inoculation and further spread of the diseases.

Adequate quantities of woody residue, and other soil organic matter sources, are critical to optimal forest growth. Except where wood constitutes potential for disease or intense wildfire or where it is replaced in relatively short time spans (warm, moist sites) it should be conserved. This is particularly true of marginal (dry or cold) sites. Excess accumulation or inadequate supplies of wood provides an opportunity for site protection and enhancement through fuel management.

STATEMENT OF E. B. CORRICK, VICE PRESIDENT AND GENERAL MANAGER, ROCKY MOUNTAIN AREA, CHAMPION TIMBERLANDS CHAMPION INTERNATIONAL CORPORATION

My name is Ernie Corrick and I appear here today representing Champion International Corporation.

At the outset, may I extend to you, Senator Melcher, my deepest appreciation for your interests and efforts in attempting to promote the use of wood residues in a manner beneficial to the general welfare of our nation.

As you probably know, Champion is completely dedicated to maximizing wood utilization from its own lands and certainly welcomes the opportunity to participate with the Department of Agriculture in any worthwhile effort to avoid the waste of wood fiber from federal lands.

In my judgment, the concept advanced in S-1996 is certainly a major step in the right direction with respect to the management of United States forest lands. Its objective of translating woodwastes into valuable assets which will help to alleviate the energy and raw material shortages now confronting our country must be given serious consideration.

In response to the invitation to offer objective comments on this bill may I preface my remarks with a very brief statement of what I understand the Secretary of Agriculture may require of timber purchasers if this were enacted into law.

First, the purchaser may be required to remove from the timber sales area wood residues. Next, he may be required to process this residue although the type or manner of processing is not clear. I assume it would be a chipping type operation. Finally, the residue would be transported to a point of perspective use. Both the cost and energy demand factors of each of these three activities would be relatively substantial but there is a safeguard for the purchaser in the provision on page two that the Secretary may not make such requirements in instances where it would be more expensive to remove the residue than its value after removal.

However, as I understand, this safeguard would not apply to any residue removed for reasons associated with fire prevention, site preparation, wildlife habitat or other land management purposes (p 2, 120 et seq.) Thus, do we not find ourselves in the position of being forced to remove, process and transport all residue irrespective of value if the Secretary found any relationship between the residue and fire prevention, site preparation, etc.

To avoid this possible consequence, may I suggest that following the word "However" on page 2, line 20 the language "except in cases of wood residue removal for fire prevention, site preparation for regeneration, wildlife habitat improvement, or other land management purposes" be deleted. Then after the word "products" on page 3, line 2 we add the following sentence. "In cases of wood residual removal for fire prevention, site preparation for regeneration, wildlife habitat improvement, or other land management purposes, the Secretary may require the removal of such residue upon agreement to pay the difference between the expense of removal and the fair market value of the residual at point of delivery."

We know that you are fully cognizant of the fact that wood fiber utilization can contribute only to a small part of the solution to the energy shortage problem. We also know that you recognize that there are still many questions to be answered before we proceed with a full-fledged program of residue removal. And, of course, care must be exercised that an investment for residue removal will not result in serious dislocations in other areas. Nevertheless, your efforts in presenting proposals to assist in the solution of our major energy and wood utilization problems are very much appreciated and we shall be pleased to participate with you to any extent you may wish in obtaining satisfactory legislation to help in attaining this conclusion.

The third and final study will delineate markets for all possible materials salvaged from the forest without threatening the fertility and characteristics of the soil. These materials may find markets as posts, poles, house logs, saw logs, alcohol feedstock, pulp, chips and fiberboard, compost and other uses.

These three studies and the material developed from any other sources will be used to study the feasibility of opening a wood concentration yard . . . the facility to which people who have been turned away from other markets can go and sell at an advantage to all parties. As unemployment increases, we feel there is special importance in opening these opportunities, and particularly, to reduce the bureaucratic barriers, contracting obstacles and economic problems which prevent these people from having easy access to forest materials at one end and a feasible market at the other.

The many independent souls, now underemployed or not employed at all, who can thin, glean, clean up trash and cut, haul and deliver material which should be made reasonably available to them, will exhibit the same eighteen-hour-per-day ambition which has allowed the American farmer to fill the food pipeline. Under present contracting and legal conditions, they are discouraged from coordinating with the Forest Service and other forest owners, logging contractors or anyone else. As with farmers, the economic incentives need not be large, or even certain, . . . they just need to be able to overcome the artificial obstacles which have kept them out of the woods and away from the gates of uninterested buyers.

We especially emphasize that a large number of individuals with trucks and chainsaws awaits your action to clear roadblocks at the supply end to create an open and dependable market. We of course, recognize that problems of roading, watershed protection, administration, changes in contracts and with contractors, development of new markets and new forest product uses, and the health of the forest must be considered.

However, after more than ten years of struggle to acquaint the public and the agencies with the potential of wood waste, we are glad to find that we are no longer alone.

PROPOSAL

ECONOMIC FEASIBILITY OF ESTABLISHING A CONCENTRATION YARD TO UTILIZE THE LOW-VALUE WOOD RESOURCE IN THE BITTERROOT VALLEY

I. Background

During the past four years, the Bitter Root Resource Conservation and Development Committee and the U.S. Forest Service have worked together to identify and evaluate alternatives for expanding forest-based industry in the Bitterroot Valley. There exists a high level of unemployment and underemployment among Bitterroot Valley workers who depend, at least in part, upon woods and mill work for a living. At the same time, substantial volumes of available wood are not being utilized. This includes extensive dead timber, small stems, and material left on logging sites as residue following conventional harvesting operations.

Active participants in investigations to date have included representatives of wood products industry firms, cooperating logging contractors, and Forest Service researchers. Studies have been carried out to evaluate the unused wood resource, determine product potentials, and investigate low capital investment harvesting techniques. A study has also been completed operating modes that may be applicable to the Bitterroot Valley situation.

A wide array of opportunities exist for using the wood currently considered unmerchantable. Needed, however, is a means of aggregating the resource and channeling it to the appropriate end use, providing a base for industrial expansion. Concentration yards (sometimes referred to as merchandizing yards) have successfully performed a similar function in other parts of the country.

Proposed is a study of the economic feasibility of establishing a concentration yard in the Bitterroot Valley. The study would build upon the base of information already developed, evaluating market opportunities, capital investment and operating costs, and alternative operating strategies.

Results of the study would provide a sound factual basis for assessing the probability of success of a concentration yard venture. Assuming a favorable outlook, the results would serve to guide planning, investment, and operating decisions.

II. The wood resource

In 1976, there were six sawmills in Ravalli County which, together with mills in Missoula, absorbed the sawlog and veneer/log output of the Bitterroot Valley. There were also four post and pole plants and seven houselog operations that used primarily lodgepole pine poles. This level of resource utilization leaves, unused, a considerable volume of wood material that is potentially available. This resource consists of several types of material: dead trees, small stems, and tops from regular sawlog harvests, thinnings and salvageable dead stems, and stands that have mostly small diameter, decadent or stagnated trees. Often there are some high value products mixed in, but the value of the stand is too low to attract normal logging operations.

Much of the potential is in mature and overmature lodgepole pine stands, which could yield about 1.2 to 2.3 million cubic feet of wood annually. In addition, about 1.6 million cubic feet of wood is currently left as logging residues, mostly in other forest types. These logging residues plus all the available but unused lodgepole pine material total at least 1.9 million cubic feet, suited for roundwood products (small sawlogs, houselogs, posts, poles, etc.), plus about .9 million cubic feet suited for fiber or fuel. These volumes are based on current or anticipated harvest levels developed from a recently completed plan for the Bitterroot National Forest, and includes only "standard" National Forest land, suitable and available for conventional logging. Salvage logging of dead material (using methods that protect more fragile lands) and wood from small private woodlots could add another 1 million cubic feet or more. Although demand for roundwood products has increased, there still appears to be substantially more residue material available than local wood products firms now utilize.

III. The concentration yard concept

There are several reasons why the available low-value wood described above is not now utilized. The material includes a diverse mix of sizes, conditions, and product potential, and volume per acre may be low. This makes it uneconomical for a conventional sawlog or veneer/log harvesting operation to handle.

Additionally, larger-volume logging operations are unwilling to undertake the sorting, handling, and merchandizing tasks involved in supplying material to smaller specialty plants.

From the small plant or mill operator's point of view, sources of raw material supply are scarce and usually unreliable. The operator cannot profitably harvest the material needed, since he has no ready means of dealing with the proportion of the wood material that does not meet his specifications. Purchasing a specified type of material from woods operators involves the risks of extreme price variation, inconsistent delivery, and questionable quality.

Finally, from the land managers point of view, timber sales are built around higher-value conventional products such as sawlogs and veneer logs, with little opportunity to sell the lower-value components. The residue component typically remains on-site to create a disposal problem.

A concentration yard could resolve these problems and, in addition, provide an employment opportunity for small-scale loggers or other individuals with limited equipment who want to harvest wood, but not become involved in the complexities of selling a mix of material. In general, the mode of operations would include these activities:

The concentration yard would inform and coordinate its logger-suppliers as to available logging residues or salvage, thinning, or other harvesting opportunities;

The logger would deliver the woods-run material to the yard and be paid at time of delivery;

The yard would sort and cut material for its highest potential use, consistent with current market needs;

The yard would find and maintain market outlets for the material, and could maintain inventories for outlets with long-term contracts to buy from the yard;

Additional processing could be performed at the yard for outlets that desired such services, including debarking, trimming, size sorting, etc.

In total, the concentration yard would provide benefits to:

The conventional logger by permitting him to remove the items he is primarily concerned with and organizing for other operators to handle the remaining material.

Land owners by providing a reliable market outlet for wood generated by thinning, salvage, sanitation cutting or other stand improvement activities.

Manufacturers by providing a single large volume supplier rather than depending on many individuals and erratic or unreliable supplies.

Local unemployed and underemployed people, by providing an outlet for their labor and whatever equipment they have, with stumpage arranged by the yard, and a quick-delivery, quick-paying outlet assured.

ENERGY SYSTEMS ENGINEERING, RESEARCH, AND DEVELOPMENT,
East Missoula, Mont., November 29, 1979.

Re: Testimony for S. 1996.

Hon. Senator MELCHER,

DEAR SENATOR MELCHER: This letter is intended to provide support of your legislation (S. 1996) and to encourage your support of the technological development described in the attached Exhibits "A", "B", and "C".

Briefly, this proposed development, first introduced in 1972, is designed to utilize the waste logging residue as a fuel source to generate on-site electric power. The generated electricity will replace diesel powered equipment to supply energy to electric-motor driven equipment employed in the handling of these forest residues. Once perfected, this power source could serve as the energy source for a host of forest management functions.

I believe that a system utilizing the available energy from forest residues to recover and process those residues could play an important role in the economical and successful accomplishments intended by this legislation.

The cost of this development including generating systems, equipment development, testing and evaluation of systems and system analysis would be between \$500,000 to \$1,000,000 over a five to ten year period.

I apologize for the brevity of the information describing this proposal and should you feel a need for additional detail, please call upon me to provide you with the information.

Thank you for this opportunity to present this proposal to you and I wish you success in passage of this important legislation.

Sincerely yours,

ALBERT V. BELLUSCI,
P.E. Lic. No. 924E.

[EXHIBIT A]

U.S. DEPARTMENT OF AGRICULTURE,
FOREST SERVICE,
November 21, 1972.

Reply to: 7120 Equipment Development and Test.

Subject: Solid Fuel Turbine.

To: E. W. Amundsen.

Attached is a rough sketch proposal for the development of a solid fuel turbine utilizing wood slash waste or volatile extractions from wood material as the gaseous fuel.

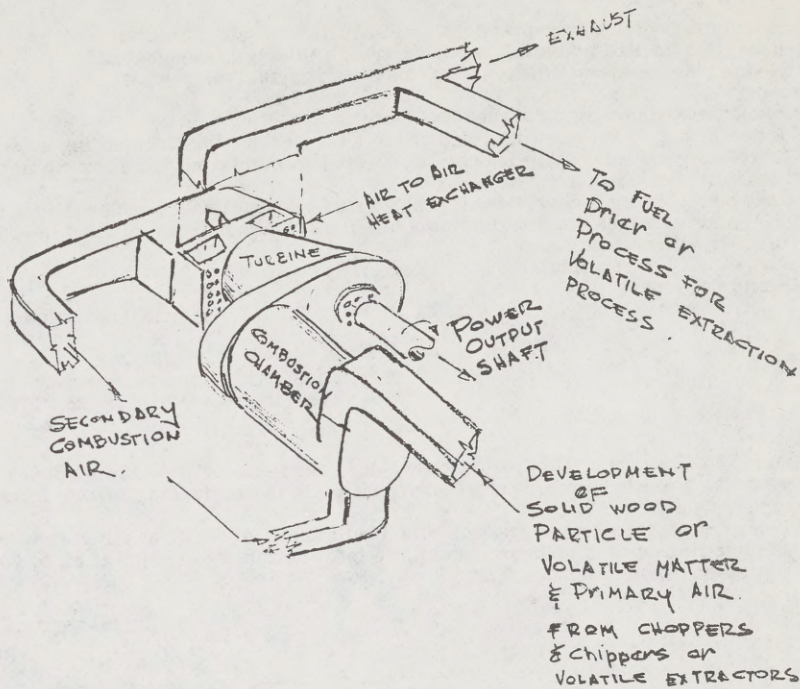
The purpose of the turbine development would be as a power source for a mobile type chipper plant operating on slash sites or as a mobile type complete logging, slash disposal, chipper, and energy source for small on-site dispensable greenhouses, etc. A proximate analysis of Douglas-fir sawdust indicates a high heat of 8,130 BTU/lb. and constituent of 10.3 percent moisture, 78.3 percent volatile matter, 11.2 percent fixed carbon and 0.2 percent ash.

This brief description, hopefully, will stimulate your appetite enough to seriously allow myself and our illustrator to work up a good presentation for this project.

Please let me know.

ALBERT V. BELLUSCI,
Mechanical Engineer.

Enclosure.



Development of a solid particle or wood volatile extract turbine as a power source for on-site mobile plant Utilization of solid wood slash material

[EXHIBIT B]

JUNE 15, 1973.

HON. MIKE MANSFIELD,
U.S. Senate,
Washington, D.C.

DEAR SENATOR MANSFIELD: The magnitude of waste material produced from logging operators (slash) and the potential energy stored in this material has been of considerable interest to me for some time. Being a mechanical engineer I have had a natural interest in this problem and have had a system of utilization under study for nearly a year.

The purpose of this letter is to inquire of you and to request your help in realizing this proposed system of utilization become a reality.

The proposed utilization of this available energy is described as follows:

A. The potential energy stored in the waste material is converted to thermal and mechanical energy on the immediate logged over site.

B. The converted energy is used to provide a controlled environment to accelerate the early growth of seedling trees for revegetating the logged over site. The period of time required for accelerating the seedling growth and hardening the seedlings to the stresses of the normal environment is expected to be less than one year.

This is admittedly a radically new concept of energy utilization, many of the systems are now available that make the system practical. Development is necessary on the energy conservation equipment selected to provide the controlled environment.

The benefits derived from this proposed system of waste utilization are what make this development worthwhile. These benefits are:

On site utilization of logging waste.

Elimination of burning practices and reduction in air pollution.
 Reduction in fire potential resulting from utilizing waste material.
 Reduction in loss of nutrients by accelerating the early growth of seedling trees.

Immediate reforestation of the logged site.

A shortening of the growing cycle of trees by accelerating the seedling growth.

There are the immediate benefits that come to mind and there are no doubt others that may develop.

It is possible that a development program may be established under the Clark-McNary Act whereas federal funding and federal lands may be supplied in order to proceed with such a program?

I hope that I have stimulated your interest.

Sincerely yours,

ALBERT V. BELLUSCI.

U.S. SENATE,
 OFFICE OF THE MAJORITY LEADER,
 Washington, D.C., June 28, 1973.

MR. ALBERT V. BELLUSCI,
 Missoula, Mont.

DEAR MR. BELLUSCI: This will acknowledge your letter of June 15 in which you discuss the proposal for utilizing slash materials in the logging of our forests for energy purposes.

This is an interesting suggestion and I will check to see if any research has been done in this area. When I have more information, I will send it on to you.

With best personal wishes, I am

Sincerely yours,

MIKE MANSFIELD.

U.S. SENATE,
 OFFICE OF THE MAJORITY LEADER,
 Washington, D.C., July 14, 1973.

MR. ALBERT V. BELLUSCI,
 Missoula, Mont.

DEAR MR. BELLUSCI: Enclosed is a letter I have received from the Forest Service in which they discuss on-site utilization of logging residues.

I hope you find the report of interest and if I receive any additional information, I will pass it on to you.

With best personal wishes, I am

Sincerely yours,

MIKE MANSFIELD.

Enclosure.

U.S. DEPARTMENT OF AGRICULTURE,
 FOREST SERVICE,
 Washington, D.C., July 10, 1973.

Hon. MIKE MANSFIELD,
 U.S. Senate,
 Washington, D.C.

DEAR SENATOR MANSFIELD: We appreciate the opportunity to comment on Mr. Albert V. Bellusci's June 15 letter to you regarding the on-site utilization of logging residues. We intend to follow-up promptly on the details of his idea.

The Forest Service is actively pursuing all possible avenues for ameliorating the impact of logging residues for several reasons. First, we need to find practical ways to extend timber supplies for both solid wood and fiber products. Logging residues would appear to be our best immediate source of additional raw material. Secondly, we need to find alternatives for open burning of logging slash to alleviate fire hazard and to prepare cutover areas for future crops. Thirdly, we need to explore all possible ways to extend energy resources. Residue wood could provide a significant increment if efficient handling and conversion systems were developed. And finally, we need to tidy up logged areas to meet our quality goals for esthetics, wildlife, and watershed values. Mr. Bellusci's proposal appears to address most of these problems.

Our staff in Missoula has been working closely with a committee in the Bitterroot over the last several months in an effort to explore possible avenues

for residue utilization. We are instructing Dr. Roland Barger who heads up our utilization research in Missoula to meet with Mr. Bellusci and to incorporate these new concepts into the research work unit problem analysis.

Sincerely,

JOHN R. MCGUIRE, *Chief*
(For R. Keith Arnold).

[EXHIBIT C]

OCTOBER 13, 1975.

To: Chief, U.S. Forest Service, U.S. Department of Agriculture, Washington, D.C.

Subject: Renewable resource assessment written proposal for a specific development.

DEAR SIR: The attached proposal (in schematic format) pertains to renewing timber resources by supplementing new growth management methods with an unlimited source of low-cost energy through conversion of logging residue (slash) to electrical energy and useful by-products.

The important aspects of this proposal are not the methods of energy utilization for new growth development but of making available low-cost energy. It is recognized more recently that as management systems become more intense and sophisticated there is a proportional increase in the energy requirements. Therefore, the development of a flexible, low-cost energy source utilizing an available waste product is not only a valid concept but practical within today's technology and essential as well.

Although I have previously submitted this proposal, I feel because of its importance that it be brought to the attention of Forest Service officials again. The development of the available energy source must necessarily rank high in establishing priorities for high-return resource management.

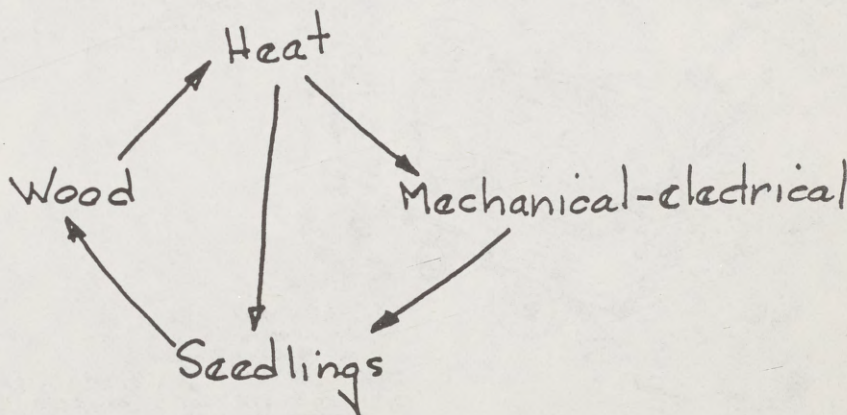
Should the review board require additional information, please contact me at either of the below addresses. Because I have conceived this concept, it is requested that any proprietary rights of development remain with me.

