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STATE OF MARYLAND

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of the Cost Effectiveness of Washington Gas Light Company's Demand Side Management Programs	)))	Case No. 8720

DIRECT TESTIMONY OF

PAUL CHERNICK

ON BEHALF OF

THE OFFICE OF PEOPLE'S COUNSEL

Resource Insight, Inc.

May 29, 1996

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EXHIBITS

Exhibit ____ (PLC-1) *Professional qualifications of Paul Chernick.*

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I. Identification and Qualifications

Q: State your name, occupation and business address.

A: I am Paul L. Chernick. I am President of Resource Insight, Inc., 18 Tremont Street, Suite 1000, Boston, Massachusetts.

Q: Summarize your professional education and experience.

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

I was a utility analyst for the Massachusetts Attorney General for more than three years, and was involved in numerous aspects of utility rate design, costing, load forecasting, and the evaluation of power supply options. Since 1981, I have been a consultant in utility regulation and planning, first as a Research Associate at Analysis and Inference, after 1986 as President of PLC, Inc., and in my current position at Resource Insight, I have advised a variety of clients on utility matters. My work has considered, among other things, the cost-effectiveness of prospective new generation plants and transmission lines; retrospective review of generation planning decisions; ratemaking for plant under construction; ratemaking for excess and/or uneconomical plant entering service; conservation program design; cost recovery for utility efficiency programs; and the valuation of environmental

externalities from energy production and use. My resume is appended to this testimony as Exhibit ____ PLC-1.

Q: Have you testified previously in utility proceedings?

A: Yes. I have testified approximately one hundred and thirty times on utility issues before various regulatory, legislative, and judicial bodies, including the Massachusetts Department of Public Utilities, the Massachusetts Energy Facilities Siting Council, the Vermont Public Service Board, the Texas Public Utilities Commission, the New Mexico Public Service Commission, the District of Columbia Public Service Commission, the New Hampshire Public Utilities Commission, the Connecticut Department of Public Utility Control, the Michigan Public Service Commission, the Maine Public Utilities Commission, the Minnesota Public Utilities Commission, the South Carolina Public Service Commission, the Federal Energy Regulatory Commission, and the Atomic Safety and Licensing Board of the U.S. Nuclear Regulatory Commission. A detailed list of my previous testimony is contained in my resume.

Q: Have you testified previously before this commission?

A: Yes. I testified in Case No. 8278 and Case No. 8241 on the least-cost planning efforts of Baltimore Gas and Electric Company (BG&E); in Case No. 8473 on the reasonableness of the proposed contract between BG&E and the AES Northside generation project; in Case No. 8487 on the electric cost allocation proposed by Baltimore Gas & Electric; in Case No. 8179, on Potomac Edison's contract with AES Warrior Run, in Case No. 8697 on a proposed gas rate increase of BG&E, and in Case No. 8702 on the allocation of the DSM costs of the Potomac Edison Company.

Q: Have you testified previously on cost-allocation and rate-design issues?

A: Yes. I have testified about ten times on cost allocations and rate design, in addition to several related pieces of testimony on such related topics as the allocation of DSM program costs, and the derivation of marginal/avoided costs for evaluation of DSM, non-utility generation and utility supply options.

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

A: Yes. I am the author of a number of publications on rate design, cost allocation, power-plant cost recovery, conservation program design and cost-benefit analysis, and other ratemaking issues. These publications are listed in my resume.

Q: Are you engaged in any least-cost planning activities in Maryland?

A: Yes. I am a consultant for the Maryland Office of People's Counsel to the DSM collaboratives for WGL and PEPCo, as well as more limited roles in collaboratives with BG&E, Delmarva Power, and Potomac Edison. I am generally responsible for issues concerning avoided costs, resource allocation, cost recovery and regulatory policy.

II. Introduction and Summary

Q: For whom are you testifying?

A: I am testifying on behalf of the Maryland Office of Peoples Counsel.

Q: What is the purpose of your testimony?

A: I provide an outline of the parties' cases and explain why gas commodity costs are avoidable costs that should be included in DSM screening.

Witnesses Haymes and Conopask raise other issues that are beyond the scope designated for this proceeding: the environmental costs of gas consumption, the rate effects of DSM, redistribution of income, and the choice of cost-benefit test. These background topics introduced by the Commission Staff are discussed in Mr. Plunkett's testimony.

Q: Please summarize your testimony.

A: I describe the nominal arguments proposed by Witness Haymes and Witness Conopask for excluding gas commodity from avoided costs for DSM screening, based on their assertion that gas is insufficiently scarce to justify the "extreme" effects of DSM. I show that their nominal position is internally inconsistent, implausible, and incorrect; and that their real argument is an attack on the public policy of promoting energy efficiency with utility funds raised from ratepayers, based on their belief that this practice interferes with "personal freedom." I note that the positions taken by Witness Haymes and Witness Conopask are inconsistent with Annt. Code of Maryland Article 78 §28g, which mandates utility DSM programs and ratepayer funding.

In Section III, I outline the OPC's response to the Haymes and Conopask nominal arguments. Section IV explains that resource scarcity is not a requirement for inclusion of benefits in economic theory, least-cost planning practice, or any sensible public policy framework. Finally, in Section V, I show that gas commodity passes many of the tests Witness Conopask constructs to define scarcity, even based on data from the sources he cites.

III. Summary of the Parties' Cases

A. Summary of Witnesses Haymes and Conopask's Nominal Case

Q: Please summarize the case laid out by Witnesses Haymes and Conopask in this docket.

