

STATE OF VERMONT
BEFORE THE PUBLIC SERVICE BOARD

**Petition of Entergy Nuclear Vermont)
Yankee, LLC, and Entergy Nuclear)
Operations, Inc., for authority to)
continue after March 21, 2012,)
operation of the Vermont Yankee)
Nuclear Power Station)**

Docket No. 7440

DIRECT TESTIMONY OF
PAUL CHERNICK
ON BEHALF OF
CONSERVATION LAW FOUNDATION
AND
VERMONT PUBLIC INTEREST RESEARCH GROUP

Resource Insight, Inc.

FEBRUARY 11, 2009

Mr. Chernick's testimony provides an evaluation and analysis of certain economic impacts of the proposed extension of the Vermont Yankee license to assist the Board in determining whether an extension of the license for Vermont Yankee will "promote the general good of the state" per 30 V.S.A. §248(a)(2). Mr. Chernick's evaluation includes the value to Vermont and potential uses of the revenue-sharing provision in Paragraph 4 of the March 3 2002 Memorandum of Understanding, risks to Vermont of the underfunding of the Vermont Yankee decommissioning fund, and the importance of a below-market power contract to ensure benefits to Vermont ratepayers.

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1 **I. Identification and Qualifications**

2 **Q: Mr. Chernick, please state your name, occupation and business address.**

3 A: I am Paul L. Chernick. I am the president of Resource Insight, Inc., Five Water
4 Street, Arlington, Massachusetts.

5 **Q: Summarize your professional education and experience.**

6 A: I received an SB degree from the Massachusetts Institute of Technology in June
7 1974 from the Civil Engineering Department, and an SM degree from the
8 Massachusetts Institute of Technology in February 1978 in technology and
9 policy. I have been elected to membership in the civil engineering honorary
10 society Chi Epsilon, and the engineering honor society Tau Beta Pi, and to
11 associate membership in the research honorary society Sigma Xi.

12 I was a utility analyst for the Massachusetts Attorney General for more
13 than three years, and was involved in numerous aspects of utility rate design,
14 costing, load forecasting, and the evaluation of power supply options. Since
15 1981, I have been a consultant in utility regulation and planning, first as a
16 research associate at Analysis and Inference, after 1986 as president of PLC,
17 Inc., and in my current position at Resource Insight. In these capacities, I have
18 advised a variety of clients on utility matters.

19 My work has considered, among other things, the cost-effectiveness of
20 prospective new generation plants and transmission lines, retrospective review
21 of generation-planning decisions, ratemaking for plant under construction,
22 ratemaking for excess and/or uneconomical plant entering service, conservation
23 program design, cost recovery for utility efficiency programs, the valuation of
24 environmental externalities from energy production and use, allocation of costs

1 of service between rate classes and jurisdictions, design of retail and wholesale
2 rates, and performance-based ratemaking and cost recovery in restructured gas
3 and electric industries. My professional qualifications are further summarized in
4 Exhibit CLF/VPIRG PLC-1.

5 **Q: Have you testified previously in utility proceedings?**

6 A: Yes. I have testified more than two hundred times on utility issues before
7 various regulatory, legislative, and judicial bodies, including utility regulators in
8 24 states and three Canadian provinces, and two Federal agencies.

9 **Q: Have you testified previously before the Vermont Public Board?**

10 A: Yes. I testified in the following cases:

- 11 • Docket No. 4936, on Millstone 3;
- 12 • Docket No. 5270 on DSM cost-benefit test, pre-approval, cost recovery,
13 incentives, and related issues;
- 14 • Docket No. 5330, on the conflict between the HQ purchase and DSM;
- 15 • Docket No. 5491, on the need for HQ power and the costs of alternative
16 purchases;
- 17 • Docket No. 5686, on the avoided costs and water-heater load-control
18 programs of Central Vermont Public Service (CVPS);
- 19 • Docket No. 5724, on CVPS avoided costs;
- 20 • Docket No. 5835, on design of CVPS load-management rates;
- 21 • Docket No. 5980, on electric-industry restructuring and avoided costs;
- 22 • Docket No. 5983, on the prudence of Green Mountain Power's decisions
23 regarding the HQ contract, avoided costs, and distributed utility planning;
- 24 • Docket No. 6018, on the prudence of CVPS's decisions regarding the HQ
25 contract, avoided costs, and distributed utility planning;

- 1 • Docket No. 6107, on the prudence of GMP's decisions regarding the HQ
- 2 contract and distributed utility planning;
- 3 • Dockets Nos. 6120 and 6460, on the prudence of CVPS's decisions
- 4 regarding the HQ contract;
- 5 • Docket No. 6545, on the sale of the Vermont Yankee nuclear power plant
- 6 to Entergy Nuclear Vermont Yankee;
- 7 • Docket No. 6596, on the prudence of Citizens Utilities's decisions
- 8 regarding the HQ contract, including the role of transmission constraints in
- 9 that decision and its consequences.
- 10 • Docket No. 6860, on the use of distributed resources to defer or avoid
- 11 portions of the Northwest Reliability Project.

12 Most of these appearances were sponsored by the Department of Public
13 Service. My testimony in Dockets No. 5330, 5491, and 6860 were sponsored by
14 the Conservation Law Foundation; in Docket No. 5270 I testified on behalf of a
15 collaborative of Conservation Law Foundation, the Department of Public
16 Service and CVPS.

17 **Q: Have you been involved in other aspects of utility planning and regulation**
18 **in Vermont?**

19 A: Yes, including the following activities:

- 20 • participation in the CVPS and Vermont Gas DSM collaboratives;
- 21 • preparation of testimony on the avoided costs of Green Mountain Power in
- 22 Docket No. 5780, not presented due to settlement of the case;
- 23 • assisting the Department of Public Service (DPS or the Department) in the
- 24 power-supply negotiations of the externalities investigation;
- 25 • providing consulting support to the Vermont Senate on stranded costs and
- 26 Vermont Yankee economics;

- 1 • assisting the Burlington (Vermont) Electric Department on distributed
2 utility planning;
- 3 • assisting the Department in the statewide collaborative on distributed
4 utility planning, and in the Southern Loop and Stratton area-specific distri-
5 buted utility planning collaboratives.