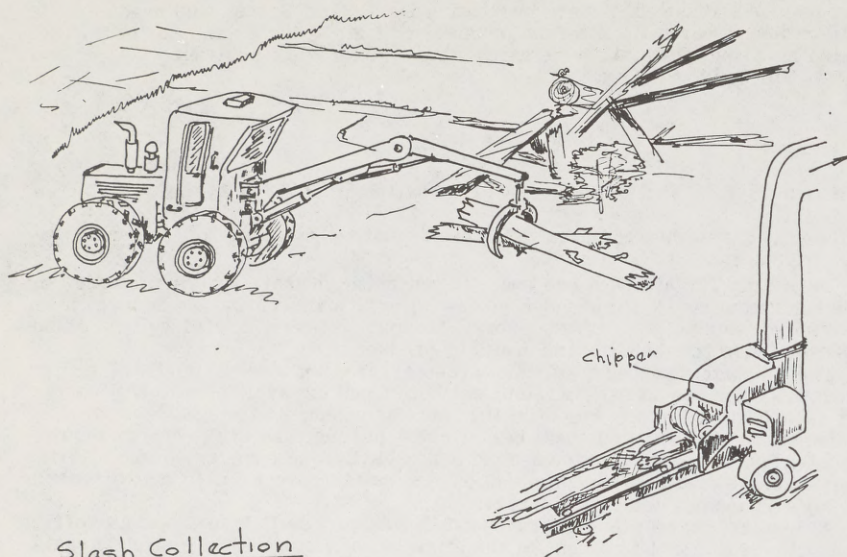
Missoula Equipment Development Center, Fort Missoula, Building Number 1, Missoula, Mont. 59801; or Route 4, Marshall Grade, Missoula, Mont. 59801.

Sincerely yours,

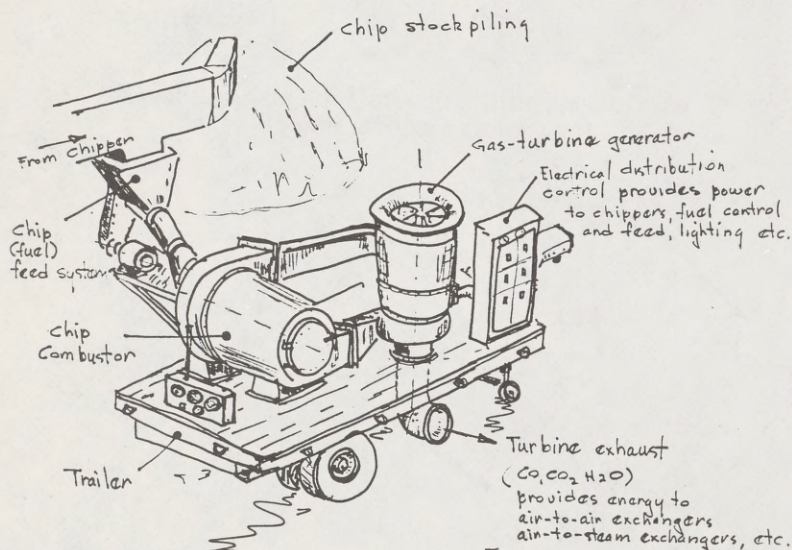
ALBERT V. BELLUSCI,
Professional Engineer.

A system of wood waste utilization to replenish a harvested site thru energy conversion

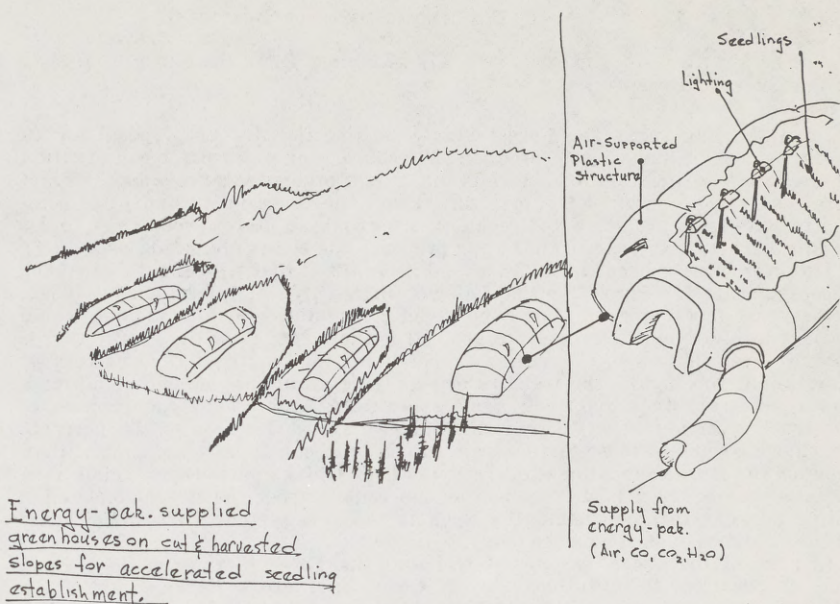




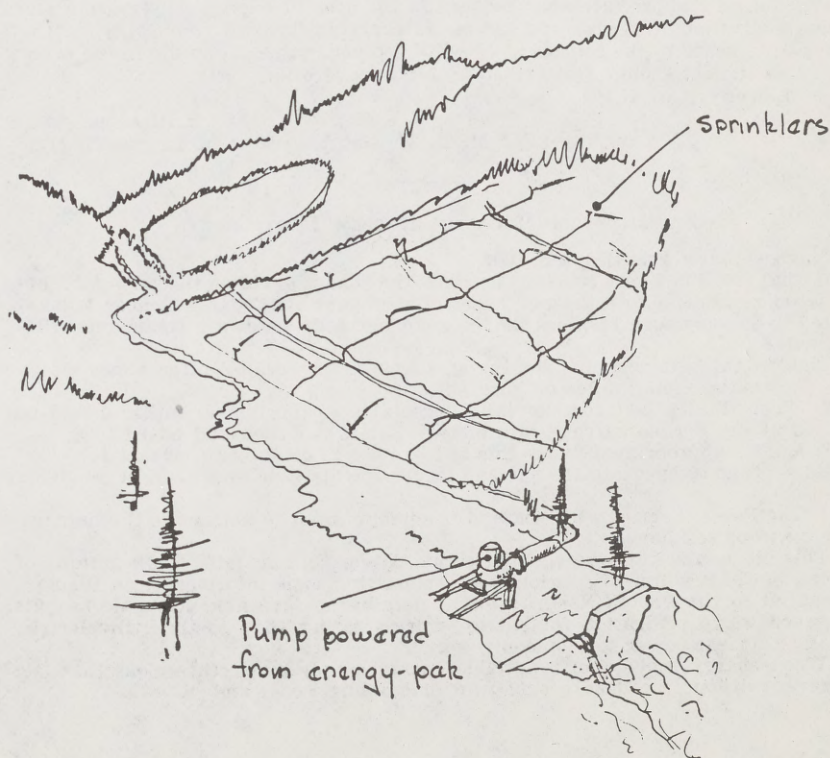
Slash Collection and Particle Reduction



Energy-package Concept



Irrigated and fertilized irrigated sites for seedling development



U.S. DEPARTMENT OF AGRICULTURE,
FOREST SERVICE,
Washington, D.C., December 2, 1975.

Mr. ALBERT V. BELLUSCI,
Missoula, Mont.

DEAR MR. BELLUSCI: The Forest Service has reviewed your proposal for an energy source utilizing waste products. We share your concern for conservation of energy and utilization of materials that might otherwise go to waste. We are sure that you are aware of efforts throughout the Government and private industry to develop processes and techniques for making useful products of forest residues. Therefore, we feel that your proposal has some interesting aspects.

However, your concept is so broad and generalized that we cannot offer much encouragement for Forest Service followup in research and development. There are several factors which should be given consideration before anyone would become deeply committed to such a project. Is there enough of the energy source (Btu's) available to do everything proposed for the length of time necessary? How would you handle the logistics of supplying all of the materials and manpower necessary to a relatively remote location? How would you propose to construct greenhouses on terrain that might have slopes from 15-50 percent? Considering some of these factors, would your proposal be more economical than some of the more conventional operations? These things plus others would have to be answered very positively before one could expect the development of a chip combuster/turbine combination such as you have sketched. We do not know of the existence of such a device today.

In view of the above, we do not feel that the Forest Service could commit time or resources to initiation of a project of this nature. Perhaps one of the industry organizations such as American Pulpwood Association (APA) or National Forest Products Association (NFPA) might be interested in your proposal. Their members own and operate most of the equipment of the type you propose.

We sincerely appreciate your concern in the area of energy conservation and waste utilization. We wish you success in carrying forward your concepts. Unless you indicate to the contrary, we will keep your proposal on file in the event that this subject should again come up for consideration.

Sincerely,

C. R. UELLER
(For M. R. Howlett, Director of Engineering).

STATEMENT OF MCGREGOR RHODES, LIBBY, MONT.

Changes that are needed in S. 1996.

1. That small business concerns be given the chance to bid on the salvage rights to wood residues before the purchaser of merchantable Federal Timber is mandated to salvage such residues that are not normally used in a commercial timber sale.

This would be a big plus for the small operator, because often times we do not possess the capital to bid on large sales.

2. Wood, that is not commercially acceptable to the lumber mills, should be priced at the normal salvage rate of two dollars per thousand board feet.

3. Monies appropriated under this bill be used to establish a market for wood residues that compensate the salvage logger for his time and costs in removing residues.

4. The Forest Service will seek and use public input to determine the best use for the wood residues.

This bill is a step in the right direction. It clearly mandates the beginning of a new era of resource utilization. I am submitting some information on Biomass potential in the Pacific Northwest that details the favorable economic benefits of wood waste utilization for energy sources rather than costly hydroelectric, coal, or nuclear power development.

Wood energy provides a renewable energy supply and creates jobs that last forever without the deadly acid rain of sulphuric coal and oil.

[The following material was supplied by Doug Smith, see p. 45 for his oral testimony.]

HARVESTING AND UTILIZATION OPPORTUNITIES FOR FOREST RESIDUES IN THE NORTHERN ROCKY MOUNTAINS

LEGISLATION AND POLICY INFLUENCING WOOD RESOURCE UTILIZATION

(By Douglas S. Smith, Legislative Assistant to U.S. Senator James A. McClure of Idaho)

National materials policy has, as a framework for harvesting and utilization opportunities for forest residues, long standing as well as recently enacted statutes. Beginning with the now repealed Organic Administration Act of 1897, it has been made clear that the establishment of national forests is "... to furnish a continuous supply of timber for the use and necessities of citizens of the United States;". The Monongahela court decision which raised questions about the Forest Service's ability to sell timber unless it consisted of, "... the dead, matured, or large growth of trees found upon such national forests as may be compatible with the utilization of the forests thereon," caused Congress to enact the 1976 Forest Management Act. Originally Congress merely wanted to clear up the uncertainty created by the Monongahela issue, however in the process a major piece of legislation emerged, supplementing and amending the historic Forest and Rangeland Renewable Resources Planning Act. During the legislative process leading to the passage of the 1976 Forest Management Act a wide range of forest users and other interested public contributed. This interest has carried forward in the preparation of regulations, which it is fair to say, has been highly controversial.

It is useful for our purposes today to quote from Section 3 of the 1976 Forest Management Act:

REPORTS ON FIBER POTENTIAL, WOOD UTILIZATION BY MILLS, WOOD WASTES AND WOOD PRODUCT RECYCLING

"(c) The Secretary shall report in the 1979 and subsequent Assessments on:

"(1) the additional fiber potential in the National Forest System including, but not restricted to, forest mortality, growth, salvage potential, potential increased forest products sales, economic constraints, alternate markets, contract considerations, and other multiple use considerations.

"(2) the potential for increased utilization of forest and wood product wastes in the National Forest System and on other lands, and of urban wood wastes and wood product recycling, including recommendations to the Congress for actions which would lead to increased utilization of material now being wasted both in the forests and in manufactured products; and

"(3) the milling and other wood fiber product fabrication facilities and their location in the United States, noting the public and private forested areas that supply such facilities, assessing the degree of utilization into product form of harvested trees by such facilities, and setting forth the technology appropriate to the facilities to improve utilization either individually or in aggregate units of harvested trees and to reduce wasted wood fibers. The Secretary shall set forth a program to encourage the adoption by these facilities of these technologies for improving wood fiber utilization.

"(d) In developing the reports required under subsection (c) of this section, the Secretary shall provide opportunity for public involvement and consult with other interested governmental departments and agencies."

The Forest Service reports they are not ready with an assessment on this section at this time. The Resources Planning Act (RPA) Assessment is due to be submitted to Congress on January 22, 1980.

The Resource Conservation and Recovery Act, also known as the Solid Waste Disposal Act, was enacted in 1976, and has caused concern in other industries because of the tentative regulations concerning the definition of hazardous waste. The implications in the wood fiber field are yet to be assessed, but because of the volume of fiber involved, as well as the diverse conditions, the impact on future use and planning is likely to be significant. Clean air and water laws will continue to have a major impact on all phases of forestry activities.

Energy programs and policy are developing rather rapidly as we grapple with our goal to be less dependent on foreign sources of oil. The Society of American Foresters in a study report of a task force titled, *Forest Biomass as an Energy Source*, reports:

"Forest biomass—a renewable, versatile source of energy—can contribute the equivalent of approximately 9.5 quads to U.S. energy needs. (This value is exclusive of wood required for conventional products, but includes aboveground biomass in net growth from commercial forests; mortality; and wood from land clearing, noncommercial lands, urban tree removals, and urban wastes.) If commercial forestland were fully stocked and intensively managed, biomass available for energy could increase to the equivalent of 18.9 quads by mid-21st century.

"Biomass can be burned directly or converted to gas, oil, and char. Many forest industries, particularly pulp and paper manufacturers, now burn biomass for up to half their fuel needs. Blending biomass-derived alcohol with gasoline and using biomass in electrical generation may become practical.

"The Federal Energy Administration (FEA) estimated in 1976 that annual energy use in the United States was about 75 quadrillion BTUs (or 75 quads), and that use in 1985 would be 98.9 quads. The agency also estimated that even under the most favorable conditions the U.S. cannot expect to gain more than 6 quads from emerging technology by 1990. A more realistic figure, it indicated might be 2 quads.

"The emerging technologies evaluated by FEA included solar, geothermal, and synthetic fuels, but evidently excluded forest biomass. Energy currently obtained from wood is estimated at 1.1 to 1.7 quads. Members of the task force are confident that wood use for energy is increasing greatly, but we have no way of knowing the extent."

The comment that FEA evaluation excluded forest biomass potential reinforces similar comments, complaining about the lack of attention by FEA to forest biomass potential. Despite the apparent lack of overall planning and assessment of this energy resource, there are many local and regional examples of increasing utilization of fiber for energy production. Studies and actual use of efficient wood stoves are being conducted by the Tennessee Valley Authority. The Eugene (Oregon) Water and Electric Board uses large amounts of sawmill residue (hog fuel) for steam generation. Washington Water Power in Spokane has announced plans to build a wood fired generating plant. Pullman Swindell Company gave a presentation to Senate staff last summer on their woodex pellet production from wood waste. More and more individuals are discovering the small chain saw and using spare time to gather firewood from a variety of sources.

Private companies have expressed interest in installing medium-size power generating plants using wood waste transported for up to 50 miles radius. The main problem in finalizing plans is the inability to reach agreement between the land manager and the power company over a long term supply of fiber at an assured price.

Pending legislation, including Synfuels (S. 932), the promotion of the development of energy from agricultural commodities, forest products, and their wastes and residues, and rural energy conservation practices (S. 1775), and windfall profits (biomass property), which allows 20 percent tax credit, provide more substance for utilizing the energy potential of wood.

Discussions with the Chief's office (Forest Service) in the past few years indicates they have about all the authority they need to develop a more comprehensive utilization of wood fiber for our energy needs. The key factors involved in moving ahead seem to be economics, and supply and demand. One has only to note the rapid change in the price of foreign oil—and our dependence on it—along with Middle East uncertainties to estimate where our energy situation is heading.

A prudent person would have to consider all of our energy options, especially under-utilized domestic options such as wood biomass.

Forest products industries continue to face the roller coaster effect of the price of money and its relation to the housing market. With the interest rates at 15 percent and up, some experts predict housing starts at a 1.1 million level next year. Should the price of lumber and plywood drop, mills having timber sales with super-high bid prices, and no cheap timber to mix, will have a tough time of this economic period. Since the only certainty in the lumber business

is "uncertainty", the secondary source of wood biomass is likely to be affected. Our softwood imports have recently risen from 20 to 26 percent of U.S. consumption which becomes more of a factor in our balance of payments.

There are other factors that have an effect on our land base, its availability, and the potential for utilization of wood biomass. The ultimate disposition of the Forest Service roadless areas (RARE II) is yet to be determined. The Senate recently passed a central Idaho wilderness bill, followed by an Oregon wilderness bill. The Idaho bill ordered RARE II lands in central Idaho released with report language, while the Oregon bill released remaining RARE II lands with statutory release language. It is likely the disposition of RARE II by the Congress still has a long way to go.

This, of course, leaves a cloud over the planning process for wood fiber management. Senator Melcher's bill (S. 1996) authorizes the recovery of wood residues in the national forests for use as fuel, for conversion to use as petrochemical substitutes or wood products. This is done through the use of residue removal incentives. Residue recovery as a function of brush disposal, slash disposal, site preparation, timber stand improvement, and other relevant forest practices has not yet been thoroughly examined. Again, markets, costs, supply and demand, and other factors need to be thoroughly examined.

A current battle is emerging over timber economics, especially in the Northern, Intermountain, and Rockies areas of our National Forest System. Whether timber management can meet a test of 5 percent or 10 percent on Investment is being challenged. This is another important factor in the fiber potential picture. Along with this goes road construction policy and other harvest requirements under the 1976 Forest Management Act and subsequent regulations.

The previous discussion suggests there are many conflicting and vague policies that address, or fail to, the opportunity for wood biomass management. We have a new challenge to be creative, and unique new markets to consider that are in the National interest. Wood biomass management can have beneficial effect on tomorrow's forests. It is to be hoped we can develop a positive policy to utilize this opportunity.

U.S. DEPARTMENT OF AGRICULTURE,
FOREST SERVICE,
Ogden, Utah, December 26, 1978.

Hon. JAMES A. MCCLURE,
U.S. Senate,
Washington, D.C.

DEAR SENATOR MCCLURE: Mr. Doug Smith called this office recently and requested some information on the growth of lodgepole pine stands. Ed Harvey of our Timber Management Staff returned his call December 11 and they discussed pine growth and the risk of mortality.

The growth of normal timber stands is usually displayed adequately by yield tables; however, in the case of the lodgepole pine, very few yield studies have been undertaken. We have used yield tables developed by the British Columbia Forest Service in 1947 and the Canadian Forestry Service in 1976. These publications indicate that cubic foot growth per acre is quite high in the young age classes of lodgepole pine and peaks at ages ranging from 80 to 140 years except on the very best of sites.

Empirical yield tables developed from the Bridger-Teton National Forest inventory data indicate that the culmination of the mean annual increment occurs at about 100 years while managed yield tables made with a research developed computer model give culmination ages that range from 100 to 120 years.

Some lodgepole pine stands will never reach the calculated age of growth culmination due to the devastating effects of mountain pine beetle infestations. This problem is discussed in the research publication: "Guidelines for Reducing Losses of Lodgepole Pine to the Mountain Pine Beetle in Unmanaged Stands in the Rocky Mountains," by Gene Amman and others. The publication points out that the risk of beetle infestation is high in lodgepole pine stands that are over 80 years of age at the lower elevations and latitudes and have an average tree diameter in excess of 8 inches.

A conflict between the objectives of scheduling the harvest of stands and of reducing mortality arises after the timber stands reach the projected culmination of mean annual increment of growth. This conflict must be resolved during land management planning. A departure from the calculated base harvest schedule

specifically aimed at reducing mortality losses should be evaluated during the planning process. If appropriate, the departure should be implemented.

