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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

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4 PUBLIC MEETING TO DISCUSS ENVIRONMENTAL SCOPING

5 FOR THE VERMONT YANKEE NUCLEAR POWER STATION,

6 LICENSE RENEWAL APPLICATION

7 EVENING SESSION

8 + + + + +

9 WEDNESDAY,

10 JUNE 7, 2006

11 + + + + +

12 BRATTLEBORO, VERMONT

13 + + + + +

14 The Public Meeting was convened at the

15 Latchis Theatre at 50 Main Street in Brattleboro,

16 Vermont, at 7:00 p.m., F. "Chip" Cameron, Facilitator,

17 presiding.

18 NRC STAFF PARTICIPATING:

19 F. "CHIP" CAMERON

20 ERIC BENNER

21 RICHARD EMCH

22 FRANK GILLESPIE

23 SPEAKERS:

24 SHAWN BANFIELD

25 BERNIE BUTEAU

1 SPEAKERS (continued):

2 CLAIRE CHANG

3 ELLEN COTA

4 JOSHUA DOSTIS

5 JOHN DREYFUSS

6 JOHNNY EADS

7 DART EVERETT

8 MIKE FLORY

9 DENNIS GIRROIR

10 MIKE HAMER

11 JOAN HORMAN

12 GEORGE ISELIN

13 DAN JEFFRIES

14 DEB KATZ

15 MARIAN KELNER

16 LARRY LAKENS

17 BETH MCELWEE

18 SUNNY MILLER

19 EVAN MULHOLLAND, ESQ.

20 KAREN MURPHY

21 CHRIS NORD

22 BILL PEARSON

23 GARY SACHS

24 GOV. THOMAS P. SALMON

25 RAY SHADIS

1 SPEAKERS (continued):

2 EMMA STAMAS

3 TED SULLIVAN

4 EMILY TINKHAM

5 CLAY TURNBULL

6 SHERRY ZABRISKIE

7 BETH

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1 I N D E X

2 Welcome and Purpose of the Meeting,
3 Francis "Chip" Cameron, NRC 5
4 Overview of License Renewal Process,
5 Eric Benner, NRC 10
6 Overview of Environmental Review Process,
7 Richard Emch, NRC 18
8 Audience Questions 27
9 Public Comments 43
10 Closing/Availability of Transcripts,
11 Francis "Chip" Cameron, NRC
12 Adjourn

1 P R O C E E D I N G S

2 7:00 P.M.

3 MR. CAMERON: If you could take a seat,
4 we're going to get started with the meeting tonight.
5 (Pause.)
6 Good evening, everyone. Nice to see all
7 of you and thank you for coming out tonight on a rainy
8 night and my name is Chip Cameron and I'm the Special
9 Counsel for Public Liaison at the Nuclear Regulatory
10 Commission which we're going to be referring to as the
11 NRC tonight.
12 Welcome to the meeting. The subject of
13 the meeting tonight is going to be the environmental
14 review that the NRC conducts as part of its evaluation
15 of an application that we received from the Entergy
16 Company to review the operating license for Vermont
17 Yankee and it's my pleasure to serve as your
18 facilitator tonight. And in that role, I'll try to
19 help everybody to have a productive meeting this
20 evening.
21 I just wanted to cover three items of
22 meeting process before we get to the substance of the
23 discussions. And one is the format for the meeting
24 tonight. Secondly, I'd like to talk about some very
25 simply ground rules and last, I'd just like to

1 introduce the two NRC speakers who will be giving you
2 some background information tonight.
3 In terms of the format for the meeting,
4 we're going to start out with a couple of brief NRC
5 presentations to give you some background on license
6 renewal at the NRC and on the environmental review,
7 specifically that part of license renewal so that you
8 know what we look at in deciding whether to grant a
9 renewal for any particular reactor and so that you
10 know how to get information about the process, the
11 schedule for the license renewal and how you can
12 participate.
13 We'll have time for a few questions on
14 process after those presentations, to make sure that
15 we've explained things clearly to you, but the most
16 important part of the meeting tonight is to hear from
17 all of you, to hear your views.
18 This particular meeting is called a
19 scoping meeting and very simply, that's to ask for
20 public comments, advice, recommendations on what the
21 scope of the draft environmental impact statement
22 should be. The NRC is going to prepare a draft
23 environmental impact statement and we'd like to know
24 what issues we should look at, what alternatives
25 should be considered as we develop the environmental

1 impact statement.

2 The staff will tell you about submitting

3 written comments. We're taking written comments as

4 well as meeting with you tonight, but we did want to

5 be here in person to talk with you.

6 Any comments you give tonight are going to

7 carry the same weight as any written comments that we

8 receive.

9 In terms of ground rules, they're very

10 simple. When you speak, please introduce yourself and

11 give us any affiliation, if that's appropriate. And

12 I would ask that only one person speak at a time.

13 Most importantly, so that we can give our full

14 attention to whomever has the floor at the moment, but

15 also so that we can get a clear transcript. We have

16 a court stenographer, Mr. Peter Holland, who is up

17 here. He's going to be recording all the comments

18 tonight. And that's going to be our record. It's

19 also going to be your record of what transpired here

20 tonight.

21 I would also ask you to try to be brief,

22 so that we can have an opportunity for everybody who

23 wants to talk to speak tonight and I'm asking you to

24 follow a five-minute guideline. When you come up here

25 to give us your comments and I'll ask you to

1 summarize, as we get close to the five-minute
2 guideline.
3 And I found that five minutes is usually
4 enough for someone to summarize their major points for
5 us and you can elaborate, if you want to with
6 detailed, written comments that you submit to us, but
7 even though it's only five minutes, it does two
8 important things. One, it alerts the NRC staff to
9 what they should begin looking at immediately, even to
10 exploring that in more detail with you after the
11 meeting. And secondly, it alerts everybody else in
12 the audience to what concerns people might have about
13 the license renewal.
14 And finally, I would just, as usual for
15 any meeting, is to just display courtesy to those that
16 might have different opinions from you tonight. And
17 I want to introduce the NRC speakers this evening and
18 we're going to Mr. Eric Benner who is right here.
19 Eric is the Chief of the Technical Review Branch
20 within the License Renewal Program. And Eric and his
21 staff, they are responsible for looking at the
22 technical review issues in the environmental impact
23 statement.
24 And just to give you some background on
25 Eric, he's been with the Agency for about 15 years.

1 He's been a reactor inspector in one of the NRC
2 regions. He's also been on the staff of the
3 individual Commissioners who make up the Nuclear
4 Regulatory Commission and has been an advisor to the
5 NRC and the United States in terms of the development
6 of the international convention, the Treaty on Nuclear
7 Safety. He has a Bachelor's in nuclear engineering
8 from Rensselaer Polytechnic Institute and he has a
9 Master's in environmental engineering, I believe, from
10 Johns Hopkins University.
11 Eric will be giving you an overview of
12 license renewal and then when Eric is done, we're
13 going to turn to Mr. Rich Emch who is right here.
14 He's the project manager for the environmental review
15 on Vermont Yankee. And he'll be providing some of his
16 detailed contact information to you in a few minutes.
17 But Rich has been with the Agency for over 30 years
18 with the Nuclear Regulatory Commission. He's been
19 involved in all aspects of reactor regulation,
20 focusing on radiological protection and safety and his
21 academic background is a Bachelor's in physics from
22 Louisiana Tech University, and a Master's in health
23 physics from the Georgia Institute of Technology.
24 And with that, I would just thank you all
25 for being here with us tonight and I'll turn it over

1 to Eric.

2 MR. BENNER: Thank you, Chip. I'd like to

3 begin by thanking all of you for taking the time to

4 come out and talk to us tonight. I hope the

5 information we provide will help you understand the

6 NRC's license renewal process and your role in

7 ensuring that our environmental impact statement that

8 we prepare for the Vermont Yankee license renewal is

9 accurate and complete.

10 Next slide, please.

11 (Slide change.)

12 MR. CAMERON: I think you need to raise it

13 and --

14 MR. BENNER: Can everyone hear? Okay.

15 No?

16 MR. CAMERON: Well, say something and then

17 we'll be able to tell.

18 MR. BENNER: Can everyone hear now? Okay,

19 I see heads nodding in the back, so I'm going to take

20 that as affirmative.

21 We have several purposes for tonight's

22 meeting and this is going to reiterate some of what

23 Chip said. First, is background. We'll discuss the

24 NRC's mission and process for renewal of nuclear power

25 plant licenses with particular emphasis on our

1 environmental review process, including the typical
2 areas we look at in the environmental review and the
3 schedule for the Vermont Yankee review.
4 Well, I'm sure that many of you are
5 familiar with the NRC's mission and some of our
6 processes. I'll ask you to be patient with me as we
7 go through this for the people who are not familiar
8 with these processes.
9 At the conclusion of the presentations,
10 we'll have some time, as Chip said, for questions
11 about the process. After the question and answer
12 portion is complete, then we'll move into what we
13 consider one of the more important purposes of the
14 meeting and that is to receive any comments that you
15 may have on the breadth and depth, commonly called the
16 scope of our environmental review. I'd ask you to
17 hold your comments until that time because for
18 purposes of the transcription, it's easier to have the
19 presentation portion, the Q & A portion and then the
20 comment portion all discrete.
21 Additionally, we'll also give you some
22 information about how you can submit comments outside
23 of this meeting.
24 Next slide, please.
25 (Slide change.)

1 MR. BENNER: Before I discuss the license
2 renewal process, I'd like to take a minute to talk
3 about the NRC in terms of what we do and what our
4 mission is.
5 The Atomic Energy Act is the legislation
6 that authorizes the NRC to, among other things, issue
7 operating licenses for nuclear power plants. The
8 Atomic Energy Act allows for 40-year license for power
9 plants. This 40-year term is not based on safety
10 limitations, but is instead based primarily on
11 economic considerations and anti-trust factors.
12 The Atomic Energy Act also authorizes the
13 NRC to regulate the civilian use of nuclear materials
14 in the United States. In exercising that authority,
15 the NRC's mission is three-fold: to ensure adequate
16 protection of public health and safety; to promote the
17 common defense and security; and to protect the
18 environment.
19 The NRC accomplishes this mission through
20 a combination of regulatory processes such as
21 conducting inspections to verify compliance with our
22 regulations; evaluating operating experience from
23 power plants domestically and internationally; and
24 issuing enforcement actions when licensees are found
25 to be not in compliance.

1 The regulations that the NRC enforces are
2 contained in Title 10 of the Code of Federal
3 Regulations which is commonly referred to as 10 CFR.
4 Next slide, please.
5 (Slide change.)
6 MR. BENNER: As I have mentioned, the
7 Atomic Energy Act provides for a 40-year license term
8 for nuclear power plants. The NRC's regulations also
9 include provisions to allow for an extension of the
10 license for up to an additional 20 years. For Vermont
11 Yankee, the current operating license will expire on
12 March 21, 2012. The licensee for Vermont Yankee,
13 Entergy, has requested license renewal for the plant.
14 As part of the NRC's review of the license
15 renewal application, we'll perform an environmental
16 review to look at the potential impacts of the
17 environment associated with an additional 20 years of
18 operation. As I stated earlier, the purpose of this
19 meeting is to give you information about this process
20 and to seek your input as to what issues we conduct in
21 our environmental review.
22 Next slide, please.
23 (Slide change.)
24 MR. BENNER: The NRC's license renewal
25 review involves two parts: an environmental review

1 and a safety review. This slide really gives a big
2 picture overview of the license renewal review process
3 which involves these two parallel paths. I'm going to
4 briefly describe these two review processes, starting
5 with the safety review.
6 Next slide.
7 (Slide change.)
8 MR. BENNER: Two guiding principles form
9 the basis of the NRC's approach in performing its
10 safety review. The first principle is that the
11 current regulatory process is adequate to ensure that
12 the licensing basis of all currently operating plants
13 provides and maintains an acceptable level of safety
14 with the possible exception of the effects of aging on
15 certain structure's systems and components.
16 The second principle is that the current
17 plant specific licensing basis must be maintained
18 during the renewal term in the same manner and to the
19 same extent as during the original license term.
20 Next slide.
21 (Slide change.)
22 MR. BENNER: The safety review for license
23 renewal focuses on aging management of systems,
24 structures and components that are important to safety
25 as determined by the license renewal scoping criteria

1 contained in 10 CFR Part 54. The license renewal
2 safety review does not assess current operational
3 issues such as security, emergency planning and safety
4 performance. The NRC monitors and provides regulatory
5 oversight of these issues on an on-going basis, under
6 the current operating license. Because the NRC is
7 addressing these current operating issues on an
8 continuing basis, we do not re-evaluate them during
9 license renewal.
10 Next slide, please.
11 (Slide change.)
12 MR. BENNER: As I mentioned, the license
13 renewal safety review focuses on plant aging and the
14 programs that the licensee has already implemented or
15 will implement to manage the effects of aging. Let me
16 introduce Mr. Johnny Eads. Johnny is the safety
17 project manager and he's in charge of the safety
18 review.
19 The safety review involves the NRC staff's
20 evaluation of technical information that's contained
21 in the license renewal application. This is referred
22 to as a safety evaluation. The NRC staff also
23 conducts audits as part of the evaluation, and there's
24 a team of about 30 NRC technical reviewers and
25 contractors who are conducting the safety evaluation

1 at this time.

2 The safety review also includes plant

3 inspections. The inspections are conducted by a team

4 of inspectors from both headquarters and NRC's Region

5 1 office in King of Prussia, Pennsylvania. A

6 representative from our Inspection Program is here

7 today, Senior Resident Inspector Dave Pelton. And the

8 Resident Inspector lives in this area, works at the

9 plant 40 hours a week conducting independent

10 inspections of the licensee's activities to ensure

11 compliance. The result of inspections are documented

12 in separate inspection reports.

13 The staff documents the results of its

14 review and safety evaluation report. That report is

15 then independently reviewed by the Advisory Committee

16 on Reactor Safeguards or ACRS. The ACRS is a group of

17 nationally-recognized technical experts that serve as

18 a consulting body to the Commission. They review each

19 license renewal application and safety evaluation

20 report, form their own conclusions and recommendations

21 on the requested action and report those conclusions

22 and recommendations directly to the Commission.

23 Next slide, please.

24 (Slide change.)

25

1 MR. BENNER: This slide illustrates how these
2 various activities make up the safety review process.
3 I'd like to point out that the hexagons on the slide,
4 the yellow hexagons, indicate opportunities for public
5 participation. Also, the staff will present the
6 results of its safety review to the ACRS and that
7 presentation will be open to the public.
8 Next slide, please.
9 (Slide change.)
10 MR. BENNER: The second part of the review
11 process involves an environmental review with scoping
12 activities and the development of an environmental
13 impact statement. As I've said, we are here today to
14 receive your comments on the scope of that review.
15 We'll consider any comments on the scope that we
16 receive at this meeting or any written comments. Then
17 in December, we expect to issue a draft environmental
18 impact statement for comment.
19 Next slide, please.
20 (Slide change.)
21 MR. BENNER: So the final Agency decision on
22 whether or not to issue a renewed operating licenses
23 depends on several inputs, inspection reports, and an
24 associated confirmatory letter from the Region 1
25 Regional Administrator, conclusions and

1 recommendations of the ACRS which are documented in a
2 letter to the Commission, the Safety Evaluation Report
3 which documents the result of the staff's safety
4 review, and the final environmental impact statement,
5 which documents the results of the environmental
6 review.
7 Again, the yellow hexagons on the slide
8 indicate opportunities for public participation. An
9 early opportunity is during the scoping meeting today.
10 The meeting on the draft EIS is another opportunity.
11 The opportunity to request a hearing ended on May 27
12 of this year, and three petitions were proffered
13 containing about 10 separate issues. As I mentioned,
14 the ACRS meetings also are open to the public.
15 Now I will turn it over to Richard Emch,
16 who will discuss the environmental review in more
17 detail.
18 MR. EMCH: I'm Rich Emch. I'm the
19 Environmental Project Manager for the Nuclear
20 Regulatory Commission for the Environmental Review of
21 the license renewal application for Vermont Yankee.
22 Next slide, please.
23 (Slide change.)
24 MR. EMCH: We conduct this review under
25 the guidelines of the National Environmental Policy

1 Act of 1969. NEPA requires that Federal agencies use
2 a systematic approach to consider environmental
3 impacts. They also require that an environmental
4 impact statement be prepared anytime there is a major
5 Federal action which has the potential to
6 significantly affect the quality of the human
7 environment.
8 The Commission decided that we would issue
9 an environmental statement for any license renewal
10 projects. In 1996 and revised in 1999, the Commission
11 prepared a generic environmental impact statement that
12 looked at the 92 aspects of environmental impact for
13 the 103 operating reactors in the United States. This
14 generic environmental impact statement was for license
15 renewals specifically.
16 Next slide, please.
17 (Slide change.)
18 MR. EMCH: I mentioned that there were 92
19 issues that were evaluated in that generic
20 environmental impact statement. Approximately 69 of
21 those issues were labeled as what we call Category 1
22 issues which means that we concluded that the impact
23 was essentially the same at all power plants in the
24 United States and that it was small. For the other
25 issues, the decision was made that there was enough

1 variability in the impacts of those areas from power
2 plant to power plant that we needed to do a plant
3 specific analysis of those aspects of the
4 environmental impact.
5 Going back again for the Category 1
6 issues, in addition to the plant specific reviews, we
7 do it for the Category 2 issues. For Category 1 are
8 the ones where we made the generic conclusion. We do
9 what's called a search for new and significant
10 information. What that means is we're looking for any
11 information, we will look for any information
12 affecting that particular plant that would cause us to
13 want to decide whether or not, or cause us to think
14 that there might be some challenge to that generic
15 conclusion.
16 If we find such new and significant
17 information after evaluating, then we come to the
18 conclusion that it is new and significant, and then it
19 does challenge the conclusion, then we need to do a
20 plant specific review for that issue for that plant.
21 That's that first yellow arrow on my right-hand side
22 there.
23 For the issues that are in Category 2
24 issues, we do conduct a plant specific review. All
25 that goes into this generic, all this goes into what

1 we call a supplement to the generic environmental
2 impact statement. It's a plant-specific supplement
3 for each plant, in this case, Vermont Yankee.
4 Next slide, please.
5 (Slide change.)
6 MR. EMCH: The purpose of all this review
7 is against this decision standard. In simple
8 language, to me, this decision standard says what
9 we're trying to do is determine whether it is
10 acceptable, whether the environmental impact of an
11 additional 20 years of operation of the plant is
12 acceptable.
13 Next slide, please.
14 (Slide change.)
15 MR. EMCH: Now that we talked about what
16 we're going to do, let's talk about the schedule. As
17 you can see from -- I'm not going to read the entire
18 schedule, but let me just hit a few of the high
19 points.
20 The first high point I'm going to hit is
21 tonight, this scoping meeting. In the parlance of
22 NEPA, this is a scoping meeting. In other words, this
23 is where we come talk to the public, the people who
24 live and work near this plant and ask you if you have
25 any information about issues or if you have

1 information that you want us to be specifically aware
2 of as part of our review of this plant.
3 We already know we're going to be looking
4 at the 92 Category 1 and 2 issues, but it's possible
5 that you might have some issue that we need to know
6 about or you might have some information that we need
7 to know about.
8 On June 23 is when the end of the scoping
9 period occurs. There are a number of ways to do -- to
10 give us comments. One is by speaking tonight. You
11 can send it in by email. You can write them by
12 letter. We'll talk a little bit more about that at
13 the end of my presentation.
14 The next big events are the public
15 meeting. After we take your scoping comments and all
16 the other information that we find as part of our
17 review, we will develop a draft environmental impact
18 statement and we will send that draft environmental
19 impact statement out with preliminary conclusions.
20 We'll send it out to the public for review. When you
21 signed up tonight, we asked you to sign up on a yellow
22 or blue card. If you put your address on either one
23 of those cards, we'll send you a copy of that draft
24 environmental impact statement when we develop it.
25 Then we'll come back in January, probably

1 at this same theater for another meeting where we will
2 ask you, give you the opportunity to give us comments
3 about that draft environmental impact statement. You
4 can tell us what you like, what you don't like, what
5 you wished we had changed, what you think we missed.
6 And then finally, and the comment period
7 will run into March and then in the end we'll issue a
8 final environmental impact statement in August of
9 2007.
10 Next slide, please.
11 (Slide change.)
12 MR. EMCH: This depicts all the various
13 areas where we gather information. The first area of
14 information -- place where we get information is from
15 the licensee's application. The licensee includes an
16 environmental report in the application that they send
17 in for license renewal. That environmental report
18 does a couple of things. First, it includes plant-
19 specific analyses for the Category 2 issues. The
20 other thing it does is it includes licensee's
21 description of the extent that they went to try to
22 find new and significant information that might affect
23 the Category 1 issues.
24 We also have our staff audit. I have a
25 team of people from the Nuclear Regulatory Commission.

1 I also have a team of various environmental science
2 experts from the Argonne National Laboratory, led by
3 Mr. Dave Miller.
4 Together, we do on-site audit activities.
5 We've done some. We'll be doing additional ones where
6 we look at the site. We look at the site environs.
7 We go out and talk to various government agencies. We
8 consult with them about information that we need in
9 order to carry out our review. That kind of moves
10 down to the next box. We talk to the Agency for
11 Natural Resources here in Vermont. We talk to the
12 people, the Historic Preservation Officer. We talk to
13 the State Health people. Talk to a wide range of
14 Federal agencies such as Fish and Wildlife Service,
15 NOAA Fisheries Service and gather all the information
16 that we need to do the review.
17 We also talk to -- what we call permitting
18 authorities. In the State of Vermont, EPA has
19 delegated the responsibility for issuance of what we
20 call a national pollutant discharge elimination system
21 permit and that's been delegated to the State of
22 Vermont and we talk with the officials in the State of
23 Vermont who are responsible for issuing that permit to
24 make sure we understand what's going on there.
25 We also will talk with social services in

1 the State or in the community near the plant. And
2 finally, what we're here for tonight, as I mentioned
3 before, is to get comments from you folks about the
4 issues that we need to look at and information that
5 you believe we need to look at as part of our review.
6 Next slide, please.
7 (Slide change.)
8 MR. EMCH: This picture depicts in a broad
9 sense the areas that we look at as part of the review.
10 You'll see terrestrial and aquatic ecology there.
11 You'll see water quality, air quality, socio-
12 economics, environmental justice, radiation
13 protection, and looking at archeological and cultural
14 resources -- I believe I covered all of them.
15 That's a kind of a broad view of the things that
16 we do as part of our review.
17 Next slide, please.
18 (Slide change.)
19 MR. EMCH: This is some additional
20 information about how to contact us or to get more
21 information about the review. As I said, my name is
22 Rich Emch. There's the phone number up there that you
23 can contact me at. Four libraries in the local area
24 have agreed to make the documents involved in the
25 review available. This is the licensee's application.

1 The draft environmental impact statement, when we
2 issue it, those can be found at these libraries: the
3 Vernon Free Library in Vernon, Vermont; the Brooks
4 Memorial Library here in Brattleboro; the Hinsdale and
5 the Dickinson Memorial Library in Northfield,
6 Massachusetts. You can also find these documents on
7 the web at the web address that's up there.
8 Let's talk again about how to submit
9 comments. First and foremost, of course, you can give
10 us comments by making a presentation here tonight.
11 You can also send them to us by mail at the address
12 that's up there. You can email them to us. The email
13 address that's been set up specifically for that
14 purpose is VermontYankeeEIS@nrc.gov and then if you
15 wish, you can deliver them to us in person in
16 Rockville, Maryland.
17 Again, the scoping comments, we need to
18 receive them by June 23rd or they need to be
19 postmarked by June 23rd. If they are, I assure you we
20 will consider them. If they come in after that, we'll
21 consider them to the extent that we have time to do
22 so.
23 With that, I'm finished with my
24 presentation.
25 Chip, are you ready to take some

1 questions?

2 MR. CAMERON: Yes, thanks, Rich. And

3 thanks, Eric.

4 Unfortunately, we don't have a lot of time

5 for questions, but if there are a few that we could

6 address at this point, we'll be glad to do so and the

7 staff will be here after the meeting to talk to you,

8 if we don't get to your questions.

9 Let's go right here and please, just

10 introduce yourself to us.

11 MS. MILLER: Yes, I'm Sunny Miller. I

12 live and work at Trap Rock Peace Center in Deerfield,

13 Massachusetts.

14 I'd like to ask why at the nrc.gov website

15 I can't select Vermont Yankee and get simply all the

16 reports for this reactor separate from the myriad

17 collection of reports at all reactors? I find it very

18 difficult to isolate the information that I'm looking

19 for. It takes me hours and hours to look at what's

20 there and I can't select easily what I want to find.

21 MR. CAMERON: Thank you, Sunny.

22 MR. EMCH: If you go to the website and

23 select Vermont Yankee under license renewal you can

24 find fairly simply a number of the documents, but if

25 you're talking about -- I'm not sure what range of

1 documents you're talking about.

2 MS. MILLER: I'm specifically interested

3 in emissions, in mishaps, in irregularities of all

4 kinds and that is blended into -- it looks like it's

5 blended into the entire national history of thousands

6 of mishaps and problems nationwide.

7 MR. EMCH: Yes, I understand what you're

8 talking about, ma'am. In fact, I understand it can be

9 difficult. I don't really have a good answer for

10 that. We can take your name and number and I can get

11 in touch with you and I can try to help lead you to

12 some of those documents, but -- do you have something

13 to add?

14 MR. EADS: Yes, like you, I face that same

15 challenge. If you'll end your search on ADAMS,

16 there's a place where you put in a docket number. If

17 you'll insert the number 05000271, that docket number,

18 that is the docket number for Vermont Yankee and it

19 will only pull up those documents related to Vermont

20 Yankee.

21 You can then do a key word search and find

22 those items particular to VY that you'd like to see.

23 You can also specify a day range.

24 MR. CAMERON: And Johnny, are there --

25 when you talk about key words for Sunny's search and

1 you heard the types of things that she's interested
2 in, are there particular terms of art that the NRC
3 uses that cover things like that?
4 MR. EMCH: Yes. As a matter of fact,
5 thank you, Johnny, for that. Yes, as a matter of
6 fact, when I'm doing searches like the ones you're
7 talking about, ma'am, one key word that I often use is
8 effluent and another key word that I often use is
9 environmental. Those will usually pull up their
10 effluent reports and those will usually pull up their
11 environmental -- radiological environmental monitoring
12 reports.
13 MR. CAMERON: Great, thank you for that.
14 Yes, sir?
15 MR. NORD: You mentioned a couple of
16 minutes ago that you anticipate that the generic
17 environmental impact statement is going to show small
18 effects. And so my question is directed at those
19 small effects. In light of the recent publication of
20 the National Academies of Science BEIR VII report,
21 Biological Effectives of Ionizing Radiation which has
22 finally shown something that many people have
23 suspected for decades which is that there is no
24 threshold below which radiation doses are safe. So I
25 want to know how the NRC has taken this new finding of

1 BEIR VII from our own national academies into account
2 in their assessment? That's one half of the question.
3 The other half is I've always thought that
4 environmental impact statements relating to specific
5 sites would have to be specific and so why is it that
6 we're talking about generic environmental impact
7 statements?
8 MR. CAMERON: This is Chris, right? Chris
9 Nord, okay.
10 Rich, can you answer the question?
11 MR. EMCH: Right. I want to answer in
12 reverse order, if that's all right with you. The
13 first one which -- or the second one rather was why
14 generic, right. Okay.
15 When we say Category 1 issue, that means
16 that we've already examined it for all the plants and
17 we've determined it's small and it's the same for all
18 plants. An example of an issue that is considered a
19 Category 1 issue is, indeed, exposure to the public of
20 radiation. The reason it's considered to be a
21 Category 1 issue and to have a small impact is because
22 the NRC, the EPA issue radiation standards for the
23 public and the plants follow those standards, stay
24 within those standards and therefore our conclusion is
25 that if they're within those standards, that the

1 impact is small.

2 Now let's move to the other part of your

3 question. Actually, that particular aspect of BEIR

4 VII wasn't entirely new and actually BEIR I, BEIR III,

5 BEIR V and BEIR VII all talk about similar issues and

6 from the very beginning, the BEIRs have always said

7 and all the international agencies and indeed the NRC

8 has always taken the approach that there is some

9 health risk associated with any amount of radiation

10 exposure.

11 Excuse me, sir, I'm talking. There is

12 some health risk associated with any amount of

13 radiation exposure. Now BEIR also talked about how

14 small that risk is for very small doses, but basically

15 in that respect BEIR VII, it's not new. We have known

16 that for some time. We have used that theory for some

17 time.

18 MR. CAMERON: Okay, thank you, Rich.

19 Let's go to Evan and please introduce yourself.

20 MR. MULHOLLAND: My name is Evan

21 Mulholland. I have a question about the slide

22 decision standard for environmental review. You

23 mentioned that standard and my question is can you

24 give us some examples of what environmental impacts

25 might be unacceptable so that it would result in a

1 non-issuance of the new license? What types of
2 impacts might cause that decision to happen?
3 Thank you.
4 MR. EMCH: It's fairly difficult for me to
5 answer that because we haven't run into it yet, but we
6 use the standards or the descriptors, if you will,
7 from NEPA which is small, moderate and large. If one
8 -- if we were to find a large impact, that would
9 certainly -- we would certainly be in a category where
10 we'd have to give serious consideration to whether
11 that was acceptable or not.
12 Now there are other ways of dealing with
13 it. There are mitigating measures and things like
14 that, but if we ran into that, we would be in that
15 kind of a range.
16 I will mention that in all the 42 that we
17 have finished up to date, the impacts were all small
18 with the exception of the impact of entrainment on the
19 winter flounder fishery at the Millstone Plant in
20 Connecticut which was a moderate.
21 MR. CAMERON: Okay, thank you, Rich. I
22 think Gary has a question over here. Your question,
23 Gary?
24 MR. SACHS: The question is what is the
25 basis the NRC uses to determine radiation exposure?

1 MR. EMCH: That's a pretty broad subject.
2 I'm going to kind of put that together with the
3 question that you asked when you were here earlier
4 today.
5 Basically, the NRC uses not only standards
6 from EPA. We look at broad range of standards that
7 have been published. ICRP, you mentioned that earlier
8 today, International -- I'm never quite sure exactly
9 -- International Committee on Radiation Protection, I
10 think it is. There's also the NCRP, National
11 Committee on Radiation Measurements and Protection.
12 There's the BEIR report. There's a fairly
13 wide range in number of the National Academy of
14 Sciences, etcetera and after we look at all of those,
15 the NRC uses information from all of those to base the
16 radiation standards. In the case of EPA, the overall
17 standard from EPA is 25 millirem per year to any
18 member of the public from the entire fuel cycle,
19 including reactors.
20 MR. SACHS: The follow-up question would
21 be given BEIR VII, BEIR I, III, V and VII, all of
22 which say that any radiation is damaging to the
23 public, how can you as officers, so to speak, of the
24 public good, expect us to say oh, sure, fine, extend
25 the license for 20 more years, keeping putting out

1 radiation? It is damaging to the public.

2 MR. EMCH: You said "damaging". I said

3 there is some health risk from any amount of radiation

4 exposure. As I said, BEIR VII also talked about the

5 very, very low risk at very low doses at the kinds of

6 doses that we're talking about for public exposure

7 here.

8 MR. CAMERON: We don't have time for an

9 extended dialogue, but to the extent that we're saying

10 things here, let's make sure we get it on the record,

11 and Gary, you said?

12 MR. SACHS: You mean hurting us a little

13 bit. Thank you, sir.

14 MR. EMCH: I mean there is a certain

15 level, small though it may be, of risk associated with

16 any radiation exposure at the levels that we are

17 talking about. The levels that the NRC has defined

18 for nuclear power plants, we regard those doses as

19 being relatively safe for humans.

20 MR. CAMERON: Rich, can you just -- it's

21 not just the NRC in terms of -- I mean there's the

22 EPA. Can you just talk a little bit about other

23 Federal agencies?

24 MR. EMCH: Chip, we just went through the

25 whole thing. I said there's an EPA standard. There's

1 an ICRP --

2 MR. CAMERON: All right.

3 MR. EMCH: BEIR.

4 MR. CAMERON: Okay. Let's go right here

5 for a question. Yes, ma'am. And please introduce

6 yourself.

7 MS. MURPHY: My name is Karen Murphy. I

8 have a question. The 9th Circuit Court of Appeals

9 just made a ruling in California and it said that the

10 NRC must consider the consequences of acts of

11 terrorism and all licensing proceedings as part of the

12 environmental impact statement under NEPA. So will

13 you be doing that for VY?