A: While Witnesses Haymes and Conopask have not been totally clear and candid in their testimony and discovery responses,[1] I believe that the case presented by Witnesses Haymes and Conopask can be summarized as

1. Public actions (including those by government and those tolerated by regulatory agencies) that redistribute income are only justifiable if a "public purpose" or "public aspects are present" or there are "public good characteristics" to the action.[2] Witness Haymes limits the public interest to situations in which at least one of the following apply:
   - There are environmental effects not included in the resource's price.
   - Redistribution of income or wealth is desired.
   - The resource is scarce.[3]

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[1]Responding to the testimony of Witnesses Haymes and Conopask is particularly difficult due to their non-standard use of words. To Witnesses Haymes and Conopask, "cost" means "price," "society" means "non-participant," "inefficient" means "saving energy and money that the market would have wasted," and "scarce" means whatever gas commodity is not.

[2]This seems to be what Witness Conopask means when he says that increasing efficiency through DSM is inefficient (!) because it benefits some customers and is paid for by all customers.

[3]Haymes's lists of justifications for DSM (at 4, lines 6–7, and at 12, lines 15–17) may not represent his standards, but just lists of reasons advanced by somebody at some time. Actually, it is not clear that these or any other conditions would ever meet the standards of Witnesses Haymes and Conopask for public funding of energy efficiency (Haymes at 12).

2. Witness Haymes rejects each of the preceding potential reasons for pursuing gas DSM, as follows:
   - He assumes that gas has no significant environmental effects, and that the collaborative's failure to monetize environmental costs somehow implies that they cannot be used as a justification for DSM.
   - He argues that WGL's DSM redistributes income in the wrong direction.
   - He quotes Witness Conopask's conclusion that gas is not scarce.
3. Witness Conopask defines a special strict kind of scarcity—which is distinct from the conventional economic meaning of that term—that he says is required to create a public purpose in conserving the scarce good.
4. Witness Conopask argues that conserving gas is not a valid public purpose, since gas commodity is not scarce in the sense he uses.
5. Finally, Witnesses Haymes and Conopask assert that if conserving gas is not a valid public purpose, then gas costs are not avoidable for publicly-financed programs, even for those that have other public purposes.

B. The Real Concerns of Witnesses Haymes and Conopask

Q: Is the testimony of Witness Haymes and Witness Conopask really motivated by the belief that gas commodity costs are not avoidable?

A: That is not the real issue. No one seriously argues that reductions in gas commodity usage do not lead to a reduction in costs. Witnesses Haymes and Conopask recognize that gas commodity is an avoided cost in private

decisions, in gas supply planning, and in public or utility DSM that is paid for by participants.

Witnesses Haymes and Conopask's concern is directed toward publicly funded DSM, rather than towards the design of DSM to conserve gas commodity. On the one hand, they have no problem with counting avoided commodity costs in evaluating publicly operated programs paid for by participants. On the other hand, they reject DSM driven by other considerations. For example, Witness Conopask accepts the use of DSM programs to reduce capacity requirements in principle, but would include only some of the benefits of DSM motivated by capacity concerns, so they are unlikely to pass the screening. Witness Haymes is dubious about including any capacity benefits.[4]

Q: Do Witnesses Haymes and Conopask acknowledge that gas costs are actually avoidable?

A: Yes. Witness Haymes admits that the avoidability of commodity is not the real issue.

- He admits (at IR 1-89) that gas commodity is avoidable for participant-funded programs, private decisions, WGL supply decisions, and at least some promotional programs.

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[4]For example, Witness Conopask (at 14, lines 3–9) attempts at length to prove that gas is not avoidable because it is not Conopask-scarce, and then asserts that, even if it were Conopask-scarce, it probably still wouldn't be avoidable. Similarly, Witnesses Haymes and Conopask accept the avoidability of pipeline and distribution capacity, but Witness Haymes (at 14–15) warns that they may change their position after the "first round of analysis", perhaps to screen out any DSM that passes the first round. See also IRs 1-56, 1-61, and 1-76.

- He asks the Commission (at 3, lines 16–17) to "structure" avoided cost to "reflect appropriate policy," rather than to reflect the avoidability of commodity.

Witness Haymes sets forth the following other issues, not related to commodity-cost value, for consideration:

- He says (at 10, line 19) that he and Witness Conopask are concerned with a "direct examination of the policy question", which he defines (at IR 1-58) as, "What is the appropriate level of DSM for WGL, what form should the DSM take, and how should it be funded."
- He asserts (at 11, lines 12–13), "An examination of public policy in this case should center around the method by which DSM is funded."[5]

Similarly, Witness Conopask argues that

- DSM should not be pursued because whatever results from the market is, by definition, correct. (at 7–8)
- "Energy conservation as public policy" should be rejected in favor of "the natural market evolution of capital substitution for energy" (at 7, lines 13–14).[6]

None of these additional issues are avoided-cost issues. Witnesses Haymes and Conopask really are asking the Commission to revisit its DSM policy, ignore the results of the TRC test (as applied by every utility,

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[5]While Haymes-Conopask often suggest that their problem with DSM is related to the collection of costs through a surcharge, this appears to be another red herring, since they would have the same problem with programs funded by base rates, taxes, or even revenues from promotional programs (at IR 1-23). The issue is not the surcharge, but public funding in any form.

[6]Of all the statements of Haymes-Conopask, this is the most direct challenge to the statutory duty imposed by §28g.

regulator, and expert of which I am aware), institute a more severe form of the RIM test, and eliminate all ratepayer funding for all DSM.