We believe the information Mr. Harvey relayed to Mr. Smith was helpful. If we can be of further assistance in this matter, please let us know.

Sincerely,

PATRICK J. SHEEHAN,
(for Vern Hamre, Regional Forester).

[Reprint from Idaho Falls, Idaho, Post-Register, May 18, 1978]

FOREST SERVICE CUTTING ISLAND PARK TREES KILLED BY BEETLES

(By Kent Lauer, Post-Register staff writer)

ISLAND PARK.—"It's bound to be a shock to some people."

That's how John Healey of the Island Park Ranger District of the Targhee National Forest summarized the extensive tree cutting program in the scenic Island Park area.

Most East Idaho outdoor recreationists realize that many of the lodgepole pine stands in the area have been killed by the mountain pine beetle invasion. But out-of-state campers invading the area may be surprised to see some campgrounds bare, except for a few small trees and a lot of stumps.

Increased winter logging and leveling of trees in sensitive areas, such as campgrounds, has undoubtedly left scars within the district of the Targhee National Forest. And U.S. Forest Service officials are warning would-be campers and visitors that cutting infested trees is their only alternative in battling the pine beetle.

Forest Service officials also say they will be a target for criticism this summer from unknowing visitors who see fallen trees, piles of tree debris and barren campgrounds.

More small timber sales of insect-infested lodgepole stands along major highways will create "static" among some visitors, Bill Samuels of the Island Park Ranger District said Wednesday during a tour of the area.

He said, however, that harvesting the infested timber and reforesting harvested sections is the only way to return the forest to a healthy status.

Many of the trees cut through the small sales have not been cleaned up, leaving an unsightly mess for visitors to the area. But Forest Service officials say the fallen trees will be picked up by logging operators as soon as the soil dries out. The soil is presently too soggy for equipment to stand on.

Visitors to the Island Park area, Forest Service officials say, will have to be content with smaller trees in the next 20 years, as the mature, infested trees are replaced with young trees that are not as susceptible to pine beetle destruction.

This past winter was the first time Targhee officials have allowed extensive small winter timber logging, and they say they will now weigh the program to determine its merits.

There are some trade-offs associated with winter logging, Samuels said. Some of the trees in the understory are saved because crews can work on snow, he said, adding that trampling causes losses among the 10 to 15 foot trees.

"We think we've gained more than we lost," he said.

About 200 acres of small sales were contracted this winter, Samuels said. Small sales usually contain about 200,000 to 300,000 board feet, while large sales can include up to 10 million board feet.

This past spring, Forest Service personnel have been forced to cut infested trees in campgrounds, but they say they are trying to save everything possible—including the narrow, understory trees known as whips.

Beetles attack thick-diameter trees, so the whips were passed by, they say. The whips, however, are weak trees, relying upon the overstory, mature trees for protection against the elements. Forest Service officials say they have a "flimsy chance for survival."

The loss of trees within the campgrounds is clearly going to be more noticeable this summer, compared to previous tourist seasons, said Healey, who is in charge of the campgrounds.

Forest Service officials say campers from outside the area, including a large amount of traffic from Salt Lake City and Ogden, Utah, will probably be a little disgruntled and somewhat dismayed at conditions.

The tree debris in campgrounds will be collected into piles and burned. Sections which can be used for firewood will also be piled and made available to campers.

Free firewood permits are also being issued to persons desiring wood taken from tree stands in campgrounds.

Healey said last summer between 200 and 300 permits were issued for one campground, and the entire "loop" was cleaned up in one day.

Cooperation from the public in gathering free firewood has been an instrumental factor in cleaning up areas in which beetle infested trees are cut, Forest Service officials say.

Logging operators have also been cooperative in piling up tree debris and saving young, healthy trees, officials say, placing a significant economic impact on their operations.

Some of the campgrounds are already cleaned up and small trees have been planted in selected areas. Spruce seedlings have been planted by Boy Scouts in some of the campgrounds. Planting trees, however, is an expensive process—about \$15 a tree, Healey said.

SAFETY HAZARD

Uncut infested trees also pose a safety hazard in campgrounds, officials say, because they are easily uprooted by winds and could fall on unsuspecting campers.

Targhee National Forest is also considering spraying large, high-value campground trees with an insecticide known as Sevimol, he said. The insecticide has been approved for use in Idaho, and costs about \$8 a tree to apply, he added. Spraying will be limited to just campgrounds and other sensitive areas.

The Island Park Ranger District is undergoing an extensive physical change, thanks to the pine beetle. And Forest Service personnel say the change to a new, young forest can't be avoided, and the public must be willing to accept such a change.

RARE II OPPOSITION

Editor:

(An open letter to John R. McGuire, Chief, U.S. Forest Service, USDA.)

I find it difficult to allot valuable time for correspondence on all the irresponsible proposals drafted by the massive political machinery intended to amputate my brain and insult my intelligence. However, all people occasionally regress to play childish games; and during recent months, I have read and colored the RARE II comic books, listened to others' comments, analyzed various Idaho area photographs from many years, and arrived at the following conclusions about RARE II:

1—Over forty years of mismanagement by the U.S. Department of Agriculture Forest Service is really unacceptable performance by any standard. Seventy-five percent of all Government controlled forest trees in Idaho are dead or dying from budworm and beetle infestation. Past and proposed delinquencies by the Department are covered on pages 1 thru 77 of the Idaho Supplement to RARE II with no real benefits evidenced by RARE II. No human or natural benefits will ever be realized by federal game playing and ego-oriented politicians that waste our total resources for studying, duplicating, processing, and spending our tax dollars to maintain organizations and agencies that usurp authority from the American people and Constitutional Government.

2—Adopt State Land Control, and use programs to be governed and regulated by local residents. Reduce the U.S. Department of Agriculture Forest Service to one representative from each state. Return all federally regulated land and appurtenances to each state. (Place this issue on all 1979 voting ballots in each state and county.) Land use within each county of the state to be governed by resident voting on balloted petitions and issues. This approach is human and in the best interest of all those who know and love the land.

3—RARE II Conflicts and Definitions: Government-directed war games pollute and destruct vast areas of land, air and water resources. I suggest the Armed Services and Forest Service hierarchy exchange plans. Admittedly, RARE II agrees that roadless forests that are not logged are subject to increased fire hazards, loss of wildlife habitat and uncontrolled disease and insect problems. Please choose one definition or write me about your RARE II Roadless Area Review and Evaluation: Restore American Rights Enthusiastically—too; Radical Achievement Resolved Emotionally—too; Retarded and Rejected Environmentalists—too; None of these. Call your favorite politician for personal advice and guidance—too.

In summary, the feasibility for adding more land to federal control through RARE II would ultimately permit more mismanagement and bureaucratic takeover of human and natural resources that have never been constitutionally

authorized by honest hardworking American citizens. I resent political mandates that are implied or formalized by misguided bureaucrats, and know by years of personal experience that the games people play are ever changing and have no application to the real life.

My conclusion for government by, for, and of the people is fundamental to the success or failure of the American heritage. Contemporary government compares to the rampid destruction from typhoons, hurricanes, tornadoes, and related stormy weather. However, government should and can be like the subtle, beautiful and dynamic changes of our four seasons. And only when political ambitionists deal with reality will our past, present and future reward amount to a human and natural renaissance. It undoubtedly appears ridiculous to be practical and rational at a time when our government is bent on dictatorial chaos, and I regret that my means will not permit a large government staff and the expensive equipment necessary to overwhelm the citizenry on all occasions.

Please do your part to defeat RARE II and Environment Draft Statement 78-04. It is not necessary in Idaho.

JAMES D. SEARS,
Inkom, Idaho.

[Reprint from the Chronicle-News, Aug. 24, 1978]

RESEARCHER TO ATTACK PINE BEETLE PROBLEM

McCALL.—Mark Chatelain of the University of Idaho recently began a research project in the forests near McCall studying natural methods of reducing timber losses caused by the mountain pine beetle.

According to a news release from the University of Idaho, Chatelain, a doctoral degree candidate in forest entomology, is researching a method which attracts insect predators to the infested stands and one which provides predators with a place to winter and multiply once they get there.

"Present control methods such as chemical spraying seem to be ineffective against the beetle," Chatelain says. "We're trying to develop more effective and environmentally safe methods of control."

Chatelain's goal is to lure predatory insects, particularly the clerid beetle, to infested stands of lodgepole pine using chemical sex attractants or pheromones.

The news release explains that sex pheromones have been used successfully to attract predators of the southern pine beetle and the western pine beetle.

The second part of Chatelain's project focuses on conserving beneficial insects after they've been attracted to the infested stands. Previous research indicates that since clerids overwinter in the lower parts of trees, populations of clerids might be conserved by leaving high stumps and by not treating the stumps with chemicals during salvage operations.

Assisted by his wife, Mona, Chatelain plans to have the preliminary data compiled by May, but his final research results "probably won't be useable for about two years."

Chatelain says: "I don't think any one control technique would ever be a panacea. Any method has to be used in conjunction with others."

[Reprint from the Idaho Falls (Idaho) Post-Register, May 1, 1978]

STUDY YIELDS NEW LIGHT ON PINE BEETLE CONTROL

PULLMAN, Wash.—A new understanding of the ecological role of the mountain pine beetle in the lodgepole pine forests of the West is giving forest managers new tools for preventing outbreaks of the pest, a U.S. Forest Service official said here Wednesday.

In an interview, William Ciesla, leader of the Methods Application Group at USFS offices at Davis, Calif., said recent research has shown that "if man doesn't manage the lodgepole pine forests, the insects will."

Ciesla was at Washington State University for a three-day conference where new knowledge of the mountain pine beetle was presented to forest resource managers. An entomologist by training, he served as head of a panel assessing the value of the new knowledge for forest managers.

Symposium coordinators included Gene D. Amman, research entomologist, U.S. Forest Service Intermountain Experiment Station, Ogden, Utah; Ronald Stark, professor of forest entomology, University of Idaho; and Alan A. Berryman, professor of forest entomology, WSU. New information presented came

from USFS research and from a five-year study on integrated pest management headed by Berryman and Stark and funded by the National Science Foundation and the Environmental Protection Agency.

"What has frustrated forest managers is the knowledge gaps in pest management. There has been no knowledge of why pest outbreaks occur in certain stands, what can be used to forecast outbreaks and what land managers can do to prevent outbreaks from happening," Ciesla said.

"I've been critical of university and agency research efforts in the past, questioning its relevance to the needs of resource managers," he said. "I find this work very encouraging because it is providing realistic tools for management."

One of the most important new insights about the mountain pine beetle, which slowly kills trees by girding its bark, is that it is an important agent of plant succession in the lodgepole pine ecosystem. Ciesla explained that when stands of this species are about 80 years old and the inner bark begins to thicken, the trees are very susceptible to attack by the beetle.

From an ecological standpoint, the beetle kills off old lodgepole pine to make way for a more diverse, stable forest including spruce and fir, or to build up extensive fuel to feed wildlife and thus prepare new sites for pure stands of lodgepole pine, Ciesla said.

Vast pure stands of lodgepole pine have sprung up in areas cleared by wildfire, he explained.

[Reprint from the Idaho Falls (Idaho) Post-Register, May 9, 1978]

MOUNTAIN PINE BEETLE CAUSES "REAL HAVOC" IN IDAHO YARDS

ABERDEEN.—It won't be unusual if the nice ponderosa or lodgepole pine tree in your backyard turns an ugly brown and dies this summer.

It won't be unusual because that very thing has been happening throughout Idaho and other Western States during the past few years, and 1978 could be the worst year yet for home owners.

The culprit is the mountain pine beetle. It's been a habitant of the Rocky Mountains longer than man has, and before the days of summer homes and Idaho skiing vacations it played the role of a "good guy"—weeding out old trees so young saplings had room to grow.

According to Larry Sandvol, entomologist at the University of Idaho Research and Extension Center in Aberdeen, beetle infestations have been on the upswing in recent years, despite new insecticide registrations and an increase in preventive spraying.

"It's become a major problem, and it seems like it's getting worse," Sandvol said. "Last summer I had quite a number of calls concerning beetle infestations."

SEVERE DAMAGE

There are several reasons why mountain pine beetle damage has been so severe during the past 15 years; the U.S. Forest Service has described it as being at an "epidemic level" in many western states.

For starters, mild winters experienced throughout the Rockies during the past decade have permitted the beetles to multiply at a healthy rate. Populations have also been boosted by overstocked stands of ponderosa pines, which provide an abundance of host material.

Another reason why beetle populations have spread is that the U.S. Forest Service has been unable to control them in the national forests. At a cost of several dollars per tree for effective beetle control, it's just not economically feasible to spray the millions of trees that exist in these forests.

As a consequence, the burden of controlling these pests is squarely placed on the home owner. If those nice backyard ponderosa and lodgepole pines are to be saved, the problem has to be recognized and dealt with long before the trees lose their green color.

According to Sandvol, pine trees should be closely watched if other nearby trees are infested.

"The first sign of the mountain pine beetle is pitch spots in the trunk of the tree," he said. "It's a yellow resin substance . . . where the beetle is boring into the trunk."

"If a nice pine tree in my backyard had pitch spots in it, I'd do what I could to save it," he continued. "While it isn't economically feasible for the Forest

Service to control the pests in the national forests, it certainly is feasible for the home owner to save the few high value trees that are in his backyard."

According to information published by the U.S. Forest Service, once the beetle bores its way through the bark of the tree, it digs canals around the perimeter of the trunk, destroying the cambium area of the tree. A bluestaining fungus will then discolor the sapwood of the tree a few months after the initial beetle attack. This fungus is carried into the tree by the pest, and is a sure sign that the tree has been both attacked and killed.

Attacked trees start fading a month to a year after the beetle first bores through the bark, according to U.S. Forest Service information. The needles will change from green to yellowish green, sorrel, and finally rusty brown before dropping off.

[Reprint from the Chronicle-News, June 1, 1978]

BEETLE GETS THE BEST OF TARGHEE FOREST

(By Patsi Harris, Staff Writer)

Healthy, mature, green trees on the Targhee National Forest are fast being replaced by yellowish and red beetle infested stands of trees that cover hundreds of acres of once beautiful forest playgrounds.

"The pine beetle is and always has been a part of the lodgepole population," says Bill Samuelson, a forester on the district staff at the Island Park Ranger Station. "But the beetle reached epidemic proportions when a number of natural conditions all came together at once."

In order to help curb the pine beetle epidemic and rid the forest of the dead and dying trees that make up from 85 to 90 percent of the Targhee Forest the forest service has introduced cutting operations throughout the entire infested forest.

"Once the trees become infested with the beetle, which attacks mostly healthy, mature trees, they die within a few years, fall down and drive out the big game, because the animals are not able to graze within the crisscross of fallen trees or travel freely within the forest because paths are blocked," says Samuelson.

"Besides driving out a lot of our natural big game the fallen trees create fire hazards in the forest," he says.

At the present time the forest service is introducing logging operations into portions of Targhee. All but two of the 11 campgrounds within the Targhee have been logged out at the present time.

"We are trying to remove the bug infested trees on the Targhee; which is the hardest hit national forest in this region of the United States," said Samuelson. "In 1960 the forest service introduced a spraying program, but that did not stop the spread of the beetle and it was a very man-power intensive program and cost a lot of money.

"Infestation has multiplied greatly since last year and will continue until all of the larger trees in the forest are gone. We will have to start over with a new forest.

"We are not going to have large green trees for years to come in the Targhee. We are going to be left with a small tree forest because there is very little understory in most places and the cost of transplanting mature trees with a vanner tree planter is just too expensive to be done all through the forest. We are going to place some trees in the logged out campgrounds, but at a cost of \$15 per tree.

"The public is not aware of the impact of the bugs and it is hard to really take in the extent of the damage that has been done. There is no way to replace the experience of coming into a campground with large mature trees. However, we are doing what we can to replace trees wherever possible with the tree transplant program and leaving all small, uninfested trees and any mature trees that have not been attacked," he said.

"The problem with leaving the mature, uninfested tree is that the root systems on the lodge pole is very shallow and with no support and buffering from other trees they are very easily blown down."

In many of the campgrounds, such as Buffalo, the forest service has initiated a firewood program where the public can come in and obtain a permit for free fire wood. The forest service cuts the trees and the public is allowed to come in and cut into firewood and pick up the slash that is left.

The service thinks that this program has made it possible to accomplish two important things in the forest. It cleans up the bug infested timber and it creates a fuel break in case of a forest fire.

"This program has proved to be a good thing for the public and a good thing for the forest service. It accomplishes the clean-up job for us and it provides free firewood for the public," said Samulson. "All the people have to do is stop in at the ranger station and pick up a free firewood permit.

"The sad thing about the whole operation is that the forest is going to look pretty tough for a while," Samulson said. "The slash that is left will have to be burned when conditions are right and it will take a long time to regrow an entire forest.

"We will have no problem with reforestation because we have a very stable soil in the Targhee Forest," he said. "In places where there is no understory there will be reforestation with the planting of seedlings. This will be done at a cost of about \$225 per acre, replanting two-to-three-year-old trees.

"In the reforestation program we are going to try and involve the public whenever possible," the ranger said. "The Boy Scouts have already offered their help as a community project but this will be on a very limited basis."

There are different stages of logging operations visible through the Targhee National Forest. Along highways and in campgrounds the trees are being cut, slash piles made and the dying timber removed while it is still usable.

The timber is being removed by local logging operators that have purchased the timber from the service and have contracts on the log sales. Within the contracts the service is stipulating the operators are responsible for the piling of the slash left after the removable of the usable timber.

"We are trying to rebuild an entire forest. It has hit us that hard and we will have a young forest for quite a few years," Samulson says.

[Reprint from High County News, Sept. 22, 1978]

THE MOUNTAIN PINE BEETLE PLAGUE—COULD THERE BE A SILVER LINING?

(By Stephen S. Campbell)

Is the infestation of Rocky Mountain forests by the mountain pine beetle an environmental disaster?

Nobody knows. However, David A. Kovacic, a Ph. D. candidate in ecology at Colorado State University, is trying to find out by testing the hypothesis that mountain pine beetle attacks may make forests more productive and diverse.

The beetles are major killers of lodgepole pine, ponderosa pine, Western white pine and white bark pine. They are at epidemic levels in forests in Montana, Idaho, Wyoming, and Colorado. In Colorado, for instance, beetles have killed 85 percent of the trees in some ponderosa pine forests on the Front Range. In all of these areas, people are concerned about loss of timber, loss of trees in home and resort areas, and potential forest fires during extremely dry periods.

But Kovacic sees another side to the infestation. The dead trees let more light and moisture hit the forest's floor. Pine resins, which may suppress plant growth, nitrogen bacteria and decomposers, are eliminated after trees are killed. These factors, along with less competition from pine trees, allow the grasses, leafy plants, sedges and shrubs to increase. Kovacic says this growth may provide increased forage for birds and mammals.

"Cyclic perturbations in an ecosystem may lead to increased stability of the ecosystem," Kovacic says.

Beetles have always been in Western pine forests, Kovacic says. Only when conditions are right (even-aged stands 50-100 years old with diameters of 8-12 inches) is the beetle able to cause infestations of epidemic proportion. Man's intervention with the forests in past logging and in present fire control is the major cause of these even-aged stands, Kovacic says.

The beetle has one brood of larvae per year. Beetles mature sometime in the middle of August when they leave infested trees and fly to healthy ones. Females bore under the bark of the healthy pine and lay their eggs.

They carry a fungal disease known as "blue-strain," which clogs the flow of sap in the tree. "The dual action of the beetle and the fungus actually kills the tree, and not just the beetle itself," Kovacic says.

When beetles attack a tree, sap flows from the beetles' holes. Some trees can flush out beetles with their sap, and others can't. This ability to resist infestation

seems to depend upon the time of year, as well as the age and health of the tree.

Kovacic says that the job of deciding whether or not to try to control the mountain pine beetle in future infestations is a difficult one.

"Entomologists can predict future epidemics before they start, but public concern at the onset is low since pine beetle problems are not apparent. Only after an epidemic is in full swing does the public get excited, and this is when the government is motivated to appropriate funding to control the epidemic. Nevertheless, once an epidemic is under way it is too late to control it."

Besides, the economics of beetle control can be staggering.