14 MR. BENNER: As you indicate, that's a

15 very recent decision and there is an appeal and review

16 process associated with that decision. Right now, the

17 NRC lawyers are reviewing that decision to see whether

18 or not we would make any appeal attempts, but I would

19 say that there will be some movement on that decision,

20 either implemented or appealed well before the draft

21 environmental impact statement would be published for

22 Vermont Yankee.

23 MR. CAMERON: I guess it should be noted

24 that that decision did concern the consideration of

25 terrorism in the environment assessment and it should

1 be clear to people that does not mean that the NRC was
2 not considering terrorism as part of its safety
3 review.
4 Yes, sir?
5 MR. DOSTIS: I'm the waffle man. My
6 question is about background radiation. Do we have a
7 baseline that we can compare background radiation as
8 currently happening on the planet to, a baseline
9 perhaps 10, 20 years ago and to note what our
10 background radiation levels are now? That's my first
11 question.
12 Second question, it's known that ionizing
13 radiation occurs through solar, occurs through rocks,
14 through -- occurs TV and computers. Do you think that
15 sitting in front of your screen, your computer screen
16 is as safe or safer than being in a nuclear power
17 plant?
18 MR. EMCH: Let's do the first part of it
19 first and I'll get to the second part of it. The
20 first part of it is, not exactly sure what it was all,
21 but I'll try to hit some -- and you'll let me know if
22 I don't get it, okay. I think I got it. I'll try it.
23 If I miss something, you let me know.
24 Currently, what we saw and there's a chart
25 out in the hallway that talks about this,

1 approximately, everybody as a member of planet earth
2 gets about 360 millirem per year of background
3 radiation. Now that includes cosmic radiation which
4 you mentioned. It includes radiation from naturally
5 occurring radionuclides in the crust of the earth such
6 as granite and building materials. It includes
7 radionuclides that are in your body as a course of
8 nature. It includes medical x-rays, things like that
9 and usually included in that 360 we have the line that
10 says "less than one millirem per year from the nuclear
11 fuel cycle".
12 So that's -- approximately 360 that
13 includes radon in your homes, that sort of thing.
14 There's a wide range of sources of radiation.
15 Now I don't know -- I don't recall reading
16 anything that that number has gone up in the last 20
17 to 25 years what you were asking earlier. What I can
18 tell you though as far as a background, before Vermont
19 Yankee ever started operation, they did a pre-
20 operational radiological environmental monitoring
21 program for I think it was approximately three years
22 to establish what the background levels of radiation
23 were in the same areas they were going to be taking
24 measurements during operation.
25 So they established their background, yes.

1 There's a baseline around the plant to the
2 extent that they had monitoring stations in
3 Brattleboro, yes.
4 MR. CAMERON: Okay.
5 MR. EMCH: Pardon?
6 MR. CAMERON: We've got to get this on the
7 record, so -- and it is the waffle man, right?
8 MR. DOSTIS: Yes.
9 MR. CAMERON: Can you just ask that and
10 then we're going to take two more questions and we're
11 going to go the public comment.
12 Yes sir.
13 MR. DOSTIS: Okay, you have a baseline
14 that was formed 33 years ago, I would say. Has that
15 been updated to recent times?
16 MR. EMCH: Okay, well, at the locations
17 right at the plant, it's obviously very difficult to
18 do that because the plant is now operating, but as
19 part of their environmental monitoring program, they
20 do still have what they call control stations, what we
21 refer to as control stations. They have indicator
22 stations that are very close to the plant, control
23 stations that are a sizeable distance from the plant.
24 The assumption is that those control stations at a
25 sizeable distance from the plant, where they're taking

1 measurements, that there is absolutely no influence
2 from the plant on those, so you can watch for
3 variations in natural background which there are
4 variations. You can look for variations in natural
5 background that way, sir.
6 MR. CAMERON: Okay, thank you. We're
7 going to take this gentleman and then this lady down
8 here and then I think other questions are going to
9 have to wait until after the meeting.
10 Yes sir. Please introduce yourself.
11 MR. JEFFRIES: Thank you. My name is Dan
12 Jeffries. I'm an engineer at the Vermont Yankee
13 nuclear power plant. The question relates to this
14 matter of personnel exposure to ionizing radiation.
15 We have about 100 nuclear power plants in the country
16 and roughly with retirements, I'm just going to make
17 an estimate that maybe we've had a thousand people
18 work at those nuclear power plants. So we've got
19 about 100,000 people who have been working at nuclear
20 power plants for about the last 30 years. Does the
21 NRC or does any agency that you're aware of evaluate
22 the health condition of those 100,000 employees in
23 regard to any adverse effects on their health as a
24 result of their having worked at these nuclear power
25 plants for all this time?

1 MR. CAMERON: Thank you, Dan.

2 Rich?

3 MR. EMCH: There have been some studies.

4 There was one completed fairly recently that was

5 published in the British Medical Journal, I believe it

6 was. It was a study of -- with using records of

7 occupational exposure, plant workers, etcetera, for 15

8 nations. It was led by a Dr. Cardis, C-A-R-D-I-S.

9 The NRC is still evaluating it, but I think, in

10 general, what it showed was that by and large, no,

11 there was no excess cancers amongst that group.

12 MR. CAMERON: Okay, thank you. Yes ma'am.

13 MS. KELNER: I have a question. The woman

14 back here said that there was a decision to take into

15 account terrorist threats to nuclear plants and the

16 response that you gave immediately was the NRC is

17 thinking of appealing it and I'm wondering why that

18 would be the first response to something like that

19 instead of wow, we better take this more seriously or

20 what are the valid points in that?

21 So I'm a little concerned with that

22 initial response. I'm wondering why.

23 MR. BENNER: Like Chip said, the Court's

24 ruling was not directed at whether or not the NRC was

25 doing a good job at assessing terrorism at nuclear

1 power plants. The Court's decision was specific to
2 does the NRC need to talk about the environmental
3 impacts of terrorism in our environmental -- in that
4 case it was environmental assessment. For this
5 activity, it would be for the environmental impact
6 statement.
7 Now going into that decision, the NRC had
8 arguments of why it felt that terrorism did not need
9 to be considered in the environmental impact
10 statement. So certainly we are going to do whatever
11 the Courts instruct us to do, but we need to look at,
12 we need to go through the ruling of the Court to see
13 if there was a misunderstanding, we didn't convey what
14 we intended to convey or whether there's something we
15 can learn from it.
16 MR. CAMERON: That's right, but let me try
17 -- your name is?
18 MS. KELNER: Marian Kelner.
19 MR. CAMERON: Marian, can I just try to
20 answer your question?
21 MS. KELNER: Why do you think terrorism
22 shouldn't be part of the environmental impact
23 statement?
24 MR. CAMERON: That wasn't your first
25 question. You were upset about the fact that why

1 should the NRC think about appealing this. And with
2 any agency that gets a negative ruling on something
3 from Federal Court, one of the things that the agency
4 has to do and in concert with the Department of
5 Justice is just to consider that option. So that's
6 just sort of a matter of course. It doesn't mean that
7 because the NRC, the Commission is considering that
8 that the NRC thinks that terrorism shouldn't be part
9 of the licensing review. And we do have one of our
10 members of the General Counsel here who can talk to
11 you a little bit more about that after the meeting.
12 Steven Hamrick.
13 If you could explore that further with
14 her, Steve.
15 I think we need to go to public comment.
16 We've got a lot of speakers which is good, but we want
17 to make sure we hear from all of you and I'm going to
18 just list the first few speakers so that you know when
19 to expect to speak and I guess I'm just going to ask
20 you all to try to be as brief as possible so we can
21 get everybody on.
22 But our first speaker is former Governor
23 of Vermont, Governor Thomas P. Salmon, who we're going
24 to ask to speak and then we're going to go to Debbie
25 Katz and Sunny Miller.

1 So Governor?

2 And we're going to ask everybody to come

3 up here and use the podium. Thank you.

4 GOV. SALMON: Thank you, Mr. Cameron,

5 ladies and gentlemen. My name is Thomas P. Salmon.

6 I've lived in this county for 47 years. I was

7 privileged to serve as Governor of Vermont for two

8 terms in the 1970s. More recently, for much of the

9 1990s, I served as president of the University of

10 Vermont. I currently am a member of the Vermont

11 Energy Partnership which is represented here this

12 evening here.

13 Let me try to be mercifully brief, if I

14 may. It was my understanding that the environmental

15 considerations were the primary focus of this meeting

16 and I've tried to structure my brief remarks on

17 environmental concerns. First among equals is that

18 since 1972, when the Vernon plant came online, the

19 State of Vermont has avoided some 100 million metric

20 tons of fossil fuel pollution and that's not an

21 inconsequential environmental effect of life,

22 particularly given the realities of potential

23 replacement power later in this century with the

24 candidates principally being natural gas and coal,

25 both of which cause gaseous greenhouse emissions into

1 the environment.

2 Point two is the fact that we're in the

3 midst of a global warming debate in this country. And

4 in my view, decisions ultimately made by regulatory

5 bodies such as the NRC must factor in the realities of

6 global warming and the clear and present danger

7 suggested by unnecessary and unwanted ingestions of

8 improper pollution into the Vermont and the

9 environment of the country.

10 Now I have an old-fashioned view, having

11 watched this plant grow, having been in the

12 legislature of Vermont when it was authorized many

13 years ago and that view is not likely accepted by all,

14 maybe viewed as heresy in some quarters, but it speaks

15 to the notion that this plant has been both safe and

16 environmentally friendly over these many years and in

17 that context in terms of its contribution or I should

18 say noncontribution to pollution in this state, has

19 helped make Vermont a cleaner place in which to live.

20 Now we're engaged in our state in a

21 conversation about energy as we speak and this meeting

22 tonight is an exceedingly important meeting on that

23 subject. Now there are some interesting participants

24 in this discussion and I'm aware of one. The Sharon

25 Academy up in Sharon, Vermont, senior class, this past

1 winter, put together an energy plan and they went up
2 to Montpelier and introduced the plan before the House
3 Natural Resources Committee. We had opportunity in
4 the Vermont Energy Partnership, myself and Amanda
5 Eiby, got to visit with the students and offer a
6 critique of their remarkable work, but what we learned
7 is this. These students in their analysis of
8 Vermont's energy future included that nuclear energy
9 is "clean, reliable, affordable and long lasting."
10 And in opting for renewal of the license issue before
11 us tonight and beyond, to describe the "cultural
12 negativity about nuclear power as unjustified." That
13 was the students' view in their words.
14 The point is this. People of all ages and
15 perspectives are entitled to participate in this
16 debate and maybe, just maybe, our kids might teach us
17 a lesson or two on this important subject.
18 Now this Commission will travel many miles
19 before it sleeps on these issues. You begin the
20 process here in Brattleboro tonight and I for one wish
21 you well in your profoundly important work.
22 (Applause.)
23 MR. CAMERON: Thank you, Governor Salmon.
24 And next, we're going to go to Deb Katz of Citizens
25 Awareness Network.

1 MS. KATZ: The NRC is here tonight to talk
2 about it's environmental impact study. Now you'd
3 think this is a no brainer, right? To store toxic
4 waste along the banks of the Connecticut River is
5 dangerous and vulnerable and to store more of this
6 waste would be even more dangerous and vulnerable for
7 another 20 years. And yet, that's exactly what
8 they're talking about doing.
9 And the waste confidence rule of the NRC
10 which at this point is a commitment that this waste is
11 going to move somewhere is basically bankrupt, giving
12 the legislative problems with getting waste anywhere.
13 And it's a no brainer, isn't it, to store
14 toxic waste, 35 million curies of cesium alone, 70
15 feet in the air, outside of containment. That seems
16 pretty dangerous and vulnerable as well, and yet, they
17 want to do more of this. And they don't have a
18 solution to what to do with the stuff they have now.
19 This all seems like a no brainer, but it
20 doesn't seem to be a no brainer to Entergy or the NRC.
21 They think all of this potentially makes a lot of
22 sense and in this post-9/11 world, this isn't just
23 dangerous, this is irresponsible and unconscionable.
24 And although the NRC continually says we can't talk
25 about terrorism, we can't talk about terrorism because

1 they're dealing with it every day.

2 The truth is the California Appellate

3 Court said we can and we must and they rejected NRC's

4 arguments that looking at a terrorist attack in terms

5 of licensing was too speculative, that it was looking

6 at a worse case scenario, that it was secrecy and so

7 we couldn't ever talk about it.

8 The truth is we better start talking about

9 it be cause if this reactor is here and it's a prime

10 target for terrorism, we're all affected by it and

11 even if it's not attacked by terrorism to have nuclear

12 waste that will be dangerous for 250,000 years stored

13 on this site for decades, if not hundreds of years is

14 something that should not be allowed. Without a

15 solution to the waste problem, there should be no

16 relicensing. And that should be it, cut and dry.

17 The truth is the 9th Circuit, in its

18 decision won't save us. It acknowledges our fears and

19 our concerns, but remember, the NRC is in the

20 permitting business. It believes in safe nuclear

21 power. We do not.

22 To create a sustainable energy future, we

23 can't just put ourselves in the hands of the NRC

24 although we want to thank New England Coalition, the

25 Massachusetts AG and the State of Vermont for, in

1 fact, intervening to hold Vermont Yankee and the NRC
2 accountable. It is the Vermont legislators that will
3 decide our future. They will decide what is best for
4 all of us and we must keep this process open and
5 honest.
6 In New York State, Congresswoman Nita
7 Lowey commissioned a study by the National Academy of
8 Sciences about whether Indian Point could be replaced,
9 the Indian Point reactors. And it, in fact, found
10 that Indian Point reactors could be replaced in the
11 State of New York. It wouldn't be easy, but it was
12 possible.
13 But why don't we have a National Academy
14 of Science study here? Why haven't our legislators
15 called for that so that we can have an independent
16 look at what it would take to replace Vermont Yankee,
17 not done by the NRC as part of their environmental
18 impact study which is set up to permit Vermont Yankee
19 to go ahead, not done just by the Public Service
20 Commission which has mixed loyalties in terms of this,
21 but a real independent study. It is the will that we
22 have to exert on our legislators to do what's right.
23 We need a clear vision at this point of a safe energy
24 future, a future that we know is safe for our
25 children.

1 I want to end with this notion of a
2 vision. We envision a future of safety, prosperity
3 and health for all. People generate their own
4 electricity in their own homes. Local energy
5 production is easy and accessible for all. We live in
6 a world where safety, prosperity and human health are
7 what we value above all and it is something that we
8 have to hold sacred for all of us, not relicensing
9 Vermont Yankee.
10 Thank you.
11 (Applause.)
12 MR. CAMERON: Thank you, Deb Katz. We're
13 going to go to Sunny Miller now. Then we're going to
14 go Mike Flory and Shawn Banfield.
15 Sunny?
16 MS. MILLER: Thank you, neighbors, for
17 coming. I note that the relatively sparse number of
18 people here. A large number of us, willing to come
19 out on a dreary night, but many others unwilling to
20 come and hear a charade because we don't believe that
21 this environmental review will adequately investigate
22 the details that need to be investigated.
23 First of all, a point of order. These are
24 plants. On the shores of the Connecticut River, we
25 have a nuclear power station and if our friends in

1 Washington aren't willing to notice that plants are
2 green, we, in Vermont, New Hampshire and Massachusetts
3 are going to revise our language and quit calling the
4 nuclear power station a plant, because it's a
5 euphemism that obscures the reality.
6 Smell them. They are sweet.
7 Secondly, radiation monitoring is now
8 inadequate and will be inadequate. In Western
9 Massachusetts, the Department of Health is doing no
10 radiological monitoring. When I called them and asked
11 how long would it take to find out my levels in
12 Deerfield, they said well, one to two hours. But of
13 course, that's a theoretical possibility. If the call
14 comes in the middle of the night, will the response be
15 prompt? If there's uncertainty about whether the
16 person who called was a little daft, will the response
17 be prompt? It will not be adequate because government
18 likes for us to remain calm. Government likes for us
19 to conspire with the illusion that everything is under
20 control.
21 And we tolerate and are polite to listen
22 and to consider things together, but there will come
23 a time when the process is failing, that the people
24 arise and insist as they did on Cochibamba, Bolivia,
25 when Bechtel came and announced that they had made a

1 deal and owned all the water. The people of
2 Cochibamba came to the streets and asserted
3 successfully using little more than conch shells, that
4 the water belongs to the people. This air, this land,
5 this water belongs to the people and with all due
6 respect, former Governor, I don't know where you went,
7 Salmon, the 250,000 years of radioactive waste storage
8 and management which, of course, will be fraught with
9 problems has an untold greenhouse effect. So please
10 don't imagine that nuclear power is saving us from
11 greenhouse effects.
12 Thirdly, health monitoring is inadequate.
13 And it will be inadequate, except that where there's
14 a will, there's a way and we have been successful in
15 collecting a number of baby teeth. At Traprock Peace
16 Center, at the Radiation Health Project, Radiation and
17 Health Project -- radiation.org is their website.
18 Ours is traprockpeace.org. You can download a form to
19 mail in baby teeth. We need more baby teeth from the
20 10-mile radius and we can assess Strontium-90 levels
21 to actually see the differences. Mothers who were
22 carrying their children while they lived within the
23 10-mile zone and breastfeeding while they lived in the
24 10-mile zone are particularly important. Please ask
25 your neighbors if they've been saving baby teeth and

1 there are forms outside. If all of you who care, even
2 if you work at the reactor, please, I invite you to
3 participate in this science project to see what our
4 levels are. I don't expect the environmental group to
5 be doing that for us. We have to do it for ourselves.
6 Fourth, thank you, Deb, for mentioning the
7 future because down in Franklin County, Massachusetts
8 and the rest of Western Massachusetts, there's a group
9 called Co-op Power is working to form a biodiesel co-
10 op and you have a chance to invest, so that the people
11 own this co-op and determine that after the biodiesel
12 factory, not a plant, is successful, those investments
13 will turn to solar and wind power because where
14 there's a will, there's a way, whether government sees
15 it or not.
16 Fourthly -- that was number four. Number
17 five, do we have an in-depth -- defense-in-depth? Do
18 we expect environmental impact in detail and in depth?
19 No, I'm sorry, I don't expect it, but I do expect that
20 on father's day when Citizens Awareness Network and
21 Traprock Peace Center and probably the New England
22 Peace Pagoda, I hope and others will join together in
23 a walk to the Entergy Headquarters. Some will gather
24 at Entergy, the reactor site. Others will gather
25 beginning at 10. Others will gather at noon at the

1 Brattleboro Common and come together to the Entergy
2 offices. Let's bring our plants, our strawberries and
3 anticipate the success of our people who are willing
4 to endure and persevere for what is right.
5 Thank you all for envisioning that bright
6 future together.
7 MR. CAMERON: Thank you very much, Sunny,
8 and --
9 (Applause.)
10 MR. CAMERON: Thank you. And I wanted to
11 switch the order to allow two people to come up next
12 who perhaps need to leave early. One is Beth McElwee
13 and the other one is Ellen Cota. So if we could have
14 Beth come and then Ellen.
15 Beth? And Ellen, you're right there.
16 Okay, good.
17 MS. McELWEE: Good evening. My name is
18 Beth McElwee and I'm here tonight to share a unique
19 perspective on the socio-economic benefits of Vermont
20 Yankee to our surrounding communities. I was born and
21 raised in Brattleboro and have had the opportunity to
22 interact with Vermont Yankee in a variety of
23 capacities over the past 24 years.
24 As a young teenager, I worked alongside
25 other kids my age at Vermont Yankee functions,

1 preparing rooms, serving meals and distributing
2 materials to attendees. By providing these
3 opportunities to responsible youth, Vermont Yankee
4 introduced us to a high standard of work, while
5 encouraging us to further develop our interpersonal
6 communication skills.
7 As an active member of my high school
8 class, I approached Vermont Yankee on several
9 occasions to request their sponsorship of various club
10 activities and events, including Register to Vote Day
11 and High School Day Under the Dome. With enthusiasm
12 and generosity, Vermont Yankee went above and beyond
13 my requests with their donations to both of these
14 community-oriented activities.
15 As a college business student, I served as
16 a part-time summer intern for Vermont Yankee Nuclear
17 Power Corporation during their transition to Entergy
18 Vermont Yankee. The internship and co-op
19 opportunities provided by Vermont Yankee are highly
20 utilized and greatly beneficial to students of all
21 disciplines throughout many regions of the country.
22 The contacts and experience gained in this internship
23 helped me to excel academically and gave me the
24 credentials to obtain a highly sought position in the
25 Boston area following graduation.

1 Two years later, I've made the decision to
2 return to the Brattleboro area and pursue my
3 professional and personal aspirations in this
4 beautiful rural community. As I suspected, the job
5 market in this area is significantly different than
6 that of Greater Boston and I found it difficult to
7 find professional employment opportunities, to utilize
8 the experience and skills I've worked so hard to
9 obtain.
10 Vermont Yankee is one of the few
11 organizations in this area at which these skills could
12 be fully realized. In addition, Vermont Yankee
13 provides the needed infrastructure to attract other
14 businesses to this area, so that young adults like me
15 will be able to stay in Vermont and enjoy the area
16 we've grown to appreciate.
17 We need to make sure that there are jobs
18 available here to support those who wish to make this
19 area our home. Vermont Yankee goes a long way in
20 helping to secure this future for Vermonters.
21 Vermont Yankee should stand tall in this
22 community. In addition to providing the most
23 reliable, clean and safe source of energy throughout
24 New England, their commitment to community
25 involvement, youth development, and vast employment

1 opportunities makes them a crucial and highly
2 beneficial component of this community. A renewal of
3 their operating license is integral to the
4 continuation of the flourishing New England rural
5 communities that we've all come to love.
6 Thank you.
7 (Applause.)
8 MR. CAMERON: Thank you, Beth. We're
9 going to go to Ellen Cota. Then we're going to
10 continue with Mike Flory, Shawn Banfield, Claire Chang
11 and Ray Shadis.
12 Ellen Cota.
13 MS. COTA: Yes, I'm Ellen Cota. I am a
14 mother. I work at Vermont Yankee and I live in the
15 Emergency Planning Zone and it make sense to approve
16 the license renewal.
17 Entergy is committed to being
18 environmentally and socially responsible and has given
19 a lot to this community.
20 The financial impact of not extending the
21 license would affect Vermont negatively for many
22 years. But more importantly, the environmental impact
23 of closing Vermont Yankee would pose even greater
24 threat. People have been told not to eat the fish out
25 of the Connecticut River because of the mercury

levels. Well, Vermont Yankee and other nuclear power plants do not emit the poisons or greenhouse gases which are slowly devastating our environment.

In addition, Vermont Yankee has a proven record of safe operations. Safety is and has been its number one priority. Entergy is a business. Corporate Entergy is a business. And I can assure you that Corporate Entergy would not put money into this license renewal process if they did not believe that Vermont Yankee was a well run, well maintained, safe facility.

Vermont Yankee is committed to safe operation and if I did not believe this, I would not work there.

The environmental benefits of generating electricity without emitting greenhouse gases is a wonderful legacy for our children and our grandchildren. I believe that we should approve the license renewal process.

Thank you.

(Applause.)

MR. CAMERON: Thank you, Ellen. Please, you're going to hear opinions that are different than yours and just, you know, just respect those opinions, that's all. Thank you.

1 Next four speakers, Mike Flory, Shawn
2 Banfield, Claire Chang, Ray Shadis.
3 Mike Flory.
4 MR. FLORY: Thank you for the opportunity
5 to be here and speak this evening. My name is Michael
6 Flory. Some of you may have read about me a few weeks
7 ago. I was the fire brigade member reported as
8 injured in our unusual event and I'm happy to say that
9 reports of my demise were just a bit exaggerated.
10 (Laughter.)
11 I am the chairman of Unit 8, Local 300 of
12 the International Brotherhood of Electrical Workers.
13 I work at Vermont Yankee along with more than 120 IBEW
14 members. I'm proud to say that I was born and raised
15 here in Vermont and I currently live just a few
16 hundred yards from the front gate.
17 We are proud to work at Vermont Yankee
18 because of the essential power it produces. We know
19 that our work at the plant helps to make Vermont a
20 cleaner, more prosperous place to live. Without
21 Vermont Yankee, the 620 megawatts that we currently
22 supply to the New England grid would have to come from
23 a fossil fuel power plant. Wind power, the
24 Connecticut River hydro project and energy
25 conservation, while all nice ideas, simply cannot

1 replace the steady, reliable, baseline power that we
2 produce.
3 Since opening in 1972, Vermont Yankee has
4 prevented more than 100 million tons of fossil fuel
5 emissions from entering the atmosphere. This has been
6 prevented not only by rendering an in-state coal plant
7 unnecessary, but also from reducing the amount of out-
8 of-state electricity that we have to purchase, most of
9 which would come from coal plants, as coal still
10 accounts for half of the power produced in America
11 today.
12 In 2005, Vermont Yankee avoided the
13 emissions of 7,700 tons of sulphur dioxide; 2,000 tons
14 of nitrogen oxide and 2.5 million metric tons of
15 carbon dioxide. Emissions of sulphur dioxide lead to
16 the formation of acid rain. Nitrogen oxides are a key
17 precursor of both ground level ozone and smog and
18 greenhouse gases like carbon dioxide contribute to
19 global warming.
20 The 2,000 tons of nitrogen oxide prevented
21 by Vermont Yankee last year is the equivalent of what
22 would have been generated by 105,000 vehicles. For
23 comparison, in Vermont, we have 280,000 registered
24 cars. Let me repeat. We at Vermont Yankee are proud
25 of what we do, proud to produce power cleanly and

1 safely and safety is our highest priority.

2 We would not work in the plant, let alone

3 live near it with our families, if we felt that that

4 place was not safe or that safety was not a priority

5 at Vermont Yankee.

6 We have seen and been instrumental in the

7 plant's continued enhancements and upgrades, most

8 recently during the power uprate process. The cost of

9 Vermont Yankee's power to Vermont consumers like

10 myself is also far below regional market prices. As

11 a baseload generator, we are able to provide lower

12 cost power which is so critical for this state.

13 I respectfully submit that if you like

14 having lights that go on at the flick of a switch, if

15 you like computers that don't fry as a result of

16 rolling brownouts, if you enjoyed air conditioning

17 during last week's heat wave or heat during last

18 month's cold snap, you should like Vermont Yankee's

19 low cost, clean, safe power.

20 Vermont Yankee's value to my home state

21 can only become more valuable as time goes on. As

22 global warming becomes more and more destructive, we

23 can remain an environmentally friendly source of power

24 with zero greenhouse gas emissions. As the world

25 energy market has become more competitive, we can

1 continue to be a source of reliable, economic,
2 baseload power and that is why we encourage the NRC to
3 renew Vermont Yankee's license.
4 Thank you.
5 (Applause.)
6 MR. CAMERON: Okay. Thank you, Mike. And
7 is Shawn -- Shawn is here. Shawn Banfield. And I
8 would just encourage everybody -- I would thank
9 everybody for following the guidelines and just
10 encourage everybody to be as brief as possible. Thank
11 you.
12 Shawn.
13 MS. BANFIELD: Thank you. Good evening.
14 My name is Shawn Banfield. I'm here tonight as an
15 active member and officer of the board of directors
16 for the Vermont Energy Partnership. I'd like to thank
17 the Nuclear Regulatory Commission for holding this
18 hearing tonight.
19 The Vermont Energy Partnership was founded
20 in January of 2005, shortly after the state report
21 warned of a serious energy challenge facing us in the
22 near future.
23 Our founding members came together,
24 because they recognized the importance of making sure
25 that adequate electricity was available so Vermont

1 could continue to be a great place to live and work.
2 The partnership is a diverse group of more than 50
3 business, labor and community leaders, committed to
4 addressing the immense electricity supply gap issues
5 facing Vermont. Our members include a cross section
6 of experts in the energy sector. Our members employ
7 thousands of Vermonters. They run businesses, large
8 and small. And represent union workers, some of whom
9 devote their professional lives to the operation of
10 Vermont Yankee in a safe manner.
11 The partnership fully supports the
12 relicensing of the Vermont Yankee nuclear power plant
13 in Vernon and I will explain why. It is no secret
14 that Vermont's demand for energy is continuing to
15 grow. But it may be a less known fact that Vermont
16 faces uncertainty over its future energy supply.
17 Currently, one third of Vermont's electric supply
18 comes from the Hydro Quebec -- from Hydro Quebec. And
19 these long-term contracts will begin to expire
20 starting in 2014. There is no guarantee that the
21 contracts will either be renewed or renegotiated,
22 given the other more local business opportunities
23 Hydro Quebec has in the province.
24 Another approximate one third of Vermont's
25 electric supply is made up of a wide array of both in-

1 state and out-of-state renewable sources and
2 nonrenewable sources. The Partnership supports the
3 in-state development of renewable energy supplies,
4 encourages the increased use of energy efficiency and
5 the expansion of conservation measures. However, the
6 fact remains a reliable energy portfolio must be made
7 up of a baseload source of power.
8 Vermont Yankee accounts for the last one
9 third of the Vermont portfolio, energy portfolio.
10 About 34 percent of Vermont's total electricity supply
11 needs are met by Vermont Yankee today.
12 So let me put this debate in further
13 context. Vermont has not brought online a significant
14 power generating facility in over 20 years and there
15 are no plans to date to do so in the near future. To
16 make matters worse, proposals to develop small-scale
17 generation in Vermont have been met with sharp
18 criticism and severe opposition.
19 In a time when energy costs are at their
20 highest, the Vermont Yankee plant will not only play
21 an essential role in our state's energy portfolio, it
22 is critically important to Vermont's economy and
23 environment.
24 From an economic standpoint, a stable,
25 relatively low-cost power provider helps to maintain

1 and expand businesses in Vermont, while at the same
2 time providing an opportunity to attract new business.
3 In a time when Vermont faces an increasing, aging
4 population the plant provides employment to 600 highly
5 skilled men and women. Those individuals in the
6 company provide more than $200 million in economic
7 benefits to the Wyndham County region and the State of
8 Vermont as a whole.
9 According to the Vermont Public Service
10 Department, the company through the power purchase
11 agreement, will provide Vermont customers
12 approximately $250 million in savings over the life of
13 the contract. This estimate, it should be noted, was
14 made when energy prices were far lower than they are
15 today. And in fact, at 3.95 cents per kilowatt hour,
16 Vermont Yankee power today costs Vermonters 40 percent
17 less than other sources of electricity. This matters
18 most to Vermont's elderly and the poor.
19 But aside from the important economic
20 benefits of Vermont Yankee's continued operation,
21 there are also relative environmental benefits from
22 this in-state generation source. Today, we live in a
23 country where half of the electricity generated comes
24 from coal-burning sources, yet Vermonters can be proud
25 to say that that is not true here. Vermont Yankee is

1 a clean, emissions-free facility. Unlike fossil fuel-
2 generating facilities, nuclear power does not release
3 harmful greenhouse gases and other toxins into the
4 atmosphere that are the primary cause for global
5 warming.
6 It is becoming abundantly clearly that
7 nuclear energy is the only emissions-free source that
8 can meet consumers' demand for reliability and at a
9 reasonable cost.
10 Leading environmentalists around the
11 world, like Dr. Patrick Moore, co-founder of
12 Greenpeace, have come to the conclusion that nuclear
13 power is the only source that can help remedy and save
14 the planet from catastrophic climate change. Just
15 last month, Dr. Moore said in the Washington Post
16 "nuclear energy is the only large-scale, cost-
17 effective energy source that can reduce these
18 greenhouse emissions while continuing to satisfy a
19 growing demand for power. In these days, it can do so
20 safely."
21 He went on to say, "the extremists who
22 fail to consider the enormous and obvious benefits of
23 nuclear power also fail to understand that nuclear
24 energy is practical, safe and environmentally
25 friendly."

1 In closing, without Vermont Yankee,
2 Vermont utilities will be forced to buy additional
3 power on the spot market that would be less reliable
4 and considerably more expensive.
5 Do Vermonters really want to pay more and
6 be dependent on power from fossil fuel sources such as
7 natural gas and coal which now contribute to global
8 warming and the earth's degradation? The Vermont
9 Energy Partnership thinks not.
10 Vermont Yankee has an important and
11 crucial to play in the future of our state. It is
12 both economically and environmentally appropriate to
13 grant the plant's license extension. We know there's
14 a wide array of support for the continued operation of
15 this plant for the reasons I have articulated here
16 tonight: its essential economic benefits, its
17 environmentally sound operations and its important
18 role as a component in the Vermont energy portfolio.
19 On behalf of the Partnership, I'd like to
20 thank you for the time here today and I appreciate the
21 opportunity.
22 MR. CAMERON: Thank you, Shawn.
23 (Applause.)
24 MR. CAMERON: Claire Chang is going to
25 join us down here and then we're going to go to Ray

1 Shadis and then to Sky Churchill.

2 This is Claire.

3 MS. CHANG: Hi, I'm Claire Chang. I

4 recently saw a very interesting movie. It was called

5 "Enron, the Smartest Guys in the Room." And in this

6 movie, the movie was based on a book that was written

7 called The Smartest Guys in the Room and these --

8 Enron is an energy company. They were dealing with

9 originally natural gas and then they moved into a

10 number of other energy sources including electricity.

11 And what they were doing was -- I don't know how to

12 explain it. It's very complicated. But the

13 California energy crisis, quote unquote, which we all

14 knew a little bit about, but didn't really know a lot

15 about, is covered pretty heavily in this film in which

16 Enron, Duke Energy and a number of other utilities,

17 which Entergy is also a utility -- it is a power

18 company that sells energy, electricity and other forms

19 of energy at the highest cost that it can possibly get

20 to reap the highest profits that it can possibly get.

21 However much they're paying their workers

22 or they spend on publicity or community groups or high

23 school soccer clubs or whatever else, Entergy is a

24 profit-making company.

25 (Applause.)]