Q: Why did Witnesses Haymes and Conopask choose to make avoided cost, rather than the policy issue or the funding method, the subject of this case?

A: Witness Haymes admits that their decision to focus on avoided cost was driven by procedural considerations, because "Avoided cost was the open question" (IR 1-60). Rather than directly attack the legislative intent expressed in §28g, Witnesses Haymes and Conopask chose to restate their policy positions as a technical argument about avoided costs, which they saw as the remaining "open question."

Some of the policy concerns raised by Witnesses Haymes and Conopask are reasonable topics for discussion by serious policy analysts.[7] That discussion has been underway in Maryland for the last seven years or so, and the questions have been answered. Those policy issues should be approached directly, not through an indirect argument about the avoidability of gas commodity.

Q: What is Haymes and Conopask's real concern with DSM policy and funding issues?

A: Witnesses Haymes and Conopask raise a range of policy and funding issues, including income distribution, rate effects, and individual freedom. As discussed by Mr. Plunkett, the testimony and responses of Witnesses Haymes

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[7]The evidence strongly demonstrates that public funding of DSM is justified by reduction total costs, but people who are not familiar with that evidence can sincerely question the need for such funding.

and Conopask indicate that neither the effects of DSM on low-income customers, nor the number of non-participants, nor increases in rates to non-participants seem to be their real concern.

The fundamental underlying concern expressed by Witnesses Haymes and Conopask is that public funding of energy efficiency would interfere with individual freedom. Witness Haymes appears to be addressing self-sufficiency when he argues that

- "One customer should not be asked to provide a benefit to another customer unless there is a clear [and highly restricted] public purpose" (at 3, line 10–11).
- No public funding can ever be justified by cost savings, and that "a dollar of benefit should accrue to the customer from whom a dollar is taken" (at IR 1-27).
- In justifying public funding of DSM, "one must include the costs involved in the reduction of individual freedom of choice" (at IR 1-28).[8]

Similarly, Witness Conopask expresses a strong preference for individual decisions in the marketplace, even if those decisions (which we know are distorted by capital constraints, lack of consumer control, and information and transaction costs) result in the inefficient use of energy and unnecessarily high costs. He goes so far (at 8) as to suggest that improving on the haphazard ("measured") pace of acceptance of cost-effective energy efficiency would be "inefficient."

This rhetoric of rugged individualism appears to represent the fundamental motivation of Witnesses Haymes and Conopask in requesting

[8]The importance of "choice" is also mentioned by Witness Haymes at 16.

this proceeding. This explanation is consistent with their approach to DSM in the collaborative, where they refused to work on finding acceptable solutions to the specific problems they identified (e.g., income distribution, rate effects). Witnesses Haymes and Conopask are not concerned with any narrow technical issue: they simply do not want public funding of any DSM.

Q: Is the opposition of Witnesses Haymes and Conopask to the efficiency efforts required by §28g limited to the gas utilities?

A: No. While Witness Haymes (at 8) proposes some spurious distinctions between electric and gas utilities, he is unable to explain (at IRs 1-41, 1-42) why these purported differences are relevant to the avoidability of costs. He also urges (at IR 1-49) that fuel costs be ignored in evaluating electric utility DSM programs, as well as for gas programs.[9]

C. Summary of OPC's Response

Q: What is OPC's response to Witnesses Haymes and Conopask's critique of DSM?

A: Following the list in Section A above, OPC's responses are as follows:

1. Public actions are properly justified by a wide range of concerns. In particular, reducing costs below the level that would be achieved without public action is a valid justification for many actions, including

[9]Sometimes Witness Haymes suggests that gas fuel could be an avoided cost for utility programs (e.g., at IR 1-89), apparently contradicting his other positions.

DSM.[10] Mr. Plunkett's testimony shows that cost-minimization is the primary justification for DSM.

The economic rationale for DSM market intervention is that it overcomes the market barriers to individual energy-efficiency investments that are cost-effective compared to utility avoided costs. Those avoided costs do not depend on who pays for DSM costs.

2. Of the limited justifications for DSM considered by the staff, two support conservation of natural gas: gas conservation has environmental benefits, as discussed in Mr. Plunkett's testimony, and gas is scarce, as I discuss below. Income redistribution is not a justification for pursuing DSM, but it is not an obstacle to DSM, as discussed in Mr. Plunkett's testimony.

3. Scarcity, in the sense described by Witness Conopask, as a requirement for public interest or avoidability of costs is an ad hoc concept, inconsistent with the economic literature.

4. Gas commodity is scarce, in both the normal economic sense and in Conopask's unique sense.

5. Conserving gas is a valid public purpose in itself, but even if it were not, gas costs avoided by WGL actions are cost savings and should be counted in evaluating those actions.

Q: On what points does OPC agree with Witnesses Haymes and Conopask?

A: OPC shares Witnesses Haymes and Conopask's nominal concerns that gas avoided costs be properly computed, that low-income customers not be

[10]Witness Haymes (at 4) mentions reduction in long-term costs and in customer bills as possible justifications, agrees (at IR 1-35) that DSM produces long-term cost reductions, but fails to explain why he does not believe cost reductions justify DSM.

adversely affected by gas DSM, and that gas DSM not unduly raise customer rates. As DSM programs are expanded beyond the pilot phase, the magnitude and incidence of DSM rate impacts should be carefully analyzed and any identified problems should be addressed.[11] We also agree that future natural-gas supplies are likely to be more abundant, and prices lower, than once projected. Those lower prices are incorporated in the current WGL avoided costs, which assume constant commodity costs over the analysis period.[12]

Lower long-term forecasts of gas avoided costs will tend to reduce the amount of cost-effective gas DSM investment. However, the impact of lower gas prices and greater gas availability described by Witness Conopask does not remove the basic economic rationale for gas DSM.