6 **Q: Are you the author of any publications on utility planning and ratemaking**
7 **issues?**

8 A: Yes. I am the author of publications on rate design, cost allocation, cost recovery,
9 cost-benefit analysis, and other ratemaking issues. Several of my recent papers
10 and report deal with issues in electric and gas industry restructuring, including
11 integrated resource planning and performance-based ratemaking. These are
12 listed in my resume.

13 **II. Introduction and Summary**

14 **Q: On whose behalf are you testifying?**

15 A: My testimony is jointly sponsored by the Conservation Law Foundation and
16 Vermont Public Interest Research Group.

17 **Q: What is the purpose of your direct testimony?**

18 A: The purpose of my testimony is to provide the Public Service Board with an
19 evaluation and analysis of certain economic impacts of the proposed extension
20 of the Vermont Yankee license. This evaluation is offered to assist the Board in
21 determining whether an extension of the license for Vermont Yankee will
22 “promote the general good of the state” 30 V.S.A. § 248(a)(2). My testimony
23 evaluates the proposal presented to the Board and describes the minimum
24 conditions needed to ensure that if a license for Vermont Yankee is extended, it

1 will provide benefits to Vermont. My testimony addresses several aspects of the
2 proposal by Entergy Vermont Yankee and its affiliates (collectively “Entergy” or
3 “ENVY”) to extend the duration of the certificate of public good for the Vermont
4 Yankee plant, allowing an additional twenty years of plant operation.
5 Specifically, I address the following issues:

- 6 • The inadequacy of the decommissioning funds for Vermont Yankee and the
7 importance of ensuring the adequacy of Vermont Yankee’s decommis-
8 sioning funding, in light of uncertain costs and investment returns, and
9 recommendations to ensure the availability of sufficient decommissioning
10 funds.
- 11 • The limited value of the revenue-sharing agreement between Entergy and
12 the DPS, considering the dramatic reduction in current and expected market
13 energy prices since Entergy filed its application.
- 14 • Necessary conditions to provide benefits from the revenue-sharing agree-
15 ment to promote the general good of the state.
- 16 • The need for a favorable power-supply contract between Entergy and
17 Vermont utilities to promote the general good of the state and provide
18 economic benefit to Vermont from an extension of any license for Vermont
19 Yankee, in light of the likelihood that the revenue-sharing agreement
20 benefits will be small.

21 **III. Decommissioning Funding**

22 **Q: Do you have concerns about the adequacy of the decommissioning funds for**
23 **Vermont Yankee?**

1 A: Yes. I am concerned that the funds available for decommissioning Vermont
2 Yankee are insufficient.

3 **Q: Please explain your concerns about the adequacy of Vermont Yankee's**
4 **decommissioning funds.**

5 A: The decommissioning fund is not sufficient to account for known uncertainties,
6 including the possible early shutdown of the plant, escalation in decommis-
7 sioning costs, and poor investment returns. Based on recent experiences, there is
8 a non-trivial risk that Vermont Yankee would need to close abruptly during the
9 life-extension period. For example, in early January 2009, Vermont Yankee
10 experienced two leaks of radioactive water within two days. Vermont Yankee's
11 overall performance compared to the industry moved from between the top and
12 median quartile through 2006 to the bottom quartile for 2008.¹ Poor investment
13 returns would also dramatically reduce the value of the decommissioning fund
14 compared to expectations, as we have seen over the last year. Use of decommis-
15 sioning funds for spent fuel storage or other uses as Entergy has proposed,
16 would also limit the funds available for decommissioning. If Vermont Yankee is
17 left with insufficient decommissioning funds and no source of revenues or
18 additional funding, the state of Vermont will be burdened with costs that are not
19 reflected in Entergy's proposal. At a minimum, Vermont would bear the nuclear
20 equivalent of a junk car in its back yard. It would bear the environmental and
21 economic cost of a plant that is not in operation and is not decommissioned.
22 Those risks and costs must be incorporated in the economic analysis for the

¹"Vermont Yankee Benchmark Report," Appendix B at B-3 of the DPS Act-189 reliability assessment (12/22/08).

1 Board to ensure that the continued operation of Vermont Yankee will promote
2 the general good of Vermont.

3 **Q: Have any other US nuclear power plants shut down prior to the end of their**
4 **operating licenses?**

5 A: Yes. This was the case for most or all of the small (less-than-500-MW) nuclear
6 units, such as Massachusetts Yankee.² The following commercial-size (greater-
7 than-400-MW) units retired before the end of their licenses:

- 8 • San Onofre 1
- 9 • Maine Yankee
- 10 • Connecticut Yankee
- 11 • Millstone 1
- 12 • Zion 1 and 2
- 13 • Trojan
- 14 • Rancho Seco
- 15 • Three Mile Island 2

16 These early retirements comprise about 8% of all the commercial-size units
17 built in the US and about 20% of those units that entered service through 1973.³
18 Vermont Yankee entered service in 1972.

19 **Q: What would constitute adequate decommissioning funding in this**
20 **proceeding?**

²Vermont Yankee is one of the smallest of the commercial-sized units.

³Several other smaller commercial plants—including Massachusetts Yankee, Dresden 1, Indian Point 1, Humboldt Bay, and LaCrosse—were also retired early.

1 A: Soon after the end of the current license, Vermont Yankee should have adequate
2 funds to decommission the plant safely, with a high level of confidence. The
3 level of confidence should reflect the following risks:

- 4 • higher decommissioning costs related to the circumstances of retirement,
5 such as an accident;
- 6 • higher decommissioning costs related to changes in costs;
- 7 • lower decommissioning funds due to poor market performance.

