

UNITED STATES

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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In re: Docket Nos. 50-247-LR; 50-286-LR
License Renewal Application Submitted by ASLBP No. 07-858-03-LR-BD01
Entergy Nuclear Indian Point 2, LLC, DPR-26, DPR-64
Entergy Nuclear Indian Point 3, LLC, and
Entergy Nuclear Operations, Inc. June 28, 2012

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PRE-FILED WRITTEN REBUTTAL TESTIMONY OF

STEPHEN C. SHEPPARD

REGARDING CONTENTION NYS-17B

On behalf of the State of New York ("NYS" or "the State"),
the Office of the Attorney General hereby submits the following
rebuttal testimony by Stephen C. Sheppard, Ph.D. regarding
Contention NYS-17B.

Q. Please state your full name.

A. Stephen Charles Sheppard.

Q. By whom are you employed and what is your position?

A. I am the Class of 2012 Professor of Economics at
Williams College.

1 Q. Please summarize your educational and professional
2 qualifications.

3 A. I am a qualified expert on land use economics and
4 property valuation. I hold a Ph.D. and a Masters Degree in
5 Economics and a Bachelor's of Science in Economics. From 2007 to
6 2010 I was the Chair of the Economics Department at Williams
7 College, where I am now a Professor of Economics. Before I
8 joined the faculty at Williams, I was a Professor of Economics
9 at Oberlin College.

10 Since 1979, I have conducted research, written, lectured
11 and taught on economic and regulatory policies as they impact
12 housing, land use, house prices and land valuation. I teach or
13 have taught Advanced Microeconomic Theory; Economics of Land,
14 Location, and the Environment; Environmental Economics; Public
15 Economics; Urban Economics; Cities, Regions and the Economy; and
16 Economics of the Housing Market.

17 I have also published articles on these topics, including
18 many peer-reviewed and published papers. These include *On the*
19 *Price of Land and the Value of Amenities*, Cheshire, P., and
20 Sheppard, S., *Economica*, 62, 247-267 (1995); *Estimating Demand*
21 *for Housing, Land, and Neighborhood Characteristics*, Cheshire,
22 P., and Sheppard, S., *Oxford Bulletin of Economics and*

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1 *Statistics*, 60, August 1998, 357-382; and *The Rise, Fall and*
2 *Rise Again of Industrial Location Theory*, McCann, P., and
3 Sheppard, S., *Regional Studies*, 37, 6-7, 649-663 (2003). In 2004,
4 a co-author and I published *Capitalising The Value Of Free*
5 *Schools: The Impact of Supply Characteristics and Uncertainty*,
6 which dealt with the impact of schools and other neighborhood
7 conditions on housing values. This paper was awarded the Royal
8 Economic Society Prize for the best paper published in 2004 in
9 the *Economic Journal*.

10 In addition to writing on the topic, I conduct original
11 research on land use policies and economics. I have been an
12 academic consultant at the International Monetary Fund and an
13 academic visitor at the London School of Economics, and I have
14 consulted for many banks and private corporations, including the
15 World Bank and the Inter-American Development Bank. My education
16 and experience are described in more detail in my curriculum
17 vita (CV), which is Exh. NYS000208. A list of my publications is
18 also included in my CV.

19 Q. I show you what has been marked as Exhibit NYS000225
20 to Exhibit NYS000231. Do you recognize those documents?

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1 A. Yes. They are copies of the declarations and reports
2 that I previously prepared for the State of New York in this
3 proceeding. They reflect my analysis and opinions.

4 Q. What is the purpose of your rebuttal testimony?

5 A. The purpose of my testimony is to again discuss my
6 views on Consolidated NYS-17B (NYS-17B), which asserts that the
7 "FSEIS fails to address the impact of the continued operation of
8 IP2 and IP3 for another 20 years on offsite land use, including
9 real estate values in the surrounding area in violation of 10
10 C.F.R. §§ 51.71(a), 51.71(d), 51.95(c)(1), and 51.95(c)(4)."

11 Specifically, my purpose is to respond to the testimony, reports
12 and arguments presented by Entergy and Nuclear Regulatory
13 Commission (NRC) Staff.

14 Q. Have you reviewed materials in preparation for your
15 rebuttal testimony?

16 A. Yes.

17 Q. What is the source of those materials?

18 A. I have reviewed the testimony, reports and exhibits
19 submitted by Entergy and NRC Staff in response to my Pre-Filed
20 Testimony, NYS000224, and my most recent report, *Impacts of the*
21 *Indian Point Energy Center on Property Values* (December 2011),
22 NYS000231.

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1 Summary of Rebuttal Testimony

2 Q. Please summarize your rebuttal testimony.

3 A. The conclusions in my December 2011 report, which
4 build upon my previous reports and declarations, are based on
5 sound scientific principles and are, in my judgment, correct.
6 To the extent that they are estimates, they are good ones. None
7 of the criticisms made by experts retained by Entergy or
8 employed by the NRC are material. Some of the criticisms
9 leveled by these experts reveal a profound misunderstanding of
10 the relationship between property values and land use. Other
11 criticisms reveal a lack of critical thinking and care. None of
12 them undermine my overall conclusion: Indian Point has a
13 considerable impact on property values in the area surrounding
14 the facility, which exerts a large socioeconomic influence on
15 housing and offsite land use. The failure of the Final
16 Environmental Impact Statement to consider property values
17 renders its conclusions about socioeconomics, including offsite
18 land use and housing, invalid.

19 Summary of Work to Date

20 Q. Please summarize the analyses you have presented in
21 your five reports.

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1 A. In my first study, dated November 29, 2007, I used
2 conservative assumptions based on coal plant analysis to
3 conclude that IPEC could result in a diminution of property
4 values of more than \$500 million within a 2-mile radius of the
5 plant.

6 In my second report, which was dated February 26, 2009, I
7 updated the initial report with respect to a longer timeframe
8 for reclamation. I found that "if the diminution in current
9 property values is approximately \$500 million, then the burden
10 caused by the additional delay in restoration due to the period
11 of extended plant operation plus the longer period required for
12 site reclamation is reasonably estimated as between \$300 and
13 \$340 million."

14 In my third report, dated March 18, 2010, I outlined
15 various methods used by economists and real estate professionals
16 to determine property value. I concluded that "[i]f a
17 neighborhood contains activities that increase the range of
18 possible use values, then that increases the uncertainty in the
19 flow of benefits and diminishes the value of the property."