IV. Errors in Conopask's Concept of Scarcity

Q: What are the problems with Witness Conopask's concept of scarcity as a justification for public action?

A: There are several such problems. First, Witness Conopask does not use a standard economic definition of scarcity. Second, Witness Conopask does not provide a useful definition of his type of scarcity. Third, the type of scarcity described by Witness Conopask has no precedent as an economic or regulatory test for the public interest or for the validity of costs. In most

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[11]Indeed, OPC performed the only review of rate effects performed in the collaborative. While WGL assisted in this analysis, Haymes and Conopask have made no contribution to the modeling of rate effects.

[12]If anything, the discussion in Section V suggests that the commodity-cost inputs in WGL's avoided-cost estimates may be at the low end of the likely range.

contexts, a cost is a cost, and all costs are included in policy evaluation. Fourth, using scarcity as a screen for public interest or to determine the admissibility of avoided costs would lead to absurd and counter-productive results in utility planning and other areas of public policy.

A. Witness Conopask's Use of "Scarcity" is Non-standard

Q: What does *scarcity* normally mean in economic terminology?

A: Resources are scarce if they would be in short supply without rationing. In other words, all goods and services are scarce, unless they could be given away to all comers without becoming exhausted. There are a few such resources (air for breathing, ice-fishing spots in Minnesota in January, hiking space in Alaska), but most resources are scarce, rationed by price or other mechanisms (first-come-first served, reservations, lotteries). Just about any good for which a price can be charged is scarce. Economics can be thought of as being concerned with the allocation of scarce resources.

Q: Does Witness Conopask use *scarcity* in the normal economic sense?

A: No. Witness Conopask admits (at 6) that his definition of scarcity is not the normal economic definition.[13] Instead of using the normal definition, Witness Conopask describes a "relative scarcity" that requires some combination of exhaustibility, depletion, and rising prices.

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[13]Since Witness Conopask's testimony is clear on this point, I do not understand why both witnesses assert (at IRs 1-35, 2-21) that Witness Conopask used *scarcity* in the normal economic sense.

When Witnesses Haymes and Conopask assert that gas commodity must be scarce to justify public action or to be avoidable, they are referring to this special type of scarcity discussed by Witness Conopask.[14]

B. The Scarcity Defined by Witness Conopask is Ill-defined

Q: Is Witness Conopask's definition of scarcity clear and unambiguous?

A: No. Witness Conopask's testimony on this point is vague and contradictory. In his view, evidence of "economic resource exhaustibility" is a necessary condition for public intervention. However, he does not provide a clear operational definition of the term. He leaves at least three types of ambiguity.

First, he uses different types of tests, including "economic resource exhaustibility" (at 5, lines 2–5), "resource depletion" (at 8, line 10), and prices rising faster than some index of capital and labor costs (at 6).

Second, Witness Conopask does not clearly define the "relative price" test he proposes. For example, he does not explain how he would measure the prices of capital and labor, or which prices he would use (unit costs to the gas industry, perhaps, or gas production, or the average price in the economy for all labor) or how he would weight them, or over what time period he would measure them.[15] Witness Conopask even suggests (at 6, lines 17–18) that gas prices that rise relative to either capital *or* labor imply scarcity. Since Witness Conopask suggests that only the *relative* price of gas matters, it

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[14]To further confuse matters, Witness Haymes (at 12, lines 8 and 20) refers to Conopask-scarcity as "major scarcity."

[15]Witness Conopask may have borrowed the *relative price* concept from Brown and Field (Attachment JVC-5 at 4), which notes that selection of the index is "crucial." Witness Conopask does not deal with this critical issue.

appears that even a rapid run-up in gas prices would not concern him, so long as labor and capital (however he might define and measure those) rise faster than gas price.[16] Nor is it clear how Witness Conopask would determine whether a commodity is scarce, if the price moves non-monotonically, rising in some years and falling in others.

Third, and perhaps most critically, Witness Conopask is unclear about the appropriate planning horizon for determining scarcity. At various points, Witness Conopask suggests that resource exhaustion, or depletion, or rising prices are a concern only if they are expected to occur in a time frame that is

- "imminent" (at 7 and 10),
- the "near future," (at 9),
- the "intermediate future" (at 5, lines 8–9), which he apparently believes to be 5 years (Attachment JVC-2 at 4),
- "one MD LDC planning period," presumably five years, or "some limited multiple thereof" (at 9), which is very vague but could be 10 or 50 years,
- "the expected average life of the current stock of gas appliances (at 9), which might be about 10 years,
- the "immediate and foreseeable future" (at 8, lines 23–24),
- the "foreseeable future" (at 10 and 13)
- the "long term," which he takes to be 25 years (Attachment JVC-2 at 4).

Most of the time frames Witness Conopask discusses are shorter than the public planning horizon. Demand-side-management measures, such as in

[16]Conversely, Witness Conopask's formulation would find that gas would be scarce, even if its price were falling, so long as labor and capital costs were falling.

new construction programs, can affect gas consumption for decades. Our children and grandchildren will be dealing with the price and availability of gas well into the 21st century. It is simplistic and short-sighted to ignore all effects of gas depletion after the gas-utility planning horizon.