8 **Q: Does the current decommissioning fund account for any of these**
9 **possibilities?**

10 A: No. Even as presented by Entergy, the decommissioning fund is not likely to be
11 sufficient to complete plant closure and dismantlement at the end of its current
12 license. Exhibit TLG-3 reports that annual returns of at least 8.7% are required to
13 finance for prompt decommissioning if the plant were to close by 2012,
14 assuming that the decommissioning estimate is accurate and that the decom-
15 missioning fund started with \$447.8 million at the end of 2007. As I discuss
16 below, Exhibit TLG-2 acknowledges that the decommissioning cost estimate is
17 not intended to be an unbiased estimate of the decommissioning cost, and that
18 actual costs are more likely to be above the estimate than below it. More
19 importantly, rather than growing at 8.7%, the fund lost about 15% of its value
20 from 2007 to 2008.⁴ Recognizing actual fund value at the end of 2008, the
21 average fund after-tax return would need to be at least 12.6% to successfully
22 finance prompt decommissioning following a 2012 retirement. That level of
23 after-tax return is highly unlikely over the long term.

⁴According to Entergy's 10/14/08 filing with the NRC, the decommissioning fund started at \$439.6 million, rather than \$447.8 million at the end of 2007. That difference is much smaller than the fund's subsequent losses.

1 **Q: What is the status of Vermont Yankee’s decommissioning funding?**

2 A: At December 31, 2006, the Vermont Yankee decommissioning-fund balance was
3 \$416.5 million (“Response to Request for Additional Information,” Sullivan, T.
4 A., Entergy Nuclear Operations, NRC Docket No. 50-271, April 24, 2008). As of
5 June 30, 2008, the balance had sagged to \$413.3 million (Exhibit CLF/VPIRG
6 PLC-2 (Attachment A.DPS:EN.1-10)).⁵ By October 31, 2008, that value had
7 shrunk to \$364.4 million (Exhibit CLF/VPIRG PLC-4 (CLF/VPIRG:EN.S2-2)).
8 According to press reports of ENVY testimony before the Vermont Legislature,
9 the balance had recovered slightly to \$372 million by December 2008 (“Entergy
10 must put more money into nuke decommissioning fund,” Daniel Barlow, *Times*
11 *Argus*, Feb 6 2009).⁶ From December 2006 through June 2008, the fund lost
12 several percent in real terms, compared to the 3.2% annual escalation in the
13 Vermont Yankee decommissioning estimates from 2001 to 2006. From June to
14 October 2008, the fund lost over 12% of its value in real terms.

⁵The June 2008 balances of the individual funds in Exhibit CLF/VPIRG PLC-3 (Attachment A.DPS:EN.2-15a.1) add up to \$414.4 million.

⁶The fixed-income portion of the decommissioning fund probably recovered somewhat from October to December, while the equity portion of the fund fell in that period and has fallen further since.

1 **Table 1: Summary of Vermont Yankee Decommissioning Fund**
2 **Balances and Returns**

Date	Fund Balance	Annualized Nominal Return		Real Return Net of 3.2% Decomm Escalation	
		<i>since 12/02</i>	<i>since 12/07</i>	<i>since 12/02</i>	<i>since 12/07</i>
31-Jul-02	\$310.7 M				
31-Dec-06	\$416.5 M	6.9%		3.5%	
31-Dec-07	\$439.6 M	6.6%		3.3%	
30-Jun-08	\$413.3 M	4.9%	-11.6%	1.7%	-14.4%
31-Oct-08	\$364.4 M	2.6%	-20.1%	-0.6%	-22.6%
31-Dec-08	\$372 M	2.8%	-15.3%	-0.3%	-18.0%

3 From July 2002–December 2008, the average annual return on the fund
4 was about 2.8%, less than the 3.2% annual escalation rate in the most recent
5 decommissioning estimate (Exhibit CLF/VPIRG PLC-5 (CLF/VPIRG:EN.S2-
6 1)). Since its inception in 2002, ENVY’s decommissioning fund has shrunk in
7 real terms.

8 **Q: Does the Vermont Yankee–decommissioning-funding plan allow for the**
9 **possibility of a significant downturn in the market value of the fund?**

10 A: No. To the contrary, Entergy has been very aggressive in projecting its fund
11 return. The NRC allows plant owners to project a 2% return on their decom-
12 missioning funds.⁷ As Entergy explained in April 2008, it assumed a higher
13 return for the Vermont Yankee fund, about 2.7% real (5.79% nominal) based on
14 returns in the 2002–2007 period. The NRC staff found as follows:

⁷Plants under rate regulation can assume a higher return through the license expiration date, if approved by the rate regulator, but Vermont Yankee is not rate regulated and even this partial exemption would not apply.

1 Entergy VY's plan uses a real rate of return of greater than 2 percent
2 through the specified SAFSTOR period, based on Entergy's position that it is
3 reasonable to consider historical performance of the fund, and Entergy's
4 pending request for license renewal, in order to show sufficient funds
5 would be available to complete decommissioning.... [I]t is unacceptable for
6 VY to use greater than 2 percent real rate of return. (Vermont Yankee
7 Nuclear Power Station—Review of the Spent Fuel Management Plan,
8 James Kim, NRC Division of Operating Reactor Licensing, July 16, 2008)

9 On October 14, 2008, in response to instructions from the NRC, Entergy
10 filed a revised plan, using the 2% real return, but starting with a fund balance of
11 \$439,567,000 in 2007, rising to \$457,326,000 in 2009 in 2007 dollars (Entergy
12 10/14/08 filing, Table 2). With 2% inflation, Entergy's projected 2009 balance
13 would be about \$476 million, about 28% more than the actual balance at
14 December 2008. Even with this overstated starting balance, in order to keep the
15 fund balance from becoming negative, Entergy was forced to assume an
16 additional contribution to the fund in 2026. Entergy assumed a \$60 million
17 contribution in 2007 dollars, or over \$100 million in nominal dollars.

