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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of Docket No. 52-016

Calvert Cliffs-3 Nuclear Power Plant
Combined Construction and License Application

TESTIMONY OF SCOTT SKLAR, PRESIDENT OF THE STELLA GROUP, LTD., ON CONTENTION 10

Q.1. Please state your name and describe your professional qualifications to give this testimony.

My name is Scott Sklar and I am The President of The Stella Group, Ltd. which is a strategic technology optimization and policy firm for clean distributed energy users and companies, with a focus on system standardization, modularity, and web-enabled diagnostics. I am also an Adjunct Professor at the George Washington University teaching a unique multidisciplinary sustainable energy course. On November 4, 2010 Secretary Locke approved my appointment to the Department of Commerce Renewable Energy and Energy Efficiency Advisory Committee (RE&EEAC).. I facilitate a specialized energy security series through National Defense University and have many projects with the US Department of Defense,

Sseurity and intelligence agencies on technologies and risk, as well as optimizing renewable energy and energy efficiency.

I started my energy career serving as a military and energy aide to Senator Jacob K Javits (NY) on his Washington personal and Committee staff for nine years, and cofounded the Congressional Solar caucus in the mid-1970's where most of the renewable energy legislation first was passed by the US Congress as a result of the first and second oil embargos..

I serve on the Boards of Directors of three national non-profits: Business Council for Sustainable Energy (climate change), Renewable Energy Policy Project (energy analysis), and The Solar Foundation. I also serve as Steering Committee Chairman of the Sustainable Energy Coalition, composed of the 20+ national energy efficiency and renewable energy industry organization, advocacy groups, think tanks, and environmental groups.

I have coauthored two books, *"The Forbidden Fuel: A History of Power Alcohol*," published in 1985 which was updated and re-released in 2010 by University of Nebraska Press, and a *"Consumer Guide to Solar Energy"* first published in 1998 and is in its third publishing.

My professional qualifications are attached to this testimony as JNT000002.

Q.2. Please explain why you were unable to file your testimony as scheduled on October 21, 2011.

My mother had a major stroke and was in transfer to The Jefferson for rehabilitation therapy; her situation prevented me from submitting this input within the time constraints as required.

Q.3. What documents or information have you reviewed to prepare your testimony?

I have reviewed the NRC Staff's Draft and Final Environmental Impact Statements for Calvert Cliffs 3 (Exhs. APL000050 and NRC00003A). I have also reviewed the filings and decisions in this proceeding that relate to Contention 10C. In addition, I have reviewed documents and studies regarding the status of existing and planned wind and solar projects in Maryland and the region as well as wind and solar potential in Maryland and the region.

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

The purpose of my testimony is to discuss my views on Joint Intervenors Contention 10, which argues that the Environmental Impact Statement for the proposed Calvert Cliffs-3 nuclear reactor does not adequately consider the potential contribution of solar, wind, biomass and marine power to Maryland and the surrounding PJM grid

which allocates power to Maryland and surrounding states as alternatives to the proposed Calvert Cliffs-3 nuclear reactor.

Q.5. Why do you believe that the Environmental Impact Statement prepared for the proposed Calvert Cliffs-3 nuclear reactor does not adequately consider the potential contribution of solar and wind power to Maryland and the larger PJM grid that services Maryland with electricity?

I wish to point out that Contention 10, as admitted by the Atomic Safety and Licensing Board, is essentially a contention of omission—that the Applicants, in preparation of their Environmental Report, and the NRC staff, in preparation of their Final Environmental Impact Statement, which is based in part upon the Applicants' Environmental Report, have not adequately considered the potential contribution of of renewable energy-generated electric power as an alternative to construction of the Calvert Cliffs-3 nuclear reactor.

As a contention of omission, the burden is on the Applicants and the NRC staff to show that they have indeed met the requirements of the National Environmental Policy Act and that the Final Environmental Impact Statement does, in fact, adequately consider the potential contributions of wind and solar power as alternatives to Calvert Cliffs-3.

As Joint Intervenors showed in their initial contention and have continued to demonstrate in documents submitted during discovery during this proceeding, Applicants and NRC staff have consistently understated the potential contributions of solar and wind power to Maryland and the larger PJM grid, thus leading to a skewed portrait of those potential contributions.

I also wish to emphatically point out that all the renewable energy resources should be considered in an EIS profile of options, including baseload renewables sustainable biomass electric power and marine power (freeflow hydropower, wave, tidal, and ocean currents).

Q.6. In Section 9.2.4, in which the Final Environmental Impact Statement (FEIS) for Calvert Cliffs-3 examines a combination of alternatives that might be cost-effective, does the FEIS understate the potential contribution of wind power to Maryland and the PJM grid that services Maryland?