1 So in this movie, it turns out that the
2 utilities colluded with the electrical generating
3 plant to restrict and divert and artificially reduce
4 the demand -- I mean reduce the supply causing an
5 increase in costs and therefore an increase in profit
6 to the amount of $9 billion in one year. California
7 paid out $9 billion that it didn't need to pay out.
8 Entergy, because it's also a public -- not
9 a public, but a privately-owned utility company, also
10 sells its electricity out on the market and trades.
11 Traders buy it and compete for whatever can be
12 generated. So for Vermont Yankee, all of its
13 electrical generating capacity has been planned out
14 for 2006. That's the rest of this year and for part
15 of 2007. All that electricity has already been sold
16 and paid for, speculatively, by traders, by the
17 national grid, by whoever Entergy can sell the power
18 to.
19 So there isn't any way that they can now
20 change the cost of that electricity that they've sold
21 it for and I don't know the numbers. I just know that
22 it was sold.
23 So it's committed to this generation of a
24 set price of baseload power and baseload power means
25 that it's running 24/7 at a very even amount and I

1 think Vermont Yankee is now at 650 kilowatt hours or
2 something -- huh? Megawatt hours, right, sorry.
3 So they've already sold all this to the
4 grid and the grid has already agreed to a price, but
5 the national grid or the regional grid actually for
6 New England currently has a surplus. There's extra
7 electricity out there. We don't actually have to have
8 part of the electricity that's coming from VY right
9 now. And I don't know the technical aspects of how
10 the grid works, what happens to this extra
11 electricity. But what we need to do is to investigate
12 other ways of producing this electricity and to make
13 it economically unfeasible for Entergy to continue
14 running Vermont Yankee at its rate right now, which
15 does not mean firing all the workers.
16 All the workers at Vermont Yankee right
17 now will be employed for decades when Vermont Yankee
18 gets shut down, whether it's tomorrow, in 2012 or
19 whatever year it is because there is decommissioning.
20 The plant doesn't just -- nobody just goes through the
21 plant and turns out the lights and says "we're done,
22 goodbye." No, there's an awful lot of work that needs
23 to be done at that power plant.
24 So anyone who says that by turning off
25 Vermont Yankee means losing your job, it's not true.

1 There's no need for that to happen. So one of the
2 ways that we can economically make it unfeasible to
3 Entergy to not run Vermont Yankee is to reduce our
4 energy demand.
5 Energy efficiency and conservation are the
6 easiest and lowest cost ways of reducing that energy
7 demand. It's already been estimated that even in
8 Vermont, if we replace five lightbulbs with compact
9 fluorescents and a refrigerator or other major
10 appliance like an air conditioner or home heating,
11 other large electrical demand with energy-efficient or
12 EnergyStar-rated appliances, we could reduce the
13 demand in Vermont by 25 percent. Now this does
14 require the participation of every household or double
15 participation by half the households. But I don't
16 think that that's an unreasonable goal to have,
17 especially since it would mean that we would no longer
18 have to depend on Vermont Yankee's electrical
19 generation.
20 Another thing that you can do is you look
21 at your electric bill. The average kilowatt hour per
22 day usage is approximately 21 kilowatt hours a day.
23 So 25 percent of that would be about 5 kilowatt hours
24 a day. This is on your electric bill that you get
25 every month. So if you look at that, that would be

1 about 16 kilowatt hours. You can use that monthly
2 bill that you get to gauge how well you're doing in
3 reducing your energy demand. It's not something
4 that's impossible. It's not something that's so
5 beyond our own personal efforts, we can all take it
6 upon ourselves to make something, to effect a change
7 here and to do something different.
8 Lots of simple things that you can do,
9 just changing your light bulbs, putting your
10 appliances on power strips and turning them off when
11 you're not using them. A lot of television sets and
12 radios, stereos and appliances have a pre-heat on them
13 which means that they instantly turn on with the
14 remote control. But if you put them on a power strip,
15 it's amazing how much electricity you'll actually save
16 by not having these appliances warming 24 hours a day,
17 7 days a week.
18 The power strip also, amazingly enough,
19 can save your appliances because you're then no longer
20 susceptible to power surges and lightning strikes. I
21 know that we don't get those around here very much,
22 but -- you can turn your hot water down to 125 degrees
23 or 120 degrees and if you have an electric hot water
24 heater, it will also reduce your demand.
25 So in order to think about what other

1 choices we have and what we need to do, as
2 individuals, it's really hard to think about wind
3 power and solar power and what can we do as
4 individuals.
5 The best thing that I can think of that we
6 need to do is to read. Read books, read magazines,
7 read articles, go to the web and Harvey Wasserman has
8 a wonderful book out called Solar Topia which is a
9 fantasy, but it gives you something to hold on to and
10 something to dream about and something to think about
11 of how you can apply it to your every day life. In it
12 he says that basically wind power right now, as it is
13 technologically developed is capable of replacing a
14 majority of the electrical generation in the United
15 States from fossil fuels and nuclear power. We're not
16 just talking about only nuclear.
17 Now some of the complaints about wind
18 power are that it kills birds. Well, the first wind
19 towers that went up and I can't remember where the
20 path in California where they went up, those wind
21 towers were placed -- yes -- those wind towers were
22 designed without thinking about the birds. They were
23 like the erector set towers that have lots of braces,
24 four legs and cross bracing and then finally the wind
25 turbine at the top. Well, what was happening was that

1 the birds were resting on these bracings and then when
2 they'd see a squirrel or a chipmunk or whatever they
3 wanted to get, these birds of prey would then fly down
4 and get knocked out by the blades as they were coming
5 around.
6 Well, now the towers are not built like
7 that. They're single pole structures, so there's
8 nothing the birds can rest on. The other thing is
9 that the turbines turn so slowly now that you'd really
10 have to have a suicidally-depressed bird to fly into
11 one of these and get knocked out. So the arguments
12 about birds is really un -- my brain is fried, I'm
13 sorry. Unfounded. Good.
14 And the other thing about nuclear power,
15 not nuclear power, wind power is that it's not
16 something that's just a dream. In 2002, the
17 Conference on American Wind Power Generating
18 Association, was attended by maybe 1500 people. Last
19 year, it was attended by more than 5,000 people. It
20 had grown so much that it is not something that's just
21 a pipe dream. You can go and visit wind towers that
22 are installed in Vermont, in New Hampshire and in
23 Massachusetts right now and see how they operate.
24 You can listen that they're not noisy and
25 you can talk to the residents there who live next to

1 them who really like their wind power and really like
2 that they are in charge of and they are the ones who
3 control their own electricity generation which is
4 another issue here, is that Entergy is the company
5 that's owned and operated out of Louisiana. It's not
6 local. It's not based in Vernon. It's not based in
7 Vermont. It's very far away and they own nine nuclear
8 power plants. So they're not some little small
9 player. But we need to take control of our lives here
10 in our local area and decide for ourselves how we're
11 going to live, how we're going to generate our
12 electricity and how we're going to control it because
13 we don't want somebody else from far away saying what
14 we're going to do and how we're going to live.
15 And I think that that's really important
16 to think about those kinds of issues.
17 MR. CAMERON: Claire, are you done? Could
18 you sum up for us, please?
19 MS. CHANG: Sure. I can be done. I sense
20 there's some -- I have nothing else.
21 MR. CAMERON: Thank you very much.
22 (Applause.)
23 We're going to go to Ray Shadis and then
24 Sky Churchill and then Eesha Williams.
25 Ray?

1 MR. SHADIS: My name is Raymond Shadis.
2 I work for the New England Coalition. From 1982 to
3 1997, I served on the New England Coalition Board of
4 Trustees and from 1997 through to the present, I had
5 served as their Staff Technical Advisor.
6 I was very concerned in presenting some
7 scoping issues earlier that they met strict criteria
8 for examination by the NRC and the criteria are
9 strict, no active components and so on. But then
10 after hearing the presentations this evening, I feel
11 a little more at ease to address them and to address
12 at least one externality.
13 In the uprate proceeding before the
14 Vermont Public Service Board, Entergy presented quite
15 a remarkable witness, Dr. Ernest Moniz, M-O-N-I-Z,
16 from MIT and he is a former Assistant Secretary of
17 Energy and I had the privilege of cross examining the
18 good doctor and he made some startling admissions.
19 Number one is that all of the fuel, commercial nuclear
20 fuel produced in the United States to his best
21 recollection was produced at the Portsmouth enrichment
22 plant and the Paducah enrichment plant and both of
23 those plants, which absorb enormous quantities of
24 electricity in the process, are supplied by coal-fired
25 stations.

1 My question for Dr. Moniz was well, then
2 the pollution gets here ahead of the fuel, doesn't it?
3 And in fact, the mercury that some speaker referred to
4 earlier, those heavy, heavy coal-fired plants in Ohio
5 and the ones that provide electricity to enrich
6 nuclear fuel, among the dirtiest, do send their
7 mercury to our waters and our fish.
8 The other thing that I brought to Dr.
9 Moniz' attention and got his say on, were two
10 publications from the early 1980s when a lot of us
11 were beginning to be real concerned about global
12 warming, greenhouse gases. One, a book by Senator
13 George Mitchell and I want to call it The World is
14 Burning, but then again I keep thinking of Billy
15 Graham's, World Afire and I can't remember which one
16 is which. And the other was a publication by World
17 Watch Institute and their numbers more or less
18 reconciled. And it was this, that in order to offset
19 the growth in greenhouse gases, the world would need
20 to undertake an unprecedented construction of nuclear
21 power stations amounting to about a thousand on an
22 average of one every three days for start-up, over the
23 next 20 years.
24 And their net effect would be to reduce
25 the growth in greenhouse gases by 20 percent, not

1 reduce greenhouse gases by 20 percent. Please
2 understand the difference. Reduce the rate of growth.
3 And I asked Dr. Moniz if he thought that
4 was correct and he did a little bit of back of the
5 envelope calculation and he said yeah, that would be
6 approximately correct. The other figure that was
7 astounding was that if we were to undertake that type
8 of programming, we would then require the launching of
9 another Yucca Mountain every two to three years. We
10 can't seem to get the first one off the ground in 50
11 or 60. So those are some externalities, environmental
12 effects that I regret to say I don't think NRC can
13 consider them.
14 Going to some elements for potential
15 scoping in the environmental impact statement, in the
16 afternoon session I presented on spent-fuel pool
17 accident off-site consequences, much, much worse than
18 a reactor meltdown; much worse because the amount of
19 fuel accumulated is much more than the fuel in the
20 reactor. And what I neglected to mention in my
21 summation on that was that NRC Staff in their study,
22 NUREG-1738, said it really didn't make any difference
23 how old the fuel was. You could not eliminate
24 completely the potential for a nuclear fuel fire,
25 zirconium-cladding fire. And that's of critical

1 importance here because Vermont Yankee, like so many
2 plants, has undertaken to checkerboard their fuel to
3 segregate new and old fuel.
4 However, with the uprate, the fuel going
5 in the fresh offloads are so hot that they have to
6 integrate their reactor cooling system with the spent-
7 fuel pool cooling system and actually run the residual
8 heat removal pumps for the reactor at least for the
9 first several days that they put the new fuel in. And
10 this is a borderline critical situation. And I don't
11 mean critical in the nuclear sense, but I mean
12 critical in terms of the thermal considerations.
13 The other thing that NRC Staff said which
14 goes to earlier conversation on this was that you
15 could not assign probabilities to an act of terror or
16 an act of malevolence. And the conservative
17 regulator, protector of human health and safety, would
18 then have to assign a probability of 1, absolute would
19 be the scenario you would work under. Not one in a
20 thousand or one in 250 or some other made up number,
21 but if you can assign probabilities and you want to be
22 proactive and protective of human health, then you go
23 to 1. And it's absolute and you must protect
24 absolutely.
25 And now I will get to the two scoping

1 issue items that we reserved for this evening. Number
2 one, I want NRC Staff to be aware and take into
3 consideration that the science of seismic assessment,
4 seismology has evolved to a remarkable extent since
5 1971 when the plant was licensed. And to that effect,
6 we're going to leave them a letter from Mr. Lawrence
7 Becker, who is the Vermont State Geologist. This was
8 a letter provided to our State Nuclear Engineer and
9 entered into evidence in the Vermont Public Service
10 Board case. But Mr. Becker points out that there are
11 a number of new reports including among the more
12 recent, 1995, a report on seismic vulnerability of the
13 State of Vermont and then 1996, we have the real
14 emergence of probabilistic risk assessment for seismic
15 events.
16 NRC loves probabilistic risk assessment
17 ever since Three Mile Island and here we have this
18 risk assessment being developed for seismic events.
19 NRC has in its routine inspection activities
20 acknowledged the emerging changes in the science. In
21 1987, they issued a notice on an unresolved Safety
22 Item A-46 which is essentially the beginning of
23 applying this kind of risk assessment to various
24 components within the plant and I want to direct their
25 attention to a couple of critical components. One is

1 the core shroud at Vermont Yankee. Like so many
2 boiling water reactors, the core shroud after a decade
3 in service began to crack and at Vermont Yankee, like
4 other plants, it has this single monolithic, if you
5 will, structure has not been bolted back together. If
6 you can imagine large threaded pipe clamp-type
7 structures. It's been gerry-rigged, bolted together.
8 The question is has it been reanalyzed seismically
9 using the new seismic investigation regimen?
10 The other item that I want to point to
11 very quickly is the torus -- torus is a huge water
12 tank shaped like a donut. It sits underneath the
13 reactor. The task of the torus is to receive steam in
14 the event of an accident and condense that steam and
15 reduce pressure on the primary containment.
16 The torus at Vermont Yankee has been
17 modified many, many times. The modifications began
18 with an issue called torus lifting back in the very
19 early days of this plant. Since then we have
20 anecdotal accounts from workers, people in in-service
21 inspection, who describe the welding of gussets on
22 that torus and the abandonment of that project and the
23 grinding away of those gussets.
24 We don't know if the torus has been
25 properly heat treated and annealed to relieve stresses

1 that are induced whenever you weld anything on a big
2 steel structure like that or not. We don't know if it
3 has been seismically reanalyzed, given those
4 modifications or not.
5 One of the problems that citizens have and
6 citizen-intervenors have is that when issues like this
7 are found within a plant, typically a condition report
8 will be written. That is not public. That does not
9 go into the NRC public document room. And then the
10 item may or may not be entered into the company's
11 Corrective Action Program. That's a place where NRC
12 buries a lot of issues too. They sort of hand it back
13 to the company and say you guys fix it and make sure
14 you keep records. But those records are not public
15 and there's really no way to access them unless you
16 get involved in a legal proceeding and then maybe you
17 can touch them.
18 MR. CAMERON: Ray?
19 MR. SHADIS: Yes sir?
20 UNIDENTIFIED AUDIENCE MEMBER: Let him
21 speak.
22 MR. CAMERON: I just want to talk to Ray
23 and not to the waffle man. Ray, it's been about 15
24 minutes and we have about 25 people left to go. So if
25 you could just give us your point. I mean it's all

1 wonderful, wonderful on-point stuff and we appreciate
2 it.
3 MR. SHADIS: We will provide written
4 comments. NRC really needs to delve into the
5 seismicity issues for all of these components and that
6 would include switch yard stuff as well. We had our
7 problems.
8 The other thing I wanted to point to very
9 quickly is the cumulative off-site impact of chemical
10 releases. The cooling towers that you're familiar
11 with at Vermont Yankee put out those huge clouds of
12 vapor and for our purposes that is not the issue or
13 the problem. Clouds of vapor are clouds of vapor.
14 It's pretty much clean stuff. However, the cooling
15 towers are not 100 percent efficient. There are big
16 fans. There is water tumbling down corrugated
17 material called fill. Fans blow across it and the
18 result is that a lot of droplets are blown sideways
19 out of the towers. When you tour the plant, you can
20 feel these little droplets hitting your skin as you
21 walk around the plant. People wonder if it's
22 drizzling or what.
23 The company uses an oxidizer called
24 glutaraldehyde in small parts, two-tenths of a part
25 per million. It triggers asthma. Two-tenths of a

1 part per million exceeds California's occupational
2 exposure standards. In all the regulation, we don't
3 find any place that the regulation anticipates spray.
4 It anticipates fumes. It anticipates skin contact,
5 but I don't think any regulator ever figured you would
6 spray people with this stuff.
7 The glutaraldehyde plus, surfactant, anti-
8 rust compounds, other pesticides, other biocides, and
9 fluorine and bromine compounds are used by the
10 company. The water gets circulated in the cooling
11 towers. It flows out in spray. It goes up to a mile
12 downwind. And I just want to point out that in terms
13 of concentrations as those droplets travel, they dry
14 and we don't know what the concentrations are when
15 they land on the skin, but unless it's quantified, we
16 have to assume that it's toxic. Unless it's
17 quantified, we have to assume that there are health
18 effects and those things need to be measured in the
19 Village of Vernon and across the river in Hinsdale.
20 And that's my comments and thank you.
21 MR. CAMERON: Thank you, Ray. Thank you
22 very much.
23 (Applause.)
24 MR. CAMERON: Sky Churchill and Eesha
25 Williams. Is Sky here? How about Eesha.

1 Bob Catlon? How about Joyce, Joyce
2 Warren. Mandy Arms. I see people leaving when I call
3 your name. Hopefully, they're not the people I'm
4 calling.
5 Bill Whitmer. Bernie Buteau?
6 This battery is going, so we'll do our
7 best.
8 MR. BUTEAU: Bernie Buteau, good evening.
9 Nuclear engineer by training. Worked up at Vermont
10 Yankee for 30 years in a number of different jobs.
11 And a citizen of the planet, along with all of you.
12 Inhaler of fossil-fueled effluence, 24/7/365.
13 Thank you for the opportunity to speak
14 tonight on the operation of VY beyond its current
15 license lifetime.
16 I see your consideration of Vermont
17 Yankee's request for license renewal as very straight
18 forward and to some degree we've done the same
19 homework and so I'm going to repeat a few of the
20 things that you mentioned earlier because I'd like to
21 recite a couple of excerpts right from your own
22 website, that I think help support the position to
23 allow Vermont Yankee to consider operation.
24 It's the NRC primary mission to protect
25 the public health and safety and the environment.

1 That's what we're talking about tonight is the
2 environmental effects. In the environment, the
3 effects of radiation from nuclear reactors, materials
4 and waste facilities and you also regulate these
5 nuclear materials and facilities to promote the common
6 defense and security.
7 There's also a section there that talks
8 about reactor license renewal overview. And it states
9 that the Atomic Energy Act and the NRC regulations
10 limit commercial power reactor licenses to an initial
11 40-year -- 40 years, as you said, but also permits
12 such licenses to be renewed. That original 40-year
13 term for reactor licenses was based on economic and
14 anti-trust considerations and not on limitations of
15 nuclear technology.
16 Due to this selective period, however,
17 some structures and components may have been
18 engineered on the basis of a 40-year service life.
19 The NRC has established a timely license renewal
20 process which we've heard something about tonight and
21 clear requirements codified in 10 CFR parts 51 and 54
22 that are needed to assure safe plant operation for
23 extended plant life.
24 The timely renewal of licenses for an
25 additional 20 years, where appropriate to renew them,

1 may be important to ensuring an adequate energy supply
2 for the United States during the first half of the
3 21st century.
4 In surfing the web recently, I found an
5 interesting article. It was an excerpt from Physics
6 Today. It was dated June 4th. It states, "Some two
7 dozen power plants are scheduled to be built or
8 refurbished during the next five years in Canada,
9 China, several European Union countries, India, Iran,
10 Pakistan, Russia, South Africa. In the U.S. and U.K.,
11 government preparations are underway that may lead to
12 15 new reactor orders by 2007. The new interest in
13 civilian nuclear energy results from attempts to
14 reduce carbon dioxide emissions and increasing
15 concerns about energy security."
16 Considering what I've presented, the
17 worldwide recognition of the need for additional
18 nuclear power to help save our environment from the
19 effluence of fossil fuels and to help establish energy
20 security and I would go on to say world peace, and
21 considering the existing guidance for granting license
22 extensions, I would submit that it would be arbitrary
23 and in defiance of the rules and guidelines already in
24 place to not grant Vermont Yankee an operating license
25 extension if all requirements established in 10 CFR

1 Parts 51 and 54 are met.

2 Finally, I'd just ask that when all the

3 input that you receive is considered, you separate the

4 facts from the rhetoric. Thank you very much.

5 (Applause.)

6 MR. CAMERON: We're going to go to Marian

7 Kelner and then Ted Sullivan, John Dreyfuss and Mike

8 Hamer.

9 This is Marian Kelner. Marian.

10 MS. KELNER: Hi. This is just one brief

11 point that I'd like to make. Nobody knows what's

12 going to happen in the future. There are people who

13 believe that this plant is safe. There are other

14 people who believe that it’s not safe. There's no way

15 to determine this, I guess. Time will tell, but the

16 criteria that I'd like to present is what happens for

17 each side if that side is wrong? If the people who

18 believe the nuclear power plant is safe and they're

19 wrong, the land becomes polluted, thousands of people

20 die. This will be an effect that will be in effect

21 for hundreds of thousands of years. If the people who

22 believe that the nuclear power plant is unsafe and

23 they're wrong, what will be the effect? The effect

24 will be that there will be other sources of power,

25 conservation and nobody gets hurt.

1 So since nobody on the planet knows which
2 side is correct, I think that using this criteria
3 might guide us in the right direction. That's all,
4 thank you.
5 (Applause.)
6 MR. CAMERON: Thank you, Marian. Mr.
7 Sullivan? There he is. This is Mr. Ted Sullivan, and
8 then we'll go to John Dreyfuss.
9 MR. SULLIVAN: Good evening, thank you for
10 the opportunity to speak. My name is Ted Sullivan and
11 I'm a resident of West Chesterfield and I do work at
12 the Vermont Yankee nuclear power plant and West
13 Chesterfield is within the 10 mile emergency planning
14 zone. So what goes on at that plant is very important
15 to me as a professional and me as a family man because
16 my family lives in West Chesterfield.
17 There's a couple of things, a couple of
18 points I want to talk about tonight. One is that the
19 economic impact of shutting down or not granting a
20 license extension for Vermont Yankee is very, very
21 severe. To take one third of the electricity out of
22 the state, one third of what it needs to run, that
23 electricity has to be generated somewhere and come
24 from some other means. And if it is a fossil means,
25 whether it's oil, coal or gas, it's going to increase

1 the pollutants that are going in the air. It will
2 affect the environment, much, much, more worse than
3 what the effect is of nuclear power.
4 The 100 million tons that the government
5 talked about, that is a very, very significant amount
6 of pollutants in the air and there's empirical data
7 that supports that that has caused global warming and
8 that is now causing the oceans to heat up and that is
9 having a dramatic effect on things like hurricanes.
10 The number of hurricanes that we're having now is a
11 direct result of this global warming.
12 Go talk to the people that lived through
13 Katrina and Rita, and the intensity of that storm.
14 There's empirical data that proves that that effect
15 made those hurricanes much more severe than what they
16 really are. That's one point I want to make.
17 Another point is that we are regulated in
18 this industry and when you're regulated, there's rules
19 that you have to follow and those -- and we are
20 governed by the NRC and we have to follow all those
21 rules. As we apply for this application, the look
22 that is given to the site and to all the processes
23 that it has is exhaustive. It's a mess. And all of
24 those rules have to be met. So let's let the facts
25 decide what it is. If the NRC after their

1 investigation into what's going on at the plant and
2 whether or not we're following the rules, if they
3 conclude that we will have an effect on the
4 environment that are of such a nature that it doesn't
5 meet the regulations, then they need to not approve
6 this license application. But if it does meet the
7 rules and regulations, then it needs to be approved.
8 That's the last thing I really want to
9 say. The facts will speak for themselves and all the
10 rhetoric and all the scare tactics and all the threats
11 and things have to come out of that. Just let the
12 facts speak for themselves. Thank you for the
13 opportunity.
14 (Applause.)
15 MR. CAMERON: This is Mr. Dreyfuss.
16 MR. DREYFUSS: Good evening, my name is
17 John Dreyfuss. I also work at Vermont Yankee. I'm
18 the Director of Engineering at the plant. Thanks
19 everybody for coming out. The rain kept probably a
20 few people away, but it's good to see a lot of faces
21 out here expressing opinion as well as, you know,
22 quite a few more people I think in support of renewing
23 the license of Vermont Yankee.
24 You know, we're very proud of the
25 impeccable environmental record that this plant

1 currently enjoys. We've had a sustained, safe,
2 operational record with excellent environmental
3 stewardship. We pledge to continue that going
4 forward. I'm also very proud of the people and the
5 processes we have in place that helps sustain that
6 environmental performance. The scope of the
7 environmental audit conducted by the NRC was very
8 broad. It touched on many subjects. There were many
9 people here, both NRC staff and the contractors. They
10 were very challenging. They were very rigorous. They
11 were very thorough. And we've resolved the issues and
12 we're answering questions, many questions that came
13 up.
14 Again, I am satisfied that the process
15 will hold true and the questions will be answered.
16 And if we can provide satisfactory record and good
17 answers to the questions that came up, the license
18 should be renewed.
19 Another thing I wanted to touch on here,
20 just very briefly, is that there was a report by the
21 National Academy of Sciences that talked about Indian
22 Point. One of the key conclusions of that report are
23 that the economic and environmental impact of closing
24 those plants, shutting those plants down, was very
25 significant. And that was the key conclusion of it.

1 So I urge you to educate yourself, read about it, and
2 understand, you know, the impact of closing down a
3 plant like Vermont Yankee. Thank you.
4 (Applause.)
5 MR. CAMERON: Thank you very much, Mr.
6 Dreyfuss. We're going to go to Mike Hamer, Mr.
7 Peyton, and then to Chris Nord from Citizens Awareness
8 Network. Is this Mike Hamer coming down? All right.
9 MR. HAMER: Good evening. First I'd like
10 to thank the NRC for putting on this meeting tonight
11 for giving us all a chance to come out and talk about
12 our community and the future. I'd also like to thank
13 the police officers here tonight that are missing
14 dinner with their families to come out here and ensure
15 our safety. And for all of you, I mean, we had a lot
16 more people in this room when we started tonight, it's
17 gone down a little bit, but for everyone who stayed
18 here to the bitter end to speak out about the
19 community, round of applause for all of us. Come on,
20 here we go.
21 I have one point, one simple point to talk
22 about, 620 megawatts thermal. It's a lot of power.
23 That's not what I'm going to talk about. I'm going to
24 talk about the evolution of technology. When we first
25 started making power in this country, a lot of heavy

1 polluters. We're all ruining the environment. We're
2 damming up rivers for hydro, a lot of coal-fired power
3 plants, the most abundant source of electricity in
4 this country is coal. Fifty-eight percent of our
5 power in the United States is made from coal. We're
6 the largest coal burning country in the world, as a
7 matter of fact.
8 We're starting to see a lot of the results
9 of that over the years. You can't take a hike into
10 the mountains without finding a little mountain stream
11 or a little run-off on the side. You'll see
12 fluorocarbons, you see little rainbows in the water.
13 My daughter pointed it out to me one day and said
14 "Daddy, look at the pretty rainbows". I said "well,
15 that's pollution, honey, at its best."
16 We're looking at 20 more years of
17 operation from this facility right here. I believe
18 that there will be a better technology one day and
19 than our current technology for making power. I
20 honestly believe that. We're on the verge of a lot of
21 those things right now to this. Hydrogen cell power,
22 but scientists are predicting right now that maybe ten
23 years, possibly twenty years to be able to make
24 megawatts of hydrogen cells. Ironically, nuclear
25 power plants produce hydrogen. But then we use some

1 more energy to take that hydrogen and re-combine it
2 back with the oxygen and make water out of it and put
3 it back to the power plant.
4 So imagine if you have a hydrogen cell
5 sitting outside a nuclear power plant to make power
6 from that hydrogen. Stepping stones of technology.
7 I think that we can't get from one point to another
8 point to being completely nuclear free without going
9 through that process. We started out with plants
10 years ago, but we've improved on those technologies.
11 We've made them more efficient. We've learned from
12 our lessons of the past and made better plants to
13 continue on in the future with.
14 Our station here, I work for Entergy by
15 the way. Our station here we made significant
16 upgrades to the station since I've been here in the
17 last eight years and worked as a contractor for four
18 or five years before that, including major jobs like
19 replacing the entire LP turbine 10 years ago,
20 replacing the HP turbine. Those things are the size
21 of football fields and we did that safely with no
22 injuries on the job, employing a lot of people in the
23 surrounding communities to help do these things.
24 One day, we'll reach that point where we
25 can probably start shutting down these plants. But

1 that day isn't today. Six hundred twenty megawatts of
2 power electric. What scares me is how are going to,
3 if we shut this plant down in 2012, where are going to
4 produce that power from right now? That's baseload
5 electricity. That's not wind power with a 20 percent
6 efficiency factor. Those numbers you can look them up
7 on NEPAX. It's a website that tells how much power
8 the capacity, how much those places actually stay
9 online.
10 I'll support any power made from any
11 source that's safe like that. I believe Vermont
12 Yankee is a very safe plant having worked there for as
13 long as I have. But I don't believe that we're going
14 to be ready in the next 10 or 15 years to get away
15 from nuclear power. It's not feasible. We're not
16 going to be able to produce 620 megawatts without
17 going to coal, without going to gas power, which gas
18 has been touted as being the clean source of energy,
19 it's not. It produces half of the amount of waste
20 that our coal plants produce.
21 Oil is out of the question. Oil is like
22 less than 10 percent, less than 5 percent of the
23 entire production of power in this country, just
24 because of the unavailability of it and that we need
25 it for automobiles and other things like that, other

1 smaller, small-type things. But consider that.
2 Consider where we're going to get our power from if we
3 shut this plant down. We have to get it from
4 somewhere. It's not in my back yard. It's here.
5 It's safe. We have a proven track record of being
6 safe. Why not continue for 20 more years.
7 This license renewal team, the application
8 can be viewed at any library and online. It's huge.
9 They have a very, very large team of inspectors
10 looking at every possible aspect you can look at for
11 aging management, for how we're going to handle aging
12 management. It's the future replacement of certain
13 parts that wear out, things like that, based on
14 operating experience, etcetera and everything. It's
15 a very involved process. It's not taken lightly by
16 the NRC or Vermont Yankee.
17 Something you can consider also too is if
18 you look at Entergy, go to their website. You can
19 look at their portfolio of all the power they have.
20 You probably heard about nine nuclear plants that
21 Entergy has? We have percentages in wind power, coal,
22 gas, oil, you name it, right across the board and once
23 solar takes off or anything like that, believe me,
24 Entergy as a power company, will be on it,one of the
25 first companies on it.