20 In my fourth report, dated January 24, 2011, I took into
21 account new information about the timing of decommissioning.
22 The fourth report looked at four decommissioning scenarios going

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1 as far out as past 2100. This report concluded that "license
2 renewal combined with the potential delay in waste removal and
3 site reclamation imposes a severe burden on surrounding
4 communities. This burden is equivalent to a present decrease in
5 wealth in the communities of between \$169 million and \$237
6 million."

7 My fifth and final report is dated December 10, 2011. In
8 it I was able to make use of extensive data on residential
9 property values in the area around IPEC, for sales that have
10 taken place as early as 1945 and as recently as 2009. Thus my
11 data included sales of properties before IPEC existed as well as
12 after it had been in operation for many years. I examined pairs
13 of "repeat sales" in which I have observations on the price for
14 which a particular property sold at two points in time, and I
15 could therefore calculate the rate of price appreciation over
16 time for each of more than 1500 properties. I compared this
17 rate of price appreciation with the rate of price appreciation
18 that prevailed generally for residential properties in the
19 region. Some of these paired sales involved a sale price prior
20 to completion of the IPEC facility and afterwards. If IPEC
21 generated a disamenity, then the rate of price appreciation for
22 these pairs of sales will be lower than expected. If IPEC

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1 generated no disamenity, the rate of price appreciation for
2 these sales would be generally equivalent to the rate observed
3 throughout the area. I estimated the impact of the IPEC
4 disamenity in this way.

5 Relationship of Property Values to Land Use

6 Q. Are real property values a factor in determining land
7 use?

8 A. Yes.

9 Q. How is "property value" tied to land use generally?

10 A. Property values and land use are intimately connected,
11 and the role of property values in determining land use patterns
12 has been understood and written about for a long time, going
13 back to the middle of the 19th century. For example, 30 years
14 ago George Tolley wrote, in a book he co-authored with Douglas
15 Diamond, that "...the same things that influence house price
16 also determine location patterns. . .city size and migration."
17 *The Economics of Urban Amenities*, edited by Douglas B. Diamond,
18 Jr. and George S. Tolley, New York: Academic Press (1982). The
19 location patterns of human activities, and the resulting
20 population and size of cities are central to understanding land
21 population and size of cities are central to understanding land
22 use. The very meaning of the phrase "land use" refers to the

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1 uses to which land is put by persons in the community--in
2 particular by the owners of the land. One cannot understand the
3 land use consequences of a decision or public policy without
4 careful analysis of how the decision or policy will affect house
5 prices and property values. The role of the concept of "highest
6 and best use" in determining and appraising property values
7 shows, conversely, the importance of land use in determining
8 property values.

9 Q. Would you characterize property values as a major or
10 minor factor when compared to other relevant factors?

11 A. I would characterize property value as a major driver
12 of land use, together with regulatory controls, local public
13 expenditures and tax rates.

14 Q. Are there other factors that contribute to land use
15 determinations?

16 A. Yes.

17 Q. What other factors contribute to land use
18 determinations?

19 A. Environmental amenities or disamenities play an
20 important role, as well as regulatory controls (e.g., zoning or
21 similar regulations that affect use), relevant taxes, and
22 expenditures on local public goods.

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1 Q. Would an analysis of land use that took into account
2 only tax rates and changes in population as drivers be a good
3 analysis in your opinion?

4 A. It would not. It is widely understood that within
5 regulatory bounds land uses are determined by property values.
6 Specifically, land uses that generate the highest property
7 values predominate.

8 Q. Is this simply your opinion?

9 A. No. It is widely accepted in my field. This is the
10 basis of the concept that we refer to as "highest and best use."
11 As is clear from his 1992 book, Dr. Tolley accepts this premise,
12 too.

13 Q. Why is it important to assess the impact of IPEC on
14 property values in the immediate vicinity of the plant?

15 A. First and foremost, it is important to assess the
16 impact of NRC decisions regarding IPEC on property values
17 because NRC guidelines require that in applications for renewal
18 an environmental impact statement be prepared. This
19 environmental impact statement must evaluate, among other
20 things, the impacts of the renewal and of the no-action
21 alternative for off-site land use. Evaluation of these land use
22 impacts cannot be said to have been undertaken if the EIS simply

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1 makes assertions that no change will occur. Evaluation of land
2 use impacts requires analysis of the significant factors that
3 determine land use, and how these factors can be expected to
4 differ between a decision of approval or a decision of no-
5 action. First and foremost among these factors are property
6 values. An EIS that lacks any analysis of property values
7 cannot be said to have evaluated land use impacts as required by
8 NRC guidelines. Beyond the requirement that the EIS present an
9 evaluation of impacts of the decision on land use, the decision
10 maker expects that the EIS will present an evaluation of social
11 and economic conditions in the community including impacts on
12 housing. Naturally, evaluation of the impacts on housing
13 requires analysis of what can be expected happen to house prices
14 under the no-action alternative as well as in case of approval.
15 As in the case of land use impacts, evaluation requires more
16 than making assertions that are unsupported by careful data
17 analysis.

18 Q. Have you read the testimony of NRC experts Jeffrey J.
19 Rikhoff, Andrew L. Stuyvenberg and John P. Boska, set forth at
20 NRC000081?

21 A. Yes.

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1 Q. At A10, Mr. Rikhoff testifies that the 1996 Generic
2 Environmental Impact Statement (GEIS) for License Renewal of
3 Nuclear Plants, NUREG-1437, requires a discussion of "the impact
4 of license renewal on the use of offsite land (e.g., the use of
5 the land for agricultural, residential, commercial or industrial
6 purposes), not its value." Mr. Rikhoff claims that the "issue
7 is whether nuclear power plant operations would cause offsite
8 land use to change." From an economics perspective, is Mr.
9 Rikhoff's view of "the issue" right?

10 A. From an economics perspective, no. I cannot opine on
11 how a court would interpret NUREG-1437 but I can tell you that
12 Mr. Rikhoff's understanding of what "would cause offsite land
13 use to change" is flawed.

14 Q. What is wrong with it, in your opinion?

15 A. Mr. Rikhoff appears to believe that it is possible to
16 evaluate whether plant operations would cause offsite land use
17 to change without evaluating whether plant operations would
18 alter off-site property values. This belief is fundamentally
19 mistaken. It is contradicted by numerous peer-reviewed
20 scientific studies of land use and land markets.

21 Q. Entergy has suggested that if Indian Point could be
22 shown to have an adverse impact on property values, that impact

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1 might not be attributable to physical impacts on the
2 environment. Do you have a response to that?