The U.S. Forest Service and Colorado Forest Service have been working on spraying insecticides. "Spraying has been very successful if done in time," Kovacic says. But over large areas such as national and state forests, "it is impossible and the cost is prohibitive." Trees have to be sprayed on the bark thus eliminating any large-scale aerial spraying.

A Canadian Forestry Service brochure points out two other limitations of spraying. "These insecticides must be handled with great care . . . because of the threat to other forms of life, and this method of combatting bark beetles does not yield any salvage."

In the later stages of beetle epidemics, natural predators, including insects and woodpeckers, may prove useful, Kovacic says.

[Reprint from the Idaho Falls (Idaho) Post-Register, Sept. 28, 1978]

FORESTERS MUST BALANCE AESTHETICS, TIMBER VALUE, BEETLE HARM

(By Dana Howard, Post-Register staff writer)

ISLAND PARK.—Chris Liggett is a timber forester and he is "cruising" the forest. Trudging through the six inch deep September snow, he's swiftly deciding which lodge pole pine goes and which one stays. And in Island Park, where the pine bark beetle has crumbled almost all of the healthy, mature lodge pole pines, not many of them stay.

In the race to clear out the diseased trees to make way for new growth and to sell to an increasingly hungry timber market, the Island Park area's become a "pretty hustle-bustle place," for loggers and foresters, says Liggett.

Driving through Island Park, anyone can see the innocent rust-colored banks of dead pines that remind the summer tourist of a New England autumn, only in mid-summer. The trees won't look so pretty when the needles fall off.

HIDDEN

Taking a small knife out of his back pocket, Liggett starts peeling away the bark of one sample tree that he says has been "hit." Scraping away, the blade finally reveals the end of the hair-thin track made under the bark, where the tiny black beetle is calmly chewing away at the tree's vital "phloem" or inner bark.

But from 100 feet away, a forester can tell whether a pine has been hit. Soon after the pine bark beetle enters the bark of a tree, the trunk becomes dotted with fresh little sap spitballs that shows the tree is trying to reject the insect that will almost inevitably destroy it.

Targhee Forest officials say that the beetle has hit nearly all of the mature lodgepole in the Targhee (of which Island Park is a part) and that in two years, 90 percent of it will be gone. Because the beetle is moving into the Ashton and Yellowstone areas, they are likely to experience the same pattern.

Bob Riley, timber forester for the Targhee, estimates that since the early 60's when the beetle first hit, between 800 million and 1 billion board feet of lodgepole has been killed. The dollar value of so much wood is difficult to estimate, says Riley, because the price of the wood has risen over the years and now fluctuates anywhere from \$1 to \$40 per thousand board feet.

NUTTY?

There's this guy who used to give tours of the pine bark beetle trees. He used to like to eat the pine bark beetles. "Said they tasted like nuts," recalled Liggett.

That's about the only use anyone's ever found for the beetle—the tiny insect that has changed the whole complexion of logging in the Targhee Forest. But

the way Liggett puts it, "They're literally eating themselves out of house and home," so they will eventually run out of food and the cycle of devastation will end. But for now, the Targhee's timber management plan aims to remove as much dead and diseased timber as quickly as possible, while it's still fit for the marketplace.

QUESTIONS

But the rapid and thorough removal of so many lodge pole pines, raises some questions among wildlife biologists, hydrologists, soil scientists, landscape architects, fisheries biologists and a host of other specialists the forester must reckon with before he decides which trees are cut.

In spite of what the specialists say, however, "targets for timber harvests in the millions of board feet are designated each year by high level forest management. The foresters know what their "targets" are, their job is to decide the best way for the timber to be taken out and the places where some compromises can be made.

"Probably the biggest controversy we have now is the visual problem—the aesthetics of the forest," says Liggett. "Foresters used to make all of the decisions, but now they have to consult with all of the specialists."

TRAINING

The issue of aesthetics in the woods is such an important one that this week Targhee foresters will attend a day-long session at Targhee headquarters in St. Anthony with its resident landscape architect for a "visual awareness" training session.

What kind of decisions do foresters in Island Park face?

Slash piles have become an important issue in this "gateway to Yellowstone." From the road, piles of leftover branches and scraps from a clearcut or a thinning don't look as picturesque as an open field would, but when they are immediately destroyed, an important tree regeneration step is ignored. Lodgepole pine cones open up to become fertile seeds when they are exposed to heat from a fire or the summer sun. Good silviculture practices would leave the slash piles on the ground through at least two weeks of mid-summer sun to give the cones a chance to open.

AESTHETICS

"You get beautiful, natural regeneration from that," sighs Liggett, but he agrees that "a real forester is able to make compromises." In Forest Service jargon, the forester who can't bend a little for aesthetics is labelled the "timber beast."

This year, slash piles along the highway leading into Island Park were cleared out and the snowy bottom of the forest floor is now clear. The "architects" got their way in the end.

"Dwarf mistletoe," says Liggett, snapping off a tiny branch of a small lodge pole, "This forest is full of it." The yellowish moss, hardly resembling the Christmas-kissing variety, drains the tree's sap, so it grows slowly.

Though many foresters think those sick trees should go to make way for the new, the Forest Service will often heed its wildlife biologists who argue that wildlife need more cover areas in the shrinking Island Park Forest—so the trees are left.

WILDLIFE

Wildlife biologists also contend that in the giant effort to clear the dead trees from Island Park—as well as other areas in the United States with insect problems—that not enough attention is given to the wildlife who depend on dead trees and their insects for shelter and food.

Liggett says he disagrees: "You aren't going to be able to get rid of any food for woodpeckers." Because logging at this point isn't able to keep up with the destruction of the trees, many feel that there are still plenty of dead trees around for the birds.

"Some people say, 'why not leave the forest for firewood?' but they're picky and they don't get it all out—so that's why we have commercial harvests," explained Liggett. "We're trying to blend the two—we're trying to let firewood people in to sale areas after loggers have removed everything, but before we've pulled the slash. They can destroy a couple of days work."

"SNIPPER"

In a snowy clearing in Island Park, a nimble yellow machine that looks like a bull dozer with a giant-sized pair of snippers on it is swiftly "snipping" 200-foot trees off at their bases, bolstering them before they topple, and carrying them upright to a neat pile of logs before it lets go.

Because the logger is placing the trees exactly where he wants them, they are not crashing into the smaller ten-year growths, as they would in a normal logging operation. Normally, the felled trees would litter the crushed forest floor before they were hooked up to dozers with chains and dragged into piles, effectively sweeping away any small trees that hold the earth and water together and are the beginnings of a new, healthy forest.

Don Eck of Eck Brothers, one of the Targhee's biggest logging contractors, devised the "snipper" for use in the Island Park forests.

FLAT

Unfortunately, the technique can't be used in all forests. But in Island Park, the ground is flat and the spindly lodgepoles are uniform. "Making it easily adaptable to technology."

Eck's snipper has been adapted from areas like the lake states in the Midwest and in the South, where the land is also flat.

Eck's also invested in the "Hahn Harvester," a \$140,000 machine that automatically delimbs each log from the snipper's pile, placing it in a long, narrow platform fitted with a pair of curved shears that clamp on the log and run up and down its rough, limbed surface until it's smooth. When the log has been delimbed, a saw appears around the middle of the platform and, "bucks," or cuts the tree in two. The two halves are then neatly flipped into an adjacent pile. The limbs have been tossed into another.

DANGER

"Working the woods is dangerous—this eliminates the danger," says Eck, watching the bright green machine.

"We actually train women to run this machine—had a woman running it this morning," said Eck, incredulous.

In an average operation, loggers must cut the limbs off and the trees in half by chainsaw and handle the heavy chore of hooking them onto chains to drag them into piles.

And because the Hahn Harvester technique doesn't end up dragging a lot of dirt and snow into the slash piles, they're clean and solid and easy to burn.

"That's 100 percent cellulose," admires Liggett.

CRUISING

But before the Hahn Harvester and the snipper get into the forest, Liggett and his fellow foresters have cruised the forest to decide whether the timber it holds is marketable.

What are the buyers looking for?

A potential saw timber stand needs logs at least seven inches in diameter, anything less won't do for the making of two by fours in the stud mill. The foresters will also look for stand of large diameter trees, which tend to grow in clusters, to make "sale packages."

"The first thing we look for is regeneration. If it's just mature and there's no little stuff, then it's a clearcut—but if there are signs of regeneration, trees less than 10 feet, then we'll cut around the new trees."

According to Liggett, watershed problems and erosion connected with clear-cutting aren't too big a concern in Island Park because the land is flat and the soils are very permeable, which means that water will drain well from it.

If they do run across an area subject to mass soil movement or slumping, "we're sensitive to it," and the loggers stay out says Liggett.

Foresters will also try to leave strips of forest when they have logged an area for wildlife cover and for "seed walls" to promote regeneration, even though many of the trees they are leaving are dead.

VISUAL

The "leave strips," are also left for "visual cushions," says Liggett: "We try to break up an area. We're so flat here—it doesn't take much to make it look like Nebraska."

One big market the dead lodge poles have found in the past few years is the log home business. These buyers go with the "Dead Only" contracts and are looking for wood that has been hit by the beetle, but has not yet lost its needles—the sign that the tree has also lost its fiber.

"They have a whole different mind set. They can take a lot of the stuff that was previously unmarketable," says Liggett, explaining the log homebuilders are looking for dead trees because they are dried out and have shrunk as far as they will go, so they know just how big the "chinks" will be.

VOLUME

For each section of forest that is cruised and judged for its timber, an estimate is made of its volume by statistical sampling methods, which are then fed into a computer.

Once the forester has the acreage and volume, an appraisal is written up that describes the timber's volume, the reason for the cut, and the physical and biological condition of the stand.

Liggett estimates that Island Park's accelerated program for salvaging lodgepole sells about 12 to 15 million board feet each year. And that's aside from the larger sales of healthy trees. Each year, the forest holds from 60 to 70 open sales of timber.

Because the demand for timber has shot up in recent years, the lodgepole pine has become more attractive. The competition is so high for the long-necked trees at present, that a sealed bid for a sale often runs over 20 times the estimated value of the cut.

"We can't keep up with the beetle," admits Liggett. But if he and the several other foresters in Island Park can meet their "targets" for clearing out the rusting, dying lodge pole pines, he says, "this place is going to start looking good in the next few years."

UNIVERSITY OF MONTANA,
SCHOOL OF FORESTRY,
Missoula, Mont., December 10, 1979.

Mr. JAMES GILTMEIER,
Russell Senate Office Building,
Washington, D.C.

DEAR SIR: We chatted briefly in the hall last week at the hearing on Senator Melcher's bill: the utilization of forest products. The final reports which I am preparing for the U.S. Forest Service are long and technical. They will be abstracted at a later time for use by field managers. I will send the rough drafts as soon as they are typed.

I wish to explain a few key points which have bearing on the bill:

1. We have many thousands of measurements of the nutrient content of 9 commercially important forest species from western Montana which are generally useful in the northern Rocky Mountains. There are several other studies of the nutrient content of other forest ecosystems in the United States, but none that I am aware of which evaluate nutrient losses from different intensities of harvest.

2. Clearcutting where wood is removed down to a 5-inch top removes about as much of each biologically important nutrient as will be returned in a 70-year rotation. The nutrients present in wood and bark of the logs removed represents between 1 and 10 percent of the total ecosystem available nutrients (those in living material above and below ground and recyclable from decay, plus those expected to be returned in 70 years of precipitation, plus those readily accessible in the soil as available nutrients in the root zone).

3. Although 1 percent of the available ecosystem nutrients are removed with conventional harvest of logs in clearcutting (heaviest possible treatment) and 1 percent will be returned in 70-100 years, most soils lost about 1 percent of the available biologically essential nutrients below the root zone in 70 years. This means that precipitation will not really replace the nutrients lost in con-

ventional harvest because an equal amount are leached beyond the reach of the roots.

4. Harvest will not damage the productive capabilities of a site as long as there are 3-4 times as much of each nutrient left in available form in the root zone as is needed to replace the material removed. The slash which is left will decay in ± 70 years (up to 3 inches in diameter) and will provide nutrients to grow that portion of the forest in the next rotation. Those nutrients added from precipitation will in effect leach beyond the reach of the roots. After logging and burning, nutrient loss below the root zone is accelerated for 1-5 years before it returns to the control (unburned, unlogged) levels. If the soil has enough available nutrient (established 20 percent of the total complement of available nutrients) to replace those nutrients which were removed in harvest 3-4 times over, then no serious harm can be expected (no serious reduction in the productive capability of the site as a result of harvest).

5. Our results on relatively productive soils show that the removal of wood down to 5 inches in diameter leaves ample available nutrient at the time of harvest to support the wood needed for the next 3 to 4 rotations. In productive soils, wood may be removed to 3 inches in diameter. In highly productive areas, some branchwood can be removed with no apparent harm to the ecosystem, in terms of nutrients other than nitrogen. Because of the nutrient rich nature of foliage, small branches, litter, duff, and shrubs and herbs, it is not recommended that these materials be removed for fuels. Studies of poor soils have not been conducted. Very little added information is needed to evaluate nutrient losses from harvest on poor soils. The data now available require only some added soil information to allow us to calculate rough nutrient budgets. Until more is known about poor productive sites, it is not recommended that steep, shallow, or very young soils should be harvested at more than the level of conventional utilization.

6. A safe rule for harvest level is that there should be enough nutrient readily available or recyclable within the ecosystem at the time of harvest to grow the next 3 to 4 rotations (ie: replace what was removed in harvest). We cannot afford to subsidize each successive rotation with nutrients released from weathering during that rotation. If freshly released (weathered) nutrients are needed to grow the wood and bark (or other portions) of a forest, and these are removed in harvest, then the site will never become more productive, the soil will not mature, and site productivity will deteriorate. So far, data suggest that wood and most branches can be removed with no harm on productive sites.

7. The one concern is the possible loss of nitrogen fixing organisms as a result of removing cull wood not suited for mill use. The loss of these nitrogen fixers can reduce forest productivity. Our data deal with only those nutrients derived from rock, not those which are biologically fixed. Our results do not apply to nitrogen, and Dr. A. Harvey (U.S. Forest Service) should be contacted in regard to the influence of removing cull wood on nitrogen availability. If nitrogen poses no problem, the other nutrients should not cause a problem with reasonable levels of heavy utilization. I will be glad to answer questions.

Sincerely,

NELLIE M. STARK, Ph. D.,
Professor.

NATIONAL FOREST PRODUCTS ASSOCIATION,
Washington, D.C., December 14, 1979.

HON. JOHN MELCHER,
U.S. Senate,
Washington, D.C.

DEAR MR. MELCHER: This letter expresses the views of the National Forest Products Association on S. 1996, which you introduced on November 9, 1979. Briefly, the forest industry strongly supports the concept of taking reasonable economic and environmentally sound measures to increase the utilization of wood residues. Enclosed is a paper describing in general terms, NFPA's position on improved utilization and increased use of forest biomass for energy.

The industry does have some reservations, however, about provisions in S. 1996 that authorize the Forest Service to require timber purchasers to remove material from sale areas to collecting yards. The intent of the bill needs clarification. Under one interpretation, the bill provides authority the Forest Service already has. Under another interpretation, it could reduce sale receipts and thus lead to

increase the area of national forest land identified as unsuitable for timber production under section 6(k) of the National Forest Management Act.

FOREST INDUSTRY CONCERNS OVER ISSUES RAISED BY S. 1996

It is useful to differentiate between mandatory removal of unmerchantable material from the sale area as authorized by S. 1996 and requirements commonly placed in the Forest Service timber sale contract to treat unmerchantable material on the sale area by piling it or yarding it from harvest areas to the nearest log landing. The forest industry can support the concept of mandatory yarding of unmerchantable material when some land management objective is being achieved which cannot be achieved at a lower cost using other methods. An example would be the yarding of unmerchantable material in order to accomplish site preparation or fire hazard reduction objectives, where other methods of site preparation and hazard reduction would be more costly than yarding this material.

An entirely separate issue is raised by the mandatory removal of unmerchantable material from sale areas. Although this practice is promoted by some as a convenient and a low cost method of solving the utilization problem, this method can have very high costs both to taxpayers and to consumers. Stumpage is a residual value, derived after costs of harvesting, removing, and processing timber products are deducted from end-product values. Mandating the removal of material which will not pay its way out of the woods has the effect of lowering land values and net receipts to both counties and the federal treasury. It could also affect the area of land identified as unsuitable for timber production under section 6(k) of the National Forest Management Act of 1976. This provision requires the Secretary to identify lands "which are not suited for timber production considering physical, economic, and other pertinent factors * * *." If the volume of unmerchantable material is large, such as occurs in much of the West, required removal will be extremely expensive on a per-acre basis, and could lead to situations where harvest of large areas of forest land would be economically marginal, although timber production on a long-term basis might otherwise be determined as desirable. This could cause a reduction in the total wood supply and an increase in the price of wood to consumers.

Another problem relates to the transitory nature of the market for low value material. Timber and plywood prices fluctuate widely in concert with housing market cycles. When housing demand is great and lumber and plywood prices high, there are markets for much low value material which would normally be left in the woods. However, during average or low timber markets the market for low value material may disappear altogether. In the past, severe problems have been created in situations where sales were prepared, appraised and sold during a high cycle in the lumber market and required removal of low value material which had a market at the time. Shortly thereafter, all markets for this material disappeared and purchasers were left with sale contracts requiring that substantial volumes of material be removed from sale areas for which purchasers could not find a buyer at any price. Provision needs to be made to waive mandatory removal requirements for material for which no markets exist at the time the sale is logged.

There is another issue which is often not well understood in the concern to find solutions to our energy problems. There is a tendency to quote the energy value of logging residues in the woods without considering the significant costs and energy requirements of gathering, processing, and burning these residues. Slash must be yarded to a landing, loaded on trucks, hauled to the generating plant, then further handled, stored, chipped (and perhaps dried) before burning. Each of these steps involves costly handling of a bulky commodity using expensive labor and equipment and also involving significant expenditures on non-renewable fossil fuels. We are concerned that mandatory removal could create a situation in which more energy will be expended gathering and processing these residues than will be produced from it.

NFPA position on S. 1996

Section 1(a) of S. 1996 would authorize the Forest Service to require timber purchasers to remove wood residues from sale areas "to points of prospective use." A significant constraint on this authority is imposed language stating that: "except in cases of wood residue removal for fire prevention, site preparation for

regeneration, wildlife habitat improvement, or other land management purposes, the Secretary may not make such requirements in instances where it would be more expensive to remove wood residue than the value such residue wood provides as fuel or other merchantable wood products." This language creates considerable uncertainty as to the intent of S. 1996. Although it may be necessary to yard unmerchantable material from harvest units to the nearest log landing to achieve the listed land management objectives, it will seldom be necessary to actually remove such material from the sale area itself to achieve these objectives. Therefore, it can be anticipated that little material will be removed from the sale area unless it can meet the requirement that the value of the material must exceed the cost of its removal. If that is the case, the Forest Service already has adequate authority to require purchasers to remove material having a positive net economic value.

Irrespective of the previously referenced language, if it is the intent of the bill to authorize the Forest Service to require unmerchantable material to be removed from timber sale areas, the forest industry would have several serious concerns. The forest industry, as a matter of principle, strongly opposes the mandatory removal of unmerchantable material unless overriding public objectives are shown to be served. One concern relates to burdens which might be imposed on timber purchasers to haul substantial volumes of unmerchantable material great distances. Timber purchasers are in business to harvest and process timber, not to haul logging slash to collecting yards or power plants. Even if appraisal allowances are adequate (and based on past experience they will likely not be), a tremendous burden could be imposed on timber purchasers by mandatory trucking of wood residue.

The Forest Service has a long standing policy against not requiring timber purchasers to carry out activities which are not more or less directly related to management of the sale area or to the access routes to the sale. It is also current Forest Service policy, with respect to utilization of timber sale material, not to require utilization to such close standards that the total value of the sale is reduced. This policy is sound. As explained previously, to do otherwise could unnecessarily reduce land values, directly reduce county receipts, and tend to make large areas of land economically submarginal.

If the Forest Service wishes to utilize sale residues to an extent not justified by their value as wood products, they should do so using appropriated monies—not timber values. If the agency wants timber purchasers to haul this material outside the sale area, such arrangements should be by mutual agreement.