1 So consider that when you think about it.
2 Look at the facts. Have we been operating safely?
3 And where are we going to get our power in the future
4 if we shut this plant down now in 2012.
5 Thank you.
6 (Applause.)
7 MR. CAMERON: Thank you, Mr. Hamer. Is
8 there a Mr. Peyton here? Then we're going to go to
9 Chris, Chris Nord from Citizens Awareness Network.
10 MR. NORD: Well, thank you to those who
11 have stuck around. My name is Chris Nord. I'm the
12 vice president of the Citizens Awareness Network. I'm
13 also on the board of the C10 Foundation over in
14 Newbury Port, Massachusetts which runs one of the two
15 state-of-the-art real-time radiation monitoring
16 systems in the United States.
17 I wanted to address first an issue that
18 has come up over and over again that Governor Salmon,
19 I think was the first to speak to the issue of global
20 warming and how nuclear is purported to be a solution,
21 a near-term solution for global warming, just to say
22 that it has been shown in numerous studies, chief
23 among them, out of Rocky Mountain Institute which is
24 run by world renown Emory Lovins and his wife, Hunter,
25 a couple of researchers back in the late 1990s looked

1 at global carbon mitigation strategies, using nuclear
2 and using renewables as two alternative paths. And
3 they discovered a finding that they put two different
4 ways which I think are provocative. One, that for
5 every $100 spent on nuclear that could otherwise have
6 been spent on what we call renewables, an extra ton of
7 carbon is released to the atmosphere that would have
8 otherwise been prevented. And that's because, as Ray
9 Shadis pointed out earlier, it's going to take many,
10 many years of many, many hundreds of nuclear plants to
11 begin to cut back on the acceleration of global carbon
12 using nuclear. And the energy efficiency and
13 renewable strategy is a much simpler, more direct,
14 cost-effective way to go about it.
15 The other way that they put it, I'm
16 drawing a blank on it. I'll leave it alone. Let's
17 see. Someone mentioned nuclear as a method of
18 retaining world peace and maintaining world peace in
19 the world and I just had to speak to that because it's
20 obvious to all of us, if we allow ourselves to think
21 about it because of current controversies on the
22 international scene where there is a country that is
23 claiming that they just want to have a nuclear power
24 system, that it is impossible to separate the
25 production of electricity through the fission process

1 from nuclear bomb technology. And we are engaged in
2 a long-term Faustian bargain to think that nuclear is
3 a way to a cleaner environment and that it's going to
4 somehow protect world peace.
5 In fact, if we are to go that way, then we
6 would be nothing but hypocritical to not allow other
7 nations of the world to do that, but that is precisely
8 what we're attempting to do in the international
9 sphere right now.
10 Okay, as to my original plan, I really
11 wanted to address my comments tonight to the Nuclear
12 Regulatory Commission and that's why we're here. I
13 have no doubt that the workers of Vermont Yankee
14 believe that they're doing the absolute best job that
15 they can and I applaud that. I do the best possible
16 job I can at my work as well, so I have no doubt that
17 you're proud of what you do and you deserve to be
18 proud of what you do.
19 The NRC has returned to the homeland of
20 the democratic process, to come to New England.
21 They're in New England at Plymouth for the Pilgrim
22 plant. They're in New England at Seabrook for the
23 Seabrook nuclear power station. And they're here for
24 Vermont Yankee. And I really have one question and I
25 think that many people who are concerned citizens have

1 one question that we can create permutations for and
2 that is who do you work for? And who do you serve?
3 Who do you actually serve?
4 The permutations that I'm talking about
5 have to do with many things that fall within this
6 larger category of design basis. And the first one I
7 want to mention is the design basis for spent-fuel
8 pools. Okay, the design basis for the spent-fuel pool
9 at Vermont Yankee originally was what is called low-
10 density racking. Now low-density racking was created
11 originally as a way to configure spent fuel because it
12 guaranteed a redundancy in the safety system for spent
13 fuel.
14 Now I hope that the NRC is actually paying
15 attention because I drove all the way over here from
16 Newton, New Hampshire, in order to speak to the NRC
17 hoping that the NRC would, in fact, take these
18 comments seriously. You have high-density racking at
19 Vermont Yankee because the NRC was willing to
20 sacrifice the redundant safety system because there's
21 no place to put the fuel.
22 What that has meant though is that were
23 there a fire -- I'll back up. Were there to be a loss
24 of coolant accident by any means in the spent-fuel
25 pool that is racked in high-density racking, that fire

1 cannot be put out. A fire in a high density pool will
2 burn until it burns itself out. And when you're
3 talking about radionuclides that extend as much as 20
4 times the extent of radionuclides that were released
5 during the Chernobyl accident, sitting in a spent-fuel
6 pool 70 feet off of the ground, not within a concrete
7 dome, but underneath sheet metal, we're looking at a
8 terrorist catastrophe in the making.
9 So first step, design basis. I call upon
10 the NRC to return nationally to the original design
11 basis configuration for spent fuel. Spent-fuel pools
12 should not be allowed to be racked in high-density
13 racking. You're giving away the safety system that
14 was originally built in that would allow that spent
15 fuel to be cooled with ambient air were there a loss
16 of coolant accident. That no longer exists at Vermont
17 Yankee. So that's number one, design basis.
18 Following that, and because of this
19 extraordinary threat of terrorism in this post 9/11
20 world, and because of the unusual way that Vermont
21 Yankee sits in relationship to the top of this country
22 right along the Connecticut River that goes all the
23 way to the Canadian border, there's a scenario that we
24 need to consider. And along with that scenario comes
25 my second request that we need in this new age of

1 terrorism to remake the emergency planning zone so
2 that it is not ten miles, that it extends to the full
3 extent of the ingestion pathway.
4 That means a 50 mile radius. And that is
5 too little, but it's a start. We need to have
6 contingency plans for what is going to be done out to
7 the city of Keene, and actually all the way out to the
8 city of Concord and out to Rutland, in many different
9 directions, because were there a loss of coolant
10 accident at that spent-fuel pool for any reason, the
11 calamity that would be created as a result of that
12 would definitely reach major cities far away depending
13 on which way the wind blows. So point two, extend the
14 emergency planning zone.
15 At Plymouth, at a license extension
16 meeting before the NRC earlier this year, I asked the
17 NRC for any features concerning their emergency plans,
18 emergency response plans, for the greater Boston area
19 in light of the possibility of an awful event, a
20 terrorist attack, catastrophic event, at their also
21 highly densely racked, highly overfull 35 million
22 curies of just Cesium in their spent-fuel pool at
23 Pilgrim, and there was no answer. I got blank stares.
24 That's because there are no contingency plans for the
25 children, for the mothers, of the greater Boston area.

1 And in this age of terrorism, it's only going to take
2 one terrorist attack against one U.S. nuclear reactor
3 for this to all be a very bad idea. And we need to
4 wake up, smell the coffee, and start to do something
5 about this.
6 Remember that a 20-mile an hour wind
7 blowing out of the south from the Pilgrim plant would
8 reach the greater Boston area in two hours. At
9 Hampton, in New Hampshire earlier this year, I heard
10 an NRC on-site inspector say to the audience that when
11 he puts his children to bed at night he realizes, he
12 believes, that he and his children are as safe as they
13 can possibly be. And so I had to point out to him a
14 scenario that I'm going to bring up tonight, because
15 it bears directly on the plant that we are talking
16 about, the Vernon plant that the workers here and the
17 owners and those that work for Entergy are so proud
18 of. And that is a terrorist cell hijacking a plane in
19 airspace Canada. They don't have to be able to
20 navigate very well. All they got to do is follow the
21 river under radar, 500 miles an hour, straight down
22 the Connecticut River right into the spent-fuel pool
23 of Vermont Yankee. It would happen so fast and so I
24 said to him I want you to not go to sleep at night
25 thinking how safe you are.

1 I want you to be lying in bed at night
2 awake being worried about this stuff until you, the
3 NRC, decides to actually take the public health and
4 safety into consideration and start making good on all
5 of these promises that you're making of protecting the
6 environment and protecting public health. We can't go
7 on like this any longer. This has to change. So
8 that's the third one.
9 We need to revise the design basis threat
10 as the 9th Circuit Court has indicated. And I think
11 it's actually, I have to say, NRC members, that it's
12 deplorable that you're considering appealing it. Like
13 why is it not in your interest to just assume the
14 responsibility? In other words, the way that we need
15 to be living, en masse, is by what is known as the
16 precautionary principle.
17 We need to learn the precautionary
18 principle, we need to teach the precautionary
19 principle, and we need to act the precautionary
20 principle on the part of our regulators so that we can
21 hand off a clean, safe, healthy environment to future
22 generations. If we don't act the precautionary
23 principle, one day, one bleak day we're going to wake
24 up and some awful event is going to happen and we will
25 have gotten caught not having been prepared for it,

1 and that's what this is all about.

2 I don't know how to state it any more

3 strongly. I'll go back to my original question, who

4 do you actually work for? Are these meetings, these

5 public meetings, merely an appeasement so you have the

6 general public come up to the microphone, make a few

7 statements, and then they go away and you get to go on

8 your merry business and decide in collusion with this

9 industry how it's going to go. Or are you actually

10 taking into account the real concerns that are

11 obvious, if you just sit and think about them, we're

12 talking about 35 million curies of Cesium-137 sitting

13 in that spent-fuel pool.

14 It's deplorable that there's nothing being

15 done. And I think that it's high time that something

16 be done and the license extension hearings for Vermont

17 Yankee are a great time to do it.

18 I will finish by saying that once that is

19 returned to low-density storage, what that

20 necessitates is that the fuel that is taken out of the

21 spent-fuel pool must be put in interim storage that is

22 robust which means that it is a hardened, cast

23 structure. It is a dispersed structure so that they

24 can't be all hit with one terrorist attack and it

25 probably should be put in a berm. I mean there's a

1 technology for this and you're going to be hearing all
2 about it because the State of Massachusetts is
3 bringing their contentions on the Vermont Yankee issue
4 exactly on the basis of what I've been describing,
5 robust storage for spent fuel at Vermont Yankee and
6 the rest of the boiling water reactors for a start,
7 for a start.
8 Those are my comments. Thank you for
9 listening.
10 (Applause.)
11 MR. CAMERON: Thank you. Thank you very
12 much.
13 Is Dart Everitt still here and Bill
14 Pearson? While Dart is coming down and Bill Pearson
15 still here?
16 Let's go to Dart. This is Dart Everitt
17 and then we're going to go to Emily Tinkham.
18 MR. EVERITT: I will be brief. According
19 to Rich Smalley, who is a Nobel Peace Prize winner for
20 chemistry in 1996 for his work on nanotechnology by
21 mid-century the world will require a doubling of its
22 current world-wide energy demand of 14 terawatts of
23 power. To achieve this demand will require the
24 equivalent of one 1,000 megawatt power plant going
25 online every day for nearly 38 years. And this is

1 from Discover of February 2005 and I have it in the
2 testimony here.
3 Although I assume the initial mandate of
4 the NRC regarding environmental issues 30 to 40 years
5 ago concerned the rather micro impact that is of the
6 areas immediately surrounding a nuclear plant,
7 certainly now the issue is equally a global concern of
8 greenhouse gases, foremost carbon dioxide.
9 I'm not an expert. I am a concerned
10 citizen, concerned about the future of energy for the
11 State of Vermont, the future energy requirement for
12 the world, and the environmental impact the sources of
13 that energy will have.
14 Dr. Arthur Westing, a resident of Putney,
15 Vermont, 10 miles up the road, is an expert. He has
16 served on the faculty or been a research fellow at
17 several education institutions, including Harvard
18 University, the Stockholm International Peace Research
19 Institute. He has served as the director of the
20 United Nations Environmental Program Project, Peace,
21 Security and the Environment, and is the author of
22 many articles and several books on the environment.
23 At the moment, unfortunately, he is in Sweden.
24 He told me he wished he could be here to
25 testify on the importance of Vermont Yankee to the

1 energy future of Vermont and give his wholehearted
2 supported to the relicensing. I am submitting an
3 email from him to me giving me the authority to give
4 you two letters he has written on energy and the
5 environmental issues, as well as his résumé. His
6 latest letter cites a British report on the role of
7 nuclear power and low carbon economy which he uses to
8 calculate the impact shown on the following page.
9 Thank you for beginning this lengthy
10 process for the relicensing of Entergy and Nuclear
11 Vermont Yankee Power Plant. I hope the evidence
12 supports a positive decision.
13 I think this is very important. It shows
14 that for CO_2 production from various sources of power,
15 that kilograms of CO_2 per kilowatt of electricity for
16 cradle to grave or a full production cycle. Coal,
17 it's 891. Natural gas is 356. Photovoltaics,
18 interestingly enough is 50, while wind and nuclear are
19 16. Nuclear power is very important to the future
20 energy of this world and this state and please, I hope
21 you consider relicensing it.
22 Thank you.
23 (Applause.)
24 MR. CAMERON: Thank you. If you could
25 just give that to Eric and we'll try to -- for those

1 of you who might be interested in reading these
2 documents, we'll see if we can get put on the
3 transcript for people to look at for their
4 information.
5 Bill Pearson. Bill.
6 MR. PEARSON: Bill Pearson. I live in
7 Brattleboro. I appreciate the opportunity to speak.
8 Can you hear me now?
9 Bill Pearson. I live in Brattleboro. I
10 appreciate the chance to speak tonight.
11 I went to Brooks Memorial Library in
12 Brattleboro to read Entergy's environmental impact
13 statement. I found a six-page glossary of
14 abbreviations and acronyms. I couldn't find any
15 section on ethics and morality.
16 We are fixated on Vermont Yankee's
17 production of 30 percent of Vermont's electrical
18 energy needs without comprehending that Vermont Yankee
19 also produces high level radioactive waste that will
20 be hazardous for thousands, tens of thousands,
21 hundreds of thousands of years. Is there something
22 genetic about our mental makeup that causes us to not
23 take this into account?
24 The typical commercial reactor contains
25 around 15 billion curies of radioactivity during

1 operations. Those dry-cask storage units can hold
2 hundreds of thousands to millions of curies. Smaller
3 truck-sized casks for highway use each contain 40
4 times the radiation released at Hiroshima. After 60
5 years of blustering by the Federal Government, there
6 still is not any safe way to deal with dangerous spent
7 fuel from nuclear power plants.
8 How ethical is it then to continue making
9 it? What system of morality allows us to condemn
10 hundreds, perhaps thousands of future generations the
11 worry and expense of safeguarding radioactive waste
12 material? Also protection from natural disasters or
13 terrorism. Replacing those Holtec dry casks every 20
14 years or is it 50 years, I don't remember, for 100,000
15 years? That's not going to be cheap.
16 That consideration alone ought to be
17 enough to shut down our nuclear power plants. One
18 product of the Iranian enrichment process is so-called
19 depleted uranium. The United States has been using it
20 by the thousands of tons in munitions in Iraq. The
21 United States has now sold depleted uranium to 29
22 other countries. When DU explodes, it produces tiny
23 ceramic uranium oxide particles that easily invade the
24 body. And eventually produce a variety of cancers and
25 other illnesses. Human DNA is affected. Deformed

1 babies are born.

2 The United Nations has called DU a weapon

3 of mass destruction. How ironic.

4 It is also genocidal. Global winds are

5 wafting DU dust all over the world. It's half-life is

6 4.5 billion years. How much DU was produced over the

7 years in enriching uranium for Vermont Yankee's fuel

8 rods? How complicit is Vermont Yankee, and are we, in

9 the weapons industry?

10 Vermont Yankee routinely emits radioactive

11 material into the air, soil and water. Presumably

12 these emissions are permissible. But who knows?

13 Permissible emissions are not the same thing as safe

14 emissions.

15 In July of 2005, and this has already been

16 brought up tonight, the U.S. National Academy of

17 Sciences released its latest biological effects of

18 ionizing radiation report, otherwise known as BEIR

19 VII. Basically what it pointed out was that no amount

20 of radiation can be considered safe.

21 How ethical and moral is it then to site

22 an elementary school directly across the street from

23 Vermont Yankee? Children are far more vulnerable to

24 radiological damage that adults.

25 Nuclear power plants, especially geriatric

1 ones like Vermont Yankee, are prone to accidents and
2 leaks. We've seen this in recent history. Let me
3 give you a quick review of some results from accidents
4 at other nuclear facilities.
5 A 400 percent increase in leukemia
6 incidents in the population living downwind of the
7 Pilgrim nuclear power reactor in Massachusetts in the
8 first five years after fuel was known to have leaked
9 excess radioactivity.
10 Three to 400 percent increase in lung
11 cancer in the general population within the plume of
12 the Three Mile Island accident.
13 Six to 700 percent increase in leukemia in
14 the general population within the plume of Three Mile
15 Island.
16 Eight thousand percent increase in thyroid
17 cancer in Belarus children living near Chernobyl,
18 reported six years after the meltdown.
19 Further effects found in victims of the
20 Chernobyl accident, less than 10 years after the
21 meltdown include the following. A 500 percent
22 increase in thyroid cancer in children in Ukraine. A
23 75 percent increase, incidence of heart disease.
24 A 200 percent increase in respiratory and
25 digestive disease. A 200 percent increase in birth

1 defects.

2 Among atomic workers, a 250 percent

3 increase in all cancers. And finally, a 1200 percent

4 increase in all cancers exist around the Sellafield

5 reprocessing facility in England.

6 I would urge us not to take too seriously

7 Entergy's environmental impact statement. Despite the

8 hard work of lots of people--and this is the point--

9 they forgot to deal with ethics and morality.

10 They were also in error to dismiss as,

11 quote, inadequate, alternative energy sources.

12 We need to understand that solar wind,

13 biomass, geothermal and others are safe, clean,

14 dependable, and most important, sustainable.

15 Conservation and efficiency should also be added to

16 the list.

17 If given the billions in Federal subsidies

18 that nuclear has enjoyed over the years, these

19 alternative energies could easily meet our energy

20 needs without harming the environment.

21 Until and unless we can ensure the health

22 and safety of human beings, and of all the

23 environment, and all forms of life, we shouldn't even

24 be using nuclear power. Let me register my vote as

25 not being in favor of a 20 year extension of Vermont

1 Yankee. Thank you.

2 MR. CAMERON: Thank you, Mr. Pearson.

3 We're going to go to Emily Tinkham, if she's still

4 here, and then to Mr. Turnbull.

5 Emily.

6 MS. TINKHAM: Good evening. My name is

7 Emily Tinkham and I live in Keene, New Hampshire. I

8 am a daughter, a sister, and an Entergy Vermont Yankee

9 employee. I truly believe that the only way to keep

10 this amazing area that we live in environmentally

11 friendly, while producing 34 percent of Vermont's

12 electricity is to continue the safe and reliable

13 operation of Vermont Yankee.

14 PARTICIPANT: (speaking from an un-miced

15 location)

16 MS. TINKHAM: Vermont Yankee produces

17 enough--

18 MR. CAMERON: Could you just let people

19 talk. Okay? Thank you; thank you.

20 MS. TINKHAM: Vermont Yankee produces

21 enough electricity to power about 620,000 homes and it

22 does not burn fossil fuel. Over the years, this has

23 avoided millions of tons of fossil air pollution. If

24 Vermont Yankee were to close, it would be replaced

25 with large amounts of fossil fuel generation and

1 greenhouse gas emissions that lead to global warming.
2 Thank you.
3 MR. CAMERON: Thank you.
4 Mr. Turnbull.
5 MR. TURNBULL: After a while it starts
6 feeling like a family reunion at these meetings, and
7 I extend that to everyone here.
8 Hi, my name is Clay Turnbull. I'm a
9 resident here of Windham County. I own a home in
10 Townsend. There's some level of emotional energy
11 around the environment impacts of operation of Vermont
12 Yankee, and I know that emotions can lead to unclear
13 and unobjective thinking.
14 Global warming. Are you concerned about
15 global warming? Twenty years ago, folks were,
16 scientists were making quite a bit of noise about it,
17 and the administrator at the time said, nah. Do you
18 believe it? And if you do believe global warming is
19 an issue, and you think it's upon us, do you want your
20 power coming from coal-burning facilities that
21 generate greenhouse gases and smog?
22 We know that our use of electricity
23 contributes to global warming. If you believe we can
24 fulfill our electric needs in Vermont without Vermont
25 Yankee's baseload electricity, if you want economical

1 power, then please listen closely.

2 If you are concerned about greenhouse

3 gases, we can't afford this distraction of dangerous,

4 dirty, expensive source of electricity. Low cost,

5 safe, clean power, zero greenhouse gases emissions.

6 That must be wind and solar.

7 Slide 17. Can we get slide 17, or is that

8 all torn down?

9 MR. CAMERON: I think it probably would be

10 difficult. If you could just summarize what was on

11 it, Mr. Turnbull.

12 MR. TURNBULL: Sure. It was an image of

13 a nuclear power station with some green grass and blue

14 river, and puffy white clouds. It was a very serene

15 place you'd want to go picnicking, and I thought

16 because we're looking at environmental impacts, the

17 slide would be more appropriate to show what are the

18 forms of effluent from a nuclear power station.

19 You know, through the effluent discharges,

20 emissions, radiation, chemicals, other pollutants.

21 Now that's just my opinion. I'm not

22 saying anyone in this room is bad or anyone in this

23 room is better than someone else. We are all in this

24 together. From my perspective, I want to share

25 something with both sides of the aisle, if we're gonna

1 play politics and be like so much of the rest of the
2 world.
3 I look in these white boxes up top, these
4 lights, and I assume that they're incandescent lights
5 because I see that there's a number of them burned
6 out, and they probably are a hassle to replace, and
7 the two lights on top of each box I can see are
8 clearly incandescents.
9 That light's incandescent. We're in a
10 room filled with incandescent lights. The most
11 inefficient light source that you can use. The only
12 thing inefficient way to light this room would be to
13 have torches. And actually that might be more
14 efficient, to tell you the truth.
15 So we need more power. We won't be able
16 to survive without the nuclear power station!
17 Well, geez, you know if I look in my sap
18 bucket and I see there there's a hole in the bottom of
19 it, most Vermonters aren't gonna look at that and say,
20 oh, there's a hole in the bottom of the bucket, I
21 better tap more trees.
22 They'll say, well, I should start by
23 plugging the hole. That's not to say that we could
24 shutter Vermont Yankee tomorrow. But I do believe
25 that in the long run, we really need to embrace safe,

1 clean energy--wind, solar, and other sustainable long-
2 term renewables.
3 And I see him walking up to the side here.
4 Let me just take a quick scan. A reliable source of
5 power must include baseload power, so let's buy
6 windpower from New York, if Governor Douglas won't get
7 out of the way and let the public get their wind
8 generation in Vermont, when the wind's not blowing
9 we'll use hydro, and as a last resort, we'll use the
10 power that we get off the open market, not spot
11 market, though.
12 Vermonters overwhelmingly embrace
13 renewable energy. 75 percent want wind. There's
14 probably even more that want solar. Small-scale
15 renewables. When the first incentive program came out
16 in Vermont two years ago, they thought it would last
17 for two years. In seven months, it was all used up.
18 People wanted solar. People wanted wind.
19 Our elderly, who must choose between
20 electricity, or food, or medicine, they need solar hot
21 water systems. They need energy audits. They need
22 efficiency upgrades of their homes and their
23 apartments.
24 And there's jobs in doing that. Lots of
25 jobs. Vermont needs jobs. We need plumbers,

1 carpenters, engineers, concrete workers, electricians,
2 energy planners, and that's exactly why we need to
3 implement a clean, renewable energy program today,
4 putting nice tradespeople to work.
5 Thanks for listening. Those are my
6 thoughts.
7 MR. CAMERON: Thank you very much, Mr.
8 Turnbull. Thank you.
9 How about Hattie Nestor and Joan Horman,
10 Vedrana Wren? Karen Murphy? Shaun Murphy? George
11 Clain. Dennis Girroir? George?
12 MR. GIRROIR: Good evening. My name is
13 Dennis Girroir. I will try to keep it simple and
14 relatively brief. This is pretty familiar to me here.
15 Tom Salmon is pretty familiar. I'm a Vermont Yankee
16 employee for better than 30 years, almost like Bernie
17 Buteau is. But my roots are here in Brattleboro. I
18 was born in this town, frequented this theater,
19 graduated from the local schools here, and never
20 really left. Came back after going off to school.
21 I know the area exceptionally well;
22 intimately. I grew up north of here. I raised a
23 family a little bit south of here, all within the EPZ.
24 I've observed how the environment has changed over the
25 last 50 years.

1 In many areas it hasn't changed at all.
2 In many areas it's quite improved. Being down in
3 Vernon, working for Entergy, I've watched how we've
4 conducted business down there and the effect on the
5 very local environment down there, the changes taking
6 place and the effect on the plant.
7 I've watched as we've operated very, very
8 well, and have witnessed the very, very exceptional
9 operation we have down there.
10 I see the impact on me personally, the
11 impact on my family and friends, and my peers.
12 I look at the overall impact of Vermont
13 Yankee, environmentally, economically, and very
14 personally, and I've got some pretty significant
15 observations over the last 30-35 years, and I'm still
16 waiting to identify one that is truly negative, truly
17 negatively impacting all of us. All of us. My
18 family, my friends, all of you, and me, personally.
19 I don't plan on leaving this area. I love this area.
20 This is home. It's beautiful everywhere but it's
21 really beautiful to me here, and because of that, I
22 have that very vested interest.
23 I'm very much in favor of alternate
24 powers, power generation. I'm very much in favor of
25 conservation. I'm very much in favor of acknowledging

1 reality, and the reality is that Vermont Yankee has a
2 very, very positive influence on this area, and all of
3 us. I need this continued operation of Vermont Yankee
4 for myself, for my children that are grown now, and
5 most certainly for my grandchildren. I thank you
6 very much.
7 MR. CAMERON: Thank you; thank you,
8 Dennis. Is Emma Stamas? And then we'll go to George
9 Iselin and Michael LaPorte. This is Emma.
10 MS. STAMAS: I'm a citizen of this area,
11 actually in Massachusetts, I live just outside the ten
12 mile limit, and I know dozens of farmers, retired
13 people, students that live in that area, some within
14 the ten mile limit, that are very concerned about
15 allowing the plant to have its life extended even five
16 more years, let alone twenty.
17 And the reason is this. If I had been
18 driving a car for 32 years, which is the life of this
19 plant, and I had never had an accident, would that
20 mean that over the next five, ten, fifteen, twenty
21 years, you could guarantee that that same car would
22 drive me safely through life without a single mishap
23 or accident? I do not think that we are being very
24 logical if we think that our technology is so
25 wonderful, that we can stand here and say we are not

1 gonna have any problems over the next 20 years,
2 because we know exactly what we're doing, how we're
3 going to present any kind of crack or malfunction from
4 developing into something more serious.
5 I don't think any of you could make that
6 bet, that I'm gonna be fine in my 32 year old car for
7 the next 20 years, and we're all sitting here betting,
8 if we approve this plant to be, have its license
9 extended for 20 years, we'll all making that bet, not
10 just with my life but with the lives of every single
11 citizen, child, mother, father, whatever, and every
12 plant and animal that lives in this area.
13 We're making that bet, and I think that
14 that's a foolish bet because I think we're not so
15 dumb, that we're willing to take that risk, and I also
16 think we're not so dumb that we can't create better
17 technologies, safer technologies, other than
18 continuing to rely on fossil fuels and nuclear power
19 and all the old standbys that we've continued to try
20 to pretend are our only choices.
21 We have lots of choices to make, lots of
22 decisions to make, and they can create jobs, they can
23 create energy, they can create a better life for the
24 future inhabitants of this region.
25 If we're so smart to create this

1 technology, so well, that we can be positive it's
2 gonna be safe over the next 20 years, why aren't we
3 smart enough to make it better, to create safer
4 nuclear power plants with safer designs, and to close
5 those that are no longer capable of operating safely?
6 And why aren't we capable of beginning to
7 create more wind and solar and conservation
8 technologies that could create immediate jobs for many
9 more people who wouldn't have to be as highly educated
10 as the people who build nuclear power plants or
11 decommission them?
12 I don't think we are so dumb, that we have
13 to sit here and listen to, oh, the plant has worked
14 great for 32 years, and believe that we're never going
15 to have any problems in the future.
16 I think we're smarter than that and I
17 think we can do better than that, and I think that in
18 every meeting that the NRC is a part of, they had
19 better rethink who they're working for and start
20 thinking about the children and grandchildren who are
21 going to have to get out of this technology of nuclear
22 energy and nuclear waste proliferation, and get into
23 something safer and more sustainable.
24 And I ask everyone to go home and urge
25 people to write letters, those of you who left early,

1 or those that know people who left early, write
2 letters, get them in by June 23rd, make your comments
3 known.
4 This isn't about, oh, the plant is great,
5 let's just continue it. It's about a lot more than
6 that. Thank you.
7 MR. CAMERON: Thank you, Emma.
8 George Iselin, Michael LaPorte, and
9 Sherry? Okay. This is Mr. Iselin? Okay; great.
10 MR. ISELIN: We live just 17 miles
11 downwind of the nuclear plant. Anyways, I'm concerned
12 mainly about the effects of waste storage of the
13 nuclear industry not having any known way to not have
14 to have this material guarded for, virtually forever.
15 And the dry cask storage, the new way of storing it,
16 isn't something that's really viable to continue
17 renewing and guarding for the next 250,000 years, and
18 it's being stored in an unstable situation.
19 The cement pad it sits on has a geologic
20 formation that's virtually mud underneath it, and it's
21 on the edge of a river, and this is considered the
22 solution.
23 Meanwhile, we have the problem of re-
24 racked spent fuel storage. Anyway, I think the
25 solution, even better than soft-path technology of

1 windmills and solar and photovoltaics, which we need,
2 is conservation.
3 Like Clay said about the incandescent
4 lights, if anyone's flown in an airplane at night down
5 on the Eastern seaboard, just the streetlights alone,
6 that we don't need to keep burning everywhere. I
7 mean, certainly it's nice to have some in the inner
8 city for safety, but there's just so much lifestyle
9 change that we need, like mainly outfitting our own
10 homes to be energy efficient.
11 And get away from the economics of
12 centralized power, which these large power stations
13 lend themselves to, get more into diversified means of
14 sustaining ourselves.
15 Anyway, I think that the main issue is
16 whether we are gonna let this outfit produce more
17 waste, contributing hot water to the rivers, and
18 things that actually do contribute to the global
19 warming, and we need to decide whether it's suicidal,
20 actually murderous, to allow these wastes to be put on
21 to future generations. Thank you.
22 MR. CAMERON: Thanks, Mr. Iselin.
23 Is Mr. LaPorte here? we're going to go to
24 Sherry and then we're going to go to Gary Sachs.
25 Sherry.

1 MS. ZABRISKIE: Hello. I'm Sherry
2 Zabriskie. I live in Guilford, Vermont. I've come to
3 many hearings regarding the sale of Vermont Yankee,
4 the operator, the license extension. I feel like I've
5 spoken many times against nuclear power and I'm at the
6 point where I feel like nobody's listening as far as
7 Vermont Yankee or Entergy.
8 The government, the NRC for sure. And so
9 I'm not here to speak to those people. I'm here to
10 speak to the people. I feel like it's time--it's
11 wonderful when ten people get arrested protesting
12 here, and five people on Tuesday got arrested,
13 standing up for what we believe in. But we know that
14 this is not clean, there's no answer for the waste.
15 You know Vermonters don't want this. We know there's
16 other answers.
17 I, for one, live off the grid. I don't
18 rely on this power, we don't need it, and like Clay
19 said, 75 percent of Vermonters know this, and we can
20 move on.
21 So what I'm here to say is it's time for
22 us to gather as the masses, people, like a thousand of
23 us at the same time, in the same place, to stand at
24 Vermont Yankee's doors or wherever. I don't know what
25 the answer is but let's make a date with thousands of

1 us, because I know, personally, hundreds of people in
2 this community that are fed up, that don't want this.
3 So let's get together. Let's make a date
4 with thousands of people. I don't know where we're
5 gonna be but we're gonna like block the road at the
6 power plant, or something, for days, and stand
7 together, until they're willing to sign something
8 saying they'll close, at least in 2012.
9 It takes massive--like in the sixties, or
10 whatever--it takes us altogether at the same place, at
11 the same time, to say we don't want this, and stand
12 together. I know Citizens Awareness Network gets
13 together every other Thursday night at Greenfield's
14 Market in Greenfield, Mass., 5:30 tomorrow night.
15 5:30, they have a meeting and it happens every other
16 Thursday.
17 And I don't go. I send them money and I
18 get their newsletter, but I'm fed up and I'm ready for
19 us all, hundreds, thousands of us to be at the same
20 place at the same time, to be strong together at once.
21 So let's do it, people. I'm going tomorrow night,
22 5:30, Greenfield. That's it. Thanks.
23 MR. CAMERON: All right. Thank you.
24 Gary. Is Gary still here? Here he is.
25 Gary Sachs.

1 MR. SACHS: Well, I'm gonna briefly
2 respond to the woman from the Vermont Business
3 Partnership who spoke earlier and mentioned the
4 Department of Public Service, and how they said how
5 much money we would lose if Vermont Yankee were to
6 close.
7 So let's take Commissioner David O'Brien
8 who's the head of the state department of Public
9 Service. He put a $60 million figure on the cost that
10 would come to Vermont ratepayers if VY closed in 2008.
11 Vermont Yankee provides roughly 250 megawatts to
12 Vermont. That represents one-third of our Vermont
13 total energy demand, which is about 750 megawatts.
14 A recent PSB study determined that energy
15 efficiency measures could reduce Vermont's total
16 electricity use by 20 percent, or 150 megawatts.
17 Let's apply that savings to what VY provides. Then
18 we'd reduce the amount of power needed to replace VY
19 to 100 megawatts. That's 250 minus 150.
20 If it would cost Vermont 60 million bucks
21 to replace the 250 megawatts over four years, it would
22 cost us 40 percent of that or $24 million to replace
23 the 100 megawatts that would remain, if we implemented
24 all the efficiency measures we could.
25 Now we're down to $24 million. Spread

1 that over four years. That's $6 million a year,
2 divided by 250,000 households in Vermont, and the
3 increase in each household's electricity bill for the
4 entire year would be roughly $24.00. That's not even
5 considering the contribution from industrial and
6 commercial users.
7 That doesn't sound like a lot of money to
8 invest in freeing Vermont from this role in the
9 production of hundreds of tons and millions, hundreds
10 of tons of radioactive waste, millions of curies of
11 deadly nuclear substances created by the Vermont
12 Yankee nuclear reactor, stored on the banks of the
13 Connecticut River. It doesn't sound like a lotta
14 money to spend to get rid of Vermont Yankee.
15 Now I'm gonna repeat what I said earlier
16 today for the few of you who are left in this
17 evening's event. Richard Monson, Harvard School of
18 Public Health, stated: "The scientific research base
19 shows that there is no threshold below which low
20 levels of ionizing radiation can be demonstrated to be
21 harmless or beneficial."
22 There is no threshold below which low
23 levels of ionizing radiation can be demonstrated to be
24 harmless or beneficial. The health risks,
25 particularly the development of solid cancers in

1 organs, rise proportionally with exposure.
2 At low doses of radiation, the risk of
3 inducing solid cancers is very small. Low doses. It
4 sounds like what the NRC was giving me earlier in
5 tonight's case.
6 As the overall lifetime exposure
7 increases, so does the risk. Every nuclear reactor
8 emits small amounts of radiation, even so-called zero
9 emission reactors.
10 3-29-2004 was two days before the NRC
11 arrived in Vernon, when they came to inform us that
12 they would not be performing the independent
13 engineering assessment which had been considered a
14 requirement on the proposed uprate by the Vermont
15 Public Service Board, the state's regulatory body.
16 5-4 of 04, the NRC changed its tune and
17 announced that it had long been planning such an
18 independent engineering assessment. They must have
19 been planning it since at least March 15th.
20 You, the NRC, say that Three Mile Island
21 was a wake-up call for the industry. That was March
22 28th, 1979. That is the same year the NRC publicly
23 stated there was no such thing as a safe amount of
24 radiation.
25 Since 1979, these are some of the events.