3 A. My study does not distinguish between Entergy's
4 physical impacts and any other kind of impacts it might have on
5 property values. Neither does any analysis done by Entergy.
6 But the literature, including many studies upon which I have
7 relied, shows that electric generating facilities are a classic
8 disamenity. The facility indisputably has physical impacts on
9 the environment including pollutant leaks, sirens, traffic
10 impacts, and aesthetic impacts. These are classic indicia of
11 nuisances. They are all physical impacts.

12 10 C.F.R. § 51 Table B-1

13 Q. Are you familiar with 10 C.F.R. § 51 Table B-1?

14 A. Yes.

15 Q. Which of the potential environmental impacts listed as
16 Category 2 in Table B-1 are relevant to Contention 17B?

17 A. The two categories of potential impacts in Table B-1
18 that are relevant to Contention 17B are Offsite Land Use and
19 Housing Impacts.

20 Q. Based on your work, how would the no-action
21 alternative, that is allowing denial of IPEC's license renewal
22 application, impact property values within two miles of IPEC?

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1 A. In sum, I conclude that denying the license renewal
2 application would allow property values to rebound. I calculate
3 that the impact of not renewing the operating licenses and
4 removing the IPEC disamenity would result in a significant
5 increase in property values within 5 kilometers of IPEC. The
6 total magnitude of this change in property values would exceed
7 \$1 billion, or about 27% of the total value of property within 5
8 kilometers.

9 Where Entergy and NRC Go Wrong

10 Q. Are you familiar with Entergy's ER?

11 A. Yes.

12 Q. Please describe the methodology used by Entergy in its
13 ER to assess the impact of the plant on off-site land use and
14 property values and why this assessment is inadequate.

15 A. Entergy relies primarily on NRC conclusions reached in
16 the GEIS for all plant relicensing processes to evaluate the
17 potential impacts on off-site land use of the relicensing of IP-
18 2 and IP-3. In using this analysis, Entergy finds that the
19 impact of relicensing itself would be small.

20 Q. Do you agree with that finding?

21 A. I do not. Entergy fails to take into account the
22 diminution of property values caused by IPEC in the surrounding

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1 communities, especially those communities in the immediate
2 vicinity like the Village of Buchanan, which according the
3 Levitan & Associates report relied on by Entergy and NRC Staff
4 perpetuates a perception that the area around the plant is low-
5 to middle-class and has caused trepidation on the part of
6 potential developers from outside the immediate vicinity.
7 Entergy does include figures related to home prices in the five
8 counties surrounding the plant, finding that they increased by
9 7.62% on average from 1990-2000.

10 The ER concludes that this increase is related to the
11 presence of the plant but provides insufficient data to support
12 that conclusion, which could also be attributable to a generally
13 growing real estate market in that same time period, or other
14 factors not considered by Entergy in preparing the ER.

15 Q. Is that all?

16 A. No. Entergy also improperly "adopts by reference" the
17 NRC's findings with respect to the environmental impacts,
18 including land use and housing impacts in the no-action
19 scenario, indicating that there would be little difference
20 between that and relicensing. This, however, ignores the
21 potential increase in property values that my research indicates
22 is likely to occur following decommission of IP2 and IP3, which

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1 could eventually increase property values by as much as \$1
2 billion, leading to an increased tax base and changes in the
3 land use patterns in the area reflecting the change in property
4 values.

5 1996 GEIS for License Renewal of Nuclear Plants

6 Q. Are you familiar with the Generic Environmental Impact
7 Statement for License Renewal of Nuclear Plants (May 1996)
8 (NUREG-1437) and supporting case studies, which include Indian
9 Point?

10 A. Yes.

11 Q. Please summarize any discussion of property value and
12 land use contained in those documents and tell me whether these
13 discussions are adequate.

14 A. In the GEIS, NRC Staff do consider the impact IPEC has
15 on property values in the communities surrounding the plant.
16 However, this analysis fails to take into account any negative
17 impact caused by IPEC's presence, instead focusing only on the
18 positive impacts the plant may have had since its development.
19 As indicated by my research, the plant has had a mixed impact at
20 best and a substantial and unacknowledged negative impact on
21 property values at worst.

22 Q. What is your opinion of the Indian Point case study?

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1 A. My opinion is that it appears to be entirely anecdotal
2 and further that the conclusions drawn from it are not supported
3 even by the anecdotal evidence recited.

4 Q. Please explain.

5 A. The case study concludes with this statement: "In
6 summary, it appears that neither construction nor operation of
7 the Indian Point plants has considerably affected housing in the
8 communities neighboring the plants or in the whole of
9 Westchester and Dutchess counties." 1996 GEIS, Appx. C
10 (C.4.4.2). But the case study notes that "occasionally an
11 outside buyer is deterred from the area because of the plants."
12 The case study also notes that "one realtor maintains that more
13 development in communities neighboring Indian Point would have
14 occurred had it not been for Indian Point." Finally, the case
15 study also points out that "[r]epresentatives of the Westchester
16 County Office of Community Development believe" that "the
17 presence of the plant perpetuated the image of these communities
18 being low to middle class."

19 Q. What do those comments tell you?

20 A. They tell me that real estate professionals and local
21 government officials believe that IPEC has depressed property
22 values in nearby communities.

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1 Q. Are their beliefs consistent, in your experience, with
2 the impact on property values of electric generating facilities?

3 A. Yes, as I testified previously and set forth in the
4 first of my reports, it has been scientifically proven that
5 power plants in general negatively affect property values and
6 that this impact is larger for nuclear power plants. *Potential*
7 *Impacts of Indian Point Relicensing on Property Values*, at 2-3
8 (Nov. 29, 2007) NYS000226.

9 Q. But what about the fact that the market had not slowed
10 and houses apparently sold quickly during the survey period?

11 A. Even taking those statements as true, they are not
12 relevant.

13 Q. Please explain.

14 A. The question I have answered is whether IPEC has had
15 an impact on property values. Houses could be selling very
16 quickly and that fact would not tell us anything about the price
17 for which they were sold. What matters is what price a house
18 would have sold for with the plant and in the plant's absence.

19 Q. In your opinion, is the case study's conclusion
20 justified?

21 A. No. I think the anecdotal evidence, which is
22 consistent with many peer-reviewed, published studies,

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1 demonstrates that the facility has had a "considerable" impact
2 on property values. And, although NRC Staff do indeed examine
3 the impact IPEC has on property values in the communities
4 surrounding the plant, the analysis fails to take into account
5 any negative impact caused by IPEC's presence, instead focusing
6 only on the positive impacts the plant may have had since its
7 development. As indicated by my research, the plant has had a
8 mixed impact at best and a substantial and unacknowledged
9 negative impact on property values at worst.