In the current timber supply crisis, many timber purchasers are not free to pick and choose between timber sale offerings. In order to stay in business, they must often bid on every timber sale the Forest Service offers. This monopoly power on the part of the Forest Service can easily be abused through the imposition of irrational and economically unsound requirements in the timber sale contract. Thus, use of the authority for mandatory removal could prove irresistible on the part of the Forest Service to force removal of large volumes of unmerchantable material at the expense of timber buyers and, ultimately, consumers and taxpayers.

Another issue which is critical to timber purchasers is the impact that the additional obligations imposed by the bill might have on their own often limited fuel supplies. During the gasoline and diesel shortage earlier this year, many purchasers were operating on less than a week's supply of fuel. If the fuel shortage returns, the additional fuel requirements imposed by yarding and hauling unmerchantable material could place purchasers in a very difficult position. There should be provision to waive the obligation to remove material not meeting utilization standards in the event that fuel shortages become critical.

In summary, the objective of S. 1996 is laudable but its intent is unclear. If its intent is to authorize removal of material from sale areas which has a positive net economic value, the bill is unnecessary. On the other hand, if its intent is to require removal of unmerchantable material, then the forest industry must oppose the bill. At a minimum there must be strong direction as to when such removal is justified. Unless there are well-rationalized standards established for such removal, it could create an open-ended subsidy of wood removal financed through timber values at the expense of federal receipts and without appropriate Congressional budget oversight.

A preferable approach, rather than a blanket change in Forest Service timber sale authority, would be to establish a modest program to pilot test the technical,

economic, and operational feasibility of using national forest wood residues for energy. The forest industry could strongly support such an approach.

We would be more than happy to work with you and your staff on this important issue.

Sincerely,

JOSEPH B. McGRATH.

Attachment.

FOREST INDUSTRY POSITION ON IMPROVED UTILIZATION

The forest industry agrees that the nation must actively seek new ways to utilize wood residues and other by-products of timber harvesting and manufacturing. There are indeed some unrealized opportunities for utilizing logging residues as an energy resource. As the price of oil continues to rise, so will the economic potential for improving utilization of logging slash for energy.

During the last few years, great advances have been made in timber utilization. Less than ten years ago, waste burning of sawdust, slabs and edgings at the mill site was a common practice. Timber of low grade and undesirable species was routinely left standing or down in the woods, creating both silvicultural and aesthetic problems. This situation has changed considerably.

Slabs and dredgings are now chipped and made into paper. Sawdust is used as an energy source. Bark is now routinely burned for energy or bagged and sold to the public as a soil amendment. Many wood processing mills generate a significant amount of their energy needs through utilizing waste wood. The industry-wide average is 45 percent. Timber of otherwise undesirable species and low quality is, in many cases, now removed from the woods and chipped to make paper or particle board. Once harvesting equipment is in the area, the extra cost of removing residue is relatively low. The increasing value of formerly unutilized logging residues as an energy resource may permit forest owners to carry out formerly uneconomic management activities, such as commercial thinning aimed at increased growth (and energy biomass production as well).

Economics is the key

Economics has been the primary factor responsible for achieving such advances in utilization. Domestic and foreign markets have developed significant outlets for great quantities of formerly wasted residues. Economics also provides the key for future increases in utilization. Where economic markets exist and continuous supplies are assured, both sawlog and non-sawlog material will be removed from harvest areas. If economic values are not sufficient to pay for removal of this material, it should be left in the woods—unless overriding public objectives are served. Removal of this material is not free. The total of any costs for raw material and its extraction and processing must be less than the anticipated gross returns to justify its removal.

S. 1996 focuses on only one aspect of the national forest wood utilization problem

It must be recognized that providing authority to increase utilization on individual national forest sale areas does not come to grips with the many other factors directly affecting the ability of the national forests to provide wood for forest products and energy. In spite of the well recognized need for the national forests to increase the harvest of forest products, current land management policies are not meeting this challenge. In the last few years, significant constraints have been imposed both on the area of commercial forest land available for production of wood products, and on the kinds of activities which are permitted on lands available for timber production. Any policy which restricts or prohibits use of land for timber production will restrict or prohibit biomass energy production.

Federal policies have fostered an uncontrolled erosion of the national land base available for timber and biomass energy production

During the land management planning process, timber growing lands on each national forest are classified as standard, special, marginal, and unregulated. The standard classification provides for growing timber to the capacity of the land under current management techniques. Under the special, unregulated, and marginal classifications, planned yields per acre are reduced well below the capacity of the land to produce on the premise that such reductions are necessary to enhance other uses, such as visual appearance, recreation, and wildlife habitat. Yet there are no uniform criteria to guide these decisions. Land on one national

forest may be classified as marginal and precluded from timber production; whereas on an adjacent national forest, land similar in forest type, soil, and other characteristics is classified as standard. These criteria may vary between districts in the same national forest.

Since fiscal year 1975, the areas of standard (full yield) timberland on western national forests have been reduced by almost 16 million acres, or 35 percent. There has been an estimated reduction in total harvest potential of about 18 percent during the past four years. This is equal to a loss of the potential production from 10 million acres of timberlands. This land base attrition is still continuing without benefit of control from the planning process established under the 1974 Resources Planning Act.

If these trends are applied to all western national forests, the resulting productive area of timberlands will be only 45.3 million acres in 1985, compared to 61.4 million acres shown in official Forest Service documents as the 1977 starting base.

The Administration is recommending the withdrawal of an additional 15 million national forest acres for wilderness use. In addition, this situation does not reflect the impact that the new planning regulations under Section 6 of the 1976 National Forest Management Act may have on land allocation for timber production.

Uncertainty discourages technical innovation

Timber supply uncertainty is one of the major current problems facing the forest industry, particularly in the West. At the root of this crisis is the question of how much of the vast federal forest holdings of the West will be managed productively for timber and multiple-use; and how much will be allocated to wilderness and other restricted use categories. If there was greater assurance of a continuous supply of raw material from the national forests, improved utilization on those lands would rapidly occur. This is shown by the generally much closer utilization and biomass energy use which occurs on forest industry lands as compared with the national forests. There is very little incentive for purchasers of federal timber to invest in the complex and expensive equipment which would provide a significant increase in utilization and biomass energy use if there is no assurance that they will have an adequate timber supply available (or will even be in business) in five years.

Forest Service policies restrict timber harvest levels and potential biomass production

Current Forest Service non-declining yield harvest policy mandates the retention of vast stands of over-mature timber for, in some cases, another century or more. Within these stands a tremendous amount of mortality, deterioration, and waste will occur. In addition, these stands are occupying, in many cases, highly productive growing sites which would be better utilized if they were promptly converted from decadent, slow-growing stands to young and thrifty stands. Moreover, and most important in the context of the energy issue, the utilization of these old-growth stands will make available substantial amounts of biomass that, while non-merchantable for roundwood uses, could be utilized as an important source of energy.

The President's June 11 order directing the Forest Service to evaluate departures from non-declining yield is long overdue. We are confident that when the Forest Service does evaluate such departures, it will find that significant increases in current harvest levels can be achieved without sacrificing environmental values or jeopardizing our future timber supplies.

POTLATCH CORP.,

San Francisco, Calif., December 12, 1979.

OFFICE OF THE SECRETARY,
Federal Energy Regulatory Commission,
North Capitol Street NE.,
Washington, D.C.

SIR: This letter is submitted in reply to the request for further comment on the qualifying status for small power production and cogeneration facilities in Docket RM 79-54 issued on October 19, 1979.

Potlatch Corporation is a medium sized forest products firm with 1978 sales of \$787,000,000. The Corporation owns approximately 1,300,000 acres of timberland in the United States and produces a variety of natural fiber products, including lumber, plywood, particleboard, bleached pulp, paper, and paperboard, milk cartons and folding cartons.

Potlatch Corporation currently cogenerates electricity and steam in its pulp and paper operations using a topping cycle. The opportunity to generate additional electricity through cogeneration and small power production is anticipated to become available to the Corporation and decisions regarding the required investments are likely to be influenced by these regulations.

Potlatch Corporation responded to the first request for comments on Docket RM 79-54 emphasizing a variety of concerns regarding the initial proposed rules. We believe that those comments in general are still valid and a copy of that filing is appended hereto for your reference. The additional comments here submitted address the preliminary environmental assessment for RM 79-54 and RM 79-55 dated October, 1979.

The definition of biomass in the preliminary environmental assessment is unusual and narrow. We understand that the proposed definition of biomass, as applied to wood, excludes byproducts of the manufacturing processes, (such as bark), byproducts of logging operations (such as slash), and byproducts of forest management operations (such as thinnings); it includes only wood grown and consumed solely for energy purposes. Well recognized concepts of biomass include all plant material, including byproducts of manufacturing, harvesting, and growing. Such a broad definition can be applied to a broad spectrum of agricultural byproducts, including wood, bagasse, rice hulls, nut shells, etc. All of these biomass materials, in the form of byproducts of other operations, are currently used in the United States for energy purposes. Growth of biomass purely for energy production now is not broadly practiced in the United States and is not likely to be economically significant relative to use of biomass byproducts, such as bark, slash, thinnings, etc., for energy for several years.

Applying a very narrow definition of biomass will hinder development of small power production facilities between 30 megawatts and 80 megawatts in capacity. Section 210(e) Exemptions of the Public Utility Regulatory Policy Act provides for exemptions from the Federal Power Act, the Public Utility Holding Company Act, and other federal and state laws for qualifying cogeneration and small power production facilities. These exemptions are limited to small power production facilities not to exceed 30 megawatts in size, except for units that use biomass as the primary energy source. With the proposed narrow definition of biomass, very few facilities would be able to take advantage of this exemption. With a broad definition of biomass, including byproducts of manufacturing harvesting and growing agricultural products, including wood, use of this exemption, as intended by the Congress, by a large number of small power production facilities will be possible.

Use of the 80 megawatt upper limit rather than the 30 megawatt upper limit will reduce the capital costs of wood power plants on a per kilowatt basis. A preliminary comparison of five wood fired power plants ranging in size from 5 megawatts to 80 megawatts showed the following continuing decrease in capital cost per unit:

	BPA ¹	BPA	BPA	WWP ²	Potlatch
Size (kilowatts).....	5,000	10,000	25,000	40,000	³ 80,000
Cost (dollars in millions).....	13.3	19.9	33.8	47	89
Cost per kilowatts (dollars).....	2,660	1,990	1,352	1,175	1,112

¹ Bonneville Power Administration.

² Washington Water Power.

³ The 80-megawatt size is approximately the maximum size for a single wood-fired boiler because of a technological limitation relating to firing wood on grates.

The information on which this table is based was shared with Mr. Patrick J. Martin of SRI International, an environmental consultant to the Commission. A copy of the letter and attachments sent to Mr. Martin is attached for your review.

Biomass fired small power production facilities qualifying for exemptions from federal and state laws should be allowed to fire up to twenty-five percent fossil fuel on an annualized basis. Biomass fired facilities, using wood as a typical example, need auxiliary fuel to assure continuous operation. Wood handling facilities (conveyors, size reduction equipment, fuel feeders, etc.) consistently break down or stop operation under attempted continuous use. To assure continued operation in a wood fired steam electric plant a source of fossil fuel, usually oil or gas, is used to assure continuous steam generation. Secondly, some wood sources have a high moisture content, either from direct contact with water or from their natural green state, such that a small amount of oil or gas must be fired continuously to assure combustion. Economics dictate that the use of fossil fuels in either manner with wood or other biomass be minimized because of the high cost of fossil fuel relative to wood. The twenty five percent limit on oil and gas was identified in the consideration of the National Energy Act and can be found in the language of the Powerplant and Industrial Fuel Use Act.

The environmental impact of the Commission's cogeneration and small power production regulations, as applied to wood biomass in its broadest definition, is insignificant and most likely positive. Likely involvement of the Commission's regulations with cogeneration and wood biomass will occur at forest products operating sites already processing large quantities of wood. What encouragement the regulations will offer to the use of cogeneration at such sites may increase burning of waste wood to generate steam and electricity with environmental benefits of reduction of solid waste disposal requirements and reduction of antiquated methods of burning waste wood, such as in teepee burners. Small power production facilities, firing wood and utilizing full condensing techniques, which are located at existing forest products operating sites should be similar in impact to the cogeneration case discussed above. Small power production facilities firing wood at sites isolated from manufacturing locations will most likely be using waste wood from manufacturing and slash from logging operations for fuel. Some thinnings from silvicultural activities may be used. The environmental impact of these activities will be to reduce solid waste disposal from manufacturing plants and to reduce the possibility of forest fires by slash removal from logging areas. Use of wood grown wholly for energy purposes in small power production facilities does not appear economic at this time. The Commission's regulations, when implemented, do not appear likely to change the economic viability of wood grown wholly for energy as a fuel for small power production capability, particularly in any relative comparison to the use of waste wood byproducts from manufacturing, logging, and silvicultural activities.

In summary, we urge that the Commission use a broad definition of biomass, including waste wood from manufacturing, logging, and silvicultural activity. We also urge that the Commission conclude that the environmental impact of the Commission's cogeneration and small power production regulations as related to use of wood as a biomass energy source is insignificant and that no further consideration by the Commission of the environmental impact relating to the use of wood as biomass is necessary.

If you wish additional information about these comments, we will be pleased to discuss them with you.

Sincerely yours,

WILLIAM J. NICHOLSON,
Corporate Energy Coordinator.

Attachments.

POTLATCH CORP.,
San Francisco, Calif., December 5, 1979.

Mr. PATRICK J. MARTIN,
Manager, Industrial Systems, Fuels and Power Management, Energy Center,
SRI International, 333 Ravenwood Avenue, Menlo Park, Calif.

DEAR PAT: Enclosed are selected pages from a Bonneville Power Administration report on a forest residue power plant that provides capital cost information for 5MW, 10MW and 25 MW units. Neil Kierulff at BPA will send you a complete copy of the report plus any other capital cost data available. Their final report

on this subject is scheduled for publication early next year and a copy will be sent to you.

Separate from this BPA data, Washington Water Power has announced a 40MW unit for Kettle Falls, Washington to come on line in 1982 with a projected capital cost of \$47 million. The Potlatch wood fired boiler in Lewiston, Idaho under construction with start up planned in late 1980 is to cost \$62 million. A 30MW cogeneration turbine plus energy management system to come on line in 1981 is \$27 million.

If the Potlatch unit were to have a condensing turbine, the rating would be about 80MW. The reliability of the Potlatch unit (8,200 to 8,400 hours per year) is greater than the Washington Water Power unit (7,000 hours per year) and thus is more expensive on a capital cost per kilowatt basis. The Potlatch unit also includes a long pipe bridge for the high pressure steam line, not to be found in a typical condensing unit.

If we assume that a condensing turbine can be obtained for the \$27 MM cost of the cogeneration and energy management system, a preliminary comparison of capital cost per kilowatt over the five to eighty megawatt range is:

	BPA	BPA	BPA	WWP	Potlatch
Size (kilowatt).....	5,000	10,000	25,000	40,000	80,000
Cost (dollars in millions).....	13.3	19.9	33.8	47	89
Cost per kilowatt (dollars).....	2,660	1,990	1,352	1,175	1,112

From this preliminary comparison it appears that the capital cost per kilowatt falls throughout the entire range of five to eighty megawatts. The range described is about the maximum for wood fired units, as there currently is a limitation in the technology relating to firing wood on grates. The Potlatch unit uses the maximum grate size available and overfires dry wood in the unit to raise the design capacity of 550,000 lbs. steam per hour.

I hope that you find this information useful in your environmental work for the FERC.

Yours truly,

W. J. NICHOLSON,
Corporate Energy Coordinator.

Enclosure.

PROGRESS REPORT—FEASIBILITY OF A FOREST RESIDUE POWERPLANT—MARCH 1979

PREPARED BY: BONNEVILLE POWER ADMINISTRATION, BRANCH OF POWER RESOURCES
AND U.S. FOREST SERVICE, PACIFIC NORTHWEST REGION AND PACIFIC NORTHWEST
FOREST AND RANGE EXPERIMENT STATION

Year of commercial operation	Bus-bar energy cost (mills per kWh)	
	Initial year of operation	20-year levelized
1982	50	71
1988	69	98
1990	76	109

BPA is developing similar cost estimates for other near-term alternative and renewable resources for generating electrical energy in the Pacific Northwest during the 1980's. These results will be included in the final report. Cost analyses of large baseload coal-fired and nuclear powerplants that could be scheduled as resource additions in the 1990's are given in Appendix B.

Several institutional constraints have been identified which create both practical and economic difficulties. Some of them relate to laws and regulations affecting BPA and USFS operations, others to Federal and State utility regulation policies. These must be resolved if this type of project is to succeed.

III. CONCEPTUALIZED 25 MW PLANT

A. Plant Description.—This study conceptualizes a 25 MW plant to derive the capital, fixed annual, operating and maintenance, and total bus-bar energy costs of a typical biomass wood-burning generating plant. Commonly available "state of the art" commercial equipment has been considered for capital cost estimates. An annual capacity factor of 80 percent is assumed.

Inventory data for available forest residue in the Estacada and Clackamas Ranger Districts indicate that a 25 MW plant could easily be supplied with the material 8 inches and larger in diameter. A larger plant could be fueled if all residue 3 inches in diameter and larger were utilized, although the cost of collection would be approximately double that of material 8 inches and larger in diameter.

The typical 25 MW plant considered in this study, along with its auxiliary systems and a 60-day processed fuel supply, can be accommodated on a 15-acre plant site, together with a 20-acre log yard and fuel processing site. A plant of this size could be located within a 20- or 30-mile radius from Estacada. One factor in site selection is the desirability of being close to additional fuel sources on U.S. Bureau of Land Management, State, and private forest lands which may support a larger size plant.

Chip delivery by belt conveyors to outdoor storage piles and recovery from beneath the piles can be accomplished with conventional systems. Chips can be screened, with oversized material hogged prior to introduction into the boiler.

The wood-fired boiler, turbine generator, and auxiliary systems considered in this study are essentially of standard design. Turbines in a power generating plant are generally the condensing type, exhausting to 3 inches of mercury back pressure, with suitable extraction points for driving auxiliary mechanical equipment.

Capital cost estimates are based on the assumption that particulate matter in stack gas will be removed in a two-stage, multi-cyclone collector, followed by a low-energy wet scrubber. Cooling water from the turbine exhaust steam condenser could be circulated through a cooling tower or cooling ponds. Other methods of cooling and waste heat utilization will also be evaluated. Ash handling by wet collection from the boiler grate, multi-cyclones, and wet scrubber is assumed. After dewatering, the slurry will contain about 75 percent solids. The resultant wood ash or char may be a marketable by-product of the process. Cooling tower blowdown of about 1 percent prevents build-up of solids in the circulating water, and can normally be discharged with minimal treatment. SO₂ removal from stack gas should not be required.

The study will also examine the feasibility of a larger plant and smaller 5 MW or 10 MW plants located closer to the logging activity. Although operations of a small plant may be affected by adverse weather in remote locations, smaller generating plants have the advantage of not requiring as much land area. The fuel storage area for smaller plants can be reduced in proportion to fuel consumption, but only moderate reductions in other space requirements could apply. On balance economies of scale would probably favor the larger 25 MW plant. Also, any new transmission lines from scattered small plants in the National Forest could have undesirable environmental impacts. If a site is close to an electrical load, the transmission line costs would be reduced. In some situations, there could be savings if the plant took the place of an additional transmission line.

B. Capital Costs and Annual Operating and Maintenance Costs.—Although this study is primarily for a typical 25 MW wood-burning generating plant, information is also being developed on the capital, fixed annual, operating and maintenance, and total bus-bar energy costs for different plant sizes.

The estimated construction costs for three different sized plants range from \$33,768,000 for a 25 MW plant down to \$13,335,000 for a 5 MW plant. Capital costs for a larger sized plant will be determined. Construction cost estimates are contained in Appendix C.

The payroll for the operation of a 25 MW plant is estimated at \$1,040,000 per year assuming \$40,000 per man-year for wages, payroll taxes, insurance and other payroll related costs. The payroll cost for the smaller plants is not expected to be reduced by more than one or two man years. Annual maintenance and supply costs are estimated at 2 percent of the capital investment, or \$495,000 for the 25 MW plant and \$196,500 for the 5 MW plant.