Most troublesome, while Witness Conopask discusses the future of gas prices, he indicates (at 7) that he only proposes responding to past price rises:

> ...as the real price of gas rises on a continuing basis over many years, the case begins to be made (a "necessary condition") to consider economic conservation as public policy.

Q: Would DSM have much effect on scarcity, if the Commission adopted Witness Conopask's approach to identifying a need for action?

A: It would be very unlikely. His approach appears to require so much evidence that economic depletion is occurring and prices are rising, that it would not support public intervention until the shortage is well underway. At that point, the inexpensive resources that could have been stretched for many years will have been exhausted, many years of efficiency improvements will have been lost, and the economy will be committed to a stock of inefficient appliances, systems, and buildings for many more years. Little delay in resource exhaustion would be gained through utility DSM programs if they were not implemented until depletion were imminent or underway.

Q: Do Witnesses Haymes and Conopask apply their ambiguous concepts of scarcity consistently?

A: No. Perhaps as an admission of the extreme nature of his view of scarcity, Witness Haymes, at IRs 1-64 and 1-65, cannot identify *any* commodities that are currently in a state of "major scarcity" in Maryland, or any commodities

that have been in a state of "major scarcity" in Maryland at any time since 1975. However, in response to other questions, Witness Haymes asserts that

- electric production plants and transmission systems are scarce resources "at certain times because usage fluctuations can have an influence on their costs to a greater extent than other inputs" (at IR 1-43) and are avoidable costs (at IR 1-44, 45).[17]
- gas production plant and transmission systems may be scarce resources because "their capacity cannot always be increased as readily as other factors" (at IR 1-46) and "may be avoidable because demand reduction could reduce their costs" (at IR 1-47).[18]
- the costs of gas production plant and transmission capacity are avoidable for purchasers (such as WGL) "when a reduction in the LDC's usage is translated into a reduction in the per unit costs of the LDC's supplies" (at IR 1-48).[19]
- among electric fuels, gas is never scarce or avoidable; oil globally plentiful but sometimes scarce due to limits on "availability inside the U.S." and sometimes avoidable "depending on usage restrictions,

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[17]I assume that Witness Haymes's references in these responses to the avoidability of costs depending on "the capacity situation" and "how purchase contracts are structured" simply mean that costs are only avoidable if there is something to avoid; but I cannot see why avoidability would depend on "the planning processes of the utility."

[18]The latter is certainly true for gas commodity: reduction in WGL's demand for gas reduces WGL's gas costs.

[19]The reference to a reduction in "per unit" cost is a throwback to the position Witness Haymes took in the collaborative, in which he conceded costs could be treated as avoidable if they were above the utility's average level for those costs. WGL's DSM will pass this test, since its will almost always avoid WGL's most expensive commodity and peaking capacity.

domestic availability and other factors"; and coal is not scarce, but it may be avoidable for "environmental reasons" (at IRs 1-49, 1-50).

- That gas commodity is not scarce, even though prices can vary widely in the "short run...because production, storage, and transportation resources are temporarily strained." (at IR 1-67)

These goods, and Witness Haymes's description of them, seem quite similar in their degree of scarcity: all of them are in relatively tight supply sometimes, abundant at other times. Witness Haymes uses almost the same words to explain why he thinks that gas commodity is not avoidable, but capacity is. If anything, fuels are scarcer, since they have a non-zero price at all times; capacity is sometimes worthless in the short term. It is difficult to believe that anyone can really believe that natural gas is less scarce than the inputs to constructing pipelines, power plants, and transmission lines, such as steel and labor.

Q: What is the real test of avoidability that Witnesses Haymes and Conopask are proposing?

A: Recall that the avoided-cost issue is simply a convenient vehicle for Witnesses Haymes and Conopask's real policy agenda, which is the termination of all ratepayer-financed energy efficiency in Maryland. Witnesses Haymes and Conopask want to pick and choose avoided costs, eliminating DSM benefits until every program fails.

C. Role of Costs and Scarcity in Cost-Benefit Analysis and Least-Cost Planning

Q: Do Witnesses Haymes and Conopask cite any authority for the proposition that resources that are not scarce (in the sense used by Witness Conopask) should not be the subject of public policy?

A: No. Nor have I found any such cites. While Witness Conopask describes (at 14) "scarcity of gas in the near term" as "the first, necessary condition for construction of a public policy to conserve natural gas," he cites no authority for this position. Even Witness Haymes (e.g., at 12 and IR 1-50) lists other considerations, especially environmental effects, that would justify "construction of a public policy to conserve natural gas."

Q: What is the normal standard for determining whether an action is a proper subject for public policy?

A: These standards are usually defined in terms of the functioning of a market, rather than the characteristics of a good. Public intervention is usually justified where private markets will not operate efficiently, due to such factors as externalities (which would include both the environmental and depletion effects discussed by Witnesses Haymes and Conopask), imperfect information, transaction costs, and the impracticality of charging for services.[20]

Q: Do Witnesses Haymes and Conopask cite any authority for the proposition that resources that are not scarce (in the sense they use)

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[20]See, for example, Steiner at 8–17. (Steiner, Peter. 1969. *Public Expenditure Budgeting.* Washington: Brookings Institution.)

should not be counted as avoided costs, or benefits, in benefit-cost analysis?