18 **Q: Is there any assurance that Entergy would be able to make a \$100 million**
19 **contribution in 2026?**

20 A: No. Entergy may be financially stressed at that time, in bankruptcy, or no longer
21 in existence. It is not clear that Entergy has made any binding commitment to
22 add to the decommissioning fund in any amount. The credit facilities from other
23 Entergy affiliates to Vermont Yankee are limited to \$70 million; while another
24 \$60 million is available at the time of decommissioning, if necessary, that latter
25 guaranty does not appear to be available in 2026.

26 As I understand the situation, Entergy has proposed to spin off Vermont
27 Yankee into an unaffiliated company, with several other aging merchant nuclear
28 plants and less financial capability than Entergy. That action would reduce the
29 probability of post-decommissioning contributions to the fund.

1 **Q: Had Entergy assumed that the contribution would be in 2012, how large**
2 **would it need to be, given Entergy's assumptions?**

3 A: A contribution of about \$20 million would be needed in 2012 to fund
4 decommissioning, even with Entergy's unreasonably optimistic assumptions.

5 **Q: Is a projected 2% real return on decommissioning funds adequate under**
6 **current circumstances, if Vermont Yankee retires in 2012?**

7 A: No. Assuming a 2012 shutdown, 2% real return, no additional contribution, and
8 Entergy's cost and schedule projections, the fund would

- 9 • decline every year from 2012 onward, since expenses would exceed return,
- 10 • be exhausted in 2068, just one year into decommissioning,
- 11 • be \$358 million short of the total estimated decommissioning cost in 2006
- 12 dollars, or about \$1.3 billion in nominal dollars, assuming 2% inflation.

13 **Q: With Entergy's assumptions, would the decommissioning fund be adequate**
14 **if the retirement of Vermont Yankee is delayed 20 years?**

15 A: The fund would cover decommissioning costs only if Entergy's aggressively
16 optimistic assumptions proved correct, including the plant operating another
17 twenty years, the fund earning a 2% real return, and Entergy's cost and schedule
18 projections being correct. Each of those assumptions is uncertain, of course. For
19 example, if future returns average 1.75% real—still better than performance to
20 date—the fund would not be adequate. The same would be true if the actual
21 decommissioning cost exceeded TLG's base projection by just 12%, an increase
22 seen in past estimates over just a year or two.

23 **Q: What factors drive the risks of an early shutdown for Vermont Yankee?**

24 A: Like any nuclear plant, Vermont Yankee may experience a nuclear accident that
25 would make return to service very expensive or even impossible, as occurred at

1 Three Mile Island 2. Similarly, the failure of the turbine, generator, or other
2 major equipment could easily render return to service uneconomical, especially
3 in periods of low power prices. Some new design issue, technical problem, or
4 regulatory requirement may arise that would be expensive to resolve, leading to
5 early retirement. It is my understanding that such emerging issues led to the
6 early shutdown of several early nuclear units, including Massachusetts Yankee,
7 Humboldt Bay, and Indian Point 1. Permanent shutdown in response to a future
8 problem would be more likely if market prices for power are low, and as
9 Vermont Yankee approaches the expiration of its license (whether the original or
10 the extended license), because there would be less time to recover any capital
11 investments.

12 **Q: What factors contribute to uncertainty in the cost of decommissioning?**

13 A: Any of the cost items in the decommissioning estimate may change, due to
14 changes in input costs, regulatory changes and other factors. Regulation can
15 affect the labor and equipment costs of SAFSTOR and decommissioning, as well
16 as the costs of transportation and disposal.

17 **Q: How do ENVY's current decommissioning-cost estimates reflect these**
18 **uncertainties?**

19 A: The decommissioning-cost estimates include allowances for contingencies,
20 which are costs that are expected in aggregate but not identifiable in detail. The
21 estimates do not include increased unit prices for inputs to the decommissioning
22 process, nor do they include any safety factor.

1 The cost elements in the estimates are based on ideal conditions; therefore,
2 the types of unforeseeable events that are almost certain to occur in
3 decommissioning, based on industry experience, are addressed through a
4 percentage contingency applied on a line-item basis. This contingency
5 factor is a nearly universal element in all large-scale construction and
6 demolition projects. It should be noted that contingency, as used in this
7 estimate, does not account for price escalation and inflation in the cost of
8 decommissioning over the remaining operating life of the unit.

9 The use and role of contingency within decommissioning estimates is not a
10 safety factor issue. Safety factors provide additional security and address
11 situations that may never occur. Contingency funds, by contrast, are
12 expected to be fully expended throughout the program. Inclusion of
13 contingency is necessary to provide assurance that sufficient funding will
14 be available to accomplish the intended tasks. (Exhibit TLG-2 at x–xi)

15 It has been TLG’s experience that the results of a risk analysis, when
16 compared with the base case estimate for decommissioning, indicate that
17 the chances of the base decommissioning estimate’s being too high is a low
18 probability, and the chances that the estimate is too low is a higher
19 probability. This is mostly due to the pricing uncertainty for low-level
20 radioactive waste burial, and to a lesser extent due to schedule increases
21 from changes in plant conditions and to pricing variations in the cost of
22 labor (both craft and staff). This cost study, however, does not add any
23 additional costs to the estimate for financial risk, since there is insufficient
24 historical data from which to project future liabilities. (Exhibit TLG-2,
25 Section 3, at 6)

26 The decommissioning-cost study (Exhibit TLG-2, Section 3, at 5–6) lists
27 such examples of excluded cost factors as:

- 28 • expenses associated with eliminating 50% to 80% of the site labor force
29 shortly after the cessation of plant operations,
- 30 • worker separation and retraining packages throughout the decommission-
31 ing program,
- 32 • retention incentives for key personnel.
- 33 • changes in the project work scope from the baseline estimate,
- 34 • unexpected levels or locations of contaminants in the plant or soil,

- 1 • errors in the as-built drawings,
- 2 • regulatory changes (e.g., worker health and safety, site-release criteria,
- 3 waste transportation, and disposal),
- 4 • alteration in commitments to accept waste and spent fuel,
- 5 • pricing changes for basic inputs, such as labor, energy, materials, and
- 6 burial.