10 Final Supplement Environmental Impact Statement (FSEIS)

11 Q. Are you familiar with the FSEIS?

12 A. Yes.

13 Q. Please summarize how it addresses land use and
14 property value and tell me whether that discussion is adequate.

15 A. For many of the same reasons outlined above, the
16 FSEIS, like the GEIS and Entergy's Environmental Report, fails
17 to connect IPEC with diminution of property values in the
18 communities surrounding the plant. This failure does a
19 disservice to the communities most impacted by IPEC because as a
20 result the ER, GEIS and FSEIS all indicate that the plant has
21 been only a positive force in the community, when studies like
22 that conducted by Levitan, which I previously mentioned, the

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1 1996 Indian Point case study, and my own research indicate that
2 the plant has suppressed property values in the area.

3 Q. What are the consequences of suppressed property
4 values?

5 A. The reduced property values have several important
6 consequences for the communities surrounding IPEC. Reduced
7 property values implies reduced levels of wealth for the
8 community. This directly affects the behavior of both
9 households and commercial enterprises. Households will
10 generally reduce their consumption of goods and services, and
11 reduce their expenditures on maintenance, rehabilitation or
12 development of their existing homes and properties. Commercial
13 enterprises can also be expected to reduce the level of
14 maintenance of their properties.

15 Importantly, there will be changes in the pattern of land
16 use that result from the reductions in property values. Holding
17 other factors equal, lower values of residential property reduce
18 the amount of land devoted to housing and reduce the incentive
19 of land owners to develop property for residential use. This
20 will reduce the quantity and quality of housing supplied in the
21 local area. These reductions in property development will have
22 the effect of reducing the local tax base and reducing local

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1 revenues. These reduced revenues result in reduced expenditures
2 on local public goods, causing secondary impacts on off-site
3 land use.

4 Tolley Rebuttal

5 Q. Are you familiar with the study conducted by Dr.
6 Tolley?

7 A. Yes. As far as I know it contains the only attempt at
8 analysis of property values (and by implication land use) that
9 has been undertaken by Entergy or NRC staff using data collected
10 from the area around the IPEC facility for purposes of this
11 proceeding.

12 Q. Please summarize the conclusion reached by Dr. Tolley
13 in that report with respect to Indian Point's impact on local
14 property values.

15 A. Dr. Tolley surveyed the existing economics literature
16 examining the impact of nuclear power plants on property values
17 and noted that the published peer-reviewed studies have been
18 inconsistent. Some studies have found statistical evidence of
19 impacts on property values or land values, and some have found
20 no effect. Dr. Tolley offers some observations on these
21 studies, noting the importance of specification and causality.
22 He then presents an analysis of property values in communities

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1 within 5 miles of the Indian Point power plant. He interprets
2 his analysis as showing that there is no impact on property
3 values due to IPEC. What his results actually show is that for
4 properties within 1.99 miles, increasing distance away from IPEC
5 is associated with a decrease in property values, and for
6 distances greater than 1.99 miles, IPEC is a disamenity that
7 reduces property values because increasing distance from IPEC is
8 associated with increasing property values. Dr. Tolley finds
9 this result "counter-intuitive," "anomalous," and "unexpected,"
10 and essentially dismisses it.

11 Q. In your view, is Dr. Tolley's result completely
12 inconsistent with your analysis?

13 A. No. While Dr. Tolley's estimates are not very
14 precise, his results show that for property in an area of about
15 12.5 square miles, proximity to IPEC might be desirable, while
16 for properties in a much larger area of 66 square miles, IPEC
17 appears to depress property values. For those properties the
18 "no-action" alternative would be likely to lead to eventual
19 increase in property values and potentially important land use
20 changes. While I have not undertaken specific calculations
21 using Dr. Tolley's imprecise model, in my opinion this much
22 larger area where property values would increase would dominate

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1 the small area very close to IPEC where property values might
2 decrease, so that over the entire area within 5 miles from IPEC,
3 the no-action alternative would lead to an increase in property
4 values, exactly as suggested by my analysis.

5 Q. Are his results counter-intuitive or incapable of
6 being explained?

7 A. Not in my opinion. There are several possible
8 explanations for the result that Dr. Tolley obtains. For
9 example, for workers employed at IPEC, choosing to reside near
10 the facility reduces their commuting costs. Of course, they
11 must tolerate whatever disamenities are associated with living
12 near the plant, but some workers may be willing to tolerate
13 these in order to enjoy a shorter drive to work. As we move
14 further away from IPEC, the probability that the buyer for a
15 property will be employed at IPEC becomes close to zero. For
16 someone who has no reason to travel regularly to IPEC, they
17 experience only the disamenity of the facility, and so will be
18 willing to pay a higher price for a property that is further
19 away from IPEC. This is one plausible explanation that is
20 consistent with Dr. Tolley's estimates.

21 Another possible explanation focuses on the imprecision of
22 his estimates. As he notes at the bottom of page 21 of his

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1 report: "If the linear term is ignored because it is
2 statistically insignificant and the statistically
3 significant squared term is retained, distance is everywhere a
4 disamenity. . . ." What this means in plain English is that Dr.
5 Tolley's estimates cannot reject the hypothesis that within the
6 range covered by his sample, house prices unambiguously increase
7 as distance from IPEC is increased.

8 Q. What does that mean?

9 A. It implies that IPEC is a source of disamenity and
10 that property values would increase under the no-action
11 alternative. This is closely related to what we might identify
12 as a third possible explanation for Dr. Tolley's result: his
13 choice of specification for the functional relationship between
14 distance from IPEC and house values. In his discussion of the
15 existing literature estimating possible impacts of nuclear
16 facilities, Dr. Tolley is quick to identify specification of the
17 functional relationship as important for understanding the
18 impact of such facilities. It is therefore surprising that he
19 does not appear to have considered alternatives to the
20 functional relationship he employs in his hedonic model. This
21 point is somewhat subtle but is an important part of the hedonic
22 methodology Dr. Tolley employs.

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1 Q. Do I correctly understand you to say that Dr. Tolley's
2 result is consistent with your conclusion that IPEC negatively
3 impacts property values?

4 A. Yes. Dr. Tolley's study not only does not exclude
5 that possibility but suggests that our conclusions are
6 consistent.