1 February 11th, 1981, Tennessee Valley
2 Authority's Sequoia One Plant in Tennessee, a rookie
3 operator caused a 110,000 gallon radioactive coolant
4 release.
5 February 25th 1982. The Ginna Plant near
6 Rochester, New York. Its steam generator pipe broke,
7 15,000 gallons of radioactive coolant spilled, small
8 amounts of radioactive steam escaped into the air.
9 January 15th and 16th, 1983, the Browns
10 Ferry Station, nearly 208,000 gallons of low-level
11 radioactive contaminated water was accidentally dumped
12 into the Tennessee River.
13 1981, 1982, and 1983, Salem One and Two in
14 New Jersey, 90 seconds from catastrophe when the plant
15 was shut down manually, after the failure of an
16 automatic shutdown system. A 3000 gallon radioactive
17 water leak in June of '81, a 23,000 gallon leak of
18 mildly radioactive water, which did splash on to 16
19 workers in February of '82, and radioactive gas leaks
20 in March of '81 and September of '82.
21 Let's go to 1996. NRC Chairperson Shirley
22 Jackson, speaking of Millstone in Time magazine.
23 Quote. "Clearly the NRC dropped the ball. We won't
24 do it again." End quote.
25 1997. Yankee Row, 20 miles from here,

1 roughly, out west, was closed. It's in Rome,
2 Massachusetts. The NRC had allowed Yankee Row to dump
3 radiation, for about 30 years, into the Deerfield
4 River.
5 February 15th, 2000, New York's Indian
6 Point Two, aging steam generator rupture, venting
7 radioactive steam. The NRC initially reported no
8 radioactive material to have been released. Later,
9 they changed their report to say that there was a
10 leak, oh, yes, but not enough to threaten public
11 safety.
12 2004. New NRC Chairman Nils Diaz, about
13 Davis Besse, said--catch this--"The agency," quote,
14 unquote, "dropped the ball," end quote. Again. Hmm.
15 I thought you said it wouldn't happen again. I guess
16 it did. Accidents do happen. That's our NRC.
17 If Three Mile Island was a wake-up call,
18 what exactly was happening at Davis Besse? I do, I
19 would like to know that. Oh, so here we are in an NRC
20 meeting. The environmental impact of Vermont Yankee.
21 We have virtually an ineffective evacuation plan,
22 untested in its entirety. What about those people
23 without vehicles? What about day care centers and all
24 the schools together? What about the transient hotel
25 guests?

1 A worst-case scenario accident at VY would
2 lead to an area the size of western Mass., Vermont,
3 and New Hampshire being uninhabitable for possibly 30
4 years or more.
5 The plumes, from the National Oceanic and
6 Atmospheric Administration, shows plumes going as far
7 north as deep into Canada. That's over Montpelier.
8 As far south as deep into North Carolina and as far
9 east as over Cape Cod, into the ocean.
10 Then in 2001, on top of that, there's
11 this, something called an Operational Safety Response
12 Evaluation. This was just a test--Operational Safety
13 Response Evaluation test. It occurred about a month
14 before 9/11. In this test, the NRC would stage mock
15 attackers to test the security of nuclear reactors.
16 They came up here to Vermont Yankee and they let the
17 security system at VY know where the people would be
18 attacking from, when they'd be attacking.
19 But that of course is to make sure that if
20 there were some real attacks at the same time, the
21 security agents would know. That's not what they
22 said. So they knew the whereabouts of where these
23 attackers were coming from.
24 And the test was to make sure that the
25 attackers could not get into the control room.

1 Obviously, stop them at the fence line would be the
2 logical thing to do.
3 Vermont Yankee failed. Oh, I'm sorry.
4 The NRC doesn't use that word. I think there's some
5 jargonistic terminology, I can't get my grip around.
6 They certainly had a low security rating on that one.
7 So the mock attackers were able to enter
8 the control room, and VY, one of the least secure
9 nuclear stations in the country--notoriety.
10 Around Vermont Yankee, numerous engineers
11 looked at me and said after 9/11, we fortified our
12 security, we invested $8 million into our security
13 system. Well, here's a question for an environmental
14 impact. Has anybody, any other reactors invested
15 after 9/11? Did everybody have to invest $8 million?
16 And if that is the case, let's say that's a given--if
17 everybody's adding $8 million to their security
18 systems but yet VY was already behind the eight ball,
19 where does that put us today?
20 I think we're still behind the eight ball because we
21 saw the same amount invested.
22 I wonder if the fact that there have been
23 no legislators to speak here tonight, speaks to the
24 futility of this event.
25 MR. LUKENS: Good evening. My name's

1 Larry Lukens. I live in Vernon, in the emergency
2 planning zone, and I work at Vermont Yankee. We've
3 heard a lot tonight, there've been a lot of really
4 eloquent speakers. I'm not going to try to match
5 that.
6 This is about the scoping for the
7 environmental review, as I understand it, and we've
8 heard a lot of things that weren't really about the
9 environment. One of the tests says, I recall from the
10 slide, is that NRC has to look at environmental
11 effects and determine whether these environmental
12 effects constitute a new and significant change in
13 things that have already been evaluated.
14 I haven't heard anything tonight that says
15 there's anything new and significant. Actually, I
16 haven't heard anything new, and I haven't heard
17 anything that sounds significant.
18 We have met all the requirements. We have
19 exceeded many of them. We continue to meet the
20 environmental requirements. We continue to be, as
21 John Dreyfus said, good stewards of our environment.
22 This plant emits no carbon dioxide. In fact it emits
23 nothing that would be considered a hazard. We don't
24 emit radioactivity.
25 And the people who have spoken tonight

1 have, as far as I can tell, not raised a substantive
2 issue that identifies a new or significant
3 environmental impact that would be an obstacle to the
4 renewal of this plant's license.
5 Thank you.
6 MR. CAMERON: Thank you. Thank you, Mr.
7 Lukens.
8 Joan, and then we have Beth, and is there
9 a Mr. Bosquet, Paul Bosquet? Okay.
10 Joan, thank you, and then Beth, and then
11 I'm going to ask Frank Gillespie to close out the
12 meeting for us.
13 MS. HORMAN: I'm just a concerned citizen
14 and I'm here in the interest of safety, as I hope we
15 all are. I don't want to talk to you as a group or
16 corporation but as people, people who have a choice in
17 how we will proceed in a world that often has
18 conflicting interests.
19 Although I value my comfort and the ease
20 nuclear power provides, my concern about our safety
21 and the safety of our future generations brings me
22 here.
23 It is easy to slip into denial, or pray to
24 God to take care of our problems. What is more
25 difficult is to take responsibilities for what we, as

1 a group, and as individuals, are doing.

2 At what point do we take responsibilities

3 for the damage we are doing with nuclear energy and

4 radiation? At what point do we say to ourselves, that

5 we have gone too far, and that this is not about

6 profit or power or comfort but about safety for us,

7 our world, and its future?

8 Do we want to risk another Chernobyl, or

9 another Three Mile Island? Safety is defined as a

10 state of being safe, freedom from injury or damage,

11 the quality of ensuring against hurt, injury, danger

12 or risk, or the state of being protected from harm.

13 Do we want to risk our safety with toxic

14 nuclear byproducts that jeopardize our future

15 generations and ourselves? Please. I hope you can

16 take a moment and hear me from my heart to your heart,

17 and then act from that place.

18 Do our personal comforts, and your

19 profits, justify the risk of proceeding with nuclear

20 power, particularly at this staging facility? Thank

21 you.

22 MR. CAMERON: Thank you, Joan.

23 Beth, would you like to come up.

24 BETH: Hi there. Thank you very much for

25 holding this public comment session tonight.

1 I am a citizen of, a new citizen,
2 actually, of Greenfield. I moved from Maine, where I
3 lived eight years, and prior to that I lived in
4 Princeton, Massachusetts, for 18 years, and just going
5 back to the beginning of my time in Massachusetts, in
6 18 years in Princeton, all those years we have a
7 windmill, thanks to the citizens of that town, and
8 they've now decided to improve on the windmill that
9 has been there, and it has provided well for, without
10 any pollution at all, for 30 percent of the energy
11 needed for that community.
12 And I believe they're adding another
13 windmill. I'm not sure of the statistics. But I then
14 went to Maine. Maine got rid of its nuclear power
15 plant, Maine Yankee, I'm not sure what year, and the
16 governor of Maine has led the people that work for the
17 government to create a plan, a 50-point plan of
18 creating renewable energies in the state of Maine.
19 They're encouraging cities and towns to
20 develop renewable energies that they will market
21 elsewhere, that universities can use, that can provide
22 jobs for people, that can be safe and viable for the
23 next generations.
24 Why don't we go that direction? I
25 attended a recent conference at Smith College at which

1 there was all different kinds of renewables presented,
2 and for the first time, I found out about geothermal
3 energy and that people in Massachusetts, at least
4 there, I'm not sure about Vermont or anywhere else,
5 are utilizing geothermal energy for commercial
6 buildings as well as residential properties, either by
7 going straight down to the center of the Earth, not
8 the center, but down where it's hotter than it is on
9 the surface--I'm not sure how many feet down you have
10 to go--but going straight down or else spreading out
11 along a piece of land next to your building and
12 creating energy right from the Earth itself, with of
13 course no pollutants in that process at all.
14 I believe that this problem of renewables
15 has to be regional and that we do need to contact our
16 legislators and take actions in our cities and towns,
17 and together that we can change the dependence on
18 nuclear and fossil fuels, and gas that have caused
19 such terrible devastation all over the world and in
20 our own communities.
21 I was a nuclear activist back in 1979, in
22 Princeton. We were asking the same questions then
23 that we're asking the NRC now, and that is, why
24 produce power when you don't know what to do with the
25 waste? When you don't know what to do with the waste.

1 When you don't know what to do with the waste. When
2 the waste, now, has become subject to the possibility
3 of a terrorist attack.
4 We can do better than this. We can join
5 together and do better than this, and I think we
6 should and I think this plant should be closed as soon
7 as possible, and that planned into the closing of it
8 should be planning for jobs for the people that have
9 worked so well at Vermont Yankee.
10 Thank you.
11 MR. CAMERON: Thank you, Beth.
12 I'm going to ask Frank Gillespie, who's
13 the director of the Division of License Renewal to
14 close the meeting for us, and I think he has some
15 important things to say to all of you.
16 Frank.
17 MR. GILLESPIE: I think besides thanking
18 the few that have struggled through, the people I
19 really wanted to thank actually had to leave early,
20 and that's people who exercised the system from the
21 first day we came out here.
22 We got three sets of petition with
23 contentions from the state of Vermont, state of
24 Massachusetts, and from the New England Coalition, and
25 it actually is gratifying, as hard as this may sound,

1 to see people actually exercise a system where we came
2 out and talked to these people and talked to the
3 governments, way before the application even came in,
4 to make sure that they were fully aware and had full
5 knowledge of what was going on, to make the time frame
6 to get those contentions in. Which leads me to
7 tonight's meeting.
8 Please give us your comments after this
9 meeting, in writing. We've got them on a transcript,
10 we'll try to pick them out, and I think I got two
11 things from this. Besides the concerns of the
12 citizens who came to talk is also potentially the
13 NRC's ability to communicate why we do what we do, to
14 some extent.
15 Questions on the BEIR VII report, we've
16 looked, as an agency, at the BEIR VII report, and done
17 written evaluations on it.
18 Obviously you haven't read those written
19 evaluations, but that's not your fault, if we hadn't
20 made them available. So in answering some of the
21 questions, I think we're going to have to string
22 together these references. We may not agree, but all
23 we can do is at least understand and see the basis for
24 why we're coming to those conclusions we come to.
25 So we may not get to agreement but we

1 should at least achieve understanding and read each
2 other's justification and backgrounds.
3 So with that, thank you for the about
4 twenty people who are still left in the room. Yeah?
5 PARTICIPANT: (speaking from an un-miced
6 location)
7 MR. GILLESPIE: Okay. It'll be sent out,
8 but how is it available to him?
9 MR. EMCH: I got it. First, it'll be on
10 our Web site, or it'll be in the ADAMS, but the other
11 thing is, we'll make copies available, we'll send it
12 out to anybody. If you're interested in us sending it
13 to you, we can do that. If you give us your address,
14 you gave us your address when you signed in. If you
15 send me an e-mail or whatever, and I'll make sure that
16 you get it. But it will be publicly available through
17 the NRC's Web site.
18 PARTICIPANT: (speaking from an un-miced
19 location)
20 MR. EMCH: RLE@NRC.gov.
21 PARTICIPANT: (speaking from an un-miced
22 location)
23 MR. CAMERON: We're going to have to go on
24 the transcript; okay.
25 PARTICIPANT: (speaking from an un-miced

1 location)

2 MR. CAMERON: You want to close. Let's

3 close down and you guys can talk.

4 MR. EMCH: I'll talk to you, sir.

5 MR. CAMERON: Yeah; he can let you know.

6 Okay. With that, thank you very much, everybody.

7 [Whereupon, at 10:36 p.m., the proceedings

8 was closed.]

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DART W. EVERETT

41 Sycamore St., Brattleboro, VT 05301 802-254-9258 deverett@sover.net
802-257-2627 FAX

TO: Nuclear Regulatory Commission
DATE: June 7, 2006
FROM: Dart W. Everett

It is estimated that by mid-century, the world will require a doubling of the current worldwide energy demand of 14 terawatts of power. To achieve this demand will require the equivalent of one 1,000 megawatt power plant going on line every day for nearly 38 years (article from Discover, February 2005, pp 16-17 attached).

Although I assume the initial mandate to the NRC regarding environmental issues 30 to 40 years ago concerned the rather micro impact, that is of a limited area surrounding a nuclear plant, certainly now the issue is equally the global concern of greenhouse gasses, foremost carbon dioxide.

I am not an expert. I am a concerned citizen, concerned about the future of energy for the State of Vermont, the future energy requirement for the world and the environmental impact the sources of that energy will have.

Dr. Arthur Westing, a resident of Putney, VT, 10 miles up the road, is an expert. He has served on the faculty of, or been a research fellow at several education institutions, including Harvard University and the Stockholm International Peace Research Institute, served as the director of the United Nations Environmental Programme project on 'Peace, Security, & the Environment," and is the author of many articles and books on the environment. At the moment, Dr. Westing is in Sweden. He told me he wished he could be here to testify on the importance of Vermont Yankee to the energy future of Vermont, and give his wholehearted support to the relicensing. I am submitting an e-mail from Dr. Westing to me giving me the authority to give you two letters he has written on energy and environmental issues, as well as his resume'. His latest letter cites a British report on *The Role of Nuclear Poser in a Low Carbon Economy* which he uses to calculate the impacts shown on the following page.

Thank you for beginning this lengthy process for the relicensing of the Entergy Nuclear Vermont Yankee Nuclear Plant. I hope the evidence supports a positive decision.

CO_2 PRODUCTION FROM VARIOUS SOURCES OF POWER

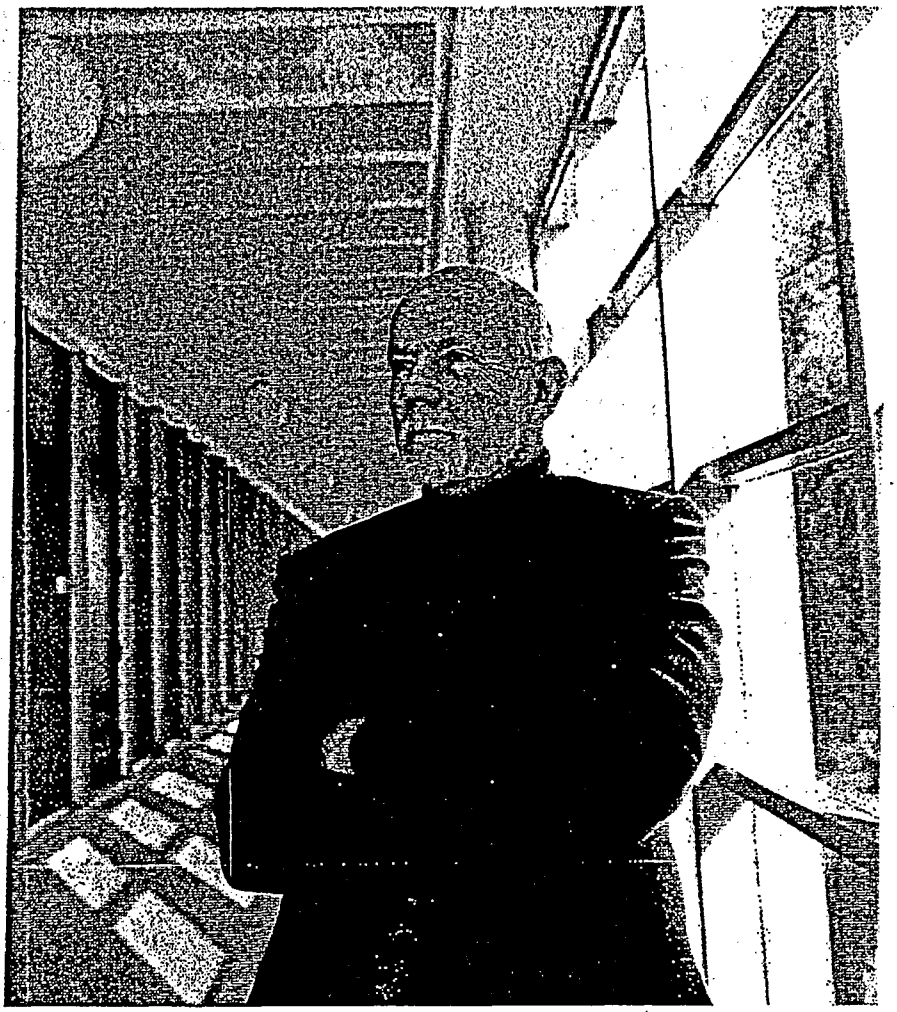
Kilograms of CO_2 per kiloWatt of Electricity for "Cradle-to-Grave" or a full production cycle

COAL	891
NATURAL GAS	356
PHOTO-VOLTAICS	50
WIND	16
NUCLEAR	16

Source:
http://www.sd-commission.org.uk/publications/downloads/SDC-NuclearPosition-2006.pdf

A Chemist's Plan to Save Planet Earth

'We are used to a world where we are rich in energy, driven by low-cost oil. That will not go on for much longer'



RICK SMALLEY SHARED THE NOBEL PRIZE IN Chemistry in 1996 for his pioneering research in nanotechnology. He discovered carbon 60, which he named buckminsterfullerene—buckyballs for short—because the molecule carries the structure of geodesic domes created by Buckminster Fuller. Buckyballs have led to the development of carbon nanotubes, used in many contemporary developments in nanotechnology. Smalley, who teaches at Rice University in Houston, is using his Nobel Prize as a bully pulpit to discuss energy, an issue he calls the most important problem facing humanity.

What is the energy problem, and why are you, a chemistry professor, so concerned about it?
S: The core of the energy problem is that we have a lot more people on this planet than we used to have. Right now most of the billions of people in the underdeveloped world are not consuming energy at any significant rate, yet they certainly will as time goes on. Either we find a way of enabling energy prosperity for everyone on this planet, or we will inherit a plague of troubles.

Such as?
S: Prosperity is determined by the abundance, quality, and cost of energy. We are used to living in a world where we are incredibly rich in energy, driven primarily by low-cost oil. That will not go on for much longer. It cannot because rapid economic development in China, India, and Africa, combined with increasing demand for fuel in the developed world will soon outpace worldwide oil production.

What will happen as energy costs climb?
S: The cost of energy going up will cause prosperity to go down. There will be inflation as billions of people compete for insufficient resources. There will be famine. There will be terrorism and war.

Why are you the right person to take this on?
S: The answer to these problems has to come out of the physical sciences and engineering. If I can't see the answer, who can?

Why don't more people seem to care about this?
S: Cheap oil. Our biggest problem for the past 20 years has been low oil prices.

Do you think it will require another shocking event like the 1970s oil crisis?
S: I'm afraid it will. I have dedicated much of my time to trying to bring this issue to the top of the agenda, hoping that the Bush administration would realize the political poetry of launching a grand new challenge to solve the energy problem. If that doesn't happen, then we will have to wait for events to bring this issue to a raging crisis.

What should we be doing?
S: We should concentrate on finding a new energy resource and a new energy infrastructure to augment and ultimately replace oil, natural gas, and eventually coal. It's a huge enterprise. Worldwide, energy is a $3-trillion-a-year operation, twice the size of global agriculture and four or five times larger than all the world's military expenses.

What about the energy companies?
S: Many people working in the big energy companies have great hopes that there are vast resources of natural gas around the planet that will keep us going for many decades. I share their hope, but I believe it is wishful thinking.

So where should research be focused now?
S: One area is in the transmission and storage of electrical energy. It would be transforming to have much more efficient electrical energy transport by wire over continental distances in hundreds of gigawatts. It would also be transforming to have electrical energy storage on a vast scale. I believe it's best to do this locally in our houses and small businesses. We need to be able to pull electrical power off the grid when it is cheapest and tuck it away

somewhere so that it is available for use later, whenever that home or business needs it. Long-distance electrical power transfer would allow primary energy producers to market their energy thousands of miles away. Imagine vast solar farms in the deserts. You know, if you look at the planet, virtually every continent has deserts. Those deserts have tremendous energy resources in the form of sunlight. Even if we find a way of generating the electricity, you've got to transport that energy from the deserts, where people don't live, to other places on the continents where they do live, and you've got to shift the time when the energy is available. I'm confident that the best answer is going to be enabled by nanotechnology.

> 'Carbon nanotubes are capable of handling incredible levels of electrical current, as much as a billion amps per square centimeter'

What can nanotechnology do?
S: Let's talk first about transmission. The angle I've been devoting my efforts to is a new kind of conducting cable made of what are called armchair quantum wires: single-walled carbon nanotubes [buckytubes] with a particular structure. These are quantum wave guides for electrons. I am confident over time we will be able to find new ways of spinning continuous cables using such technology. This approach could yield cables with the conductivity of copper but with a strength greater than steel at one-sixth the weight. Carbon nanotubes are capable of handling incredible levels of electrical current, as much as a billion amps per square centimeter. That's compared with conventional cabling material, which can carry only a couple thousand amps per square centimeter. In storage, our hope is to develop new batteries. The chemistry of batteries needs to be improved at the nano level and brought up to the macro level. The best candidates include buckytubes in lithium ion batteries, flow cells, and hydrogen fuel cells.

How far away are we from being able to store and transmit energy these ways?
S: I believe if we launch a major national research program, we can have the necessary enabling scientific discoveries—little miracles and big miracles—within the next 10 to 15 years.

Solar doesn't work very well now. Why are you so keen for it?
S: If you survey the sources for primary energy at the massive scale that we're going to need, there are only a few places you can find energy of that magnitude. Nuclear fission power plants, if you were willing to have thousands of breeder reactors around the world, would be perfectly adequate. Hydrogen fusion would be perfectly adequate. Both are probably going to be too expensive, but we ought to push them anyway.

Can any other energy sources help us until we develop solar better?
S: Coal. But we cannot burn coal much longer without somehow sequestering the resultant CO_2. Unfortunately, I doubt that we will ever be able to do that on a global scale in a practical, reliable way at the required rate of tens of billions of tons per year, year after year. That sends us right back to solar. There is thousands of times more solar hitting the earth than we will need to power 10 billion people. The only way to do it cheaply is with photovoltaics or a photocatalytic agent that is as cheap as paint. There's a lot of buzz around about nano entities that can be coated onto photovoltaic films cheaply.

So research dollars should go to solar first?
S: Yes, together with electrical power transmission and local storage. We ought to stomp on it. I realize that we'll need miracles to get there, and we can't guarantee that all those miracles are possible within the laws of physics and chemistry as we now know them, but I have faith that somehow we will find a way to make it work.

How much time do you think we have?
S: Well, we should have dealt with all of this back in the 1980s. The challenge we face is to provide for a doubling of worldwide energy production by midcentury. Right now the world runs on about 14 terawatts of power, the equivalent of 220 million barrels of oil per day. By midcentury, most analysts agree you have to at least double that to more than 440 million barrels of oil equivalent per day, or 28 terawatts.

Can we do that?
S: Not by burning things that put CO_2 into the atmosphere—too much risk to the planet. What we need is clean energy that is cheap enough to permit the development of India, China, sub-Saharan Africa, and South America. We need it at no more than three cents a kilowatt hour. If I knew how to do that now, and I turned on one such new carbon-free 1,000-megawatt power plant tomorrow, and then the next day another plant and the next day another plant, I would have to do that for 27 years each and every day in order to just get 10 more terawatts. And we need more than that.

It seems hopeless....
S: Addressing this challenge will be good for us. Even if we fail to find the miracles that allow us to make and then transport hundreds of gigawatts of power over 3,000 miles at pennies per kilowatt-hour, and even if we can never find photovoltaics that are as cheap as dirt, the enterprise of trying to do it will push our science and our engineering so far forward that we'll generate a cornucopia of unexpected new technologies that will be the basis of vast new industries.

What will inspire us to do it?
S: Presidential leadership. A president could inspire a new generation of scientists and engineers, a new Sputnik generation that would be of tremendous benefit to this country and to the world. This bold new enterprise would be good business, good politics, and most important, good for the soul. ☒

PHOTOGRAPHS BY BETH PERKINS

From: "Westing" <westing@sover.net>
To: "Dart W. Everett" <deverett@sover.net>
Subject: Energy matters

Dr Arthur H. Westing
Westing Associates in Environment, Security, & Education
134 Fred Houghton Rd; Putney, VT 05346; USA
T&F: 1-802-387-2152; E: westing@sover.net

Dear Dart,

Thank you for your call of this morning. As requested, attached (in WordPerfect) you will find three items: (1) My very recent letter on global warming and CO2 (Brattleboro Reformer, 1 Jun 06); (2) My earlier letter on electricity for Vermont (Brattlebor Reformer, 22-23 Mar 03); and (3) a brief Vermont-oriented bio.

As requested, you are welcome to submit these on my behalf to the Nuclear Regulatory Commission or similar Vermont energy-related hearings and meetings.

I shall be out of town and unreachable from 4 to 24 June.

Sincerely yours,
Arthur

AHW blurb 13 (Local).wpd

ms - Electrical op-ed.wpd

Ltr - CO2.wpd

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ARTHUR H. WESTING — BIOGRAPHY

Westing's undergraduate training was in botany (Columbia, AB, 1950). After two years in the United States Marine Corps (serving as an artillery officer in the Korean War) he became a forest ecologist (Yale, MF, 1954; PhD, 1959). He has been a Research Forester with the United States Forest Service, has taught forestry, ecology, and conservation at various colleges and universities, has twice been a Research Fellow at Harvard, and has been a Senior Researcher at the Stockholm International Peace Research Institute and the Peace Research Institute Oslo. For eight years he directed the United Nations Environment Programme project on 'Peace, Security, & the Environment', a position which took him to many countries throughout the world; and is the author of numerous articles and several books in that subject area.

Westing has been on the faculty of the European Peace University, a member of the World Conservation Union (IUCN) World Commission on Protected Areas, Vice-President of the International Society of Naturalists (INSONA), and also a member of or advisor to a number of other international environmental nongovernmental organizations and scholarly journals. He has been awarded an honorary doctorate (DSc, Windham, 1973) and a medal from the New York Academy of Sciences (1983); and he is one of the 500 individuals worldwide to have been appointed to the United Nations 'Global 500 Roll of Honour' (1990). He has been a Consultant in Environmental Security since 1990, variously to the World Bank, UNEP, UNIDIR, and UNESCO, to the International Committee of the Red Cross, to the International Organization for Migration, the Government of Eritrea, and to several other national and international agencies.

Westing moved to Vermont in 1965, and has been on the faculties of Middlebury and Windham Colleges, and an outside examiner at Marlboro College. He has served on the Governor's Environmental Control Advisory Committee, has been a Contributing Editor of the *Vermont Freeman*, and on the statewide Boards of the Vermont Wild Land Foundation, Vermont Academy of Arts & Sciences, and Vermont Coverts. Locally he has served on the Boards of the Windham Regional Commission, Windham World Affairs Council, Brattleboro Museum & Art Center, Woodland Owners' Association, and Windmill Hill Pinnacle Association.

—AHW/060603

ELECTRICITY FOR VERMONT

Arthur H. Westing
Putney (20 March 2003)

According to the Vermont Department of Public Service, roughly 40% of Vermont's electricity currently derives from hydro-power, 35% from nuclear power, 15% from fossil fuels, and 5% from wood (the remaining 5% being imported with source unspecified). Wind and solar power currently contribute negligible amounts to Vermont's electricity (each under 0.1%). Moreover, the use of electricity in Vermont has in recent decades been rising quite steadily — since 1980 at the rate of about 2.6% per year, and the State projects that this trend will continue. In this regard it is important to note that the increase in electrical use has been three times as rapid as Vermont's increase in population during that same period.

Various of my friends and acquaintances in the area are outspoken in their opposition to nuclear power plants, and seem baffled that I do not join them in their anti-nuclear activities. There is no denying that a nuclear power plant has a risk associated with it, namely the exceedingly remote possibility of catastrophic releases to its surrounding area of airborne radioactive contamination, either from faulty operation or malicious act. However, under normal operation the radioactive releases of a nuclear power plant are below those of a fossil fuel plant (especially so when coal is used, which generally contains more thorium and uranium than oil); and its contributions to greenhouse gases and immediately dangerous air pollutants are virtually non-existent. In terms of the energy obtained, uranium mining is orders of magnitude less environmentally intrusive than coal mining or oil extraction. The ultimate disposal of spent fuel and other radioactive wastes does present a problem that remains to be solved to complete satisfaction, presumably by a combination of reprocessing and burial at some remote and tectonically stable site, either in this country or elsewhere.

By contrast, the use of fossil fuels inevitably results in huge ongoing insults to the human and natural environments in at least two major forms: acid precipitation and greenhouse gases. The former seriously debilitates our terrestrial and freshwater ecosystems and the latter is a major contributor to the global warming that is on its way to becoming the ultimate insult to both the global biosphere and global sociosphere. Moreover, the oil (which now accounts for about one-third of the fossil fuels used for generating Vermont's electricity) leads our country to deal with such ruthlessly totalitarian states as Saudi Arabia and Iraq, or might well lead to the despoliation of Alaska's still relatively pristine north shore. And then to consider are the blighted lives and landscapes where the coal we use originates. As to hydro-power, more than two-thirds of what Vermont now uses comes from Canada, for which the James Bay region has paid dearly. That electricity comes to us with the legacy of a devastated environment over huge areas of the taiga ecosystem, and the utter disruption and social breakdown of the indigenous Cree population.

If nuclear-generated electricity is curtailed, this will be at the inexorable expense of almost comparable increases in the use of fossil fuels. Substitution by wind turbines — a non-polluting source of electricity that could replace modest amounts of the loss — is currently being fought

with extraordinary vehemence, especially for aesthetic reasons, wherever attempts in Windham County and elsewhere in Vermont are now being made to introduce them (and this despite the largely trouble-free Searsburg pilot operation). Vermont is already using wood to a larger extent than any of our neighboring states. Indeed, greater use of wood (now plentiful in Vermont) should be encouraged, but if substantially increased our air must be monitored for the possibility of significant contributions to its pollution.

Substitution by water power generated in Vermont could in theory replace another modest amount of the loss. However, to obtain the electricity for Vermont from the eight Connecticut and Deerfield River dams now available for sale (if not dismantled, as environmental considerations might suggest) would require a fundamental change in the State's relationship with the New England Power Pool, or even withdrawal from it. And any construction of new dams (if suitable sites could be found) would be at the expense of further disruptions to what relatively little remains of Vermont's free-flowing stream ecosystems.

Efficiency, frugality, retrenchment, and population limitations could alleviate some of the strains of any electrical deprivation — and should certainly be encouraged by all means at hand. But the simple fact remains that most of the electricity lost by eschewing nuclear power is sure to be made up by fossil fuels — and thus at a terrible continuing actual (not hypothetical) cost to humans and nature, in both the short and long terms. Regrettably, I do not have much hope for significant help from this direction, given that per-capita use of electricity in the State has increased by about 40% since 1980 despite a huge amount of publicity urging us all to be more conservative in our use of electrical (and other) energy. It is no slip of the lip that "energy use" is usually referred to as "energy demand". And even the thought of population limitations for Vermont (or the nation) is anathema to many people.

In short, I would be ready to support the phasing out of nuclear power plants in the unlikely situation that such action were unfailingly linked to replacement — as needed beyond savings from efficiency, frugality, retrenchment, and population limitations — by sources that were medically and environmentally benign (fossil fuels certainly not among them). Moreover, it is useful to recognize that electricity makes up less than one-fifth of the total energy currently being used in Vermont — transportation and space heating together accounting for the lion's share — so any energy conservation efforts must certainly take this differential into account. Finally, it is clear that Vermont does not, and cannot, act in isolation regarding many of the energy challenges we face today. Even if we direct a blind eye toward the distant unpleasantries associated with the sources of the electricity we import, we cannot forget that we also import most of our air pollution from electrical-generation plants more or less distant from Vermont.

[This appeared in the *Brattleboro Reformer* 91(18):5; 22-23 March 2003, under the title "Why I support nuclear power", and also otherwise slightly edited.]