A: No. This is an even more extreme position than their public-policy argument. Various analysts may differ as to whether a particular market is functioning well enough that public intervention is unnecessary or counterproductive; I am not aware of any authority who would suggest that any identifiable costs and benefits be ignored in a benefit-cost analysis, including the TRC. This includes all costs, not just those of particularly scarce commodities, or otherwise embued with a special public interest.

> [The cost-benefit] approach requires systematic enumeration of all benefits and all costs, tangible and intangible, whether readily quantifiable or difficult to measure, that will accrue to all members of society if a particular project is adopted." (Stokey and Zeckhauser at 134)[21]

Q: Does cost-benefit analysis distinguish between normally-scarce resources and those in more extreme scarcity?

A: In some cases. Most resources are just economically scarce, and are counted at their market prices. Where a resource is currently very scarce, or expected to get much scarcer (i.e., is in one of the various forms of scarcity considered important by Witness Conopask), a depletion externality may be added to the cost. Conopask scarcity may justify a higher-than-market valuation; it is not needed to justify valuing resources at their market prices.[22]

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[21]Stokey, Edith, and Richard Zeckhauser. 1978. *A Primer for Policy Analysis.* New York: W. W. Norton and Co. In a very odd contortion, Witness Haymes agrees (at 3, lines 12–15) that any DSM program that benefits society should be pursued and that WGL and (at IR 83a) that its customers are part of society, except (at IR 16) when they are participants in DSM programs.

[22]The additional valuation may be justified because, for example, the market is not free to operate (the resource is rationed, or not publicly traded), the impending shortage and price run-up are not widely anticipated (so that the owners of the resource are not charging depletion

There may be a price-related externality cost of gas consumption even if gas prices are falling, since price may fall even faster if demand growth is reduced, allowing technological progress to further outpace physical depletion of low-cost resources.

Q: In cost-benefit analysis, does the form of funding determine whether a cost is to be included in the analysis, as Witnesses Haymes and Conopask propose?

A: No. The form of funding affects the distribution of costs and benefits between customers. Those distributional issues can be important, but they are not properly dealt with by artificial manipulation of cost inputs. Witnesses Haymes and Conopask (at IRs 1-19, 1-20, 1-21) are not aware of any regulatory decisions allowing the "structuring" of avoided costs to "reflect appropriate policy;" i.e., guarantee an outcome. As the World Bank put it, in discussing the evaluation of multi-billion-dollar projects:

> Cost-benefit analysis has only one objective—economic efficiency—and uses a form of economic efficiency numeraire to focus on static efficiency and dynamic efficiency. It ignores distributional efficiency." (Ward and Deren at 5)[23]

In other words, the redistribution of income that so concerns Witness Haymes is not part of the TRC test, or any other benefit-cost test. Examination of equity effects is a separate—although still important—step in the planning analysis, as discussed by Mr. Plunkett.

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rents), or the social discount rate is lower than the producers' private discount rate (so the future price shock is of more concern to the public interest than to the producers).

[23]Ward, William, and Barry Deren. 1991. *The Economics of Project Analysis: A Practitioner's Guide.* Washington: The World Bank.

Q: Would the use of different avoided costs for different DSM funding approaches, as advocated by Witness Haymes and Conopask, be practical?

A: No. DSM measures are screened before the programs that will deliver them are designed. The cost-effective measures are then bundled into programs, and funding and delivery mechanisms are developed. The same measures may be incorporated in several programs, each having different structures. Depending on the structure of the program to which it is added, ratepayer funding may cover some, all, or none of the measure's incremental cost. "Structuring" avoided costs to reflect funding mechanisms, as proposed by Witnesses Haymes and Conopask, is simply not workable. If the Commission wishes to limit ratepayer funding of DSM, it would be better advised to set budget limits or set forth a policy directive on maximizing participant funding.

Q: What is the meaning of avoided costs in least-cost planning?

A: The term *avoided costs* entered the least-cost lexicon through the FERC regulations implementing PURPA §210:

> "Avoided costs" means the incremental cost to an electric utility of electric energy or capacity or both which, but for the purchase from the qualifying facility or qualifying facilities, such utility would generate itself or purchase from another source. (18 CFR 292.101[b][1]).

Avoided costs, for both non-utility generators and DSM, has always meant all costs avoided by the utility, and in some cases includes costs avoided by customers or other parties.

Similarly, the Energy Policy Act of 1992 (EPACT) defined gas-utility integrated resource planning as

> a systematic comparison between demand-side management measures and the supply of gas by a gas utility to minimize life-cycle costs of adequate and reliable utility services to gas consumers. (15 USC 3202 [9])[24]

Q: Is there anything in the economic or regulatory literature that supports the exclusion of gas commodity costs from DSM screening?

A: No. The literature clearly says that all costs must be included. Even Witnesses Haymes and Conopask agree (at IRs 1-1, 1-2, 1-3) that gas commodity is a real cost to WGL, its ratepayers, and the state of Maryland, and that it should be included for customer decisions, supply decisions, and many other applications.

D. Implications of Accepting the Approach to Avoided Costs Advocated by Witnesses Haymes and Conopask

Q: What would be the implication of accepting the approach to avoided costs proposed by Witnesses Haymes and Conopask?

A: There would be several such implications. First, virtually all gas- and electric-utility DSM programs would be terminated, especially if the Commission accepted Witnesses Haymes and Conopask invitation to further manipulate avoided costs to ensure that all DSM programs failed TRC screening. Many millions of dollars in potential efficiency benefits would be lost.

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[24]The law further requires that gas IRP "shall treat demand and supply to gas consumers on a consistent...basis," which certainly requires that the same costs be used for evaluating demand and supply.