7 Q. Please explain the methodology used by Dr. Tolley.

8 A. Dr. Tolley uses what economists call a hedonic
9 methodology, taking a number of factors into account in order to
10 reach his conclusion, but his implementation of the methodology
11 is flawed in several respects. First, the sample used by Dr.
12 Tolley in conducting his hedonic analysis is too small. The
13 study uses a sample size of fewer than 300 homes. This is a
14 very small sample, much smaller than seen in most peer-reviewed
15 published studies that employ this method. By comparison, my
16 sample contained more than 1500 data points.

17 Q. Why does sample size matter?

18 A. It is important in all statistical analysis, but
19 particularly important in hedonic analysis. Essentially, the
20 way hedonic analysis works is to take a large number of
21 properties, with their sales prices and the characteristics of
22 the properties. Ideally, there should be sufficient sample size

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1 to observe many individual properties of every type. For
2 example, expensive houses that are very close to IPEC, a short
3 distance away, and a long way from IPEC. For each of these
4 there should be old and new houses, and everywhere in between.
5 There should be many examples of every combination of
6 characteristics. The statistical analysis can then be thought
7 of as comparing houses that are similar in every respect but one
8 - for example the age of the house. By looking at how price
9 changes as the age of the house increases, holding all the other
10 characteristics constant, and averaging this change over several
11 observations, we obtain an estimate of the separate impact of
12 age on house price. Similarly, we can get an estimate of the
13 impact of being close to IPEC on house price, and use this
14 estimate as a way of testing to see if there is a disamenity
15 associated with IPEC. If there is a disamenity that has a
16 significant impact on house price, then decommissioning IPEC can
17 be expected to have a significant impact on house price by
18 removing the disamenity, and this will have a significant impact
19 on land use. Dr. Tolley's hedonic model has 7 characteristics,
20 6 of which are continuously variable and one of which is
21 dichotomous (takes only 2 values). For estimation of the impact
22 of each characteristic, we could divide each characteristic into

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1 3 ranges; think "high", "medium" and "low". Reliable estimation
2 is best served by having observations in every possible
3 combination of these ranges. There are 729 (3 raised to the 6th
4 power) such combinations. That would require 729 observations.
5 To thoroughly cover the dichotomous variable would double this
6 to require 1458 observations. Dr. Tolley's analysis uses 296.
7 While it is possible to calculate estimates with such a small
8 sample, the precision of the estimation suffers and as a result
9 the estimates are less reliable.

10 Q. Is that the study's only problem?

11 A. No. In my opinion the sample is also far too narrowly
12 focused in time. Dr. Tolley's sample consists of properties
13 offered for sale in the fall of 2011. At that time the housing
14 market in all areas, including near IPEC, was depressed for
15 reasons well outside the scope of this relicensing proceeding.

16 Q. On what do you base that opinion?

17 A. The widely reported collapse of the housing market that
18 helped cause the financial crisis that resulted in the current
19 deep and difficult economic recession. My analysis of house
20 price indices released by the Federal Housing Finance Agency
21 indicates that between the first quarter of 2007 and second
22 quarter of 2011, house prices in the region containing IPEC

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1 declined by over 17%. That makes this time period very unusual
2 and possibly unrepresentative. In my opinion it would be safer
3 to base such analysis on data collected during a less stressful
4 and unusual time for property markets.

5 Q. Are there any other problems with Dr. Tolley's study?

6 A. Yes. The property value of the data points in the
7 sample was determined using the property's asking price, not its
8 sale price.

9 Q. Why is that significant?

10 A. The asking price tells us only what the homeowner, or
11 the homeowner's realtor, thought the property was worth or what
12 would make a good starting point for negotiations, not what the
13 market ultimately determined to be the property's value. Asking
14 price is meaningless for purposes of determining fair market
15 value, particularly in a time period when property prices may be
16 changing in unexpected ways. Asking price also does not reveal
17 whether a property in fact was sold.

18 Q. What is fair market value and why does it matter?

19 A. Fair market value is the price a willing buyer will
20 pay a willing seller in an arms' length transaction. It is
21 important because it tells us what a given property is "really"

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1 worth, and will reflect the buyer's evaluation of any disamenity
2 or other conditions relevant for the property.

3 Q. What other concerns do you have with Dr. Tolley's
4 analysis?

5 A. While Dr. Tolley has previously leveled criticism at
6 the control group used in my analysis, his study contains no
7 obvious or demonstrable control group. His purported control
8 group is essentially the houses at the edge of his sample (five
9 miles from IPEC).

10 Q. What's wrong with that?

11 A. It is generally unacceptable to simply assume this as
12 the control group, since it is equivalent to assuming that there
13 is no disamenity impact of IPEC at a distance of 5 miles. The
14 existence, or not, of a disamenity is precisely what the
15 analysis is trying to discover, so to assume that none exists at
16 some distance makes the analysis invalid, or at least contingent
17 on the accuracy of the assumption, which then remains untested.
18 Unlike my analysis, Dr. Tolley's "control" group contains no
19 observations about property values in the communities
20 surrounding IPEC from before the plant existed. Further, by
21 attempting to use homes at the edge of the sample as a control
22 group, Dr. Tolley ignores the potentially broader impact IPEC

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1 has had on property values. His "control group" may be subject
2 to the same influence as all of the other samples observations
3 used in his study.

4 Q. Your analysis had a different control group. Did you
5 employ hedonic analysis?

6 A. I considered estimation of a hedonic model as an
7 approach, but decided that an alternative methodology was better
8 in this case and so I did not estimate a hedonic model. In
9 obtaining scientifically accurate estimates of impacts on
10 property prices, it is important that we establish a clear
11 control group (a set of observations that are unambiguously not
12 subject to impacts from IPEC) and have a sufficiently large
13 sample to obtain accurate estimates. For a hedonic approach, the
14 best control group is a set of observed property sales that take
15 place prior to completion of IPEC. If we can collect a
16 sufficient sample of these observations, then we can estimate
17 the value of proximity to IPEC before and after IPEC is built as
18 a way of testing for any disamenity. Working with local tax
19 assessors, I determined that it was not possible to obtain a
20 sufficiently large sample - including sales from before IPEC was
21 built - to use the hedonic approach with a proper control group.

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1 I used another methodology summarized previously and described
2 in detail in my report of December 2011.

3 Q. Please explain your concerns about the specifications
4 used in the Tolley study.

5 A. Dr. Tolley uses some of the variables inconsistently.
6 His analysis includes the distance of the homes from the plant,
7 as well as that distance squared. He includes the distance from
8 the nearest rail station but not the square of that distance,
9 and no explanation is offered for this asymmetric treatment.