7 The NRC staff noted earlier this month that “a significant uncertainty exists
8 regarding the low-level waste disposal cost due to Barnwell no longer accepting
9 waste from [outside its compact] as well as the uncertainty of the preliminary
10 assessment of the potentially contaminated soil.”⁸

11 Hence, simply having sufficient decommissioning funds to cover the
12 current decommissioning cost estimate does not provide a high level of
13 assurance—or even a 50-50 chance—that the fund will cover actual decom-
14 missioning costs.

15 One known uncertainty concerns the disposal of Class-A waste. ENVY’s
16 estimates are based on 2006 quotes for disposal at the EnergySolutions facility
17 at Clive, Utah. Aside from the inherent uncertainties of using current prices to
18 estimate prices decades in the future, the availability of disposal at the
19 EnergySolutions facility faces a number of known risks for which ENVY has not
20 accounted. EnergySolutions currently has permission to dispose of Class-A
21 waste in only part of its site; failure to receive permission to increase this area
22 would “materially restrict” its ability to accept Class A waste from Vermont

⁸“Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Spent Fuel Management Program and the Preliminary Decommissioning Cost Estimate Entergy Nuclear Operations, Inc. Vermont Yankee Nuclear Power Station Docket No. 50-271” TAC Nos. MD8035, MD8051. NRC staff memo, February 3 2009.

1 Yankee and elsewhere. Utah regulations or legislation may (1) restrict out-of-
2 region access to the Clive facility, (2) limit the capacity of the facility, and/or (3)
3 increase disposal costs through environmental costs, taxes, fees or other
4 regulations.

5 In addition, the Northwest Interstate Compact on Low-Level Radioactive
6 Waste Management has asserted a claim that restricts the facility's ability to
7 import foreign low-level radioactive waste for disposal at the facility. If the
8 Compact's claim of jurisdiction survives litigation, it may eventually restrict
9 ENVY's ability to dispose of its waste at this site, as follows:

10 Our Clive facility is highly regulated and subject to extensive licensing and
11 permitting requirements and continuous air and ground water monitoring.
12 Changes in federal, state or local regulations, including changes in the
13 interpretation of those regulations, can affect our ability to operate the
14 facility. Actions by states or the federal government may affect facility
15 capacity, expansion or extension of the Clive facility. The Northwest
16 Compact also has asserted authority over our Clive facility and restrictions
17 over our ability to import foreign LLRW for disposal at the facility. Such
18 actions may hinder, delay or stop shipments to the facility, which could
19 seriously impair our ability to execute disposal projects and significantly
20 reduce future revenues. We believe that we have sufficient capacity for
21 more than 30 years of operations based on our estimate of future disposal
22 volumes, our ability to optimize disposal capacity utilization and our
23 assumption that we will obtain a license amendment to convert a disposal
24 cell originally intended for 11e(2) waste to Class A LLRW. If we are unable
25 to obtain the license amendment, our projected capacity to dispose of
26 Class A LLRW would be materially reduced. If future disposal volumes
27 increase beyond our expectations or if our other assumptions prove to be
28 incorrect, then the remaining capacity at Clive would be exhausted more
29 quickly than projected. (EnergySolutions, Inc. Form 10-Q, 11/13/08, at 37)

30 Entergy anticipates that Vermont Yankee waste in Classes B and C would
31 be shipped to a future facility owned by Waste Control Specialists in Texas
32 (Exhibit CLF/VPIRG PLC-6 (CLF/VPIRG:EN.S2-8)). That facility has recently
33 received a license conditioned on successful completion of a number of future

1 studies and tasks. The decommissioning cost estimate uses rates for Class B and
2 C waste at the Barnwell facility in South Carolina as a proxy the costs at the
3 potential future Texas facility. Those rates must be considered speculative.

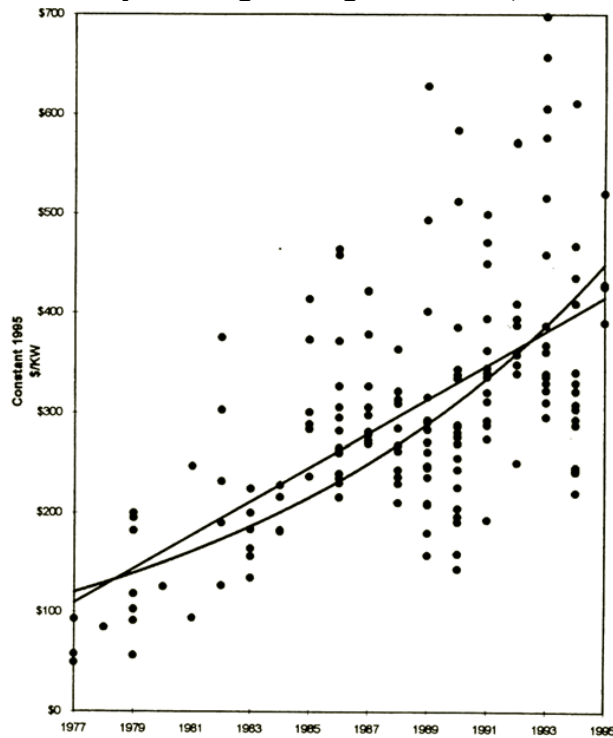
4 **Q: How stable have been the decommissioning-cost estimates by TLG Services?**

5 A: Entergy refused to provide data on past TLG decommissioning estimates (Exhibit
6 CLF/VPIRG PLC-7 (CLF/VPIRG:EN.S2-9)). My experience with earlier TLG
7 decommissioning estimates indicates that those estimates have been subject to
8 dramatic escalation. For example, a trend analysis of TLG estimates from 1977
9 through 1995 showed a four-fold increase in inflation-adjusted cost estimates.⁹
10 The current TLG decommissioning estimates for Vermont Yankee acknowledge
11 the exclusion of a range of potential cost drivers, which could result in large
12 increases from the current estimates to actual decommissioning costs.