CAPITAL COSTS OF 25 MEGAWATT WOOD-FIRED PLANT

Item	25 megawatt	10 megawatt	5 megawatt
Fuel handling: Truck dumps, screening; hogs, conveyors, stacker, reclaimers, rolling stock.....	\$2,969,400	\$1,719,900	\$1,131,900
Boiler: Furnace, grates, FD fan, ID fan, Aux. burner, BFW pumps, continuous chemical feed.....	6,060,000	3,510,000	2,310,000
Feed water treatment: Pumps, filters, de-mineralizer, de-aerator, cont. B.D. w/exchanger condensate polish.....	363,300	210,600	138,600
Ash handling: Collection hopper, crusher, eductors, de-watering, settling tank.....	686,800	397,800	261,800
Turbine/generator: Condensing turbine/generator extraction ports lube oil system, primary switchgear, unit substation, step-up transformer, Syn. panel.....	6,120,600	3,545,100	2,333,100
Heat rejection equipment: Condenser, cooling tower, circulating pumps, hot well pumps.....	929,200	538,200	354,200
Emission control: Mechanical collector, venture, scrubber, re-circulating pumps.....	262,800	163,800	107,800
Land and building: Scale house, maintenance, garage, boiler house, turbine room, C.T. foundation, roads, misc. foundations.....	¹ 2,787,600	¹ 1,614,600	¹ 1,062,600
Total cost—plant and equipment ("A"): Equipment, building foundations, installation; includes construction, administration, and markup.....	20,200,000	11,100,000	7,100,000
Engineering ("B"):			1,616,000
at 8 percent.....			1,170,000
at 10 percent.....			962,500
at 12.5 percent.....			39,000
Approximate hours.....	65,000	57,000	
Freight ("C"): at 5 percent on material (approximately 50 percent of item "A").....	505,000	293,500	193,500
Spare parts at 2 percent on material (approximately 50 percent of item "A").....	202,000	117,000	77,000
Contingency: 10 percent on "A, B, C, D".....	2,250,000	1,328,000	839,300
Subtotal.....	24,773,000	14,608,500	9,626,300
Escalation.....	3,134,000	1,815,000	1,195,000
Interim financing.....	5,861,000	3,449,000	2,314,000
Total (escalated to 1982).....	33,768,000	19,873,000	13,335,000

¹ If this project is built by the Federal Government and is located on USFS land, the cost of the land would be deducted.

POTLATCH CORP.,
PULP & PAPERBOARD GROUP,
San Francisco, Calif., August 30, 1979.

DOCKET NO. RM79-54.—NOTICE OF PROPOSED RULEMAKING ESTABLISHING REQUIREMENTS AND PROCEDURES FOR A DETERMINATION OF QUALIFYING STATUS FOR SMALL POWER PRODUCTION AND COGENERATION FACILITIES

SECRETARY,
Federal Energy Regulatory Commission, 825 North Capitol Street, N.E.,
Washington, D.C.

SIR: These comments are submitted in reply to the invitation to address the qualifying status for small power production and cogeneration facilities in Docket RM79-54 issued on June 27, 1979.

Potlatch Corporation is a medium sized forest products firm with 1978 sales of \$787,000,000. The Corporation owns approximately 1,300,000 acres of timberland in the United States and produces a variety of natural fiber products, including lumber, plywood, particleboard, bleached pulp and paper products, milk cartons and folding cartons.

Potlatch Corporation currently cogenerates electricity and steam in its pulp and paper operations using a topping cycle. The opportunity to generate additional electricity through cogeneration and perhaps small power production is anticipated to become available to the Corporation and decisions regarding the required investments are likely to be influenced by these regulations.

The subjects related to this docket addressed in these comments include the following:

1. Some basic principles in reviewing PURPA.
2. The broad impact of these regulations.
3. The breadth of the proposed definition of cogeneration.
4. An alternate definition of cogeneration.

5. A broad definition of electricity to include direct substitutes.
6. The definition of small power production facilities.
7. The definition of facility.
8. The procedures for application for certification.
9. Possible modifications of facilities.

BASIC PRINCIPLES IN REVIEWING PURPA

In the review of the Public Utility Regulatory Policy Act Potlatch Corporation participated with the American Paper Institute in developing a set of premises from which our comments on the proposed regulations in Docket RM79-54 have been developed. A copy of these premises, which are applicable to Potlatch but written from the view of the paper industry, is appended to these comments for your review and consideration.

BROAD IMPACT OF DOCKET RM79-54

There are at least four major areas of impact of the regulations proposed in Docket RM79-54:

1. Title II of PURPA is intended to encourage the generation of electric power by non-utility organizations. This additional electric power, whether sold or for own use, will benefit electricity customers throughout the country. To encourage the non-utility generators of electricity to maximize production, these nonutility generators of electricity need assurance of minimal regulation of the type that electrical utilities are accustomed. Docket RM79-54 in its attempt to define the category recognized as non-utility generators of electricity should apply as broad a definition as possible.

2. Section 206 (c) (3) of the Natural Gas Policy Act provides a permanent exemption from the incremental pricing of natural gas for qualifying cogeneration facilities. This exemption is vital for the development of cogeneration in industrial facilities in the Pacific Northwest, where natural gas is an important energy source. The natural gas in the Pacific Northwest is a mix of sixty percent Canadian gas at international energy prices plus forty percent domestic gas. The additional energy that an industrial plant, such as the Potlatch Corporation plant at Lewiston, Idaho, must purchase in order to produce electricity by cogeneration is natural gas. With the possibility that gas may be priced at up to the equivalent of distillate fuel oil, the generation of electricity through cogeneration using only 4500 BTU/Kwh, is not financially attractive. Thus, the avoidance of incremental pricing of natural gas where it will be the fuel for cogeneration of electricity is vital. This need is particularly true in the Pacific Northwest where electric power supplies will be inadequate in the 1980's.

3. Section 312 (c) of the Power Plant and Industrial Fuel use Act provides a permanent exemption from the requirements of the Act for cogeneration facilities. Again in the Pacific Northwest this issue is pertinent as natural gas is the usual fossil fuel. A specific example of the importance of the concept is the use of natural gas driven combined cycle plant to produce electricity and process steam. In such a plant natural gas is burned in a combustion turbine generating electricity, the hot exhaust gases are passed through a waste heat boiler to produce steam, the steam is passed through a back pressure steam turbine to produce additional electricity and exhaust steam for process heat.

4. Section 301(b) (5) (L) of the Energy Tax Act provides an additional ten percent tax credit for certain specially defined energy property, which may include cogeneration equipment.

DEFINITION OF COGENERATION PROPOSED IN DOCKET RM79-54

The definition of topping cycle cogeneration proposed in Docket RM79-54, which requires twenty percent of the fossile fuel input or fifteen percent biomass fuel input to appear as cogenerated electricity, will exclude all of the cogeneration at Potlatch Corporation. The proportion of input energy appearing as electricity in our installations, which we believe are typical in the forest products industry, range from a low of three to five percent to a high of ten to twelve for an installation under consideration. The key factors affecting the proportion of input energy to the boilers that appears as electricity are the

pressure levels of the steam headers and the proportion of the steam bypassed around the turbine generator. The calculations assume that the turbine generator is sized to the steam flow and that no steam is bypassed around the turbine generator. In real situations, there are many other uses of high pressure steam that would cause less than all of the steam to pass through the turbine generator.

The definitions of topping cycles, bottoming cycles, etc., used in Docket RM79-54 are very complicated and as presently proposed exclude large portions of existing and potential cogeneration capacity in the United States. We recommend that the definition of cogeneration be made very broad and very simple in order to include all practical cogeneration and not discourage small cogenerators with unnecessary complexity.

AN ALTERNATE DEFINITION OF COGENERATION

With the concerns identified above, we, through our participation with the American Paper Institute, have attempted to prepare a broader and simpler definition of cogeneration. The basis for the definition is based in Title II of PURPA and a review of the Conference Report on PURPA. From that review the following premises were developed:

1. Production of electricity through cogeneration should use less thermal energy than providing the thermal energy (or other useful form of energy) and the electric energy separately. The separate supply of electric energy is presumed to come from fossil fuel fired thermal power stations using full condensing techniques.

2. The only type of fuels about which there are concerns regarding the amount of additional thermal energy use for cogeneration purposes are fossil fuels—natural gas, oil, coal, and their derivatives.

3. The measure of the amount of fuel necessary to produce electric energy in a cogeneration facility is the additional amount necessary to produce the electric energy beyond the energy necessary to produce the steam or useful energy (heat).

4. The electricity to be produced by adding the electric energy producing capability to the steam, heat, or energy unit is greater than electricity needed to produce the electricity incrementally.

5. Any qualifying facility includes both the steam, heat, or energy production and the electric energy production. Typically in a conventional steam boiler and topping steam turbine generator the qualifying facility would include the fuel supply system at the site, the boiler, the turbine, and generator, any directly connected pollution control facilities, any functionally related subordinate equipment to convert the steam or useful energy to a useable form, and all necessary foundations and buildings to support such activities.

6. A significant portion of the steam, heat, or energy available from the cogeneration unit should be used in an industrial, commercial, heating or cooling application. The concept of an operator of a large thermal generating station applying condensing techniques taking a tiny side stream out to heat a tool shed so that cogeneration could be claimed should be prohibited. For reference, attached is a graph for proportion of an extraction condensing unit operating on condensing versus the required heat rate on the cogeneration portion to meet a 9,000 BTU/Kwh requirement on the unit as a total.

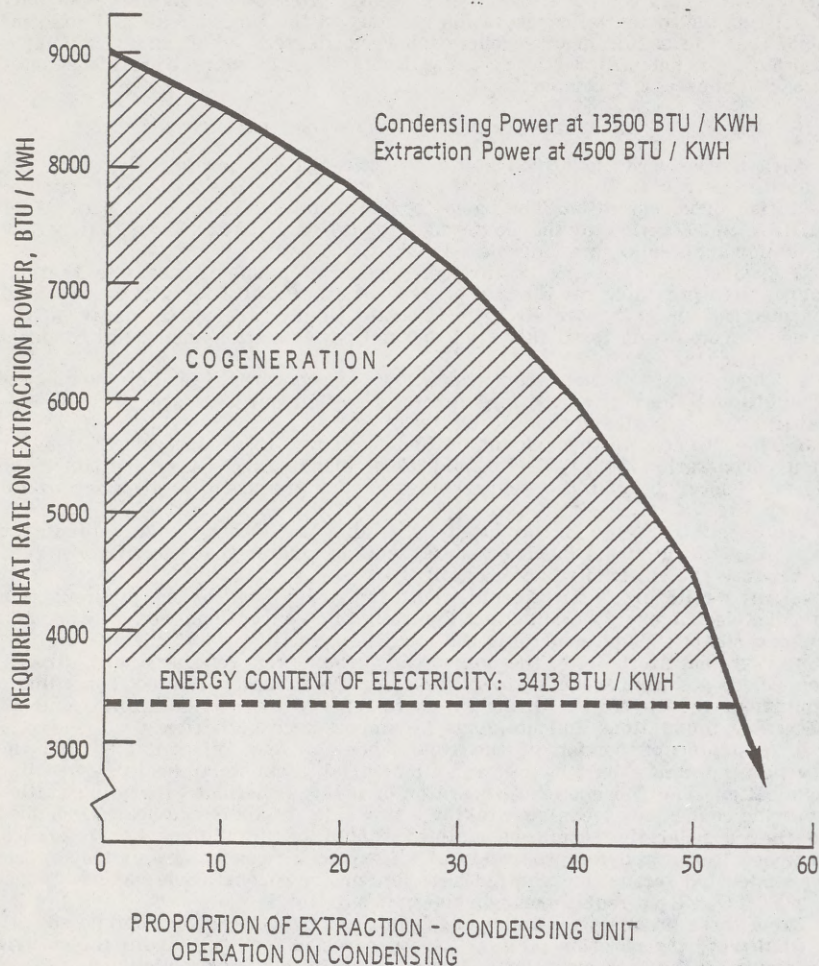
From these premises the following definition of cogeneration is proposed:

Qualifying cogeneration facility.—A cogeneration facility that for the electric energy produced incrementally to steam or useful energy production:

1. Uses less than 9,000 BTU of additional fossil fuel per kilowatt hour and
2. Produces more electric energy than it consumes

and that at least twenty-five percent of the steam, or useful energy, available is applied on an annual basis in industrial, commercial, heating or cooling uses. The qualifying cogeneration facility shall include, if applicable, the thermal generation system, the electric energy turbine and generation system, the on-site fuel supply system, any functionally related and subordinate equipment to convert the steam or useful energy to a useable form, any associated environmental control systems, and the buildings, foundations, or other necessary support systems.

RELATIONSHIP BETWEEN HEAT RATE ON EXTRACTION
PORTION OF AN EXTRACTION - CONDENSING UNIT
AND PROPORTION ON CONDENSING TO MEET 9000 BTU
PER KILOWATT HOUR ON UNIT



MECHANICAL SHAFT POWER

The definition of electricity used for cogeneration should include direct substitutes for electricity, such as mechanical shaft power. Referring to Figure 3, equipment directly driven by steam, shown with the code letter "M", are examples of mechanical shaft power. In the mode shown the mechanical shaft power is a direct substitute for electricity. The pumps and other equipment shown could be driven by electric motors. The electricity to run the motors could be generated with a back pressure turbine generator. By directly driving the equipment with steam, the inefficiencies of the generator and the motor are avoided. The exhaust from the steam driven equipment is used for process heat.

DEFINITION OF SMALL POWER PRODUCTION FACILITIES

The definition of small power production facilities should allow the case of up to twenty-five percent oil and/or gas on an annual basis as fuel. At Potlatch where we have burned waste wood and black liquor for many years we have found the advantages of gas or oil firing with wood or black liquor to include:

1. Start up and control of wood fired and black liquor fired (kraft recovery) boilers.
2. Assurance of continuity of combustion in wood fired units; in which the wood fuel often contains more than fifty percent moisture.
3. Continuity of fuel supply to the wood fired boiler, as wood fuel handling systems are notorious for mechanical failure.

We note that the twenty five percent provision of firing oil and gas would be consistent with the provisions of the Power Plant and Industrial Fuel Use Act of 1978.

The restrictions on the total generating capacity of small power production facilities at a site to eighty megawatts should be carefully defined to assure that only small power production facilities are included in the calculation. Cogeneration units should not be included in the calculation for comparison with eighty megawatts.

DEFINITION OF FACILITY

The definition of facility proposed in Docket RM79-54 needs clarification. At Potlatch's Lewiston, Idaho facility, shown in Figure 3 as a heat and power balance, we have turbine generators, mechanical shaft power driven units, gas and/or oil fired boilers, black liquor fired boilers, and wood fired boilers. Not shown on the diagram is the heat sink, or application of process heat, which consists of a lumber mill, a plywood mill, several pulping lines, three paper machines with a fourth under construction, and miscellaneous other uses. From the proposed regulations we are not certain what portions of the plant might be included in a cogeneration facility, given that the proportion of energy produced as electricity met the proposed definition in Docket RM79-54.

We believe that the definition of facility suggested above as an alternate to that proposed in Docket RM79-54 can be helpful with the facility definition issue.

APPLICATION FOR CERTIFICATION OF QUALIFYING STATUS

The application for certification of qualifying status should not in any way require prior discussions with the local electric utility. Power generated by non-utility generators need not be sold to benefit the nation. The benefits of qualifying status should be available whether electricity generated is sold or not.

Additionally, the technical information in an application should not be very complicated. Certainly the Commission is not interested in the technical details of steam use in a lumber or pulp and paper mill.

The paper work in an application for certification of qualifying status should be kept to a minimum to lessen the burden on the applicant and facilitate the processing of the application by the Commission. Prompt processing of applications by the Commission will be vital to early development of additional electricity generation by non-utility units.

MODIFICATIONS TO FACILITIES

As with the applications for certification discussed above, reporting and approval procedures for modification of facilities should be simple and promptly processed. The procedures will relate to the definition of facility discussed above. Certainly the Commission will not wish to review changes to the heat sink in a pulp and paper mill, which occur frequently.

SUMMARY

In conclusion, we hope that the Commission will encourage broad and rapid expansion of electricity generation by non-utility units. To move in that direction we recommend that the Commission apply the following concepts in the development of regulations under Title II of PURPA:

Develop definition of "qualifying cogeneration facility" and "qualifying small power production facility" which will allow for the broadest possible qualification for the benefits of Title II of PURPA.

Develop a program that requires minimal regulatory oversight by federal and state agencies as well as minimal regulatory burden on cogenerators and small power producers.

Set, as an important economic incentive for the sale of cogenerated power, a price equal to or just under the incremental costs of the local utility.

Ensure against discrimination against cogenerators and small power producers by utilities.

Design regulations so that only economic or technical considerations constrain increased power production by cogenerators or small power producers.

If you wish additional information about these comments, we will be pleased to discuss them with you.

Sincerely yours,

WILLIAM J. NICHOLSON,
Corporate Energy Coordinator.

Enclosure.

BASIC PRINCIPLES IN REVIEWING PURPA

There are two areas of interest in the regulations to come from PURPA: legal/regulatory and economic. The legal/regulatory area consists of issues relating to treatment of a cogenerator or a small power producer as a public utility and the degree of regulation activities of the cogenerator or small power producer. The legal/regulatory area is, for all practical purposes, one that must be satisfactory before the basic economic question of whether cogeneration or small power production—particularly the sale of power—is worthwhile in financial terms. The economic question primarily addresses the issue of whether production and sale of electricity is financially feasible.

The legal/regulatory and economic premises are as follows:

(1) The paper industry is not a public utility. It does not have responsibilities of a utility to serve, it is not subject to regulation as is a utility/regulated monopoly, nor does it receive the economic benefits of a guaranteed financial return as does a utility.

(2) Electricity production is not the primary business of the paper industry. Electricity production—particularly for sale—is an economic sideline to the paper industry. While technically and perhaps financially and economically capable of producing electricity for sale to the utility grid, the industry's non-economic costs of management attention and concern to by-product power generation and sale must be minimal. Any potential public oversight of costs or exposure of paper industry management to the public hearing process common to public utility regulation could be an insurmountable barrier to paper industry generation and sale of power.

(3) Determination of the price of electric power sold by cogenerators or small power producers should be based upon alternative costs for the electric utility grid to supply additional power. The alternative costs to the utility grid for acquisition of additional power can be determined through the public process. For purchase of firm power costs include operating, capital and financial costs and appropriate return. For secondary power, the costs to the grid are primarily operating costs. These alternative costs should be the basis for regulating the price of power sold to the utility grid by cogenerators and small power producers.

(4) The public benefits whenever the utility can obtain power at a cost less than the alternative cost for the electric utility grid to supply the power itself.

(5) To maximize the amount of power produced in the paper industry for sale to the public the regulated price of power sales to the grid from the private sector should be set just below the alternative cost of power to the grid.

(6) The cost associated with the supply of power from the private sector to the utility grid is not material. If these costs were material to any public consideration, including pricing, they logically would be subject to public review. This possibility alone could seriously reduce the amount of power available from the private sector.

(7) In considering a regulated price of power to attract private investment to produce firm electric power for sale to the utility grid, the principles of price setting over the longer term must be addressed. Private investment will be difficult to attract without a clear understanding of the revenue possibilities in the longer term. In a free enterprise environment this longer term look is

provided by economic and marketing analysis. In a market where the price is set by a regulatory agency, investors will require a longer term look provided by a clear regulatory statement.

(8) Power purchases by the private sector supplying electric power should not be influenced to the detriment of the cogenerator by regulatory action. In many cases purchases and sale can be treated independently; in some cases the opportunity to purchase power may be given in order that the private sector commit its resources to produce power for the electric utility grid.

WOOD—ITS ROLE AS AN ALTERNATIVE FUEL

(By E. Lawrence Klein)

TVA's Wood for Energy program seeks to deal with two major questions within a framework of environmental and resource protection, and good forest management practices.

(1) How can wood help solve the energy crisis?

(2) Can wood replace foreign oil?

The United States consumes approximately 75 quadrillion Btu's (quads) of energy annually. Out of the 75 quads used, about one-half of that or 36 quads is generated from oil, and about half of that is imported oil—about 15 to 18 quads (Table 1).