GLOBAL WARMING, ENERGY PRODUCTION, AND CARBON DIOXIDE

The most serious long-term threat to the well-being and survival of the plants and animals with which we share the earth is global warming. And the major cause of global warming is the carbon dioxide gas we humans release into the atmosphere. That carbon dioxide is largely a byproduct of our profligate use of coal, oil, and natural gas (and, among other lesser sources, the manufacture of cement). Our output of carbon dioxide has been steadily increasing since the late 19th century, and about 50 years ago surpassed the earth's ability to absorb it.

None of the ways in which we produce energy is fully benign, so clearly the most sensible way to address the problem of global warming is some combination of using less energy and of using the energy we do need more efficiently. Next it becomes important to know how the several ways of producing energy compare in their production of carbon dioxide. To be meaningful, such comparison must take into account the full production cycle, including fuel extraction, plant construction, routine plant operation, energy distribution, ultimate decommissioning, and so forth (a "cradle-to-grave" analysis); moreover, the comparison must be done on an energy unit basis (for example, per kiloWatt-hour of electricity generated).

It turns out that, on top of its staggering immediate environmental and health impacts, coal is by far the worst carbon dioxide — that is, global-warming — culprit. An authoritative study comparing several means of producing electricity throughout western Europe was published in March of this year by the British Sustainable Development Commission (see pages 21-22 at www.sd-commission.org.uk/publications/downloads/SDC-NuclearPosition-2006.pdf). For each kiloWatt-hour generated, coal produced, on average, 891 kilograms of carbon dioxide; natural gas 356 kilograms; and wind turbines and nuclear power stations each about 16 kilograms. In other words, in a cradle-to-grave analysis nuclear produced only about 2% of the carbon dioxide of coal, only about 4% of natural gas, and about the same as wind. I might add that a recent separate German report found that nuclear produced about 30% of that produced by photo-voltaics (solar panels).

There is no denying that nuclear power has drawbacks associated with its use, including the remote possibility of a catastrophic accident, the safe disposal of the still radioactive spent fuel rods, and the potential facilitation of nuclear-weapon proliferation. But to suggest that nuclear contributes significantly to our awesome global warming crisis — more so than wind or even natural gas, as recently reported by the Vermont Public Interest Research Group of Montpelier (VPIRG) on page 11 of its booklet "Global Warming in Vermont" — is slovenly if not disingenuous advocacy.

Finally it should be of interest to note that the electricity we currently obtain from our local provider, Green Mountain Power, contributes relatively little to global warming. About 92% comes from low carbon dioxide producers (45% nuclear, 43% hydro, 4% wood) and the remaining 8% from high carbon dioxide producers (5% natural gas, 3% oil) — our local low/high breakdown being about twice as favorable as for the state as a whole.

Arthur H. Westing
Putney, Vermont

[Published in: *Brattleboro [Vt] Reformer* 94(78):4. 1 June 2006]

Union support for Vermont Yankee Re-licensing

Brattleboro, VT/June 7, 2006 – Mike Flory, Chairman of Unit 8, Local 300, of the International Brotherhood of Electrical Workers, which is also a member of the Vermont Energy partnership, issued the following statement at this evenings re-licensing hearing.

Thank you for the opportunity to be here.

My name is Michael Flory. Some of you may have read about me a few weeks ago. I was the fire brigade member reported as injured in our Unusual Event, and I'm happy to say that reports of my demise were a bit exaggerated.

I am the Chairman of Unit 8, Local 300 of the International Brotherhood of Electrical Workers. I work at Vermont Yankee, along with more than 120 IBEW members. I am proud to say that I was born and raised in Vermont, and I currently live just a few hundred yards from the front gate.

We are proud to work at Vermont Yankee because of the essential power it produces. We know that our work at the plant helps to make Vermont a cleaner and more prosperous place to live.

Without Vermont Yankee the 620 megawatts that we currently supply to the New England grid would have to come from a fossil fuel power plant. Wind Power, Connecticut River hydro power and energy conservation, all nice ideas, simply cannot replace the reliable, steady, **baseline** power we produce.

Since opening in 1972, Vermont Yankee has prevented more than 100 million tons of fossil fuel emissions from entering the atmosphere. This has been prevented not only by rendering an in-state coal plant unnecessary, but also from reducing the amount of out-of-state electricity we have to purchase, most of which would come from coal plants as coal still accounts for half the power produced in America today.

In 2005, Vermont Yankee avoided the emission of

- 7,700 tons of sulfur dioxide,
- 2,000 tons of nitrogen oxides,
- 2.5 million metric tons of carbon dioxide.

Emissions of sulfur dioxide lead to the formation of acid rain. Nitrogen oxides are a key precursor of both ground level ozone and smog. Greenhouse gases, like carbon dioxide, contribute to global warming.

The 2,000 tons of nitrogen oxides prevented by Vermont Yankee last year is the equivalent of what would have been generated by 105,000 vehicles. In Vermont, we have 280,000 cars.

NRC-1

Let me repeat, we at Vermont Yankee are proud of what we do – proud to produce power cleanly and safely.

Safety is our highest priority. We would not work in the plant, let alone live near it with our families, if we felt that the plant was not safe or that safety was not a priority at Vermont Yankee. We have seen, and been instrumental in the plants continual enhancements and upgrades, most recently during the "power uprate" process.

The cost of Vermont Yankee's power to Vermont consumers like myself is also far below regional market prices. As a base-load generator we are able to provide lower-cost power which is so critical for the state.

I respectfully submit that if you like having lights that go on at the flick of a switch, if you like computers that don't fry as a result of rolling brownouts; if you enjoyed air conditioning during last weeks heat wave, or heat during last months' cold snap you should like Vermont Yankee's low-cost, clean, and safe power.

Vermont Yankee's value to my home state can only become more valuable as time goes on. As global warming becomes more and more destructive, we can remain an environmentally friendly source of power with zero greenhouse gas emissions. As the world energy markets become more competitive, we can continue to be a source of reliable, economic baseload power.

That is why we encourage the NRC to renew Vermont Yankee's license.

Thank you.

VEDRANA WRON
802 451 3145
VEX_HR@YAHOO.COM

Hello

my name is Vedrana. I work @ Vermont Yankee. I also worked @ Brattleboro Food Coop for the first two years of living in Vermont. You could say that I have experienced ~~both~~ the two opposites that this community encompasses. One thing I have noticed is that a lot of the negative sentiment is founded in the clear lack of understanding of nuclear power. ~~You have to wonder how much does the average citizen know about nuclear power? Probably as little as possible with the exception of those that live near one. They want to know as much as possible.~~ In our community the negative sentiment is very vocal. It is time that we join in the dialogue that goes beyond these ~~community~~ meetings. ~~It is my firm belief that we as~~ a company and members of this community we need to dedicate funds and develop an educational outlet. NO OPINIONS JUST FACTS. THEY WILL SPEAK FOR ~~Hear~~ The most common counter argument I hear ~~to this little "pet" theory of mine~~ is that those who oppose ~~nuclear~~ power don't want to listen. Yes, there is a certain percentage of the ~~community~~ population that very firmly believes that nuclear energy is bad. They base that belief on their

YEDRANA WRON
802-457-3145

This is where we embrace our differences

also

vision of the world. ~~[illegible]~~ there is a great segment of the population that doesn't know what to think. ~~But~~ the only voice they hear is the negative one! The one that fills them with fear and misinformation.

~~[illegible]~~

I have met many that want to listen ~~[illegible]~~ are eager to listen ~~[illegible]~~ ~~[illegible]~~ ~~[illegible]~~

name – appointed EMD town of M.
we have petitioned the NRC re: inclusion

June 7 2006

The Town of Marlbopro Vermont hereby (again) formally requests that Marlbor be included in thje EPZ for tyhe Vermont nuclear power plant. Marlboro is the only Town with property within the ten-mile radius of the power plant which is not included, and in all other cases where part opf a town falls within the ten-mile radius ther entire town is included in the EPZ. A map showing this discrepancy is a part of the original Vermont Yankee license with the NRC. I have made a similar but less detailed map for inclusiuon with his request.

~~Has Marlboro's request for hearing been granted?~~

We are entitled to the same protections as other residents who live near the power plant and being excluded from the EPZ does not allow us those protections. Items such as notification, training, input into environmental issues and etc. will all be addressed when Marlboro is included in the EPZ. Marlboro rqueusts that as the NRC looks over the license extension, a change mandating Marlboro's inclusion in the EPZ is the only reasonable stance for the NRC to take- after all, the NRC issues the license and the goal of the NRC is to protect the citizens of this country from undue exposure to risk.

want to re-inforce our request here today.

Thanks,... Dan MacArthur Marlboro VT 05344 Emergency Management director.

as for the purpose of today's meeting – Environmental Scoping – follow up on the comments of Ray Shadis & Chris Williams –

we the local citizenry ~~feel very strongly~~ know that our entire environment – our homes our farms our livelyhood – are at risk if there is ever a sizable release of radioactivity ~~material~~. Our property values will plummet and our ability ~~ofo~~ to sell and eat our own produce will be diminished – I cannot imagine a greater environmental impact and with the radioactive waste being stored on-site – probably for thousands of years – there is a greater mathematical probability that this will happen:

we are talking about all or nothing here –

~~Please do not~~ extending the license greatly increases the

likelihood of an environmental radioactive event in the future and as a local Emergency Mgmt. Director I ask that you mandate Marlboro's inclusion in the I believe that Marlboro's inclusion in the EPZ gives us a greater say in the oversight of this potential environmental event

Any Environmental Scoping must take into account the impact on our lives of thousands of years of storage here in our back yard.

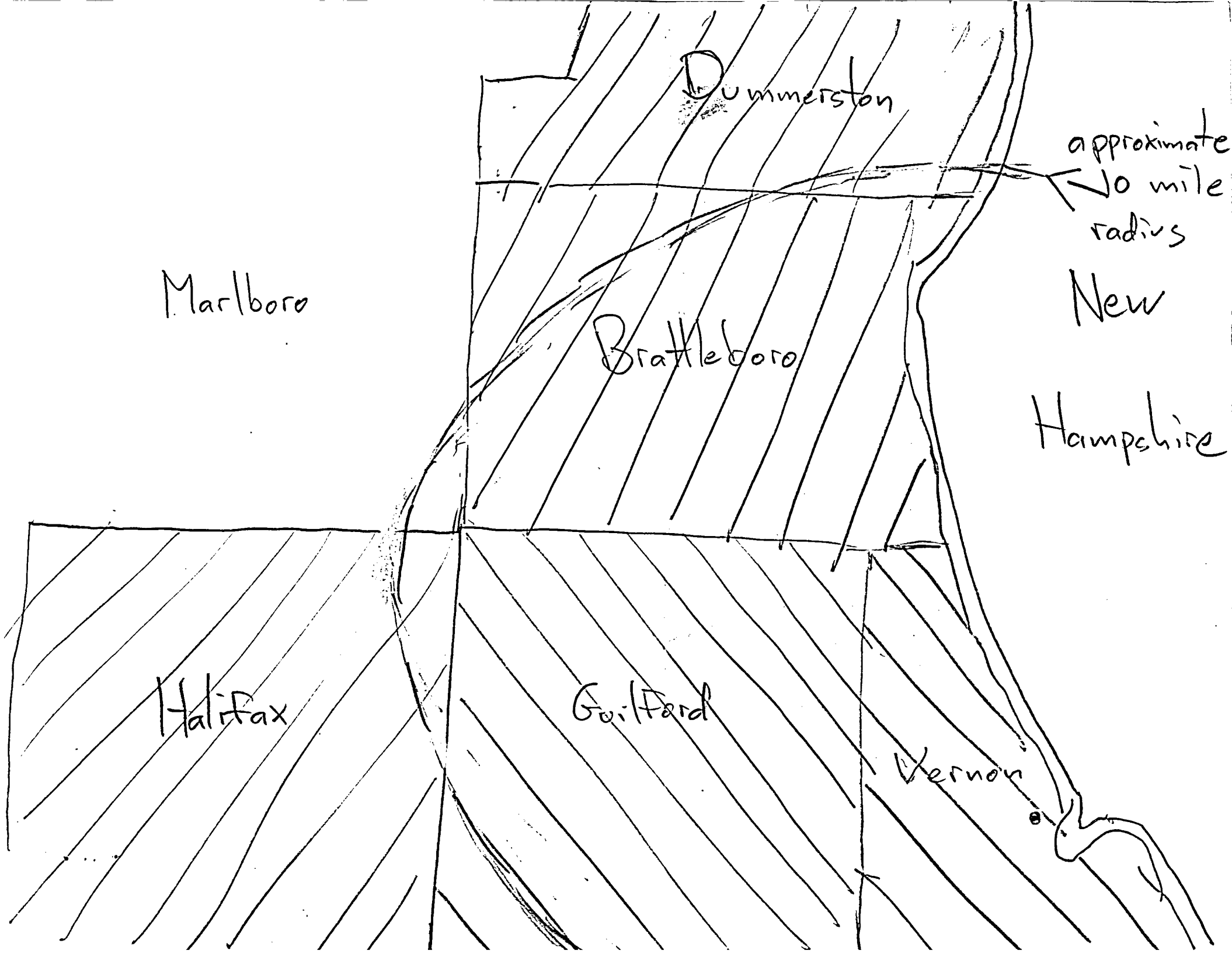
As Marlboro's EMD I insist that your review cannot be complete until you consider the environmental impact on our lives of any radioactive event. I know that technically your review ends in 2032 but our lives will be impacted for many times that long - even any event during the next 25 years could completely destroy our environment and your

~~Marlboro has petitioned for Hearing to be included in EPZ but I will re-iterate our request today—~~

~~unless the owners of VY can guarantee that we will have no radiologic active releases— say less than one in a million I think that the potential risks are too great~~ possibly ~~make~~ our lives as well. As I said earlier, I cannot imagine a greater environmental impact and I cannot imagine the NRC extending this license if there is any possibility of this happening—

Question: to estabish a comfort level with NRC— could I see a show of hands here— who is with NRC? Now, who among you has previously worked in the energy industry??

And, re: Shawn Bonfield— hidden costs of nuclear are huge— look at the federal payroll here today out of taxes but dedicated to nuclear electricity. paid


Dummerston
approximate
10 mile
radius
Marlboro
New
Brattleboro
Hampshire
Halifax
Guilford
Vernon

Sustainable Development Commission

SDC position paper

The role of nuclear power in a low carbon economy

Introduction

1.1 Why the SDC is re-examining its nuclear position

The SDC's previous position on nuclear power was agreed in 2001 as part of our input into the Energy Review conducted by the Performance and Innovation Unit of the Cabinet Office. This formed the basis of our input to the Energy White Paper (EWP) process.

The 2003 Energy White Paper was a watershed in energy policy, and was unique internationally for committing the UK to a 60% cut in CO_2 emissions by 2050. Although it is now possible that this target will need to be increased, in order to meet the international obligation to avoid dangerous climate change, the EWP contained a bold vision for future energy supply and demand. The four primary goals were:

- **Putting the UK on a path to cut CO_2 emissions by 60% by 2050, with real progress by 2020**
- **To maintain the reliability of energy supplies**
- **To promote competitive markets in the UK and beyond**
- **To ensure that every home is adequately and affordably heated.**

The EWP outlined a vision for energy supply in 2020, which saw electricity supplies still based on a market-based grid, but with increasing commitment to more local generation and microgeneration. With a strong focus on energy efficiency, renewables, and greater use of combined heat and power (CHP), the EWP stressed the need for technological and economic innovation to help bring new technologies to the market, thereby creating future options.

Since then, there has been mixed success with the policy measures put in place to deliver these goals. Carbon emissions have been rising for the past three years, mainly as a result of increased use of coal in power stations due to high gas prices, but also due to increased demand for energy, despite the effect of a number of energy efficiency measures. Progress with renewables has been reasonably encouraging, and despite concerns over delays in the offshore wind sector, it is still considered possible for the UK to meet or get close to its 10% renewables target by 2010.

However, rising oil and gas prices have put pressure on consumers, and there is increasing concern that, over the longer term, the inevitable decline in the UK's North Sea reserves will lead to energy security problems. In the electricity sector there are worries that the decline of the UK's nuclear power capacity, due to scheduled closures, will reduce total generating capacity and could increase CO_2 emissions unless this capacity is replaced by carbon-free generation.

In response to these concerns, the Government has announced a new Energy Review, which will report after the Climate Change Programme Review finishes, in mid 2006. As the Government's advisor on sustainable development, the SDC decided during 2005 that it needed to revisit its position on nuclear power so that it was well placed to advise the Government on this important and controversial issue.

1.2 Nuclear power in context

Nuclear power currently provides around 20% of the UK's electricity. This translates into 8% of the UK's energy needs once other sources of energy, such as transport fuel and non-electric heating, are taken into account. Our evidence base shows how this contribution is scheduled to decrease over the next 30 or so years, assuming no plant lifetime extensions.

Since the 2003 Energy White Paper the fundamentals have not radically changed, and many of the measures introduced since 2000

polarised, with heavily entrenched positions on both sides. This does not help with a considered analysis of nuclear power, and tends to result in reports that seek to justify a pre-determined position. Such reports are easily dismissed by opponents and will be regarded with suspicion by those that are truly 'neutral'; they are therefore of limited value to the public debate.

Our stand-alone evidence base is published alongside this paper, as a separate resource.

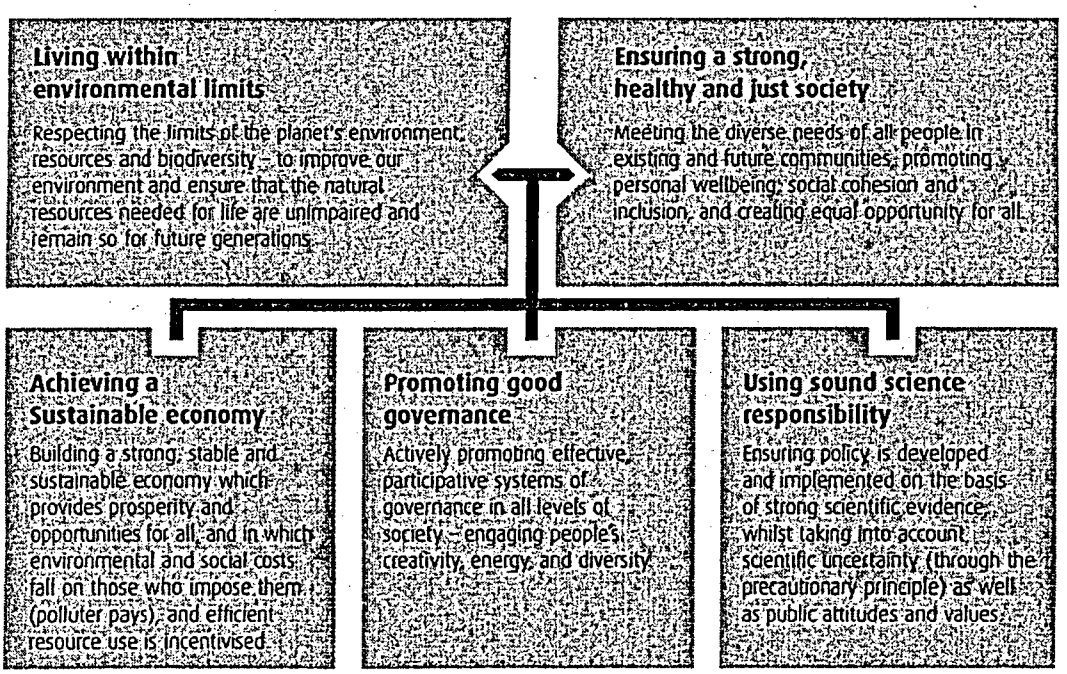
1.5 Our approach

In March 2005 the UK Government and the Devolved Administrations jointly published a shared framework for sustainable development, *'One future – different paths'*, in which five new principles of sustainable development were agreed across Government for all policy development, delivery and evaluation – see Figure 1. Based on these principles, the UK Government published its Sustainable Development Strategy, *'Securing the future'* to guide its policy-making process across different departments. We have therefore examined new nuclear development against these five principles.

In this paper we have not followed the five principles slavishly, as some are more significant for the nuclear issue than others. We have dealt with 'environmental limits' and 'sound science' together; we have looked in considerable depth at 'sustainable economy'; we have covered 'good governance' in relation to public engagement and in conjunction with 'a healthy and just society'.

In examining the evidence base, and taking into account the context of the five principles and the 2006 Energy Review, we have

Figure 1: UK sustainable development principles



Securing the Future – delivering UK sustainable development strategy

2. Sustainable Development Analysis

This section will look at the case for nuclear power based on three areas of analysis, and using the five principles of sustainable development. The analysis below draws exclusively on the SDC's evidence base, which consists of eight separate reports that are published alongside this paper.

2.1 Environment

2.1.1 Low carbon status[2]

No energy technology is currently carbon free. Even renewable technologies will lead to fossil fuels being burnt at some point in their construction due to the high levels of fossil fuel usage in almost every transport mode and industrial process, including electricity generation. For example, wind turbines are built of steel, and fossil fuels are therefore consumed in their construction either directly, during manufacture, and also from petroleum usage when the parts are transported to the construction site. However, the fossil fuel used over the life of the turbine is 'repaid' in less than 10 months, as the turbines themselves generate zero carbon energy[3].

Nuclear power stations are no different, with large up-front energy requirements during construction[4], although this is balanced by the high power output of each plant. However, nuclear differs from many renewables in its requirement for mined fuel (uranium ore). Although the total volume of fuel used is low compared to the volumes of fossil fuel required in gas or coal plants, uranium mining and the subsequent fuel processing is an energy intensive activity that must be included for full lifecycle emissions analysis. Decommissioning and waste activities are also likely to require energy inputs, and therefore their long-term impact on nuclear power's CO_2 emissions will depend on the carbon intensity of future energy supplies.

Our evidence shows that taking into account the emissions associated with plant construction and the fuel cycle, the emissions associated with nuclear power production are relatively low, with an average value of 4.4tC/GWh, compared to 243tC/GWh for coal

However, emissions from decommissioning and the treatment of waste also need to be assessed but this is difficult for two main reasons:

> **in the UK, decommissioning of existing plant is highly complex and involves plant that was not designed with decommissioning in mind**

> **the UK has not decided on its approach to waste management, which makes it difficult to assess the associated CO_2 emissions.**

The carbon impact associated with the 'back-end' of the nuclear fuel cycle is spread across all of the UK's nuclear power plants (active and decommissioned) and includes all of the electricity generated over their lifetime. Newly commissioned plants are likely to have lower lifecycle carbon emissions than for previous reactor designs, because of improvements in plant design (for example, smaller size, and improved thermal efficiency and use of fuel), and because new plant is designed so that it can be dismantled and decommissioned more easily.

A number of commentators have expressed concerns that any move to low-grade uranium ores could substantially increase the carbon intensity of nuclear power. Our evidence on uranium resource availability[6] shows that predicting if and when this might happen is very difficult to do with any accuracy. Resource availability is discussed in more detail below, but it is by no means certain that all the high grade ores have been discovered, and any increase in the price of uranium could trigger renewed interest in uranium prospecting.

It is worth noting that the CO_2 emissions associated with many of the construction inputs into a nuclear power plant could be subject to emissions trading schemes, depending on their country of origin. This presents a possible solution to the lifecycle emissions problem if

[2] Paper 2 – *Reducing CO_2 emissions: nuclear and the alternatives*

[3] Sustainable Development Commission (2005). *Wind Power in the UK.*

[4] In addition to carbon emissions from the production of concrete.

[5] These figures are for carbon (C) rather than CO_2. They have been converted from the data used in our evidence base by multiplying the CO_2 figures by 12/44.

programme would deliver sizeable reductions in CO_2 emissions. However, it is also important to realise that cuts of at least 50% would still be needed from other measures to meet the 2050 target, even with a doubling of nuclear capacity from current levels. Nuclear power can therefore be seen as a potential carbon reduction technology, but this must be viewed within the context of the much larger challenge we face. We will need a wide variety of solutions; those that decrease our demand for energy, and those that can deliver low or zero carbon energy supplies.

2.1.3 Waste and decommissioning issues[8]

There is a need to distinguish between the legacy impacts of decommissioning and waste management of the existing nuclear capacity, to which the UK is already committed, and the impacts that would result from a new nuclear programme.

The current legacy for decommissioning existing nuclear power plants is not directly relevant to decisions about whether to progress with nuclear new-build. However, such a legacy is one of public concern, particularly in relation to the cost. A recent review by the NDA suggests that their accelerated approach for the decommissioning of existing sites will cost approximately £56bn. Much of this covers a large number of non-power producing facilities, but certainly the costs of decommissioning old Magnox reactors are substantial. Our evidence points to costs of £1.3bn and £1.8bn in two cases, and this is before waste disposal.

The proposed new nuclear plant designs are expected to require much less expensive decommissioning, as unlike most existing plants, decommissioning has been given more consideration in the design process. They are also expected to produce less waste by volume. Our evidence estimates decommissioning costs at between £220m and £440m per GW of capacity, but this is before long-term waste disposal costs.

A new-build replacement programme (10GW) would add less than 10% to the total UK nuclear waste inventory (by volume). Assessing the increase in radioactivity of the inventory is complex and depends on reactor design and use, and the time chosen for the comparison. Thus, ten years after removal, the increase in activity could be a factor of nine, declining to a factor of 0.9 of current total activity 100 years after final fuel removal.

The role of reprocessing as a waste management tool is complex because of the costs (relative to the price of primary uranium) and safety and security issues (for example, the risks of proliferation – this is discussed further in Section 2.2.2 on security).

long-term so as to protect people and the environment. A dominant challenge of much nuclear waste is the period of hundreds of thousands of years over which it must be effectively isolated from people and the environment. This raises issues that are unique to nuclear waste, such as the long-term stability of our civilisation and climate, and the extent to which future technological advances might bring forward solutions so-far unknown.

Nuclear wastes in the UK are divided into three categories:

> **High level wastes (HLW)** are those in which the temperature may rise significantly as a result of radioactive decay. This factor has to be taken into account in the design of storage or disposal facilities. HLW comprises the waste products from reprocessing spent nuclear fuels.

> **Intermediate level wastes (ILW)** are those exceeding the levels of radioactivity for Low Level Waste (LLW), but which do not require heat production to be taken into account in the design of their storage facilities. ILW include nuclear fuel casing and nuclear reactor components, moderator graphite from reactor cores, and sludges from the treatment of radioactive effluents.

> **Low level wastes (LLW)** are wastes not suitable for disposal with ordinary refuse but do not exceed specified levels of radioactivity. Most LLW can be sent for disposal at the National Low Level Waste repository at Drigg. LLW that is unsuitable for disposal is mostly reflector and shield graphite from reactor cores, which contains concentrations of carbon-14 radioactivity above those acceptable at Drigg.

Spent fuel, which contains uranium and plutonium, is currently not classified as waste in the UK because it contains resources that can be reprocessed and used again as fuel or for other uses. If, however, the UK decided to abandon reprocessing as part of its waste management strategy, then spent fuel would need to be reclassified as HLW.

The Committee on Radioactive Waste Management (CoRWM) has established a baseline inventory, based on planned closure of existing plant, no new-build, reprocessing of spent fuels, and continuation of current practices for the definitions of waste. All radioactive wastes, including spent fuel, are packaged so that they are in a form suitable for storage, volume estimates are based on packaged wastes. The baseline inventory includes all wastes both in existence and forecast to arise in the future (for example from decommissioning). The baseline inventory shows that over 90% of radioactivity is associated with HLW and spent fuels, but

[8] Paper 5 – *Waste management and decommissioning*

self-regulation is appropriate

> **ongoing surface and ground-water pollution issues both for current and future activities.**

Some of these problems can be managed through regulation and management, but this can be compromised by, for example, poor governance, short-term cost considerations and possible conflict with economic goals and development aims. This can result in products being brought to world markets at prices that do not reflect the full social and environmental costs of their production.

However, any mining impact from nuclear power activities needs to be balanced against the potential environmental and health impacts of the energy sources it might displace. The health and safety impacts of coal, for example, are significant, as are coal's environmental impacts in the form of air and groundwater pollution. Oil and gas exploration also have environmental and health impacts.

There is general agreement that any new nuclear power programme would try to make use of existing nuclear sites, thereby limiting landscape and visual impacts. It is also the case that nuclear power plants are very similar to conventional fossil fuel plants in terms of local environmental and landscape impact, so the net impact of additional nuclear capacity is likely to be minimal[14].

However, some coastal sites may not be suitable for new nuclear power stations and flood-risk criteria may lead to a preference for new inland sites. This is because of the need to 'climate change-proof' decisions on where to locate new plant to be sure they take into account changes in climate that are already in the pipeline. The criteria that were used to select the current mainly coastal locations are up to 50 years old and will need to be reviewed, as many nuclear power stations and other facilities are vulnerable to sea-level rise, storm surges and coastal erosion over the next few decades.

In view of the need to reassess the suitability of existing sites, further consideration needs to be given to their viability over the longer term.

2.1.6 Summary

Our evidence shows that nuclear power could theoretically make a substantial contribution to efforts to reduce CO_2 emissions, as a viable low carbon technology. However, the evidence also shows that even by doubling our existing nuclear capacity, a new nuclear power programme can only contribute an 8% cut in emissions on 1990 levels, so a wide variety of other measures will be needed.

for tackling climate change, but as we state in Section 1.3, for the UK it is a choice whether it is part of the overall energy supply mix, rather than a necessity.

Nuclear waste and decommissioning raise a set of complicated issues with very long-term impacts. Considering the impact of nuclear new-build in isolation, we accept that future nuclear plant designs will be far easier to decommission and that it is possible to do this in a way that limits the environmental impacts. However, the long-term management of nuclear waste poses significant environmental problems that are difficult and costly to resolve.

We look at intergenerational considerations in Section 2.3.6, but on the environmental side it is difficult to be completely confident that the solution proposed for long-term waste management will avoid any adverse environmental impacts over the time periods involved.

On reprocessing; there remain serious concerns over the long-term security and economic viability of this form of waste management, with many in the industry now calling for a 'once-through' fuel cycle. The evidence would seem to support this conclusion, although there remains the question of dealing with the UK's plutonium stockpile.

Other environmental impacts from nuclear power centre on uranium mining, which can have a number of adverse effects in producer countries. However, such impacts must be balanced against the environmental and health & safety concerns related to alternatives sources of energy, especially fossil fuels.

2.2 Economy

What is the public good for our economy? (Achieving a sustainable economy)

2.2.1 Total cost of nuclear power[15]

Our evidence strongly suggests that attempts to estimate the cost of a new nuclear programme are unlikely to be accurate. This is primarily because there is not enough reliable, independent and up-to-date information available on the nuclear plant designs available for such calculations to be made. In addition, waste and decommissioning costs are, at present, not fully known.

The levelised cost of nuclear power (the p/kWh cost of output) is heavily dependent on capital costs. This makes the cost of nuclear output very sensitive to both construction costs, and the discount rate used (the required rate of return for the project).

[14] Paper 5 – This is under the assumption that nuclear capacity would most likely be replaced by fossil fuel plant, with or without carbon capture and storage technologies.

[15] Paper 4 – *Economics of nuclear power*

the next decade also highlights a potential weakness in the uranium market: the long lead times for developing new resources.

For domestic electricity supply, nuclear power may offer a hedge against high fossil fuel prices or temporary supply disruptions, but cannot offer complete security due to its reliance on imported uranium. In this regard, nuclear power is not a domestic source of electricity in the same way as renewables.

Uranium resources may also show price volatility, particularly in the short-term when shortages are expected. However, evidence on portfolio theory suggests that greater diversification of supply sources tends to reduce price risk, particularly when fuel costs are zero (as in the case of most renewables) or low (as in the case of nuclear)[18].

On balance, nuclear power has positive attributes for security of supply consideration, but these should be viewed on a portfolio basis and are not exclusive to this technology. Diversification into any basket of electricity generating options will help to reduce price risk and increase security.

It is also frequently claimed that nuclear power is necessary to provide baseload power. However, there is no justification for assuming that other plant cannot also perform a baseload function, and contrary to popular perception, the increased variability (sometimes termed 'intermittency') of some renewable technologies does not increase the need for more 'firm', or baseload, capacity[19]. Therefore, nuclear plant will need to be assessed against the long-term wholesale price of electricity within the confines of a carbon constrained, and environmentally sensitive, economy.

2.2.3 Market delivery

Our evidence suggests that nuclear power may find it difficult to compete in the UK's liberalised energy market without some form of public sector support. This is due to the long lead times of nuclear power and its high risk profile, which may discourage investors. However, the Government has made it clear that any new nuclear programme will need to be delivered solely by the private sector.

This does not rule out the possibility that the Government may decide to help support the development of new-build plant, either financially or through 'practical measures'. Our evidence points to a number of financial support options that the Government may consider, but there is uncertainty over whether they would be both legal (under EU state aid rules), or compatible with the Government's stated belief in liberalised markets.

The concept of specifying the ideal proportion of each single technology in the UK's generating mix belongs to a previous regime, where electricity supply was a nationalised industry. If liberalised markets are to be the primary mechanism for the delivery of electricity supplies, then this constrains the ability of Government to centrally plan the fuel mix, without major interventions in the market.

Energy policy aims such as CO_2 emission reductions and security of supply can be delivered by markets if the right structures are put in place. The market has so far performed well on security of supply, and the incentives are in place to ensure that new capacity is developed before shortfalls in supply develop – this is done through a simple price mechanism. To deliver this new capacity whilst reducing CO_2 emissions requires the electricity market to take account of national or international carbon constraints, and to factor these in to long-term investment decisions.