10 Q. First, could you explain what these variables are and
11 what their role is?

12 A. The variables are other factors that could explain a
13 change in property values. These variables typically include
14 distance from amenities or disamenities.

15 Q. Could you explain the significance of this
16 inconsistency?

17 A. Yes. In hedonic analysis these variables are included
18 because they are among the factors a potential buyer of the
19 property could observe that might affect her or his willingness
20 to pay for the property. This in turn would affect the fair
21 market price that we are trying to estimate. Generally we expect
22 the impact of amenities and disamenities to depend on the

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1 distance of the property from the amenity or disamenity. The
2 potential buyers are human, and human perception depends on
3 distance in ways that are not always linear in nature, so it is
4 natural to at least consider the possibility that the value of
5 the property is proportional to the straight line distance, or
6 to the square of distance, or to the square root or other
7 measure of distance. Generally, we might expect that the
8 sensitivity of a potential buyer has a similar dependence on
9 distance for all amenities or disamenities. Dr. Tolley's model
10 rejects this concept and imposes an assumption that the
11 desirability of proximity to a rail station (generally regarded
12 as an amenity) is linear in distance while the desirability (or
13 lack of desirability) of being near to IPEC (a possible
14 disamenity) is quadratic in distance. This assumption is
15 imposed without explanation or justification. Furthermore, if
16 one treats the two types of distance symmetrically, including
17 both distance from the rail station and the square of the
18 distance from the rail station, it alters Dr. Tolley's results
19 and reduces the precision of his model estimates. Treating the
20 two types of distance symmetrically by including both the
21 distance from the nearest rail station AND the square of the
22 distance from the nearest rail station and estimating the

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1 hedonic using Tolley's data reveals that both distance and the
2 square of distance from the rail station are statistically
3 significant. Furthermore, this alters the estimates of the
4 impact of proximity to IPEC. With this new model property values
5 initially decline as we move away from IPEC, reaching a minimum
6 at a distance of 1.04 miles. Within this area, Dr. Tolley's
7 sample includes only ONE property within this range. Beyond this
8 distance, increasing the distance from IPEC causes the value of
9 houses to increase, holding other factors constant, exactly as
10 would be expected if IPEC were an important source of disamenity
11 that was suppressing property values.

12 Q. Are there other problems with Dr. Tolley's study, in
13 your opinion?

14 A. Even more problematic is the particular functional
15 relationship that Dr. Tolley imposes. As I noted previously,
16 Dr. Tolley's estimates indicate that the value of a house would
17 decline for the first 1.99 miles from IPEC, and then increase.
18 Using the sample average values for house characteristics, I
19 calculated the predicted price of a detached home using Dr.
20 Tolley's model estimates, and plotted the resulting estimates as
21 distance varies from 0 to 5 miles from IPEC (in Dr. Tolley's
22 sample, the closest actual observation is about 0.75 miles from

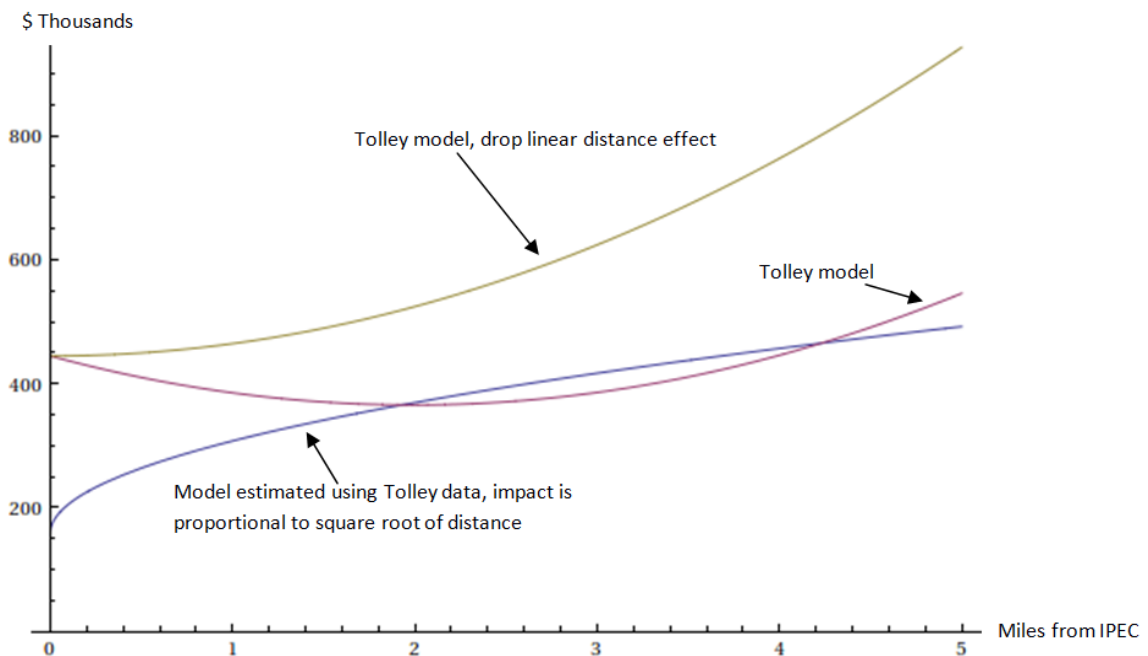
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1 IPEC and in fact there are almost no residential properties
2 closer than 0.5 miles from the center of the IPEC property).

3 Q. I show you Exh. NYS000435 (reproduced below for
4 convenience). Did you create the figure on this exhibit?

5 A. I did.

6 Q. What does it show?



7
8 A. It shows the result of the calculation to which I just
9 referred. The dark red line, labeled "Tolley model" shows the
10 estimated value of a detached home with average characteristics
11 would change as it moves from 0 miles (where the value would be
12 approximately \$444 thousand) to 5 miles (where the increased
13 distance from IPEC would generate an increase in value to more
14 than \$545 thousand). This shape matches that presented in

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1 Figure 2 of Dr. Tolley's report, although he neglects to mention
2 how much the predicted value of a house would increase if we
3 move to the edge of his sample area (where the "control" group
4 would be located). As Dr. Tolley suggests and as I noted above,
5 since the linear distance term in his model is not statistically
6 significant, we cannot reject the hypothesis that it is zero.
7 If we set it equal to zero and graph the value of this average
8 house, we obtain the upper line in the figure, labeled "Tolley
9 model, drop linear distance effect." This would imply that IPEC
10 is a source of a disamenity because increasing the distance from
11 IPEC will always increase the value of the house.