The potential for wood as an energy source is large. We are presently using approximately one quad of energy from solar and wood annually in the United States; however, we see this increasing very rapidly. Assuming full stocking of our forests, the potential for wood in the United States ranges from $7\frac{1}{2}$ to 15 quads, which approaches oil imports. Additional quantities could be produced through the introduction of intensive forestry practices and establishment of biomass plantations. We feel that these potentials are achievable if the Nation places priority on this alternative energy source. When one looks at the distribution of the logging and industrial residues, which generally reflect forest resource activity, it becomes obvious that the South and Pacific regions have the greatest potential for using residues as an energy source. The Northern regions' residue potential is lower, because of the emphasis on fiber products. However, energy will play an important role in the future management of all the Nation's forests.

The Tennessee Valley region, 201 counties covering parts of seven states, is growing forest biomass at the rate of 2.3 billion cubic feet annually with a heating value equivalent to 38 million tons of coal on approximately 30.5 million acres of forest land. The forest land in the Tennessee Valley area is producing the wood equivalent of more than one ton of coal per acre per year in annual growth. The amount of material harvested that ends up in some type of forest product, such as paper, lumber, and furniture is equivalent to 5.9 million tons of coal.

In producing these materials, wood that ends up as industrial waste is equal to approximately 2.5 million tons of coal. About 70 percent of this "waste" material, or the equivalent of 1.7 million tons of coal, is presently used in some form such as paper, fuel, and animal bedding. Approximately three-quarter million tons equivalent of this industrial residue is presently used. In addition, about 8.4 million coal-equivalent tons are left in the woods in the form of logging waste after merchantable timber is removed. The material left—tops, limbs, cull tees, and so forth—is what we consider as available for energy, and our first efforts will be directed to harvesting this material from the woods.

We have annual growth in excess of our present harvest of about 21.1 million tons of coal equivalent. If we assume that 2 percent of this is retained to build up growing stock, we could then assume that about 50 percent of the remainder could go for energy and the other 50 percent could go into the expansion of the forest products industry.

Thus, we have approximately an additional 15 million tons of coal equivalent that could be utilized annually for energy. As we manage these timberlands to their fullest potential, we can probably double the growth. If we double the growth, not only would there be more and higher quality material available for

the forest industries, but also there would be a large quantity of material available for energy for both forest and nonforest based consumers.

TAB LE 1.—U.S. ENERGY CONSUMPTION, 1975

Source	Percent	Quads
Oil.....	47	1 36
Natural gas.....	30	22
Coal.....	18	13
Nuclear.....	2	2
Solar and wood.....	2	1
Hydro.....	1	1
Total.....	100	75

¹ 18 imports.

² Potential for wood is 7.5 to 15 quads.

MARYVILLE COLLEGE

With this surplus of wood available in the Tennessee Valley, TVA began seeking ways to utilize some of it for energy, especially the low-grade material and logging residue. During this period Maryville College representatives contacted TVA to obtain help in reducing their high heating costs. Maryville College is a small, four-year institution located in Maryville, Tennessee, about 20 miles from Knoxville. Here we are installing a pyrolysis system to generate natural gases and oils to burn in an existing boiler. About two years ago, we began working with the college in determining the feasibility of using wood as an energy source to reduce heating costs.

The college is currently heated with steam produced in gas/oil-fired boilers. Annual fuel requirements are 240,000 gallons of No. 2 fuel oil and 18 million cubic feet of natural gas. The natural gas portion has been severely curtailed during recent heating seasons. Costs had doubled, then tripled with no ceiling in sight. Fuel cost in 1977 was about \$127,000 compared to only \$42,000 in 1972.

TVA made a detailed economic analysis to determine the feasibility of using wood residues from a local mill as a substitute for gas and oil. The study was nearly completed—conversion was feasible—when a new pyrolytic converter was developed by Enerco, Inc. of Langhorne, Pennsylvania. TVA personnel investigated the process and equipment and found this a better alternative than direct burning of wood residue as a fuel. The pyrolytic converter is a highly efficient, low-cost unit. From three tons of air-dry residue it will produce one ton of charcoal and one-half ton or 140 gallons of oil plus 8 million Btu's of a low Btu gas. Gas and oil are clean-burning and nonacidic; storage of oil is simple. Charcoal can be sold directly for fuel or other uses; several companies have made offers to purchase the surplus charcoal.

Pyrolysis means the heating of wood without oxygen, driving off the volatiles in the material as a gas. This gas then can be burned directly in the boiler. If the gas production is higher than boiler requirements, part of the heavy oils contained in the gas can be removed through condensing the gas. The oils are very similar to No. 6 fuel oil and the gas runs approximately 300 Btu's per standard cubic foot.

The college's heating demands require 52 billion Btu's annually at an average cost of \$2.44 per million Btu's for natural gas and No. 2 fuel oil. Using the pyrolysis unit, the college will buy 14,600 tons of wood residue annually which will produce about 82 billion Btu's in gas and oil equivalents. This equates to \$1.54 per million Btu's. Gas produced is burned immediately, but oil can be stored and burned in the college's system with only minor adjustments to their present boilers. Any surplus oil will be available for sale.

The unit is portable and uses about three tons of wood per hour. The wood infeed contains approximately 51 million Btu's and the output combining the char, oil, and gas will equal about 43.3 million Btu's resulting in an efficiency of about 85 percent. The gases and oils can be burned in standard oil- or gas-fired boilers just by changing the burner nozzle configuration. Present plans are to sell the charcoal to a briquetting company; however, its value as a fuel is tremendous because it contains about 14,000 Btu's per pound and can be fired in any

solid fuel boiler. Also the char can be mixed with oil as a slurry (whether it be pyrolytic oil or any standard fuel oil) and burned in an oil-fired boiler. This helps lower the oil consumption and reduces the SO_2 emissions from burning oil. The gases must be burned immediately, while they are still hot, since they contain all the moisture from the wood. They should be consumed before the gases have a chance to cool and the moisture contained in them goes up the stack as water vapor. The advantage of using pyrolysis in an existing gas- or oil-fired boiler is that the only change necessary is the nozzle change. This is less expensive than building a new boiler and/or converting a present gas- or oil-fired boiler to burn solid fuel such as wood. The type of feed we are using, the primary feedstock at Maryville College, will be kilned dry planer shavings averaging about three and one-half percent moisture content. In addition to that, we are going to be burning whole tree chips to determine the maximum moisture content that can be used in a pyrolysis system before the degradation of the boiler reaches a point that the fuels will not burn properly. Besides wood, the pyrolysis system can use just about any organic material as a feedstock, including corncocks, cotton gin waste, wheat straw, or other agricultural crop wastes. The pyrolysis unit will be installed sometime this fall, and by this time next year we will have enough data to assess the potential of pyrolysis in helping to reduce our dependence on gas and oil.

The unit at Maryville is transportable on a 32-foot flatbed trailer, and could be moved to the forest where logging slash and other underutilized wood could be converted to gas, oil, and char. Using the unit in this manner increases the flexibility for using the resource. The fuel materials would also be more easily and economically transported to the consumer than the original wood resource.

We have over 100 hours of operation on the pyrolysis unit with the longest run being 72 consecutive hours. At present we have commenced testing after completing modifications to the wood infed system and charcoal handling systems. The charcoal is of a very high quality as indicated by the porosity determinations.

WOOD STOVES

Another project that we have completed is a wood stove study. We worked with two manufacturers, the Riteway Manufacturing Company, Harrisonburg, Virginia, and Martin Industries, Ashley Products Division, Sheffield, Alabama. They participated with us in placing 90 wood stoves in residential homes in the Norris, Tennessee, area. Individuals were able to purchase the stoves at a discount from the factories in order to participate with us in this study. One type of installation consists of constructing a hood over the stove and piping the air into the central heating system and heating the house. Another is of a passive design—just a natural rising of the heat from the stove which causes it to flow through the duct work and heat the home. Some participants installed their stoves in their fireplaces as radiant type stoves. Still others vented the hoods into their present heating systems and used blowers on their furnaces to distribute the heat.

An average 50 percent reduction was achieved in the kilowatt-hours of electricity used in those homes formerly heated electrically. Some even showed a 70 percent reduction, depending on how the stove was installed. There may have been an even greater reduction since the people with the wood stoves indicated that they are heating more of their houses with the wood stoves than they did when using electricity. They are also keeping their houses at a slightly warmer temperature since they have installed wood stoves than they did with electric heat. The participants used approximately 80 to 114 cubic feet of wood a month for heating this past winter. With 128 cubic feet in a standard cord, they were using about 80 to 90 percent of a cord per month. Fifty percent of the participants used dry wood and 50 percent used green wood. We feel consumption would be reduced if all the wood burned were dry. If the 50 percent that were burning green wood had burned air-dried wood, the amount of wood consumed would have been less. We try to educate people to the fact that wood should be cut approximately six months to one year in advance of burning it, because air-dried wood has considerably more usable Btu's per pound than green wood. In fact, green wood will average about 4,000 usable Btu's per pound and air-dried wood will have approximately 6,800 Btu's per pound. Completely dry wood with zero moisture content will average about 8,500 Btu's per pound. A portion of the energy in the green wood is used to drive the moisture up the stack as water vapor; thus, dry wood will also reduce creosote problems in the flue and

chimney and the associated fire hazards. Most people cut their own wood; however, we feel that even purchased wood at \$50 to \$75 a cord in some areas will be an economical alternative to electric heat. It is possible to pay off the cost of a wood stove in two to five years, depending on the cost of electricity or alternative fuels for homes in a given area. Burning approximately three-quarters to one cord of wood per month over a five-month heating season will take approximately five cords of well-seasoned wood to heat the average home for a year. A good stand of hardwoods on a fair site can produce close to a cord of wood per acre per year if it is managed properly. Thus, a homeowner with five to seven acres of properly managed forest land could supply all the wood needed to heat a home.

Last fall TVA embarked on a project to study the practicality of woodburning stoves as an alternate source of residential heating. The objective is to identify, develop, demonstrate, and promote the nearer term technologies for the production and use of solar biomass materials and supplements and substitutes for fossil fuels in supplying the heating and fuel needs of residences. This program is part of the Division of Energy Conservation's Solar Applications Branch in TVA's Office of Power in Chattanooga, Tennessee. Basically this program allows homeowners to purchase and install wood-burning heaters in their homes and receive interest free loans. TVA will finance up to 5,000 wood heaters in selected areas of the TVA region. The loans will cover the cost of the heater plus installation up to a maximum of \$800 per unit. To qualify for the loan the heater must be from an approved list and the installation must pass an inspection assuring proper safety standards. The loan is administered through the local power distributor and it is paid for over a five-year period on a monthly electric bill.

LAND BETWEEN THE LAKES

In another area, we have completed construction of a small office-type building which will demonstrate the use of wood for both heating and cooling. This structure has a wood-fired furnace for heating fitted with an absorption chiller for cooling. This educational demonstration is being undertaken at TVA's Land Between The Lakes, a 170,000-acre recreation and environmental education center in western Kentucky-Tennessee. In that rural setting, TVA also plans a comprehensive demonstration of wood as an energy source. From this demonstration, we will learn and show how to use wood effectively for space heating and cooling, generating electricity, and propelling our vehicles and heavy equipment. We will also demonstrate how to grow and harvest large quantities of wood in harmony with major recreation, environmental education, and wildlife programs. In addition to using wood as an energy source, various types of energy-saving ideas and equipment will be demonstrated.

A wood stove has also been placed in the office building at our maintenance complex. This stove is installed to supplement a heat pump. Last winter the stove was adequate to heat the entire 3,000 square-foot building. Other applications include a portable wildlife check station that will be heated by a wood-burning stove, and use of wood-burning stoves in several other buildings to supplement space heating. Future plans for Land Between The Lakes include a variety of projects to demonstrate effective, efficient, and economic ways to use wood for space heating, cooling, water heating, and electric generation.

PELLET PRODUCTION

Another new development that TVA is watching is a commercial wood pelletizing plant just completed in Knoxville, Tennessee. The plant produces a small wood pellet that has a moisture content of about 12 percent and average 8,200 to 8,500 Btu's per pound. The materials brought in can be logging waste, chips, bark, sawdust, planer mill shavings, or any type of wood residue material. The raw wood is fed to a hammer mill to reduce it to a uniform size; it then goes through a dryer until it reaches about 12 percent moisture content; it then passes through a pelletizing machine and is extruded as a small fuel pellet. A standard alfalfa type pelletizing machine is used. The capacity of the plant is about 150,000 tons of pellets a year, with two eight-hour shifts. This product has its application especially in existing coal-fired boilers where the pellets can be burned separately or as a mixture with coal. The pellets, being a uniform size, feed very easily through the conveyor system and they

will help reduce the SO₂ emissions when burned with coal. However, the pellets must be kept in dry storage once they are formed since pressure causes the natural adhesives in the wood to bind the small particles together and moisture causes them to crumble.

Another demonstration in the Tennessee Valley involves a new type of automatic-feed wood chip furnace that is approximately 80 to 90 percent efficient. Developed by Dr. John Riley of the University of Maine, this is a small furnace producing between 200,000 and 500,000 Btu's per hour using either wood chips or whole tree chips. Green chips can be used. The system is thermostatically controlled and has automatic feed and start-up capabilities. The furnace burns at approximately 1,800 degrees. Hot flue gases pass through a heat exchanger, where they heat the air to be piped into the building. The flue gases pass from the heat exchanger to a wood-feed system, and predry the wood feed prior to burning. Finally, the gases go to a second heat exchanger to preheat the outside combustion air. When the gases leave the stack they are down to approximately 95 degrees. Even though this is a small unit, its output is presently too large for residential use. We are presently placing one of these furnaces in an office building at our Land Between The Lakes facility and also in a vocational school in north Georgia.

HARVESTING ECONOMICS

So far I have been discussing some of the various types of systems available and some of the things in which we are actively involved in the Tennessee Valley. However, I should mention that we are also very much concerned with harvesting wood biomass for energy, particularly, the logging waste. We want to determine the economics of harvesting logging waste both during a conventional harvest operation and also after standard logging operations are complete. We also plan to study the economics of various systems such as clear cutting, particularly ahead of strip mines where a considerable amount of biomass is left on the ground. We want to establish the economics of producing energy wood from timber stand improvement operations and wildlife habitat development thinnings.

We feel that the use of biomass for energy will play a tremendous role in improving both the quality and quantity of our forest land. It will provide the landowner a market for materials that heretofore did not exist, and he will be able to practice more intensive forest management, have it pay its way and at the same time give him a periodic income from his forest land. Further, we are thinking of studying the effects of selecting crop trees at a small age, when the trees are 6 to 10 inches in diameter, followed by a periodic (5 to 10-year) harvest of all of the remaining material on that particular site for energy wood, giving the other trees more room to grow. In one clear-cut on the Norris Watershed experimental area, we determined that, on a five-year-old clear-cut where everything down to one inch was felled and left on the ground, the growth rate was one ton per acre per year of oven-dried wood; this would equal approximately two tons per acre of green wood produced by that stand at age five.

Another area we would like to explore is power line rights of way. TVA maintains approximately 85,000 acres for the 17,000 miles of power lines it owns. We would like to see if we could produce not only energy wood on these rights of way, but also wildlife habitat.

We do not feel that TVA is going to look too hard at hardwood plantations for energy since a lot of other people are looking at them. However, as I mentioned, we are going to consider what we call natural plantations—taking the existing forest lands and seeing what we can do with them to produce energy wood.

In the Tennessee Valley we are producing about four times as much wood as we are presently harvesting. We feel that our immediate need, therefore, is to see how we can improve the quality and quantity of our existing forest lands without getting into plantations. Wood we produce for energy in these systems will be used to replace natural gas and oil primarily, and only secondarily to replace electricity. We feel that the greatest potential for wood in the United States is as a replacement for critical fossil fuels, particularly gas and oil, and it should not really be used for electrical generation. In areas where electricity is generated with imported oil burning wood to generate electricity should definitely be considered. In other areas nuclear fuel or coal can be substituted for

scarce oil and natural gas and it will have a greater economic impact on the United States. Wood burned in the boiler to generate electricity which is then transmitted to the home produces only about 30 percent efficiency from the Btu's burned. However, if the wood is burned directly in the home or establishment, especially in view of some of the new developments in wood stoves, 50 or 60 percent efficiency can be attained. Some of the new modern types I have mentioned can achieve 90 percent efficiency; therefore, by using wood directly where the energy is needed, the amount of wood available will go a lot further toward solving some of the energy problems in the United States. I do not want to give the impression that wood is the "save all" for the United States; however, I think that wood can play a major role in helping to solve some of the Nation's energy problems.

FOREST BIOMASS AS AN ENERGY SOURCE

The Task Force on Forest Biomass as an Energy Source was chartered by the Society of American Foresters on September 26, 1977, and took its present form following an amendment to the charter on October 5, 1977. It built upon the findings of two previous task forces: the Task Force on Energy and Forest Resources and the Task Force for Evaluation of the CORRIM Report (Report of the Committee on Renewable Resources for Industrial Materials). Reports of these two task forces have been published (Saeman et al. 1977, 1978).

Its charter directed the present task force to (1) study the potential of forest biomass as an energy source; (2) study possible effects on traditional biomass uses; (3) recommend whether SAF should adopt a national position and, if so, outline a proposed position; and (4) recommend other SAF activities relating to forest biomass as an energy source.

The task force proceeded by reviewing the literature, analyzing documents and statistical reports, and contacting persons engaged in research and development.

I. POTENTIAL OF FOREST BIOMASS AS AN ENERGY SOURCE

Forest biomass is all tree and woody shrub materials from root tips to leaf or needle tips. Until recently, foresters have measured only the boles of trees merchantable for traditional products. Attention is turning, however, to volumes in small stems, tree tops, and roots as well.

Estimates of total biomass, including weight tables for complete trees, have been made only for a few areas of the nation, mainly in the South and the Northeast. Until much more is known about total biomass volume, even the theoretical potential of U.S. forests cannot well be estimated. The actual potential, in turn, will be affected by many other factors, among them harvesting and utilization techniques, transportation and distribution of raw materials and finished products, and a variety of environmental considerations. Even so, estimates in this paper are considered conservative enough to justify the conclusions reached. The figures are based largely on traditional measures of boles and on rather crude projections of the limited work already completed on total tree biomass.

The data indicate that biomass now available can contribute significantly to U.S. energy needs. Not only is it relatively plentiful, but—unlike fossil fuels—it is renewable. Too, it is versatile. It can be burned in traditional solid forms, reduced to chips, or converted to liquids, gases, or char. The Council on Environmental Quality has stated (1978) that "in the absence of major breakthroughs in development of batteries or inorganic liquid fuels, biomass offers the most practical solar-based alternative for powering trucks, buses, and automobiles."

Energy needs

The Federal Energy Administration (FEA) estimated in 1976 that annual energy use in the United States was about 75 quadrillion BTUs (or 75 quads), and that use by 1985 would be 98.9 quads. The agency also estimated that even under the most favorable conditions the U.S. cannot expect to gain more than 6 quads from emerging technology by 1990. A more realistic figure, it indicated, might be 2 quads.

The emerging technologies evaluated by FEA included solar, geothermal, and synthetic fuels, but evidently excluded forest biomass. Energy currently obtained from wood is estimated at 1.1 to 1.7 quads. Members of the task force are confident that wood use for energy is increasing greatly, but we have no way of knowing the extent.

Current potential

Annual aboveground biomass growth on commercial forests in 1970 was estimated at 450 million dry tons (Zerbe 1977). In addition, available biomass included something like 120 million tons from natural mortality and another 152 million tons from such miscellaneous sources as land clearing, noncommercial forestland, and removals of street and park trees and other urban wood waste. In lieu of 152 million tons from these miscellaneous sources, however, the task force used a more conservative estimate of 110 million.

The total available in 1970 from all sources, then, was about 680 million tons. Manufacture of timber products used about 195 million tons of this total, leaving 485 million, or about 8 quads of energy, for fuel or other purposes.

Extrapolations from these 1970 figures can be made for a current estimate. Recent unpublished estimates (data of Thomas H. Ellis, USDA Forest Service, October 1978) indicate that net annual growth is now 530 million tons, 18 percent higher than in 1970, and current industrial use is 200 million tons. Thus, the equivalent of 9.5 quads is now potentially available.