Second, utilities would need to maintain different sets of avoided costs for supply, DSM funded by participants, energy-efficiency recommendations to customers, and ratepayer-funded DSM.[25]

Third, where utilities determine avoided demand-related capacity costs by subtracting fuel savings from the cost of baseload capacity (as is usually the case for PEPCo, and often the case for WGL), ignoring the commodity savings will result in overstating demand-related capacity cost. Some peak-related efficiency programs may inappropriately pass the TRC (and RIM) tests with these overstated capacity costs. Using the approach advocated by Witnesses Haymes and Conopask, any planned baseload would always be the avoided capacity, since its energy benefits would be ignored.

Fourth, avoided costs will be volatile and difficult to define, since the computational approach (ignoring commodity) will have no relation to supply planning (which Witnesses Haymes and Conopask acknowledge must include commodity).

Q: What would be the implication of counting only resources that are scarce (in the sense Witness Conopask uses) in other areas of public planning?

A: The results would be just as unreasonable as those that Witnesses Haymes and Conopask prescribe for gas DSM. In highway planning, for example, the important considerations are capital cost (which comprises labor, heavy equipment rental, gravel, asphalt, and the like), travelers' time, and fuel

[25]Witness Haymes (at IRs 1-23.d, 1-61) indicates that the avoided costs would be different for various types of funding, but does not always specify how they would differ.

use.[26] Witnesses Haymes and Conopask do not consider fossil fuels to be scarce, at least most of the time, and it is hard to see how they could identify any imminent exhaustion or depletion of human time, since population is a growing resource. Logically, none of the components of highway capital are scarce in the sense discussed by Witness Conopask, but both Witness Haymes and Witness Conopask apply different standards to capacity than operating costs, so they might be concerned with the costs of new and refurbished roads. If we ignore all highway-related costs (as a consistent application of the rules developed by Witness Conopask would require), no cost-benefit guidance is available at all. If the Department of Transportation followed Witnesses Haymes and Conopask in considering capacity costs, but not operating costs, they would include the costs of building roads, but not the costs or benefits of using them, so no new roads could be built with public funding.[27]

V. Gas Is a Scarce Resource

Q: What is the basis for Witness Conopask's assertion that gas is not scarce?

A: Essentially, he assumes his conclusion: the gas industry will achieve whatever technological progress is necessary to prevent relative gas prices

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[26]Highways are funded from taxes levied on the general public, including many people who would never use a particular road, and are therefore similar to DSM in their effect on non-participants.

[27]Perhaps Witnesses Haymes and Conopask would prefer that the public role in road construction be privatized, or that motor transport be abandoned, to avoid interfering with "personal freedom." This would parallel their recommendation with regard to utility DSM: limit road-building to that which occurs naturally, at a measured pace, in the market.

from rising, at least over the time period he sees as relevant to policy decisions.

Q: Does Witness Conopask present any empirical evidence for his projection of constant or falling gas prices?

A: He points to the historical trend of falling real prices for natural resources in general, and natural gas in particular, in which technological progress played an important role.

Q: Does Witness Conopask offer adequate support for his expectation that technological progress will prevent increases in relative gas price?

A: No, for at least two reasons. We agree that gas price has fallen in the past. However, the inferences that Witness Conopask draws from past experience is based on an incomplete model of the gas market. In addition, the staff's reading of the empirical evidence is unsupported by many observers in the field, including those that the staff recognizes as experts.

Q: In what ways is Witness Conopask's view of the gas market incomplete?

A: We agree with Witness Conopask that improved technology (e.g., horizontal drilling, computer-assisted geological imaging) has reduced the costs of finding and extracting fuel, and increased the amounts recoverable from identified reserves. However, increased knowledge does not by itself guarantee constant or falling prices. In his emphasis on technological improvement, Witness Conopask essentially overlooks two important countervailing factors: diminishing returns to scale and demand growth.

Exhibit ____ (PLC-2) presents a simplified, but more complete, model of the gas market, showing changes over time in annual supply and annual demand curves and resulting price. On the supply side, the industry faces a

rising supply curve, all else equal (including reserves, cumulative consumption, and knowledge). Over time, in the absence of technological progress, the supply curve would shift upward due to diminishing returns. Conopask (Attachment JVC-2 at 3) cites Morris Adelman, who explains:

> Now, there are good reasons to expect reserve replenishment to show diminishing returns over time. Ceterus paribus, the larger deposits would be found earlier even by chance. Once found, the better mineral would be developed first. Thus marginal costs and prices would rise, even if ultimate depletion were infinitely distant. (Adelman 1993a at 220.[28]

Whether the supply curve shifts up or down depends essentially upon what Adelman (1993b, at 4–5) calls the "endless tug-of-war" between diminishing returns versus technological improvement.[29]

Exhibit PLC-2 reflects the assumption that the rate of technological improvement more than offsets the effect of diminishing returns, as has happened historically. As a result, the supply curve shifts downward. Even

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[28]Adelman, Morris. 1993a. "Mineral Depletion, with Special Reference to Petroleum." *The Economics of Petroleum Supply: Papers by M. A. Adelman 1962–1993.* Cambridge, Mass.: MIT Press. (Conopask cites this work as Adelman [1990], referring to its 1990 publication in *Review of Economics and Statistics* 72:1–10.)