12 Q. Is that inaccurate?

13 A. Yes, it is inaccurate. Dr. Tolley appears to
14 misunderstand the implications of his own estimates when he says
15 (on page 21) that "distance is everywhere a disamenity" - he
16 really means to say that IPEC is everywhere a disamenity in this
17 case. Despite finding this potential evidence that IPEC is an
18 important source of disamenity that would reduce property
19 values, Tolley dismisses this because (as he notes on pages 21
20 and 22) "In either case, the unexpected implication is that the
21 disamenity effect is greater the farther away the property is
22 from IPEC." Of course, if IPEC is a source of disamenity

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1 property values will continue to increase as houses move further
2 away from IPEC. This is what is illustrated in Tolley's Figure
3 1 (page 20). What Dr. Tolley apparently finds unexpected is not
4 that the house values continue to increase as distance from IPEC
5 increases, but that they increase at an increasing rate. This
6 feature, however, is caused by the functional relationship that
7 Dr. Tolley assumes between house price and distance from IPEC.

8 Q. Could you give me an example?

9 A. Suppose that instead of the form used in Dr. Tolley's
10 model, we estimate the same model using the same data, making
11 one small change: we use the square root of distance in place of
12 distance and distance squared. The resulting model fits the
13 data essentially as well as the model presented in Dr. Tolley's
14 report, and the estimated parameter associated with the square
15 root of distance is estimated with such precision that it is
16 statistically significant. Using this model to predict the
17 value of an average house at various distances produces the blue
18 line in the figure, labeled "Model estimated using Tolley data,
19 impact is proportional to square root of distance." This line
20 shows house values at distance zero of about \$158 thousand,
21 increasing to nearly \$492 thousand at a distance of 5 miles.
22 Note that this model conforms well to the impact that Dr. Tolley

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1 illustrates in figure 1 (page 20) as supporting my hypothesis
2 that IPEC is the source of a disamenity. Thus it appears that
3 Dr. Tolley's data are consistent with my analysis. He just did
4 not see this because while he claims to have considered some
5 alternative specifications, he apparently failed to consider
6 this obvious and simple alternative.

7 Q. So does this revised model, estimated using Dr.
8 Tolley's data, produce a similar estimate of total property
9 value impacts as your analysis?

10 A. Yes, based on my preliminary calculations. As I
11 mentioned earlier, there are several reasons for concern Dr.
12 Tolley's approach because of the sample size, use of asking
13 price rather than sales price and so on. It is possible,
14 however, to provide an analysis of the general range of property
15 value impacts using this alternative functional form. If, for
16 the sake of discussion, we follow Dr. Tolley in making the
17 assumption that there are no impacts from IPEC beyond 5 miles,
18 then we can use the estimated value at 5 miles as a control. If
19 we let $f(d)$ represent the predicted value of an average home at
20 a distance of d miles from IPEC, then the percent impact on

21 property values at distance d is given by: $\frac{f(d)-f(5)}{f(5)}$. For $d=5$, this
22 will give an impact of zero (since for the sake of this exercise

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1 we are assuming the impact is zero at 5 miles). For $d=0.75$ (the
2 closest any sample observation is to IPEC) the impact would be -
3 41.55%. In my final report of December 2011, I estimated that
4 IPEC depressed property values by an average of 27% for
5 properties within 5 kilometers (3.11 miles). Using the revised
6 hedonic estimated using Dr. Tolley's data and assuming (for ease
7 of calculation) that properties are uniformly distributed within
8 this range, the revised model implies an average impact of IPEC
9 on property values of -25.05%. Thus Dr. Tolley's data imply
10 that property values are depressed by about 25% while my
11 analysis implies that property values are depressed by 27%.
12 This is an impressive level of agreement in estimated impacts
13 obtained using two different methodologies.

14 Q. Can you summarize your views of Dr. Tolley's study and
15 its role in the consideration of license renewal for IPEC?

16 A. There are several problems with Dr. Tolley's analysis.
17 The most salient of these are the small sample size, the use of
18 asking price instead of sales price, the inconsistencies in
19 distance variables used, the lack of a true control group, and
20 the failure to evaluate alternative functional forms. These
21 flaws led Dr. Tolley to conclude that IPEC has had a small
22 positive impact on property values, a conclusion completely

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1 contrary to that reached in our study, which found that IPEC has
2 had a negative impact on the property values in surrounding
3 communities, a fact acknowledged by Entergy in its ER. On the
4 other hand, it must be acknowledged that my study and Dr.
5 Tolley's study are the ONLY evaluation of the impacts of IPEC on
6 property values that have been undertaken using data collected
7 from the area around IPEC. Other expert reports and
8 commentaries have relied upon assumptions or the unsubstantiated
9 statements of people active in the local market. These
10 statements, in turn, have been inconsistent - with some
11 asserting a negative impact and some asserting no impact or even
12 a positive impact. Careful analysis of data indicates that IPEC
13 is an important source of disamenity that diminishes property
14 values in the area around the plant. While Dr. Tolley presents
15 a model and expresses contrary opinions, a careful reexamination
16 of his data reveals that it is largely consistent with my own
17 analysis and in fact leads to somewhat similar estimates of
18 total impact. That reinforces my conclusions: IPEC has a
19 negative impact on property values. The "no-action" alternative
20 and decommissioning of the IPEC facility will lead to a recovery
21 of property values and this can be expected to have significant

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1 land use impacts. These land use impacts have not been
2 adequately considered or evaluated in the FSEIS, GEIS or ER.

3 Q. Dr. Tolley says that the PILOT payments received by
4 the communities surrounding IPEC are critical to the plants'
5 positive impact on property values. He faults you for
6 overlooking those payments. He also criticizes your work for
7 assuming a constant rate of these payments following cessation
8 of operations at the plant. Can you please explain your
9 approach to PILOT payments in your first study and why Dr.
10 Tolley's criticism is unfounded?