Future supply

Table 1 indicates future U.S. biomass potential after subtraction of industrial demand, which is estimated at a moderate level. Current annual stand growth is 38 cubic feet of wood per acre. If stands were fully stocked they would average 74 cubic feet per acre. Biomass from all sources except commercial forest growth is assumed constant. Increases in commercial volume are projected for full stocking during the years 2010 to 2035, and after that for full stocking combined with such intensive practices as accelerated reforestation, stand improvement, commercial thinning, use of genetically improved species, improved harvesting methods, and increased protection. By the middle of the 21st century, the estimates show, U.S. forests could supply up to 18.9 quads of energy, while still meeting the need for conventional products.

TABLE 1.—ESTIMATES OF U.S. ABOVEGROUND FOREST BIOMASS POTENTIAL¹

[In million oven-dry tons]

Source	1970	1976 ²	2000 ²	2010 to 2035, with full stocking	2035 to 2085, with full stock- ing and intensive management ³
Net growth from commercial forest.....	450	530	600	800	1,200
Mortality ⁴	120	120	120	120	120
Other sources ⁵	110	110	110	110	110
Harvest for conventional product uses.....	-195	-200	-260	-260	-320
Total.....	485	560	570	770	1,110
Energy equivalent (in quads).....	8.2	9.5	9.7	13.1	18.9

¹ Estimates derived from data published by Zerbe (1977) and USDA Forest Service (1977). Moderate industrial demand is projected.

² Net growth estimates from Thomas H. Ellis, USDA Forest Service, Oct. 20, 1978.

³ Moderate industrial demand is projected to the year 2020, and it is also assumed that intensive management will double growth on 50 pct of commercial forests.

⁴ Assumes mortality is recoverable. Intensified management may reduce mortality, but an equivalent volume would be available as live wood.

⁵ Land clearing, noncommercial lands, urban tree removals, and urban wastes.

These estimates do not include belowground biomass (stump-root systems), which may yield an additional 20 percent. Nor do they include any increases from intensive management of lands presently regarded as noncommercial; only utilization of existing biomass from these lands is figured in. Also, the estimates assume that no significant acreage would be committed to biomass plantations. If 10 percent of the arable land that is currently private forest, pasture, range, and hay land were used for intensive biomass production, up to 4.5 additional quads

of energy could be produced at current estimated yield levels. Future yield increases could raise the figure to 8.3 quads, if new technology were used on biomass farms (Inman 1977).

Biomass as an alternative to fossil fuels and electricity

Forest biomass will be particularly significant to the economy when substituted directly for oil and natural gas. Current U.S. oil consumption is approximately 36 quads. About one-half that total is imported, creating a serious balance-of-trade problem. The need to improve the balance should bring about policies to encourage use of biomass as an alternative fuel. Biomass could also significantly reduce peak energy loads in areas heavily dependent on electricity for space heating.

The most promising immediate prospect is use of chips and solid wood in newly developed wood-burning furnaces, which are over 80 percent efficient (Riley 1976) and virtually pollution-free. Such furnaces are particularly suited for commercial and institutional buildings that require 200,000 to 500,000 BTU's per hour. Work is under way to develop similar furnaces for small buildings such as private homes (Hill 1977). Even where some smoke is emitted, wood is preferable to coal and oil because it contains little sulfur.

Technology is also developing rapidly for the processes of total gasification and pyrolysis. Total gasification yields a fuel for gas-fired boilers. Pyrolysis produces oil, gas, and char and is suited for large energy-users who can refit existing oil and gas furnaces. Output ranges from 150 million BTUs per hour for large stationary units to 40 million BTUs per hour for smaller mobile ones. The smaller units, which can be moved on a flatbed trailer, might be transported to logging sites, wood could be converted to gas for use on site in powering the chipping facility, and converted to char and oil for transport away from the site. Char, one of the best solid fuels known is very clean and can be burned alone or blended with oil or coal to increase the burning efficiency of these fuels and reduce their sulfur emission.

In converting to biomass for fuel, forest industry is in a particularly advantageous position: it is experienced in processing wood and usually has fairly large concentrations at plant sites. Many companies are moving rapidly toward energy self-sufficiency. The pulp and paper industry, a large energy consumer, is about 50 percent self-sufficient now. Most mills have a bark-fueled boiler and also burns black liquor.

It is technically feasible to use biomass to produce alcohol, as a gasoline substitute or blend, but the process will not be economical until gasoline prices approach \$1.50 per gallon. Certain other processes, such as wet oxidation, improved fermentation, and conversion to oil, are being investigated. During World War II, vehicles in Europe and Japan were propelled with charcoal, alcohol, and other forest biomass materials.

In heavily forested regions where fossil fuels must be imported, it may be practical to use biomass to generate electricity. Vermont and Oregon already have small plants in operation, and analyses indicating economic feasibility have been completed for several other areas. Because of losses of 65 to 75 percent in generation and transmission, however, electrical generation is one of the least efficient uses of biomass. Large capital investment and resource commitments to electrical generation also reduce the opportunities to utilize more efficient small-scale technology. Also, truck transportation costs for wood fuel become excessive for large (>100 megawatts) power plants.

Homeowners in rural areas where forests are abundant are harvesting and burning more and more wood for both primary and supplementary residential heating. Recent studies in the Tennessee Valley (unpublished data, Division of Forestry, Fisheries, and Wildlife Development, TVA, 1978) show that homeowners reduced their electrical consumption 45 to 70 percent during December, January, and February by using wood stoves. It is estimated that 6,000 wood stoves are in use in north Georgia (conversations with E. L. Klein, wood energy project manager, TVA, 1978) and that 50 percent of Maine residents now use wood for heat (Ripley and Doub 1978).

II. SOCIAL AND SCIENTIFIC NEEDS TO ACHIEVE BIOMASS POTENTIAL

Perhaps the greatest challenge to full realization of forest potential for energy as well as for conventional wood products lies in the simultaneous realization of other cultural values. Use of the forest resource must not preclude wildlife

development, recreational opportunities, watershed protection, esthetic concerns, and subtle environmental considerations. The task force believes that considerable debate will center around such issues as the nation awakens to the significance of biomass as an energy source. Professional foresters must be prepared to face such concerns and address all such legitimate issues; and the means must be found to fashion major policy decisions out of a reasonable synthesis of public and professional opinion. Trade-offs will be necessary, and the forestry profession should ensure that they are based on the best possible scientific evidence.

Because forests are already stocked with large volumes of biomass, because the same acres have traditionally sustained multiple uses, and because professional foresters have a well-developed scientific base for managing these lands, we believe existing stands offer the greatest potential for biomass production for the foreseeable future. Later, biomass plantations established on farmlands, grasslands, and on acreages such as rights-of-way for highways, powerlines, and gas lines may become significant.

Upgrading existing stands is an immediate need. Introduction of improved stock would increase growth, and in combination with creative management would contribute to improved wildlife habitat, esthetics, and environmental protection. Refinement of multiple-product management systems, especially of cultural systems, is needed. Greater attention should be given to genetic improvement of species (both native and exotic), particularly species heretofore not considered commercial. Research is also needed on regeneration techniques, rotation lengths and intermediate harvests, fertilization and irrigation, and other silvicultural treatments. New cultural systems will, in turn, require new utilization processes.

Development of efficient and economical harvesting equipment and systems will be needed for existing forests that are managed primarily to produce conventional wood products but have significant residues, and for existing forests that will be managed primarily to produce energy.

Further evaluations of nutrient drain resulting from intensive harvesting must be made.

Establishment of marketing systems is a necessity. Only through such systems can the cost of biomass be competitive and the supply to consumers be dependable. In many regions, wood energy is now economically competitive, and a major reason why more institutions have not converted is their apprehension about dependable supplies. Threatened by recent supply problems with natural gas and oil, consumers are reluctant to make large investments to switch to a fuel that has virtually no developed marketing and delivery system. Those consumers who are switching are insisting on long-term supply contracts. The forest products industries, in the unique position of being their own suppliers, are exceptions to this general reluctance.

Development of improved combustion and biomass conversion technologies is important. Work is needed to improve wood burners and to establish efficiency ratings. Auburn University, through a grant from the Department of Energy, recently organized a national center to test and rate residential equipment; fireplaces and stoves now in use vary in efficiency from 10 to 60 percent. Also needed are more efficient and more automated furnaces, new pyrolysis equipment, and fuel preparation systems for more efficient handling and cleaner combustion. Such developments are critical to increase consumer acceptance and to meet environmental standards.

To achieve the nation's full potential, biomass plantations eventually may be needed. Toward this end, systems of intensive culture should be developed for application to croplands, grasslands, and other areas that, even in pursuit of current goals, are managed far below their productive capacity. Here too, genetically improved native plants and exotic species should be evaluated. In particular, these studies should include the treatment of coniferous species to increase production of oleoresin, a petrochemical substitute. Work to date indicates that oleoresin yield from pine trees can be increased two to ten times through treatment with the herbicide paraquat. Petrochemical substitutes from the forest could contribute 0.85 quads to the national energy budget (McGuire 1977). Harvesting systems appropriate to biomass plantations are another requirement.

Any major commitment to production of biomass for energy will require more complete and reliable procedures for estimating growth, standing stock, and

utilization. We must be able to establish biomass limitations and project yield and utilization.

Increase in demand for wood as an energy source may disrupt existing timber supply systems and deplete the resource base. The risks will be greatest in the absence of hard information and strong national policies and programs. If foresters fail to educate the public and establish effective controls, many forests, particularly private nonindustrial ones, may be exploited for short-term gain. As a profession, foresters must help establish policies that balance development and use for the greatest public good.

III. IMPLICATIONS FOR TRADITIONAL USES

How will using biomass for energy affect traditional uses, especially in resource supply, product pricing, and market stability? Although the task force could not make the quantitative analysis this question deserves, we do have some observations based on data and on personal experience.

Benefits

To date, the effort of many forest industries to become energy self-sufficient is the principal influence of increased use of forest biomass. Manufacturing wastes and bark, formerly written off as part of operating costs, now furnish up to half the fuel burned at many pulp and paper and fiber plants. Other wastes, such as logging residues and cull trees, are increasingly salvaged for energy. As systems and markets are developed, wastes can also be used for conventional or reconstituted wood products. A number of plants are already making wood fuel products such as pellets.

A recent study (Goldstein, Holley, and Deal 1978) in the North Carolina Piedmont showed several benefits from utilization of hardwood species that were previously thought unmerchantable. Chipped low-grade hardwood was used to produce industrial process steam, fiberboard, and chemicals; all three products, the study concluded, would give timber owners a market for low-grade trees. In addition, the authors said, "the whole-tree chipping-logging system results in a well-prepared site with all culls removed"; such preparation ordinarily would cost \$50 or more per acre.

Benefits were also shown in a recent unpublished study of four middle Tennessee counties having 425,500 acres of forest on sites classified as average or poorer. The study (unpublished analysis, Division of Forestry, Fisheries, and Wildlife Development, TVA, 1978) assumed that 55 percent of the low-grade hardwood harvested would be available for energy, and would replace 11 percent of oil and natural gas used in the area, saving consumers about \$3 million per year. Stand improvements resulting from the harvest would be worth an additional \$640,000 annually for 20 years. Removal of the low-quality wood would reduce site preparation costs and hasten natural regeneration, reduce planting costs, provide fire protection, increase landowner income, and possibly enhance scenic values and recreation opportunities.

Intensive forest management and frequent harvesting will require access systems that are well planned from both an environmental and an economic standpoint. Capital for development of such access may be difficult to find in the beginning, but sustained increase in the biomass harvest will help overcome such economic restraints. As growth and utilization increase, technological advances also should lead to more efficient harvesting systems. With a dependable raw material flow, industry inventories can be lowered, reducing overall operating costs. In addition, industries now primarily concerned with manufacturing conventional products are likely to diversify for more complete resource use.

Emphasis on the growth of forest biomass for energy in no way precludes use for conventional fiber products. The ultimate disposition of the material will still be determined by society's needs and the relative economic net values of the products.

Possible problems

The major hazard in the orderly development of the nation's wood energy potential lies in the normal tendency to overreact to both opportunities and economic pressures. Booming sales of wood stoves for home heating and rapid conversion by commercial, institutional, and some manufacturing operations to wood-fueled systems may result in local or regional economic dislocations. For example, raw materials might be diverted from such established uses as pulp and

paper and fiberboard. At the same time, too rapid expansion of biomass harvesting may lead to local or regional overproduction. Both trends could lead to price fluctuations adversely affecting both wood energy industries and raw materials for conventional uses, at least temporarily.

These problems would be expected, however, to ease as the wood energy industry matures. At the same time, the task force believes that vigorous development of a unified national policy, combined with careful long-range planning, can prevent or ease the adverse effects of boom-or-bust cycles. In the long run, it is imperative that forest growth be increased, costs of harvesting be lowered, new product development and production processes be accelerated, and energy and conventional product operations be integrated into the broadest possible forestry industry growth.

IV. SAF POLICY AND ACTIVITIES

The task force recommends that SAF adopt a national position on forest biomass as an energy source. The position should cover the points outlined below and should receive wide publicity, including presentation to Congress and the White House.

Circumstances and opportunities

U.S. forest resources could be mobilized to supply in perpetuity up to 20 percent of the nation's current energy consumption if the problem of harvesting residual wood at a price competitive with fossil fuels were solved. Such mobilization would complement rather than threaten traditional timber uses and the economy they support; would improve the biological health and productivity of the nation's forestlands; and would strengthen the U.S. position in the world economy and generate significant employment.

Recommended SAF activities

1. The Society of American Foresters should promote achievement of U.S. biomass potential by

- publicizing the significance of biomass as an energy source,
- encouraging improved estimates of supply and utilization potential,
- helping to ensure that equipment and technical systems are available to produce wood energy economically,
- promoting forest practices and incentives to increase the growth of biomass,
- supporting legislation to produce biomass on idle or abused lands,
- promoting use of industrial and logging wastes, underutilized trees, silvicultural thinnings, and urban tree removals and wood wastes.

2. SAF should encourage substitution of wood for energy-intensive materials such as aluminum, steel, plastic, and concrete, as recommended by the earlier Task Force on Energy and Forest Resources.

3. SAF should support research and development of improved silvicultural, logging and transport, marketing, and energy conversion systems; encourage economic analysis of the effects of alternative biomass use; and stimulate research on environmental impacts.

4. SAF should also support efforts to educate the profession and the public as to the energy potential of biomass, and promote foresters' participation in policy formation and information exchange. Especially important are

- encouraging forestry schools to increase biomass curriculum,
- encouraging foresters to take part in policy and other institutional processes that can influence major decisions on biomass use.
- urging foresters to work with private and public utilities to promote biomass as an energy source,
- supporting establishment of a national clearinghouse for biomass information,
- integrating research by foresters and other technical and scientific professionals, such as engineers, architects, and chemists,
- promoting distribution of integrated technical information to legislators and government administrators,
- emphasizing that the USDA Forest Service should have primary responsibility for development of national forest biomass potential.

V. FURTHER TASK FORCE RECOMMENDATIONS

The task force recommends that the SAF Council, in addition to adopting a position similar to that outlined, also establish a means to obtain members'

opinions on biomass and report on these views. The *Journal of Forestry* should be utilized to the extent feasible. Further, the task force believes that establishment of a group to monitor significant national activities would be wise; the same group could recommend Society positions and policies. The task force recommends too that the needs identified in this report be assigned to existing working groups, where such assignment is appropriate, and that new working groups be created for the needs that do not fit an existing group.

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96TH CONGRESS
1ST SESSION

S. 1996

To authorize the recovery of wood residues in the national forests for use as fuel, for conversion to use as petrochemical substitutes or wood products, and for other purposes.

IN THE SENATE OF THE UNITED STATES

NOVEMBER 9 (legislative day, NOVEMBER 5), 1979

Mr. MELCHER introduced the following bill; which was read twice and referred to the Committee on Agriculture, Nutrition, and Forestry

A BILL

To authorize the recovery of wood residues in the national forests for use as fuel, for conversion to use as petrochemical substitutes or wood products, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 SECTION 1. (a) In order to promote full use of National
4 Forest System wood and wood residues, the Secretary of Ag-
5 riculture is authorized to establish a program using "residue
6 removal incentives" to pay timber purchasers for their costs
7 in the removal and processing of wood residues from timber
8 sales areas, to points of prospective use as fuel, or conversion

1 to use as industrial hydrocarbons, alcohols, petrochemical
2 substitutes, or wood products. The term "wood residues" in-
3 cludes, but is not limited to, logging slash, down timber ma-
4 terial, and standing live, or dead trees which do not meet
5 utilization standards because of size, species, merchantable
6 volume, or economic selection criteria. Residue should be col-
7 lected from a site so as to avoid soil depletion or erosion; and
8 further, full consideration should be given to the protection of
9 wildlife habitat with respect to the removal of standing live
10 or dead trees. Point of use is to be determined in accordance
11 with appropriate timber appraisal and sale procedures and
12 may include, but not be limited to, industrial or commercial
13 enterprises, or commercial, or Government-owned wood con-
14 centration and distribution centers. The form and method of
15 removal and processing is to be prescribed by the Secretary
16 in accordance with appropriate appraisal and sale procedures.
17 The Secretary, in making sales, shall place a reasonable
18 value on residue and is authorized to require the purchasers
19 of National Forest timber sales to process and remove wood
20 residues to points of prospective use. However, except in
21 cases of wood residue removal for fire prevention, site prepa-
22 ration for regeneration, wildlife habitat improvement, or
23 other land management purposes, the Secretary may not
24 make such requirements in instances where it would be more
25 expensive to remove wood residue than the value such resi-

1 due would provide as fuel or other merchantable wood prod-
2 ucts. The amount of the wood residue handled under the
3 "residue removal incentive" authorized by this section shall
4 be limited to that portion of the estimated cost of this work
5 covered by the value of the timber in excess of other desig-
6 nated charges. The residue removal incentive is to be applied
7 as a credit against the amount payable for timber. Except for
8 that volume of wood designated for free use disposal, wood
9 residues will be sold for not less than the appraised value
10 when a market for such material exists. The residue removal
11 incentives and revenues from the sale of such residues shall
12 be considered as "moneys received," within the meaning of
13 the sixth paragraph under the heading "FOREST SERV-
14 ICE" in the Act of May 23, 1908, as amended, section 13 of
15 the Act of March 1, 1911, as amended (35 Stat. 260, 36
16 Stat. 963, as amended; 16 U.S.C. 500).

17 (b) In addition to the moneys provided under subsection
18 (a), there is hereby authorized to be appropriated annually
19 such sums not in excess of \$50,000,000, beginning October
20 1, 1981, and each fiscal year thereafter until the fiscal year
21 ending September 30, 1986, as Congress determines neces-
22 sary for the purposes of this section. Moneys appropriated
23 under this subsection are to be available until expended to
24 cover the cost to the United States for removal of wood resi-
25 dues from National Forest System lands to points of use for

1 energy or wood products. Receipts from the sale of National
2 Forest System wood residues shall be returned to the United
3 States Treasury. Activities which may be carried out under
4 this subsection include, but are not limited to, removal of
5 wood residues from (1) active timber sales where the timber
6 value is insufficient to provide residue removal incentives for
7 the removal of all appropriate residues, (2) closed and active
8 timber sales where no residue removal credit was established,
9 (3) reforestation and timber stand improvement areas, (4) fire
10 control clearings, (5) areas of fire prevention cleanup of accu-
11 mulated wood residues, and (6) other accumulations of wood
12 residues. In addition, funds appropriated under this subsec-
13 tion may be used for (1) operation of National Forest System
14 wood residue demonstration areas, (2) establishment of fuel
15 wood concentration and distribution centers, and (3) con-
16 struction of access roads needed to facilitate wood residue
17 removal. The Secretary is authorized to cooperate with the
18 State, county, and other governmental entities by making
19 payments to such entities which cooperate in the operation of
20 those activities listed in subsection (b).

21 (c) The Secretary is authorized to make available wood
22 and its wastes and residues from the National Forest System
23 for use in research, field tests, and demonstrations (author-
24 ized under sections 2041 and 2052 of this title).

1 (d) The Secretary is authorized to promulgate such reg-
2 ulations as he deems necessary to carry out the provisions of
3 this section.

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