⁹Biewald, Bruce. 1996. "Electric Industry Restructuring and Environmental Sustainability." Proceedings USAEE 17th Annual North American Conference 116–124.

1
2

Figure 1: Nuclear Plant Decommissioning Cost Estimates by Year of Estimate
(180 Estimates by TLG Engineering 1977–1995)



3
4

Source: Biewald 1996 at 120.

5 **Q: What is the current status of the NRC’s review of the Vermont Yankee**
6 **decommissioning plan?**

7 A: The NRC staff initially rejected Entergy proposals to fund spent-fuel manage-
8 ment from the decommissioning fund and to assume a real fund return of more
9 than 2%. (Vermont Yankee Nuclear Power Station—Review of the Spent Fuel
10 Management Plan, James Kim, NRC Division of Operating Reactor Licensing,
11 July 16, 2008) In the last few weeks, the NRC staff has given preliminary
12 approval to Entergy’s revised plan for spent-fuel management and decommis-
13 sioning, subject to the following conditions:¹⁰

¹⁰“Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Pent Fuel Management Program and the Preliminary Decommissioning Cost Estimate Entergy Nuclear Operations, Inc. Vermont Yankee Nuclear Power Station Docket No. 50-271” TAC Nos. MD8035, MD8051. NRC staff memo, February 3 2009.

- 1 • Energy would need to apply for and be granted an exemption from NRC
2 regulations “in order to use the decommissioning trust funds for spent fuel
3 management (Memo at 5),
- 4 • Entergy would need to add \$60 million to the fund in 2026 (Memo at 4),
- 5 • The NRC staff also “notes that the preceding [spent-fuel-management-
6 program] analysis is based on a reported DTF [decommissioning trust fund]
7 balance that can fluctuate over time. Should there be a material decline in
8 the DTF balance, the staff’s analysis and preliminary findings may no
9 longer be valid, and the licensee would be under an obligation under 10
10 CFR 50.9 to update the DTF balance as well as any changes in projected
11 costs” (Memo at 4).

12 Since the preliminary approval was based on the December 2007 fund
13 balance of \$439.56 million that Entergy used in its October 2008 revised filing,
14 rather than the lower balance at June 2008 or October 2008, Entergy’s plan is
15 insufficient even by the NRC’s terms since it has not been adjusted to reflect a
16 material decline in the DTF balance.

17 **Q: What is the significance of the recent ENVY filings with the NRC and the**
18 **NRC’s responses?**

19 A: Entergy’s willingness to divert decommissioning funds to spent-fuel manage-
20 ment, combined with its overstatement of future fund return, its use of an
21 outdated fund balance in its revised plan, and its proposal to delay the contri-
22 bution necessary to meet even NRC’s minimum funding requirements, suggest
23 that Entergy is not committed to adequate funding of Vermont Yankee’s
24 decommissioning. While this approach minimizes Entergy’s cost and may
25 increase Entergy’s earnings, it exposes Vermont to economic harm. Prior Board
26 cases require adequate funding of decommissioning well in advance of need.

1 For instance, a recent Board order required the developer of a 16-turbine wind
2 generation facility to fund fully the decommissioning of each component of the
3 facility prior to its construction.¹¹ The evaluation of the certificate of public
4 good to extend Vermont Yankee's operating license is the opportunity to ensure
5 that Entergy funds its obligations fully and that any license extension does not
6 leave Vermont at risk of hosting a retired nuclear plant without adequate
7 decommissioning funds.

8 **Q: What improvements to the decommissioning fund should the Board require**
9 **as a condition of extending the life of Vermont Yankee?**

10 A: The following changes are needed:

- 11 • The decommissioning fund must be replenished, to offset the investment
12 losses since 2007 and to compensate for any portion of the fund committed
13 to spent-fuel storage. This would require an investment of about \$100
14 million, to get back to the balance Entergy projected for 2009. That
15 shortfall should be made up as quickly as feasible, with payments starting
16 immediately and full funding by no later than 2012.
- 17 • The shortfall that Entergy acknowledged, even with the December 2007
18 fund balance and 2% real return, would be about \$20 million in 2012. That
19 payment should be made prior to life extension, not in 2026, as Entergy
20 proposes.
- 21 • Since the Vermont Yankee decommissioning cost estimate, by its own
22 terms, excludes real risks and is more likely to be understated than over-

¹¹Amended Petition of UPC Vermont Wind, LLC, Docket No. 7156, Order of 8/8/2007 at 109 (“The decommissioning plan may allow the fund to grow as the construction process proceeds such that the funding level is commensurate with the cost of removing infrastructure in place.”).

1 stated, the Board should require that the decommissioning fund be
2 increased to cover the more stringent of the following outcomes: (a) costs
3 are 10% higher than the current estimate, or (b) the fund achieves a 0%
4 real after-tax return.

- 5 • The Board should further require that Entergy increase the fund at a rate
6 sufficient to fund decommissioning even if the plant is retired early in the
7 life-extended period, such as by 2017.
- 8 • Until the preceding conditions are met, the payments should be guaranteed
9 by a credit-worthy Entergy affiliate or letters of credit.

10 **IV. Treatment and Use of Shared Revenues**

11 **Q: Please describe the Vermont Yankee revenue-sharing agreement.**

12 A: The March 3 2002 Memorandum of Understanding (MOU) in Docket No. 6545,
13 the approval of the sale of Vermont Yankee to ENVY, provides (at ¶4) that ENVY
14 will share 50% of Vermont Yankee's revenue over a strike price with Vermont
15 Yankee Nuclear Power Corporation (VYNPC). The strike price starts at
16 \$61/MWh in March 2012 and escalates with a composite inflator. The revenue
17 sharing would continue for just the first ten years of the extended life of
18 Vermont Yankee.