[29]Adelman, Morris. 1993b, "Modeling World Oil Supply" *Electricity Journal* 14(1):1–31. Witnesses Haymes and Conopask repeatedly assert that WGL customers only benefit from reduced prices (or unit costs) of national commodity prices, and they point out that WGL DSM programs will have only a small effect on national prices. They fail to recognize WGL customers' savings from reduction in the *amount* of commodity used, the *mix* of commodity used (as the most expensive marginal resources are shed), and the demonstration effect that full-scale DSM programs by WGL (and other Maryland utilities) could have on utilities and regulators in other states (which would further reduce national prices, benefiting WGL ratepayers). None of these additional effects are reflected in Exhibit PLC-2.

so, as Exhibit PLC-2 illustrates, price can still rise (from P_0 to P_1). The key factor is the rate of demand growth.

Witness Conopask does not demonstrate that the rate of technological improvement will offset demand growth and diminishing returns; he merely assumes it.

Q: What lessons do experts draw from the historical price decline?

A: the Tellus Institute, the staff's consultant on gas DSM, recognizes the effect on past price trends of energy efficiency and low demand growth:

> Efficient use of gas over the last 20 years has extended the life of existing reserves, caused the "gas bubble," and resulted in a decline in the real price of gas and consequent positive economic impact on the U.S. economy. Hence, the efficient use of gas should be stressed. (Hornby, Nichols, and Kroll at 6)[30]

In addition, there is no reason to assume that the future is going to be like the past. Contrary to Witness Conopask's suggestion in Attachment JVC-2 at. 3, Adelman does not support the staff's interpretation of the historical evidence. To the contrary, Adelman (1993b, at 4–5) writes that simple extrapolations from past experience are not reliable:

> Mineral depletion is in fact an endless tug-of-war: diminishing returns versus increasing knowledge. So far, the human race has won big. This need not continue. We need to look at each mineral separately, and monitor the amount and cost of the flow of reserve additions.

In fact, if any implications for gas can be drawn from Adelman's discussion of oil scarcity (1993a), it is that demand growth can cause price increases. Adelman believes that past trends in oil price have nothing do with

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[30]Hornby, Richard, David Nichols, and Heidi Kroll. 1993. Position Paper filed in NYPSC Case 93-G-0326 on behalf of the Pace Energy Project and the Natural Resources Defense Council. Boston, Mass.: Tellus Institute.

resource scarcity because OPEC exerts enough control to keep market price substantially above supply cost. In the absence of the cartel, demand could exert upward pressure on price:

> But if and when the cartel loses control, prices drop sharply [which has occurred with gas deregulation in the U.S.], and output grows, cost (and rent) may increase greatly. (Adelman 1993a at 233)

Q: Do any of the experts cited by the Commission Staff indicate that gas may be a scarce resource?

A: Yes. Judging from Adelman's assessment of the domestic oil reserves, U.S. oil is a depletable resource:

> Proved reserves-added are a forecast of future production, and since 1985 they have been stable around 2.3 billion barrels per year, or 6.5 million barrels per day, a little less than current production. But costs appear to be rising. In my opinion, discoveries will not freshen the mix enough to keep the level of reserve-additions at the current level, and U.S. production will decline slowly. (Adelman 1993b at 22)

Since Witness Conopask believes that it is appropriate to make inferences about natural gas from analyses of oil, we should be able to conclude from Adelman's discussion of U.S. oil that domestic natural gas is a scarce resource, even in the sense Witness Conopask uses.

Q: Does the literature cited by Witness Conopask support Staff's expectation of constant or falling gas prices?

A: No. Gas price forecasters, including at least two that Witness Conopask refers to as experts, recognize the significance of technological improvement and expanding reserves, yet come to the opposite conclusion: technological improvement will dampen but not eliminate increases in gas prices.

The U.S. Energy Information Administration's 1996 *Annual Energy Outlook* substantially reduced its fuel price forecasts "based on recent

assessments of improved supply-side technologies and an expanded resource base" (at vii). But EIA still projects that real gas price will increase in real terms through 2015 in all five cases considered. The gas-price forecasts from four other forecasters summarized by EIA (Data Resources Inc., Gas Research Institute, American Gas Association, Wharton Econometric Forecasting Association) all show higher prices for gas in the future than at present.[31]

Witness Conopask (at 13) cites a "very optimistic" report by the National Petroleum Council that estimates that 600 TCF (16–30 years of supply, depending on demand) will be available at $2.50/MMBtu, after which new supplies would cost $3.50/MMBtu and greater. Abundant gas does not mean price will not rise. The price of gas can rise considerably as current reserves are used up and new higher cost reserves must be developed.

In fact, despite the abundance of natural gas, this same NPC report projects that price will rise in real terms: to about $3.50/MMBtu (in 1990 dollars) by 2010 in the moderate energy growth case and to $2.75/MMBtu assuming low energy growth (Attachment JVC-4 at 1). This forecast of rising costs seems to meet the definition of scarcity developed by Witness Conopask, except perhaps for the fact that the costs have not yet risen.

Q: Please summarize your conclusions.

A: Nothing in the economic or regulatory literature supports the approach proposed by Witnesses Haymes and Conopask to setting avoided costs. The level of scarcity of a resource has no bearing on the justification of public

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[31]Energy Information Administration. 1996. *Annual Energy Outlook 1996 With Projections to 2015* DOE/EIA-0383(96). Washington:EIA.

action to reduce the cost of the resource or on the avoidability of the associated cost. In any case, gas commodity is a scarce resource in every meaningful sense of the term. Gas commodity costs—along with all other identifiable costs—should be included in screening DSM programs.

Q: Does this conclude your testimony?

A: Yes.