The current market for carbon is based on the EU Emissions Trading Scheme (EUETS), which is currently designed to run in three year periods, with caps set by national governments in advance of each commitment stage. This inherently short-term system provides no long-term framework for investors, and is currently based on emissions cuts from projected baselines rather than absolute cuts from current levels.

The SDC believes that the EUETS should aim towards total downstream emissions trading, which would eventually need to include the whole economy – business, transport (including aviation), the public sector, agriculture and, very importantly, individuals. EU-wide caps on emissions should be determined by a long-term emissions reduction target, which should then be divided into annual decreases which would form the basis of the EUETS or its successor. This system would give near complete certainty of intention, and should assist investors in taking long-term decisions on low carbon investments.

There are two alternatives to this approach: develop mechanisms which intervene in the market to encourage specific technologies or technology groups, or reform the current market design to allow for more centralised planning.

The Renewables Obligation is an example of market intervention, and was justified by the Government as necessary to promote the innovation and scale needed to create a viable, large-scale renewables sector. In this regard, renewables were identified as suffering from market failure due to their lack of collective technological maturity. Can the same be said about nuclear power?

[18] Shimon Awerbuch (University of Sussex) has done extensive work in this area.

[19] A large percentage of variable renewables would increase the need for 'balancing services', but would not lead to the need for additional baseload capacity, as the increase in reserve requirement is met from remaining plant. In addition, diversity of sources will always reduce the need for reserves. This issue is explained in detail in the SDC's publication, *Wind Power in the UK* (2005).

[20] Paper 4 – *Economics of nuclear power*

disagreement over these costs, but if they are high, there is the potential for conflict. This is because the transmission and distribution of electricity in the UK is a regulated industry, and all investments need to be approved by Ofgem as part of the district network operators' (DNO) price control agreements. Faced with calls for large investments across the network, Ofgem might have to prioritise what it allows, unless it is willing to accept higher costs for consumers.

There is also the related problem that continued reliance on centralised supply may exacerbate the current institutional bias towards large-scale generation, and the reluctance to really embrace the reforms necessary to ensure a more decentralised and sustainable energy economy. The role of Ofgem is central to this issue.

The lack of flexibility, or 'lock-in', associated with investment in large-scale centralised supply like nuclear power is also a concern. This relates to the issue of sunk costs. A new nuclear programme would commit the UK to that technology, and a centralised supply infrastructure, for at least 50 years.

During this time there are likely to be significant advances in decentralised technologies, and there is a risk that continued dependence on more centralised supplies may lock out some alternatives. Decentralised supply is generally more flexible because it is modular, and can adapt quicker and at less cost to changed circumstances. More locally-based energy provision may also be conducive to the sustainable communities agenda, a key part of the UK Government's Sustainable Development Strategy.

Any bias towards one mode over another essentially prevents a level playing field, and does not therefore encourage true competition. It may be hard for the microgeneration sector to overcome such bias, and this may prevent or slow it from reaching the economies of scale necessary to show its full potential.

2.2.6 Summary

Nuclear power may be able to make a useful contribution to the UK's economy, by providing low carbon electricity at a competitive price. However, our evidence shows that it is very difficult to assess the total cost of the available nuclear technologies, particularly as the only recent development that is relevant to the UK (in Finland) has a number of hidden subsidies that obscure its true cost.

In our view commercial investors are best placed to make a real assessment of the risks, and will have much better information on likely construction costs and therefore the final cost of power produced. They will also be able to the price of carbon, which is likely to be central to their business case.

There are still a number of outstanding costs that, unless internalised, may not allow a full reflection of the cost of nuclear power in those investor calculations. There is also the issue of moral hazard, and the impact that might have on reducing the apparent cost of nuclear power by increasing the financial risks to the taxpayer.

The case for nuclear power tends to be viewed in isolation, but this takes no account of the impacts that a nuclear development route might have on other alternatives, and on the prospects for a level playing field for all technologies. Although the measurable economic impacts may be limited, the political implications of a shift in emphasis towards nuclear could be to further weaken the commitment of Government, and therefore the investment community, to renewables and specifically microgeneration technologies.

On balance, the economic case for nuclear power is heavily dependent on its position in relation to other low carbon alternatives, and the effect it might have on the long-term ability of the UK to meet its emission reduction targets. If nuclear power can prove itself to be an economically viable competitor in a low carbon economy, without leading to a drain of investment for other alternatives, then its contribution to a sustainable economy may be positive. If, however, nuclear power requires public support (whether immediately or in the long-term) and/or it diverts funds away from other viable alternatives, then its contribution may well be negative.

It is of little doubt where the UK's current nuclear capacity stands. The burden of proof would now seem to be on the nuclear industry to show that updated designs, combined with private sector financing and project management, could lead to a different outcome. However, this must take place on a truly equal and transparent basis, so that costs are internalised and the taxpayer is protected from long-term liabilities. An assessment of the cost – and public acceptance – of nuclear waste policy is essential for this to take place.

[22] Sustainable Consumption Roundtable (2005). *Seeing the light.*

attack would not lead to significantly adverse consequences.

Use of nuclear fuel (reactor grade and spent fuel) by terrorists is raised as a concern. Reactor grade fuel must be processed to produce weapons-grade material to raise it from 4-5% uranium-235 to over 90% uranium-235. Spent fuel is an even more difficult starting material because it contains much less Uranium-235 than fresh reactor fuel.

However shipments of spent fuel for reprocessing could be attacked en route from the station to the reprocessing plant, either with the intention to spread contamination over a wide area or to steal the material for future use in a nuclear weapon. Reactor grade fuel could be used to make a 'dirty bomb'.

The industry assessment is that spent fuel containers are robust and undergo stringent testing and that the spent fuel pellets they contain are not easily dispersed even under severe impact and fire. But an alternative view is that stolen spent fuel would be valuable as a dirty bomb in itself and is therefore of value to terrorists. It would appear, therefore, that the potential use of nuclear fuels by terrorists remains a risk, and therefore a concern.

Nuclear accidents are recorded and ascribed levels on a scale 0-7 (Chernobyl was level 7), and most accidental releases in the UK are at levels 0,1 or 2. While major accidents are rare, evidence from Sellafield and Japan reveals that human error and management lapses are most often responsible – circumstances which undermine public confidence in the industry, even in industrialised countries with tight regulatory regimes.

Public confidence in the regulatory regimes for nuclear power stations in ***all*** countries, not just the UK, is also important because unplanned discharges can have serious transboundary effects. This raises a number of problems, including the difficulties of ensuring that the regulatory institutions in less developed countries are sufficiently resourced, and for identifying and dealing with poor health and safety practices which could lead to transboundary environmental or health risks.

2.3.4 Proliferation risks[25]

Terrorist organisations, almost by definition, operate outside national and international law, and therefore safeguards to protect against proliferation are almost irrelevant to such groups. Similarly it is very difficult to protect against civil nuclear power being developed into a military nuclear capability where motivations are strong enough, as has been shown in a number of countries.

of the implications of developing new nuclear capacity, particularly in the context of international treaties such as the Framework Convention on Climate Change. If nuclear power is part of the UK's chosen solution to climate change, then it would be considered a suitable solution for all countries. The UNFCCC explicitly encourages "the development, application and diffusion, including transfer of technologies, practices and processes that control, reduce or prevent anthropogenic emission of greenhouse gases" (Article 4.1c).

Reprocessing nuclear reactor fuel can raise it to the quality required for nuclear warheads, most easily from light water reactors. Pressurised water reactors would have to be closed down for several months, but in a country that wishes to do this the only barriers are political, as there is no engineering constraint.

Several international treaties have been concluded with the aim of making sure either that civil nuclear power is not used for military purposes or that any attempts to do so are detected. The two principal treaties that concern the UK are the 1970 Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and the Euratom Treaty, to which the UK became a partner on joining the European Community in 1973.

Out of the 188 states that have signed the NPT, the UK is one of five declared Nuclear Weapons States (NWS), the others being France, the USA, the USSR and China. The only states that have not signed the NPT are India, Pakistan and Israel, all of which are known to have nuclear weapons, while North Korea has chosen to withdraw from the NPT.

The provisions of the NPT are implemented by the International Atomic Energy Agency (IAEA). Following the difficulties of carrying out inspections in Iraq before 2003, additional protocols were developed giving IAEA inspectors greater rights of access and requiring administrative procedures to be streamlined so that, for instance, states cannot delay the issuing of visas as a means of delaying an unwanted inspection.

States also have to provide significantly more information, including details of nuclear-related imports and exports, which the IAEA is then able to verify. The IAEA concludes that without the NPT, there might be perhaps 30 to 40 Nuclear Weapon States, whereas more states have abandoned nuclear weapons programmes than started them.

Nevertheless, a number of difficulties in the relationship between civil and military applications continue to cause concern among many commentators, including:

[25] Paper 6 – *Safety and security*

has to be taken in the context of the current waste legacy, albeit that future waste arisings are likely to be considerably smaller than existing volumes.

2.3.7 Summary

Our evidence shows that it is essential for the Government to allow the fullest public consultation in developing a policy on nuclear power. Not doing this would compromise the principle of good governance, and risks a huge public backlash against top-down decision-making. The Government needs to engage the public in a wider debate where nuclear power is considered as one of the many options that could be required for a sustainable energy policy.

We are satisfied that any new nuclear power plant in the UK would be built and operated to the highest safety and security standards. However the same level of confidence cannot always be applied to other countries, and this remains a cause for serious concern. In addition, nuclear power facilities and processes are vulnerable to attempted exploitation by terrorist groups, and although standards may be high, this does not rule out the possibility of a successful strike.

The proliferation of nuclear materials is equally a cause for concern in this context. A decision to develop nuclear power in the UK essentially removes our ability, both morally and legally, to deny the technology to others. The widespread adoption of nuclear power would greatly increase the chances of nuclear proliferation, both through the efforts of nation states and possibly terrorist organisations.

Whilst the health impacts of a well-regulated nuclear power industry are low, the risk of a low probability, but high impact event must be considered, especially in the context of the international concerns raised above.

Finally, we remain deeply concerned about the intergenerational impacts of the legacy of nuclear waste. Considering the current uncertainties over total costs and the science of long-term waste management, we find it difficult to reconcile these issues with sustainable development principles.

renewables

The UK's renewable resources are some of the best in the world, and could provide all the UK's electricity over the longer term. Despite some significant developments, our current approach remains half-hearted, and the levels of public investment needed to bring forward new technologies are inadequate when compared to our international competitors.

It is critical that the Government should now invest far more (both politically and financially) in renewables, particularly microgeneration and biomass technologies, and marine renewables and offshore wind, where the UK has a clear natural advantage.

3.2.3 The clean and more efficient use of fossil fuels

It is clear to us that fossil fuels will remain a necessary part of our energy mix for some time. We fully support the Government's stated target for 10GW of good quality CHP by 2010 as a way of increasing the overall efficiency of energy supply. However, based on our lack of progress on this target, the foundations for expanding the use of this energy efficient technology are not strong.

We also support the recent interest from Government in carbon capture and storage (CCS) technologies, which could effectively remove the CO_2 emissions that come from burning fossil fuels such as gas and coal. These could provide a bridge to a more sustainable energy future whilst providing the UK with significant export potential in another area of expertise. Of course we must recognise that CCS is as yet an unproven technology, and its development could allow a future role for coal, about which we have concerns both for reasons of sustainability and human health.

3.3 Nuclear power: our advice

It is clear that nuclear power could generate large quantities of electricity, contribute materially to stabilising CO_2 emissions and add to the diversity of the UK's energy supply. However, even if we were to double our existing nuclear capacity, this would bring an 8% cut on total carbon emissions from 1990 levels by 2035, and would contribute little before 2020. Nuclear cannot tackle climate change alone.

A key issue that the Commission explored through the evidence base was whether the UK could have a viable energy future without nuclear power. Or in other words, whether nuclear power is a ***choice***, or whether is it an ***absolute necessity***.

The conclusion from the analysis was that the UK could meet our CO_2 reduction targets and energy needs without nuclear power, using a combination of demand reduction, renewables, and more efficient use of fossil fuels combined with carbon capture and storage technologies.

In this context, the Sustainable Development Commission assessed whether nuclear power has a role to play in future UK electricity supply. We have a number of serious concerns:

Intergenerational issues

The intergenerational impacts of a new nuclear programme are of great concern, particularly with regard to decommissioning and the disposal of nuclear waste. Even if a policy for long-term nuclear waste is developed and implemented, the timescales involved (many thousands of years) lead to uncertainties over the level to which safety can be assured. We are also concerned that a new nuclear programme could impose unanticipated costs on future generations without commensurate benefits.

Cost

There is very little certainty over the economics of nuclear power. A new nuclear power programme could divert public funding away from more sustainable technologies that will be needed regardless, hampering other long-term efforts to move to a low carbon economy with diverse energy sources. Nuclear power is also prone to moral hazard, which could lead to forced public subsidy regardless of the Government's original intentions.

A Forest Full of Energy

Wood Grows as a Major Fuel in the Northeast

BY ERIC KINGSLEY

Since the time of the first humans, wood has served as an important fuel source. We relied upon it first for heat, today for electricity, and tomorrow maybe for liquid fuels. Wood used simply as a fuel source – not as lumber, pulp, or other value-added products – is known as biomass and today still accounts for half of all wood harvested worldwide. The northeastern U.S. has long been a leader in the use of wood as a source of energy, and efforts continue to keep the region at the vanguard of biomass energy and bio-product development.

Wood energy has been a meaningful part of our region's electricity mix for about 20 years, and it was a part of many paper mills' electricity supply long before that. It has seen its ups and downs over the last decade, but today, wood energy is looking as attractive as ever.

The region's wood energy industry developed in response to the last energy crisis in the 1970s. Wood was recognized as a local, renewable, and abundant energy source, and facilities to turn this resource into power were built. When projections of oil shortages made in the late 1970s and early 1980s turned out to be wrong (or at least premature), these wood-fired plants became high-cost producers in comparison to nuclear, coal, and oil. Today, we are coming full circle, with biomass power plants around the region operating at full-tilt, long-idle plants back online, and developers scouring the region for suitable locations to build new facilities.

Why? While wood energy hasn't gotten any cheaper, the competition (particularly natural gas) has become much more expensive. Faced with very real concerns about the current capacity to meet the peak electricity demand during extreme weather events (hot spells and cold snaps), public policy makers at both the state and federal levels are once again encouraging development of renewable energy.

Biomass energy in the region

In travels around the North Woods, it's hard not to occasionally end up behind a truck full of wood chips. Where are they going, and to what end? Most will shed their loads at one of many wood-fired power plants scattered across New England and New York, which each year turn millions of tons of low-grade wood into electricity to power homes and businesses.

In the power grid that serves most of New England, biomass is a small but important electricity source. Natural gas serves as the fuel for almost 40 percent of the electricity generated in the

NED THERRIEN

region, with nuclear supplying a quarter. Coal-fired and oil-fired power accounts for a little over 20 percent, leaving the rest – about 15 percent – to renewable types of electricity generation. Of this, hydropower makes up more than half, with the rest coming from biomass, landfill gasses, and a few wind farms.

Five years ago, construction of new natural gas power plants was all the rage. Proponents argued that the use of natural gas would significantly decrease the cost of electricity in the region, and a wave of new plants was built. Just like previous forecasts of cheap power, this one, too, was wrong. Today, natural gas provides some of the most expensive electricity and often sets the price for the power you buy.

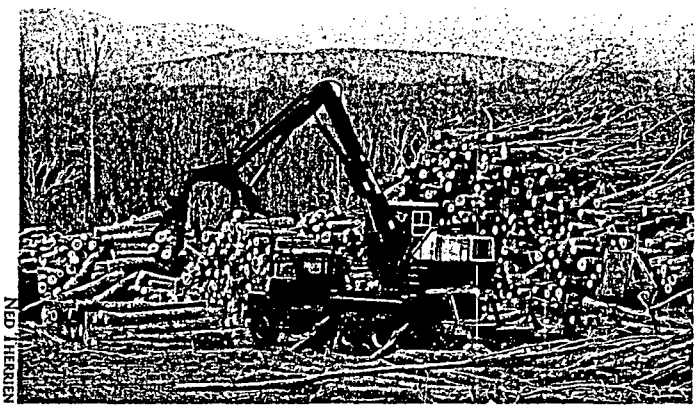
The cost to produce electricity varies widely, depending on fuel costs, debt service, economy of scale, maintenance requirements, technology used, and emissions controls. It can cost $40 per megawatt (MW) or, in a perfect storm of complicating factors, it could cost nearly four times that.

In the present environment, wood energy is competitive, and many facilities are operating at or near capacity. Biomass energy facilities, long thought of as too expensive, are suddenly looking attractive when compared to some of their competitors. Couple this with a demand that is growing faster than supply, and there is clearly a spot for biomass power.

Public policy encourages biomass power

In addition to the underlying energy market, public policy plays a significant role in the retention and growth of renewable power, including biomass. On the public policy side, the desire for cleaner fuels, energy security, and local economic development is causing leaders to evaluate ways to encourage renewable energy development. Non-market benefits of wood energy include:

- Biomass power plants have very low emissions when compared with other fuels. At Public Service of New Hampshire's Northern Wood Power Project, conversion of an existing 50 MW, coal-fired unit to wood will result in significant reductions in sulfur dioxide, nitrogen oxides, and mercury emissions. (In the interest of full disclosure, the company I work for, Innovative Natural Resource Solutions, has served as a consultant on this project.)



NED THERRIEN

CHARLES LEVESQUE

Clockwise from left: Adam Mock Logging chipping trees and tops for fuel; A&B Logging's log loader and chipping pile at Twin Mountain in the White Mountain National Forest; some operations use delimbers in the woods.

- As we station troops around the world, it's hard not to wonder which domestic fuels can help meet our energy needs. While oil is a very small part of our national and regional electricity mix, adding renewables to the mix helps diversify energy supplies and cushion price swings. Energy sources found here – wood, wind, water, and some coal – are buffered from the complexities of foreign trade and diplomacy.
- Wood energy can provide a significant economic boost to our region's rural areas and help support loggers, landowners, and wood-using industries. A 2002 study in New Hampshire found that the state's six then-operating wood-fired power plants provided up to 400 jobs and had an economic contribution of nearly $100 million. Wood fuel dollars stay in the local economy; the same can't be said for coal, oil, or natural gas.

Recognizing the public benefits associated with biomass power production, the federal and state governments have responded with incentives. On the federal level, support for biomass comes in the form of a confusing mix of loans, grants, technical expertise, and tax credits. Dividing these programs between the U.S. Forest Service, the Department of Energy, and others doesn't do much to clarify things, but one incentive – the Production Tax Credit – is easily accessible to a broad range of biomass and renewable energy projects. This tax credit allows power plant owners to receive $9 per megawatt-hour in financial support, a significant help to the economics of a biomass facility.

Additionally, at the state level, New York, Massachusetts, Connecticut, Rhode Island, and Maine have adopted a "Renewable Portfolio Standard," or RPS. In essence, an RPS requires electricity providers (the folks you send a check to each month) to get a certain, and often growing, percentage of their power from renewable energy suppliers. These programs vary widely from state to state but have proven to be a true incentive for new and existing biomass power plants. The funding comes from electricity providers, who pay a little extra to comply with the renewable energy mandate and pass the cost on to every customer, including the large ratepayers.

Besides requiring renewable energy production, an RPS can improve the economics of the biomass power plants themselves. For example, a biomass plant that qualified for the Massachusetts RPS in 2005 would have received around $50 per megawatt-hour produced, in addition to revenue from the sale of the electricity itself. With some long-term electricity contracts paying producers as much as $80 per megawatt-hour, adding the federal credit and the RPS payment can combine to make biomass energy look attractive to developers.

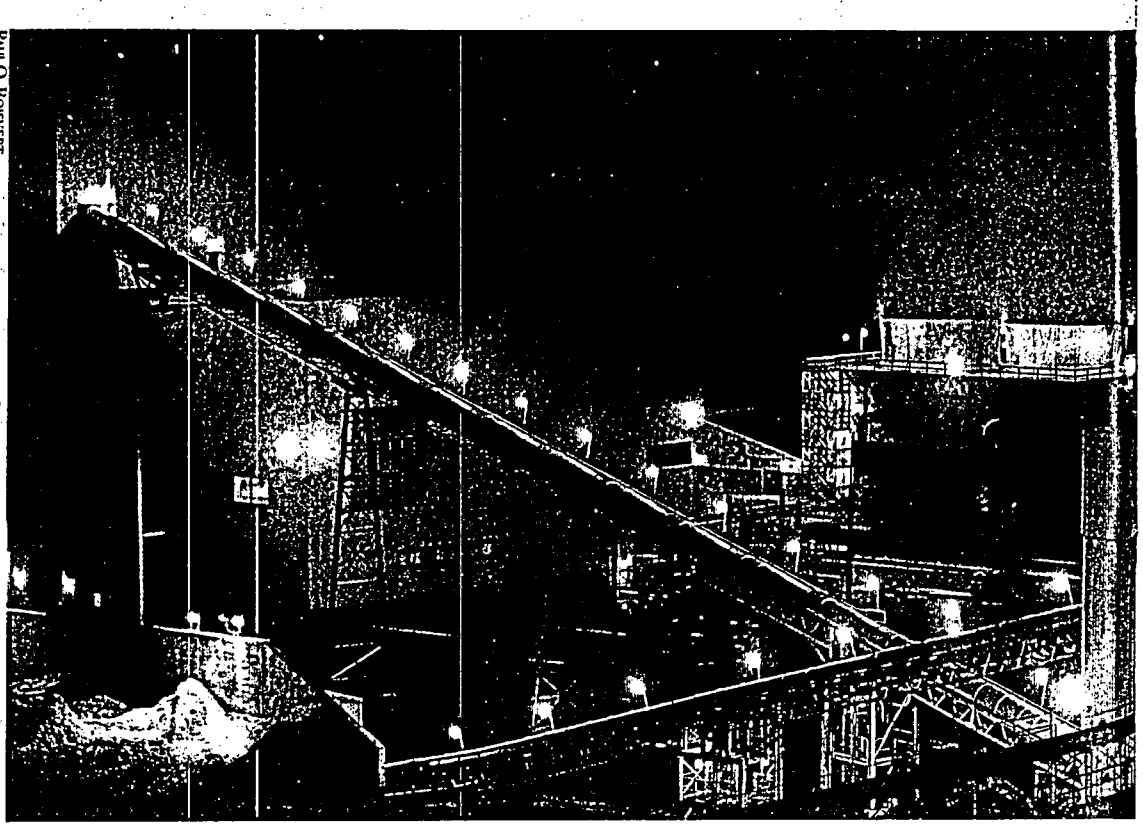
Of course, "look" is the key word in the previous sentence, and it is important to note that renewable energy payments are in their infancy, and as in any developing market, prices can swing quickly. In Connecticut, RPS payments dropped from near $40 to near $2 per megawatt-hour in 2005 alone when a new supplier unexpectedly entered the market and helped create an oversupply. Additionally, qualifying to participate in the Massachusetts RPS is not easy, with stringent technology and emissions requirements that few plants can meet.

The next generation of renewables

Today, biomass electricity is generated with wood chips from timber harvesting operations. With state and federal incentives, as well as the rise in overall energy costs, we will generate even more tomorrow. But what's beyond that?

For decades, researchers and developers have heralded the "bio-refinery revolution," where the myriad of products made today from oil (gasoline, chemicals, plastics, and more) will be made from wood. In fact, production of ethanol from wood was common in World War II Germany, when access to oil was severely limited. In the U.S., a wood-ethanol project was active in the South during World War I. The technology exists, but it hasn't yet proven competitive with oil in an open global marketplace.

The U.S. economy, and to a lesser extent the world economy,



PAUL O. BOISVERT

Clockwise from left: Night view of Burlington Electric's McNeil Generating Station, a wood-fired power plant.

Public Service of New Hampshire's Northern Wood Power Project involves replacing a coal-fired power plant with a wood-burning facility; shown here under construction.

This method gets chips out of trailers in a jiffy.

runs on oil. Our ships, cars, trains, and even loggers' skidders rely on oil to operate. The U.S., ever the consumer, accounts for a quarter of global oil consumption, more than the next five highest-consuming countries combined. This huge appetite is nearly all based on imports – we own only two percent of the world's known oil reserves.

In recent years, developers have proposed facilities making ethanol, diesel additives, bio-oil, plastic, and other products that would use wood as the feedstock. Many of these proposals died on the drawing board because investors were unwilling to take the risk with a new technology competing against low-cost oil. With oil momentarily topping $70 a barrel in 2005, however, and no return to the days of $35 barrels in the forecast, many bio-product business plans are being dusted off and updated.

Biomass does have real potential to substitute for or compete with fuels and products currently made exclusively from oil; the corn-to-ethanol industry has demonstrated that. We know that some products can be made in the lab, so today's considerable challenge is moving these to commercial production. Maine, Wisconsin, New York, New Hampshire, and others are racing to develop this emerging industry, in the hope that this could revolutionize the region's forest industry. It may, but it's also clear the revolution will be gradual, will build upon existing industries and infrastructure, and will see a large number of failures for each commercial success.

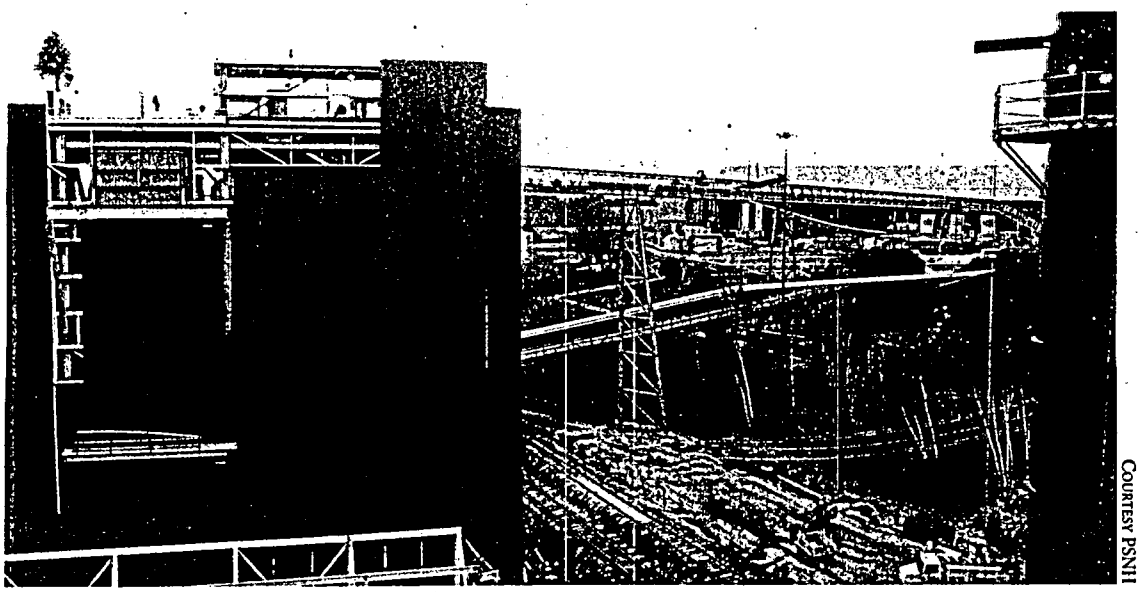
The impact on forests and forest landowners

The resurgent biomass industry, and the prospect of a new and growing bio-product industry, may have some forestland owners seeing dollar signs. It's important they not see too many. Biomass as an electricity source has historically paid little (if anything) to the landowner; this will likely continue for the foreseeable future. Landowner and logger profits are made on sawlogs and, to a lesser extent, pulpwood. Biomass provides landowners with a low-grade market for their tops, branches, and cull trees. It allows foresters to use an important management tool, and it can provide true benefits to landowners, making it possible to remove poor-quality growth that would otherwise dominate a stand's future. Just don't expect to count the benefits in a large stack of bills.

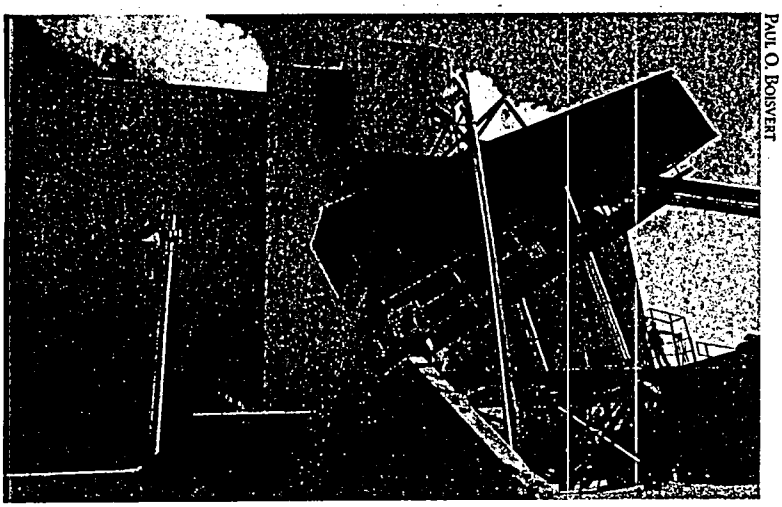
For loggers, biomass prices are now as high as they have ever been, even adjusted for inflation. However, input costs – including diesel to run the feller-buncher, skidder, chipper, and truck – are at their highest levels in 20 years. Most increases in wood price have been quickly eaten up by cost increases, so loggers aren't necessarily seeing increased profits.

Add to this the increased competition from other wood sources, including paper cubes (pelletized paper that can't be economically recycled) and construction and demolition waste, whose use is highly controversial, and it doesn't appear that further price increases are coming for supplying biomass (at least when adjusted for the cost of oil).

For bio-products, developers have been heard to promise they will pay untold fortunes to landowners. Without production facilities, these promises are worth little. When factories are built, we can expect them to pay market price for wood, and – like everyone else – seek ways to limit wood costs. They may grow the market, and therefore raise the price of wood, but don't expect $200 a cord on the stump.



Courtesy PSNH



Paul O. Boisvert

The Northeast has an abundant and sustainable supply of biomass, a landowner and logging infrastructure prepared to meet supply needs, public policy that favors biomass energy, and a population that recognizes the many benefits that wood-derived electricity and fuels can provide. As a region, we are well positioned to continue a leadership role in the adoption and advancement of biomass energy.

Eric Kingsley, vice-president of the consulting firm Innovative Natural Resource Solutions LLC (www.inrsllc.com), has been involved in the siting, conversion, or upgrading of a number of biomass power plants in the region and across the country.

Wood Chips Keep Schools Warm

By Hamilton E. Davis

Well before first light on an icy winter morning, a tractor-trailer unit wheels out of the yard at the Claire Lathrop sawmill in Bristol, Vermont, and heads for Barre Town Elementary and Middle School atop Quarry Hill. Dawn is just breaking as the rig pulls into the still-empty school parking lot and backs up to one of the twin bays in a small building adjacent to the school itself. When the bay door opens, the driver activates the moveable floor of the truck, and 30 tons of wood chips cascade into the storage bin.

Throughout the week, the chips will move in a herky-jerky fashion out of the bin onto a conveyer system, across the floor of the building, up above head height to a hopper, and then into a huge boiler, where they are burned to heat water in a heat exchanger. The hot water is then pumped through the school to heat the main building.

This system, which cost about half a million dollars, was installed in 1996 to replace electrical heat that had been installed in the 1970s, when electricity was so cheap that people said it wasn't worth metering. By the mid 1990s, however, electricity was ferociously expensive, so as soon as the wood chip system went online, the school's fuel costs dropped by 90 percent. They saved $100,000 the first year; the system paid for itself in five years.

Ted Riggen, the principal at Barre Elementary, loves everything about the system. He likes the reduced heating bill, of course, but he is also a former forester, and the idea of a sustainable fuel source has tremendous appeal to him. Administrators considering wood heat in their schools often visit, and Riggen likes giving them the tour himself. He especially likes taking them out to the storage bin and smelling the raw chips.

"Sometimes I think I could pour milk over a bowl of these chips and eat them like cereal," he says.

The most powerful appeal, of course, is the relatively low cost of the chips. Twenty-five Vermont elementary and high schools, serving roughly 10 percent of the state's students, use wood heat. In the last several years, they have saved 35 to 40 percent over oil heat, the most common alternative fuel. And that margin has been rising with the run-up in oil prices over the last year or two. According to the Vermont Superintendents Association, Vermont schools using wood in the last full school year saved a total of more than $600,000, a figure that gets a lot of attention in a financially strapped system.

According to Cathy Hilgendorf, the school construction coordinator for the Vermont Department of Education, several more communities have approved or are actively considering installing wood chip systems in their schools. "It's such a slam dunk, especially for larger schools," she says. "These systems pay for themselves in a few years. They're an easy sell, particularly since the state will reimburse the community for 90 percent of a renewable energy system." In contrast, the state pays just 30 percent of other elements of construction projects, including conventional heating systems.

While Vermont is poised to take even greater advantage of the abundant fuel its extensive forests provide, other states across the Northeast have thus far mostly ignored wood heat's potential for their schools. New York has no wood-heated schools; Maine, the most heavily forested state in the country, has just one, in Turner, in the middle of the state; New Hampshire has two, one of which is in a twin-state district with Norwich, Vermont.