19 Entergy Witness Bruce Wiggett suggests (at 4) that the receipts from the
20 revenue sharing may be allocated among the "sponsors" of VYNPC, which
21 include CVPS and GMP. He acknowledges (at 4) that he does not "know how
22 VYNPC will ultimately allocate funds received as a result of the revenue-sharing
23 provision of Paragraph 4." If the revenues are allocated in proportion to

1 sponsorship, 55% of the VYNPC revenues would flow to Vermont utilities and
2 their customers.¹²

3 **Q: How large are these revenues likely to be?**

4 A: Given current prices in the forward markets, the revenues would be very small.
5 As of January 23, 2009, the forward prices for energy at the ISO-NE Massachu-
6 setts Hub were \$65.09/MWh in 2012 and \$65.53/MWh in 2013, averaging the
7 NYMEX on- and off-peak energy prices.¹³ These Hub prices are about \$3–
8 \$4/MWh higher than the strike price.

9 The revenue sharing will be determined by the actual contract prices that
10 ENVY receives for Vermont Yankee power, not by the Massachusetts Hub prices.
11 Prices in the Vermont zone exceeded the Massachusetts hub price by 2% in 2007
12 and 0.5% in 2006. This slight price increment from the Hub to the Vermont zone
13 is overwhelmed by the decrement from the Vermont zone to Vermont Yankee,
14 which Mr. Wiggett reports to be more than 3% in 2006 and 2007 and more than
15 4% in 2004 and 2005 (Exhibit CLF/VPIRG PLC-8 (CLF/VPIRG:EN.S2-28)).
16 The Vermont Yankee nodal prices would thus average \$1 or \$2/MWh less than
17 the Massachusetts Hub price, reducing the margin available to be split with the
18 Vermont utilities to the \$1–\$3/MWh range.

19 In addition, these prices are all for firm sales averaged over all hours.
20 Prices at the Vermont Yankee bus, and averaged over the Vermont load zone,
21 will be higher than average when Vermont Yankee is out of service and lower

¹²Prior to the sale of Vermont Yankee to Entergy, Vermont utilities owned about 54% of VYNPC. Recent FERC Form 1 filings of VYNPC indicate that CVPS and GMP subsidiaries now own a total of 92.5% of the company. It is not clear to me how the allocation of the revenue sharing would be influenced by sponsorship, pre-sale ownership, current ownership, or other factors.

¹³I weighted the on-peak price 42.9%.

1 when it is operating. Mr. Wiggett estimates (at 9) that a unit-contingent Vermont
2 Yankee contract would be priced at 5% below the firm energy price. It is
3 difficult to be precise about the exact reduction in market value due to the
4 uncertain nature of Vermont Yankee's output, but Mr. Wiggett's estimate is in
5 the reasonable range. Reducing the average Vermont Yankee nodal price by
6 another 5%, or \$3/MWh, would bring the sales price below the strike price,
7 resulting in no payment to VYNPC and no benefit to Vermont from the revenue
8 sharing-provision.

9 If the price of Vermont Yankee energy is below the strike price, the revenue
10 sharing would have no value to the utilities. If the difference were \$3/MWh,
11 which might be the high end of the range at current futures prices, the revenue
12 sharing would be worth about \$7.4 million annually to VYNPC, or about \$4
13 million annually to the Vermont utilities if the revenues are allocated in
14 proportion to sponsorship.

15 **Q: How are these energy prices likely to change after 2013, the limit of current**
16 **forward prices?**

17 A: As the events of the last couple years have demonstrated, expectations of future
18 energy prices can change very quickly. The wholesale price of electric energy in
19 New England will be determined by such factors as:

- 20 • the extent to which regional energy-efficiency programs offset load growth;
- 21 • the amount of renewable capacity brought on line by renewable portfolio
22 standards and other incentives;
- 23 • the rate at which older fossil plants are retired or reduce capacity due to
24 environmental requirements and age-related costs;
- 25 • the extent of new transmission and capacity imports from Canada;
- 26 • the rate at which the economy recovers from the current recession;

- 1 • the energy-supply situation in New York, which will depend on the effect
- 2 of the preceding factors in that state, and which will determine whether
- 3 New York will be a net supplier or purchaser of New England energy;
- 4 • natural-gas prices, which depend on factors similar to those above, playing
- 5 out on a national level.
- 6 • carbon taxes or allowance costs.

7 To some extent, the value of the Vermont Yankee shared revenues will
8 depend on the success of regional and national policies. Success in promoting
9 efficiency and renewables will tend to depress the shared revenues, while
10 success in stimulating the economy and in reducing coal use will tend to
11 increase the shared revenues.

12 Natural-gas prices have been the major driver of changes in New England
13 electric energy prices; forward prices for gas at Henry Hub rise less than 1%
14 annually from 2013 through 2017 and escalate at more than 2% annually only in
15 2021, the last year of published forwards. Unless some other factor significantly
16 increases electric energy prices, the price of Vermont Yankee energy is likely to
17 stay below the strike price.

18 **Q: Why are your estimates of the shared revenues so much lower than those of**
19 **Mr. Wiggett?**

20 A: Mr. Wiggett (at 5) provides a range of estimates of the shared revenues, based
21 on a forecast of market energy prices prepared by the DPS in late 2007. That
22 forecast starts at \$82/MWh in 2012 and rises slightly in real terms. That may
23 well have been a reasonable projection a year ago, but forward prices have
24 fallen dramatically since then.