11 A. Dr. Tolley's insistence on explicit consideration of
12 PILOT payments is unfounded for two reasons. First, his own
13 analysis of local property markets includes a specific variable
14 for the amount of PILOT payments, and his model shows that the
15 impact of such payments is statistically insignificant. This
16 means that we cannot reject the hypothesis that the true impact
17 of PILOT payments on property values is zero. If their impact
18 is zero, as Dr. Tolley's own analysis suggests, explicit
19 inclusion of the impact will have no consequence for the
20 analysis. Second, Dr. Tolley misunderstands the measure of
21 impact obtained in my analysis and presented in my December 2011
22 report. My estimate calculates all of the impacts on property

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1 values that occur when IPEC is built. This includes any
2 disamenity or amenity associated with IPEC as well as any change
3 in property tax rates that might be associated with the
4 facility. Suppose that IPEC generated no disamenity, but paid
5 large PILOT payments to communities that allowed reductions in
6 property tax or increases in public services. Then houses
7 purchased before IPEC was built, but sold after these benefits
8 were realized should be much more valuable and such properties
9 would show above average rates of price appreciation. If,
10 instead, there is a large disamenity associated with IPEC, that
11 disamenity may be so burdensome that it overwhelms the value of
12 the PILOT-generated benefits. In such a case, a home purchased
13 before IPEC but sold after the combination of PILOT benefits and
14 disamenity burdens is realized will experience a below-normal
15 rate of price appreciation. After careful examination of the
16 data, I find that this latter case holds. This implies that the
17 disamenity burden is so great that it OVERWHELMS the benefits of
18 PILOT payments. My analysis doesn't ignore PILOT payments; it
19 shows that they are not enough to cause house values to
20 increase. In that sense I am obtaining a result that is
21 confirmed by Dr. Tolley's own analysis.

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1 Q. Have you reviewed the studies Dr. Tolley references in
2 Section 1 of his March 2012 study?

3 A. Yes.

4 Q. In your opinion, are these studies applicable to this
5 proceeding in the way Dr. Tolley suggests?

6 A. Not directly. They are studies that have been
7 undertaken in different communities with different
8 circumstances. The only reliable way to evaluate the impact on
9 property values and hence on land use in this case is to collect
10 data from the communities around IPEC and analyze those data.
11 This is what I have done.

12 Q. Dr. Tolley also criticizes your use of a 4% discount
13 rate in conducting your analysis, while using a 7% discount rate
14 in his own work. Please explain why you chose to use a 4%
15 discount rate.

16 A. Dr. Tolley appears to be confusing the analysis I
17 presented in my second report of February 2009 with my final
18 evaluation of the property value impacts presented in December
19 of 2011. It is impossible to tell for certain because Dr.
20 Tolley makes very sparing use of footnotes and references. In
21 the 2009 report I considered the impact of delay in receipt of
22 benefits, examining a range of discount rates up to and

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1 including the 7% rate that Dr. Tolley likes. This has no real
2 bearing on my final analysis, where I use the actual change in
3 house prices in the broader region as a basis for estimating the
4 impact of removing the IPEC disamenity that both my analysis and
5 Dr. Tolley's analysis detect in local property market data. An
6 advantage of this approach is that I evaluate the impact as of a
7 particular date (January 2011), and do not need to discount this
8 estimate.

9 Q. How does Dr. Tolley's use of a 7% discount rate
10 influence his results?

11 A. Dr. Tolley's use of the 7% discount rate only applies
12 to his analysis of the impacts of PILOT payments, presented on
13 page 28. This analysis is nonsensical and directly contradicted
14 by his own analysis of property market data presented on page 17
15 of the very same report. The analysis shows that the impact of
16 PILOT payments on land values is not distinguishable from zero.
17 In an undergraduate econometrics course one would expect to
18 explain to the students that if the parameter estimate is
19 statistically insignificant, it might make sense to leave it in
20 the model but it makes no sense to claim that the parameter is
21 of the "correct sign." This important and fundamental point
22 applies to Dr. Tolley's work as well. He has collected data from

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1 the local housing market and estimated a hedonic model. His
2 model includes the impact of PILOT payments to the community in
3 which the property is located. His analysis shows that the
4 impact of these payments is not statistically significant, which
5 means that we cannot with confidence reject the hypothesis that
6 the true impact of PILOT payments is zero. After presenting this
7 analysis he proceeds to ignore it and, 11 pages later in his
8 report, simply assumes that the impact is positive. Whether he
9 discounts these future payments by 4%, 7% or some other value is
10 irrelevant. He has made a mistake in rejecting his own analysis
11 of the data.

12 Q. Dr. Tolley states that if property values have been
13 negatively impacted by IPEC, their values would not recover
14 until the end of a potential 60-year decommissioning window. Is
15 this an accurate assumption?

16 A. No. It is likely that property values would begin to
17 recover at the cessation of operations at the plant and continue
18 through the end of the decommissioning window.

19 Q. Some of your earlier reports have been criticized for
20 considering scenarios for decommissioning of IP3 and IP3 that
21 were unlikely to occur. What is your response to these
22 criticisms?

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1 A. These criticisms are misguided and indicate that there
2 remains a failure to appreciate my central and most important
3 point. My analysis of property value data collected in the area
4 around IPEC shows that IPEC is a significant source of
5 disamenity that is affecting local land values. Dr. Tolley's
6 analysis of property market data shows the same thing, and in
7 fact using a slightly modified and very reasonable specification
8 for his hedonic model the magnitude of impacts on property
9 values are in close agreement with my own analysis. In addition
10 to these two types of data analysis, several of the statements
11 from local real estate professionals support this finding. This
12 means that IPEC is depressing property values, and that fact
13 will alter local land use patterns. When the time comes that
14 IPEC is fully decommissioned - whatever time and in whatever
15 sequence - the disamenity will be removed and land values will
16 rebound. This will generate changes in offsite land use. These
17 changes should have been understood, acknowledged and analyzed
18 as part of the application for renewal, and there has been a
19 failure to do this and, so far, a refusal to recognize that it
20 needs to be done.

21 Conclusion

22 Q. Does this conclude your rebuttal testimony?

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1 A. Yes.

2 I have reviewed all the exhibits referenced herein. True
3 and accurate copies are attached.
4

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1 UNITED STATES

2 NUCLEAR REGULATORY COMMISSION

3 BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

4 -----X

5 In re: Docket Nos. 50-247-LR; 50-286-LR
6 License Renewal Application Submitted by ASLBP No. 07-858-03-LR-BD01
7 Entergy Nuclear Indian Point 2, LLC, DPR-26, DPR-64
8 Entergy Nuclear Indian Point 3, LLC, and
9 Entergy Nuclear Operations, Inc. June 28, 2012

10 -----X

11 DECLARATION OF STEPHEN C. SHEPPARD

12
13 I, Stephen C. Sheppard, do hereby declare under penalty of
14 perjury that my statements in the foregoing rebuttal testimony
15 and my statement of professional qualifications are true and
16 correct to the best of my knowledge and belief.

17 Executed in Accord with 10 C.F.R. § 2.304(d)

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June 28, 2012

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