Massachusetts has just one high school with wood chip heat, in Athol, in the northern part of the state. Cooley Dickenson Hospital in Northampton uses wood heat, as does the Mt. Wachusett Community College in Gardner. Joe Smith, who heads

John Douglas/Flying Squirrel

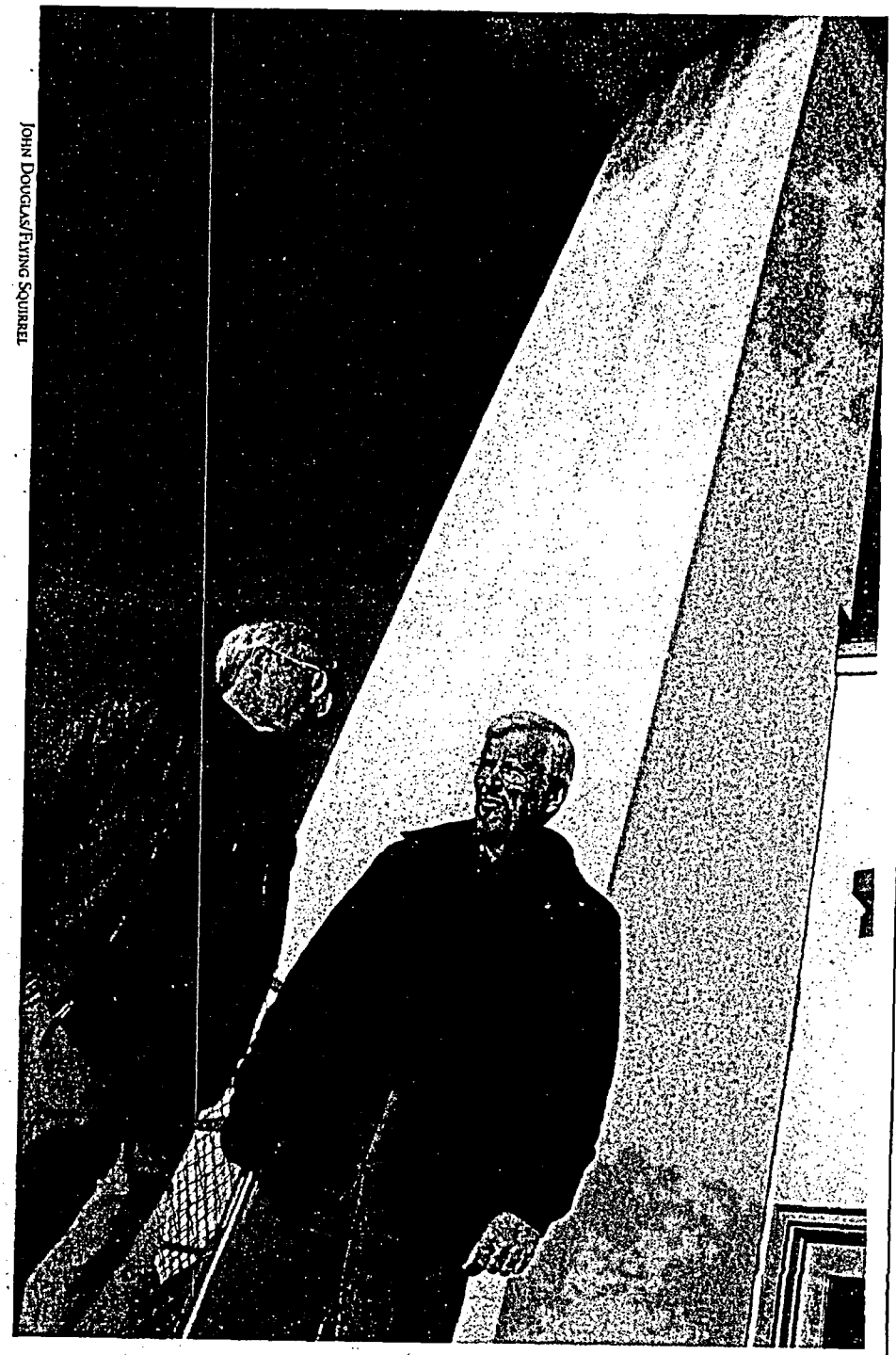
Principal Ted Riggen shows off his school's wood-chip boiler.

the Forest and Wood Products Institute at the college, says that wood-heat advocates in his region had to overcome considerable original resistance to heating with wood. There was the simple fact that they had to cut trees, which some people thought was bad, he says. Moreover, the shift to wood heat entailed significant changes in infrastructure, especially retrofitting an electric-heat campus. Just the planning and implementation of the conversion required the addition of full-time staff. Yet the conversion has paid off handsomely. The project cost was about two million dollars, but according to Rob Rizzo, the facilities chief at Mt. Wachusett, the $35-per-ton cost of wood chips is just one-tenth the cost of electricity and a fifth the cost of oil. This performance, according to Smith, has inspired Massachusetts state education officials to launch a major study of the advantages of converting elementary and secondary schools to wood heat.

It was 20 years ago that wood chip heat first came to schools in Vermont. It started in the little town of Calais, in the north-central part of the state. In the mid 1980s, Calais was paying a fortune for electric heat for its elementary school, so the town set up an ad hoc committee of volunteers to look for a solution. After considering a range of alternatives, the committee settled on wood heat; it estimated the town could save 80 percent of its fuel costs by switching from electric heat to chips and convinced the town to go ahead and install a system.

One of the local volunteers was Tim Maker, who had worked in the residential energy audit program run by the University of Vermont Extension Service and then, when that program lost its funding, established his own energy consulting company. Now 59, Maker grew up in Springfield, Vermont, and earned a degree in engineering physics at Cornell University. After working on the Calais project, Maker went on to serve as project manager for wood installations in 10 Vermont schools.

And in 2000, he set up the Biomass Energy Research Center (BERC), with offices in Montpelier, Vermont. BERC is a nonprofit corporation that carries out a wide range of studies and projects on wood energy. One of the most important of these efforts has been to serve as midwife to the installation of wood systems in schools. In addition to the Vermont projects, Maker has served as a consultant to school districts in Idaho, Montana, and New Mexico. The Center is now functioning as a partner with the Massachusetts education officials to consider extending wood heat in their schools.

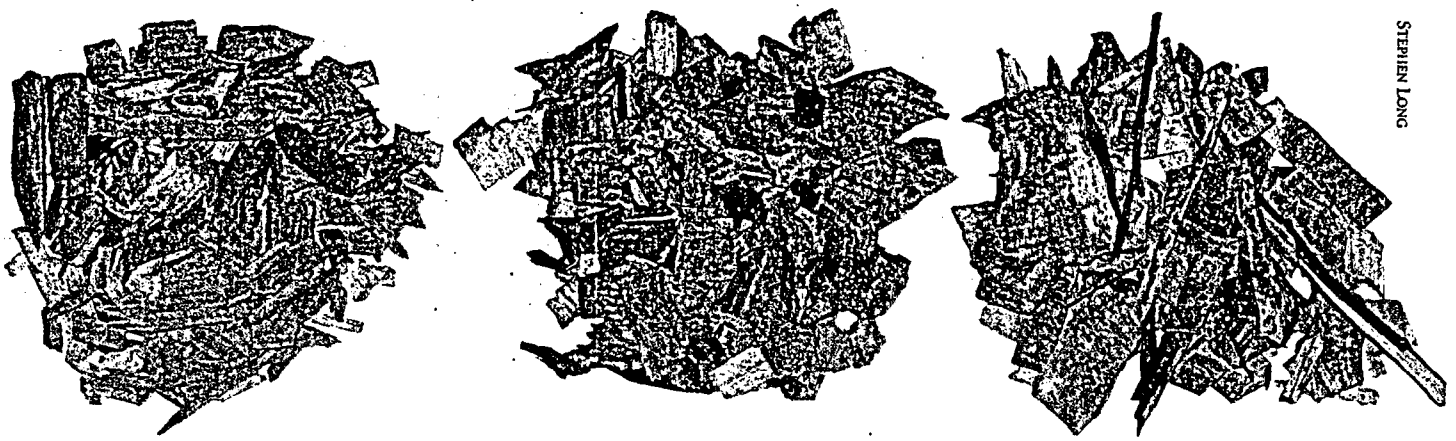


John Douglas/Flying Squirrel

Tim Maker (left) of the Biomass Energy Resource Center and principal Ted Riggen stand outside of Barre Town Elementary and Middle School's wood-chip boiler smokestack.

Maker is an unabashed advocate for wood chips; he also believes that the best way to advance this interest is by the most rigorous technical analysis of all of the issues involved – technical, scientific, environmental, political, economic. At the root of this analysis is Maker's conviction that the use of wood chips for heat is good for everybody in the Northern Forest.

It is good for rural communities because it turns a byproduct



STEPHEN LONG

The three types of wood chips, from high-grade sawmill chips (left), to medium-grade bole chips (center), to low-grade whole tree chips (right). Many schools are limited to using sawmill chips, which are also the most expensive, but some are starting to use bole chips.

into public use and produces both revenues and jobs; it saves school systems large amounts of money; it improves the forest by encouraging the weeding out of low-quality trees; and it slows global warming because it backs out the use of fossil fuels, whose consumption only adds carbon to the atmosphere. The only ambiguous area is air quality. Wood chip heat in small institutions produces lower sulfate emissions than oil heat and about the same level of nitrate emissions. But its particulate emissions are higher. These tiny particles are a problem because they can get into people's lungs. The school projects deal with this by building tall enough smoke stacks to get the particulates away from the school site; and in any event, the school system boilers are far less of a problem than woodstoves in homes, Maker argues.

The use of wood chip heat in schools has been pretty much an unalloyed success, but now the system is coming under some pressure, with chip prices drifting up after remaining low for more than a decade, and with some of the advocates beginning to worry about the stability of the chip supply. No shortages have appeared yet, but technical issues and the health of the forest products industry itself have become a concern to people like Maker.

The key to the whole system is the wood chip itself. The chips come from two sources: sawmills like Lathrop's and mobile chippers used on log landings. By far the highest-quality chips come from sawmills. The mills acquire logs, mostly hardwood, remove the bark, and saw the clean logs into lumber. Turning an imperfect round log into sound, square-edged lumber produces some waste wood – slabs and edgings – which is then passed through a chipper and then run through a screen to ensure uniform size. The result is a pale, tan piece of hardwood about two-thirds the size of a paper book of matches. Paper mills buy these chips to augment the chips they produce themselves from debarked logs. And they are coveted by the schools. As Steve Murray, the operations chief at Barre Town Elementary, says, "These are the Cadillac of chips."

At the other end of the spectrum are chips that are not even of Kia quality: whole-tree chips that come from logging jobs and land-clearing operations. In these circumstances, whole trees are fed into a chipper, and the resulting biomass is shipped off to wood-fired power plants. The chips include bark, twigs, and leaves, and they are not screened, so that there are lots of odd sizes, including long, skinny stringers that often result when small branches are chipped. These are called "dirty chips," as opposed to papermaking-grade "clean chips."

In between is a third category, called "bole chips," which are similar to whole-tree chips except that they come from the tree's bole – there are no small branches, only trunks and large limbs. The chips aren't screened, but since there are no small branches, there are few if any stringers.

It is ironic that schools, the smallest systems and by far the smallest consumer of chips, have to use the highest-quality chips. The reason is that the delivery systems in the schools, which move the chips from the storage conveyer systems and from the hoppers into the boilers themselves, have relatively small augers. These augers are easily jammed by stringers, so schools will have nothing to do with whole-tree chips, though they are the most readily available kind.

Despite these stringent requirements, nobody has worried about the supply of these chips to schools – until now. In the last year, the price of chips to schools has begun to rise, and there is considerable concern about the supply. One of the problems is that the schools use such a small piece of the chip stream, just 16,000 to 18,000 tons of the million or so tons that are harvested in Vermont each year, so they have little pricing power with the chip suppliers. In fact, Bob DeGeus of Vermont Department of Forests, Parks and Recreation, says that the mills essentially supply the schools as a community service. "They have a good-neighbor policy," he says.

Moreover, the special equipment needed to supply the schools is expensive. The big users, such as electric power plants and pulp and paper companies, have massive infrastructure to process wood, but most schools have only simple, below-ground storage bins. Jim Lathrop says the walking-bottom trailers needed to get chips to schools cost $45,000 apiece; he has two. Also, the tractors that pull the trailers have to have special hydraulics to operate the walking bottoms; he has five of those. Then there is the screening and the extra work to guarantee the highest-quality chips. "You've got a million-dollar deal to stay in this business," he says.

Finally, wood-heat advocates worry about gathering stresses and crosscurrents within the forest products industry itself. From the perspective of the schools, the biggest threat is erosion in the

financial outlook for loggers and mills. One problem is the struggle going on in the pulp and paper industry, one of the biggest purchasers of wood. The Northeast segment of that industry is being pressured by competitors in other parts of the U.S., South America, Europe, and now Asia.

The sawmills are also in a financial squeeze. Their costs are going up steadily, and the price of lumber is not keeping pace. And the loggers who supply them have their own set of challenges, including high workers' comp rates and high fuel costs that erode profitability. According to Tim Maker, this dynamic can eat away at the infrastructure needed to keep the wood chip stream flowing.

"If the paper mills go out and the number of sawmills declines, the infrastructure that supports the industry likewise begins to contract – the chipping machines and the log trucks, and the special equipment gets scarcer," he says. The chip supply for schools is critically at risk from this perspective.

BERC now has a $50,000 grant from the federal and state governments, along with some contributions from private industry, to seek a solution to this gathering problem. Maker says they are looking for ways to tweak the business model for chip producers in a way that would bolster the chip supply. "We now see an advantage to higher chip prices," he says. "Schools would still save a lot of money over oil, and it might be possible for someone to make a living in this business."

However that works out, there appears to be one step that the schools can make themselves: they could persuade the manufacturers of the wood boilers to beef up the augers and other elements of the delivery system so that the schools could routinely use bole chips. Jim Lathrop strongly supports that. "They would be a bit more expensive," he says, "but they would be much more flexible."

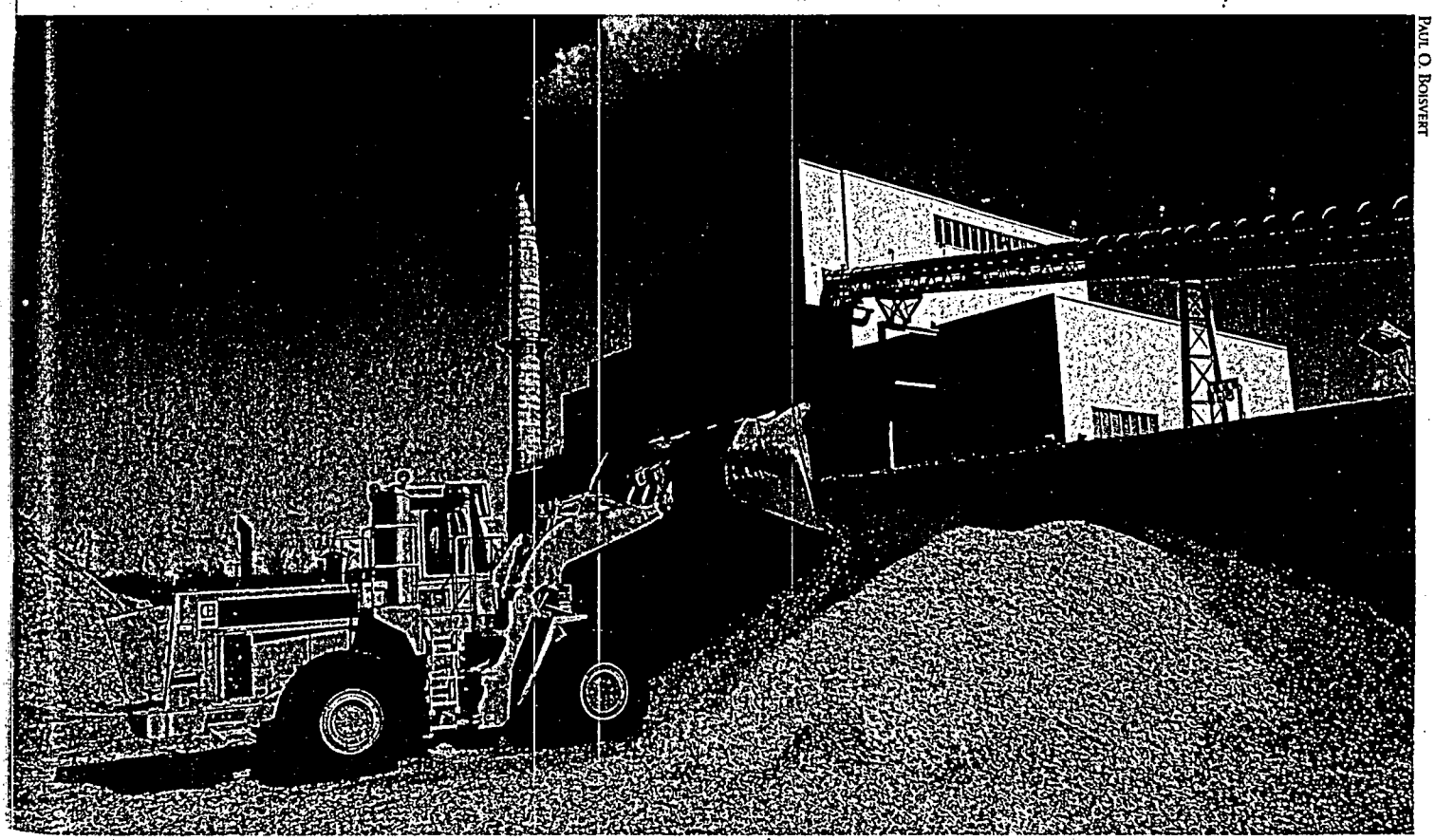
Though most schools prefer sawmill chips, some are making the gradual shift to bole chips. This year, about half of the supply at Barre Town is bole chips, supplied by Limlaw Chipping, one of the largest chip suppliers. Adam Sherman, who works with Maker at BERC, says, "I think the future for the schools is bole chips."

Despite these caveats, Vermont school officials at all levels continue to be upbeat about wood chip heat. Cathy Hilgendorf at the state education department is pushing it as hard as she can. And principals like Ted Riggen do likewise. Riggen, in fact, is talking about how to use the 88 acres of woods surrounding his school as a source of sustainable fuel. He thinks that the local vocational high school should consider adding a forest products course to its academic offerings.

"You manage the forest well," he says, "and you can sustain this flow forever."

HAMILTON DAVIS IS A WRITER AND POLICY ANALYST BASED IN BURLINGTON, VERMONT.

Unlike schools, wood-chip-fired power plants like the McNeil Generating Station in Burlington, Vermont, buy large quantities of chips.



PAUL O. BOISVERT

Putting Wood in Your Gas Tank

Wood Fiber Could Be Important Source of Ethanol

By Gail Dutton

The Midwest is making a reputation for itself turning corn stalks and husks into bioethanol, while the South is eyeing rice husks.

The Northeast, however, has a biomass that may be more valuable than either: wood. The United States Department of Agriculture (USDA) estimates that woody biomass could replace as much as 30 percent of the petroleum used in the U.S. Much of that would come from the Northeast, where forests tend to be rich with hardwoods, and "hardwoods are better than softwoods for this," says Lee Lynd, an engineering professor at Dartmouth College.

The Northeast has a long history of converting wood to paper and, in the past few decades, of converting some of the steam produced in papermaking into electricity. Wood-fired power plants have been burning chips to make electricity in the region for a couple of decades. Now wood chips, along with wastes from the pulp and paper mills, have another possible use. Researchers have found a way to convert them into liquid fuel – specifically, into bioethanol that can be mixed with gasoline and used to reduce our dependence on hydrocarbon-based fuels and also help those fuels burn cleaner.

The term "bioethanol" is commonly used to describe ethanol that is made exclusively from carbohydrates, such as corn or wood, that are found in the biosphere. This distinguishes it from ethanol in general, which can be manufactured from petroleum.

There are two broad – and very different – approaches to converting wood to bioethanol, according to Thomas Amidon, director of the Empire State Research Institute. Neither is in commercial use yet. One process – called cellulose conversion – makes bioethanol from cellulose, which, with lignin, makes up the woody parts of trees and plants. In virtually all research labs, this process has been replaced with the second, and more efficient, method – called hemicellulose conversion – which extracts the sugars from wood and uses them to make other products, including bioethanol.

Cellulose comprises about 45 percent of the wood, but, Amidon says, "cellulose is very hard to take apart." Basically, the wood is ground into fine particles and fermented, yielding about 8 percent bioethanol and 92 percent water. That mixture is distilled three times – using considerable fossil-fuel-based energy – to produce 100 percent bioethanol.

In the more efficient hemicellulose conversion, biorefineries convert hemicelluloses (wood sugars, especially xylan) to ethanol. Xylan is the second largest component in hardwood fiber, and paper companies dissolve and burn most of it in the process of making chemical pulp. But xylan can be readily captured by extracting it from the wood prior to pulping. It can then be purified and concentrated with a membrane and then fermented to make ethanol. To top it off, energy produced in the process can help power the ethanol conversion and concentration process.

By using a biorefinery model and by using energy generated during the conversion process to operate the conversion plant, much peer-reviewed research is showing a net energy gain, notes Lynd. The National Renewable Energy Laboratory in 2004 estimated that using enzymes to convert biomass into sugars could result in cost reductions of more than 20-fold per gallon of bioethanol produced, compared to the cellulose conversion.

"The idea of biorefineries is that [similar to oil refineries] you make multiple products at once," Lynd says. A biorefinery, for example, could produce steam for power generation, acetic acid, and biodegradable plastic, as well as bioethanol.

"Ethanol is one of the earliest products that will be made, but it's not the most valuable," Lynd says. Acetic acid, at about 45 cents per pound for its use in making acetates, has nearly twice the value of ethanol, and you don't have to ferment it, he says.

Using biorefineries could more than double the value of the energy extracted from wood waste products in the forest industry,

A mountain of chips; Inset: Lee Lynd, engineering professor at Dartmouth College, and some of his bioethanol-conversion equipment.

Ned Therrien; John Douglas/Flying Squirrel (inset)

from the equivalent of 300 million barrels of oil in 1990 to more than 600 millions of barrels of oil by 2030, according to a report by the American Forest & Paper Association.

Hardwoods will play a particular role in this conversion. "Different species of trees have different utilities," explains Thomas Jeffries, a microbiologist who works for the USDA Forest Service's Forest Products Labs. "Hexose sugars – glucose and galactose, for instance – are abundant in softwoods, but softwoods aren't as easy to convert to liquid fuels." Softwoods are more difficult to degrade, and their sticky pitch makes them more difficult to process than hardwoods. Although technology to degrade softwood is being developed simultaneously in the U.S., Canada, and Sweden, conifers currently are more valuable for their fiber.

Hardwoods, in contrast, have shorter fibers and more-readily degraded cellulose crystals, which allows the fibers to be taken apart by enzymes more easily than softwood fibers. Among hardwoods, the lower-density woods, such as poplar, cottonwood, and willow, are easier to convert to bioethanol. In such species, the lignin is less cross-linked and the wood has a higher hemicellulose content, lower bark content, and lower extractive components – features that make them more amenable to conversion.

Boon for the paper industry?

The still-emerging hemicellulose-conversion method offers a distinct advantage for the pulp and paper industry in the form of a new revenue stream. Traditionally, converting wood to both paper and bioethanol is a bit tricky, Jeffries says, because the acids used to break down the wood can destroy some of the cellulose, and the resulting degradation products reduce fiber yield and strength. "The toxic byproducts also inhibit fermentation of the sugars into ethanol," he says.

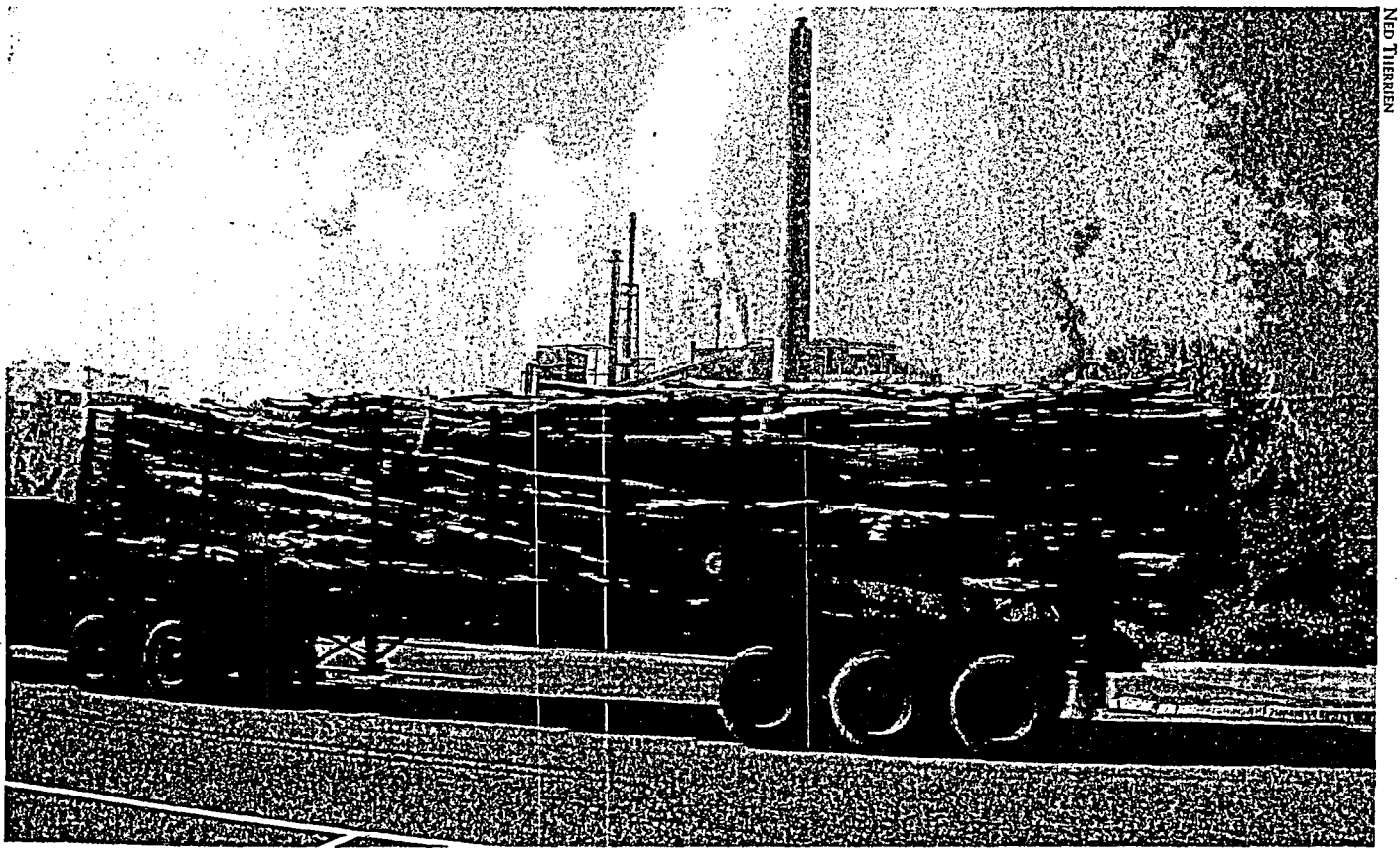
The hemicellulose conversion process, however, overcomes that problem and complements the way paper is made today. Currently, the pulp and paper industry extracts hemicellulosic sugars as one step in converting cellulose into paper, but treats them as waste. Those wasted dollars can be converted into bioethanol, either by fermenting the sugars in solution, or by converting the waste sludge using either enzymes or microbes. Processing it is economical, too, particularly when viewed against the price of oil. It can boost a paper mill's bottom line without significantly changing operations.

Economically, as a source of energy, "wood-based ethanol is a fifth the cost of oil," Lynd says. Currently, he explains, the raw material costs about $40 per ton for cellulosic biomass or $20 per wet ton for wood chips. Converting biomass to ethanol using a biorefinery is the equivalent of buying oil at $13 per barrel, he says.

That figure doesn't include the capital costs of establishing biorefineries or distribution systems, however. When those and other related costs are added into the equation, wood-based biomass could compete with oil that costs $30 to $35 per barrel – about half the peak cost of a barrel of oil in 2005.

Those numbers sound good, but starting a wood-to-bioethanol

Low-grade wood could become an important feedstock for bioethanol refineries.



Ned Therrien

Ethanol is essentially alcohol, made through a variety of processes. The feedstock can be either biological or fossil fuel. Ethanol made from biological sources (wood chips or corn husks, for example) is called bioethanol.

plant means risk and involves a large amount of capital, Lynd says. No commercial entity is as yet using wood to produce bioethanol. To build a viable wood-to-bioethanol market, "we need two complementary actions: to lower the investment hump for new plants and to do breakthrough research and development."

Most existing bioethanol plants in the U.S. rely upon corn stover – the stalks and other materials not used as food – and corn grain. Theoretically, according to the National Renewable Energy Laboratory, one dry ton of feedstock would produce nearly 125 gallons of bioethanol from corn, or 113 gallons from corn stover. It estimates that a ton of forest thinnings processed through hemicellulose conversion would produce nearly 82 gallons of bioethanol.

Grain is the main feedstock for bioethanol now, but wood has some benefits over competing biomass sources that will boost its use. Unlike such seasonal biomass crops as corn, soybeans, or switchgrass, wood can be harvested throughout the year, stored for months as chips without degrading (longer if left in log form), and can be left growing in the forest until it's needed, thus enabling just-in-time delivery systems. Wood also is denser than alternative biomass sources and so on a volume basis contains more potential energy.

Researchers agree that more study is needed to increase wood-conversion efficiency. In the meantime, Jeffries says, bioethanol plants are likely to be designed to handle multiple fuel types, such as trees, corn stover, rice hulls, and other biomass.

Other issues must also be resolved before wood-based bioethanol plants become a reality, including guaranteeing long-term feedstock supplies for the plants, Lynd says. The feedstock issue isn't trivial, Jeffries emphasizes. "Plants want 20-year contracts but can't get even 5- or 10-year contracts" with suppliers of biomass. Despite these hurdles, "There's every reason to believe we can be very successful," Lynd adds.

The interest in bioethanol extends beyond the fuel and paper industries. Lyonsdale Biomass LLC, a division of Catalyst Renewables Corporation, runs a 19-megawatt wood-fired power plant in Lyonsdale, New York, on the western side of the Adirondacks. It currently burns upwards of 200,000 tons of wood each year. Lyonsdale is working with the state government to develop a renewable portfolio project that provides an incentive to help develop the wood-to-biomass industry. Like other biomass companies, Lyonsdale burns only low-grade woods – tops, limbs, and poorly formed trees – in its existing wood-to-energy plant.

Lyonsdale is participating in biomass research being done by the State University of New York's College of Environmental Science and Forestry (SUNY-ESF). "This year, we're sending samples [of our wood biomass] to SUNY-ESF to determine potential quantities and identify potential markets," according to David BonDurant, Lyonsdale plant manager. The goal is to determine whether it's financially feasible for Lyonsdale to produce bioethanol as a byproduct of its normal operations. Lyonsdale's participation gives SUNY-ESF researchers real-world samples and feedback. Bioethanol, to BonDurant, is a value-added product that could help his plant and others become more viable. Depending on the results of the testing, bioethanol production could augment revenues from generating electricity.

"Any way of keeping the facility open is in my best interest, and the best interest of the Northeast," he says. "Until recently, biomass plants weren't competitive. The cost of fuel was high, so many biomass plants shut down in the past five years." If we can make a value-added product from the wood – like sugars for bioethanol – the plants could become more competitive, he says.

Making the plants more competitive could in turn result in better forestry in the region by providing stable markets for low-grade wood, which would be chipped as a fuel source for biorefineries. The presence of that market, in turn, encourages woodlot owners to improve their timber stands by removing poor-quality trees because they can recoup at least part of the expense of their removal. Thinning out the low-grade wood improves the long-term value of the forests. But without that market, improvement work is an expense that many landowners will not choose to incur.

"A rising tide raises all boats," Lynd says, noting that small landowners could sell the thinnings directly to biorefineries and then eventually get a higher price for their mature timber in the future because it will be of higher quality.

Lynd's optimistic outlook for bioethanol is partially based on the existing fuel market. Several states are requiring that ethanol be added to gasoline and diesel to help those fuels burn hotter, and thus more completely, which reduces air pollution

Right now, more than 30 percent of all gasoline in the U.S. is blended with ethanol, according to the Renewable Fuels Association. In early 2005, the U.S had 81 ethanol plants in 20 states, with the capacity to produce more than 4 billion gallons annually. Another 16 plants are in construction and will add another 750 million gallons of capacity, according to the Renewable Fuels Association, thus indicating the growing market for bioethanol. If the current research can turn wood as a fuel-stock for bioethanol into a commercial reality, northeastern motorists could find themselves filling their tanks with a fuel that's at least partly made from the forest that surrounds us.

GAIL DUTTON FOCUSES ON SCIENCE AND TECHNOLOGY, WRITING FROM HER FAMILY'S TREE FARM IN WASHINGTON STATE.