25 **Q: Should this computation include any other revenues?**

1 A: Yes. Vermont Yankee receives capacity revenue, but little if any ancillary
2 revenues. The MOU (at ¶4) specifies that “VYNPS revenues are based on actual
3 energy and capacity sold by VYNPS,” so capacity revenues are definitely
4 relevant to the computation. The forward capacity price for supply in 2011/12
5 has been set at \$3.119/kW-month. This price reflects the administrative floor
6 price of \$3.60, prorated over the 4,755 MW of excess capacity that cleared at the
7 floor price. Vermont Yankee should receive about \$22.6 million in capacity
8 payments in 2011/12. Only about 2½ months of the 2011/12 capacity year are
9 included in the revenue sharing.¹⁴

10 This price is likely to fall over the following few years, as New England’s
11 existing surplus is increased by additional renewables, imports, demand
12 response and energy efficiency, offset by retirements and possibly withdrawal of
13 demand response as the ISO calls on those resources more often. The capacity
14 price during the revenue-sharing period is likely to be between \$2 and \$3/kW-
15 month.

16 **Q: How would the capacity revenues change the revenue-sharing results?**

17 A: Capacity revenues would probably result in some small revenue sharing in every
18 year, assuming Mr. Wiggett’s lower estimate of strike-price escalation and that
19 energy prices rise at 3% after 2013.

20 **Q: Is it clear that Vermont will receive these revenues?**

21 A: No. The revenue sharing will depend on market prices, the escalation of the
22 strike price (which depends on nuclear fuel costs, among other factors), Vermont

¹⁴Entergy may not consider any part of the monthly capacity revenues for the partial month of March 2012 to be covered by the MOU revenue sharing.

1 Yankee performance, and how ENVY sells Vermont Yankee power. The Vermont
2 Yankee price may be depressed if Entergy

- 3 • happens to sell power long-term at a low point in the market,¹⁵
- 4 • sells Vermont Yankee power at a low price as part of a bundled contract
5 including higher-priced power from other Entergy plants or contracts,
- 6 • sells Vermont Yankee power to an affiliate below market prices.

7 The third outcome would likely result in litigation over ENVY's
8 responsibility under the MOU. The same is true for the second option, if VYNPC
9 can even determine that such linkage exists.

10 **Q: Can the Board help prevent any of these problems?**

11 A: Yes. The Board should require that Entergy report to VYNPC, the Board, and the
12 Department all of its sales transactions and contracts. In addition, approval of
13 the extension of Vermont Yankee's operating life should be conditioned on
14 Entergy agreeing that the sales price in the MOU refers to arms-length sales into
15 the market, not to affiliates, and includes the value of the plant's capacity in
16 ISO-NE's forward capacity market, or any subsequent market.

17 **Q. What use of these funds is specified in the MOU?**

18 A: The MOU does not specify their use.

19 **Q: How should any shared revenues be used to benefit Vermont?**

20 A: The Board should require that these funds provide a broad benefit for Vermont.
21 To the extent there are any revenues, they result from ratepayer contributions to
22 supporting Vermont Yankee through the many years in which it was a relatively
23 expensive resource.

¹⁵Conversely, Entergy may sell Vermont Yankee power at a high price, if it happens to find a buyer at a time of high projections of market prices.

1 Rather than refund any shared revenue or allow it to be used to offset
2 higher power costs or as part of a future contract for energy from Vermont
3 Yankee, the shared revenues should be used to provide broader and longer term
4 benefits and should support incremental energy efficiency and renewables, for at
5 least two reasons.

6 First, high shared revenues would be the result of high prices for energy.
7 Increased spending for efficiency and renewables would be most valuable when
8 energy prices are high, as they would offset high prices and reduce electricity
9 bills.

10 Second, high energy prices are likely to reflect either (a) increased reliance
11 on fossil-fueled generation and higher greenhouse-gas emissions or (b) high
12 greenhouse-gas emission prices with continued reliance on fossil generation. In
13 either case, increased investment in energy efficiency and renewables would be
14 particularly useful to help Vermont reduce greenhouse gas emissions and con-
15 tribute to meeting regional and national goals at minimum cost.

16 Compared to continuing reliance on fossil generation and imports, incre-
17 mental energy efficiency and expanded use of renewable technologies will result
18 in more local spending and jobs, cleaner air, improved health, economic
19 development, greater sustainability and other environmental benefits.

20 **Q: Do you have any other recommendations for use of the shared-revenue**
21 **funds?**

22 A: Yes. To minimize administrative costs, the funds should be allocated to existing
23 and successful programs. It is my understanding that the Vermont Clean Energy
24 Development Fund and the energy-efficiency utility would both meet these
25 standards.

1 **V. Benefits for Vermont Ratepayers**

2 **Q: Does the shared-revenue provision provide Vermont with meaningful**
3 **economic benefit from continuing operation of Vermont Yankee?**

4 A: No. Even if the Board corrects the potential problems of sales to affiliates and of
5 below-market sales, and ensures that capacity payments are included in the
6 revenue computation, market prices may be low enough that Vermont will
7 receive little or no shared revenues.

8 **Q: If the revenue-sharing provision has little or no benefit for Vermont, are**
9 **there conditions the Board could impose to increase the likelihood that an**
10 **extension of Vermont Yankee operation would benefit Vermont ratepayers?**

11 A: Yes. At a minimum, any approval of an extension for Vermont Yankee's license
12 should be conditioned on Entergy reaching agreement with Vermont utilities on
13 a power sale at prices well below current market values. As the Board pre-
14 viously approved the current power contract and determined that this contract
15 promoted the general good of the state, those same terms should be offered for a
16 new contract.

17 To reduce the risk to ratepayers of prolonged outages or early retirement of
18 Vermont Yankee, and of excessive reliance on a single resource, the contract
19 should be for a blended supply from Vermont Yankee and Entergy's other
20 merchant nuclear plants in the Northeast: Pilgrim, Indian Point and possibly
21 Fitzpatrick.¹⁶

22 **Q: Does this conclude your testimony?**

¹⁶Market prices in western New York, where Fitzpatrick is located, are considerably lower than those in New England or downstate New York, where Indian Point is located.

1 A: Yes.