Yes. The FEIS assumes, in its discussion of alternatives to Calvert Cliffs-3, a contribution of only 100 MW of wind power, and notes that this would equal approximately 250-300 MW of installed capacity.[1]

[1] FEIS for Calvert Cliffs-3, NUREG-1936, May 2011, p. 9-28 (NRC 00003A)

Further down the same page, the EIS argues that quadrupling the amount of possible wind power, to 400 MW (installed capacity of 1000-1200 MW) would not materially change its assessment.

However, the potential contribution of wind power to Maryland and the PJM grid is significantly and substantially larger than that.

Q.7. What is the real potential contribution of wind power to Maryland and the PJM grid that services Maryland?

The US Department of Energy states that the "gross wind resource" (prior to siting and other restrictions) is estimated to be more than 4,000 Gigawatts out to 50 nautical miles.

According to National Renewable Energy Laboratory "*Large-Scale Offshore Wind Power in the United States,*" Maryland itself has 53.8 Gigawatts of offshore wind potential for areas up to 50 nautical miles from shore with average wind speeds 7 m/s or greater at 90 - m elevation.[2] Even accounting for wind's lower capacity factor, this would equal about 10 Calvert Cliffs-3 reactors, and is clearly many times more than the wind contribution contemplated by the FEIS. Total potential for the four nearby mid-Atlantic states (Maryland, Delaware, New Jersey, Virginia) is 262.6 GW.

[2] JNT000003

The U.S. Department of Interior, a crucial partner with primary jurisdiction over offshore wind projects in federal waters, announced a 'Smart from the Start' initiative in November 2010 to facilitate siting, leasing, construction of new wind and marine energy projects. One goal is "to fully harness the economic and energy benefits of the Nation's vast Atlantic wind potential…"[3] DOI plans to expedite the leasing framework for Atlantic wind by: identifying "wind energy areas" (WEAs) in the Atlantic, as well as Facilitating information gathering from key agencies regarding environmental and geophysical attributes and other uses of WEAs. DOE plans to assemble information in publicly available format for potential investors and applicants, and for use of BOEMRE[4] in evaluating lease sales in WEAs.

Besides the NREL report, a University of Delaware study also examined Maryland's offshore wind power potential.[5] This study pre-dates the NREL Offshore Resource report by a few months, however it is more site specific.

Page 11 describes the process used in assessing wind resources and how that translates into power production. The method used is a quick and dirty method in wind resource assessment and typically developers will fund an AWS Truepower or Second Wind company to do a more thorough analysis for deploying turbines.

[3] JNT000004
[4] Bureau of Ocean Energy Management, Regulation and Enforcement (formerly MMS)
[5] APL000010

The table on page 19 states that using existing, proven technology in shallow waters (0-35 m), there is potential to install 14,625 MW of capacity, generating 4,982 MW on average, under the given assumptions. This too is far greater (more than10 times greater) than the potential contribution for wind power provided in the FEIS.

That there is substantial real interest in developing this potential is well documented. NRG Bluewater Wind already has proposed a 600 MW wind farm off the coast of Maryland.[6] This single project, which would tap wind resources more than 12 miles from land, would itself provide four times the amount of wind power initially examined in the FEIS, and ½ or more of the amount the FEIS argues would not change its assessment.

In addition, Bluewater Wind has received approval to build a 450 MW wind farm off the coast of Delaware and is proposing to build another 350 MW off the coast of New Jersey, both of which would feed into the PJM grid that services Maryland. With these projects alone, which only scratch the surface of potential offshore wind power in Maryland and the region, the wind power produced would exceed that considered in the Calvert Cliff-3 FEIS.

The tremendous potential for offshore wind in Maryland and the mid-Atlantic can also be seen in the October 2010 announcement by Google and GoodEnergies that they have established a consortium in a $5 billion transmission backbone to bring

[6] JNT000005

offshore wind in the region to the shore.[7] Such large investments in transmission are not made to transmit small amounts of electricity.

Q.8. In Section 9.2.4, in which the Final Environmental Impact Statement (FEIS) for Calvert Cliffs-3 examines a combination of alternatives that might be cost-effective, does the FEIS understate the potential contribution of solar power to Maryland and the PJM grid that services Maryland?

Yes, the FEIS assumes a contribution of only 75 MW from solar power, and discounts solar photovoltaics entirely. This may be due to an apparent misconception about the nature of "baseload" power and the ability of solar photovoltaics to provide reliable electric power.

The FEIS assumption of 75 MW of solar power ignores Maryland state law, which mandates that a minimum of 2% of the state's generating capacity be provided from solar power by 2022. This 2% minimum itself means that approximately 250 MW of power must be generated from solar power by that date.

However, this minimum amount is likely to be greatly exceeded.

Q.9. What is the real potential contribution of solar power to Maryland and the PJM grid that services Maryland?

[7] JNT000006

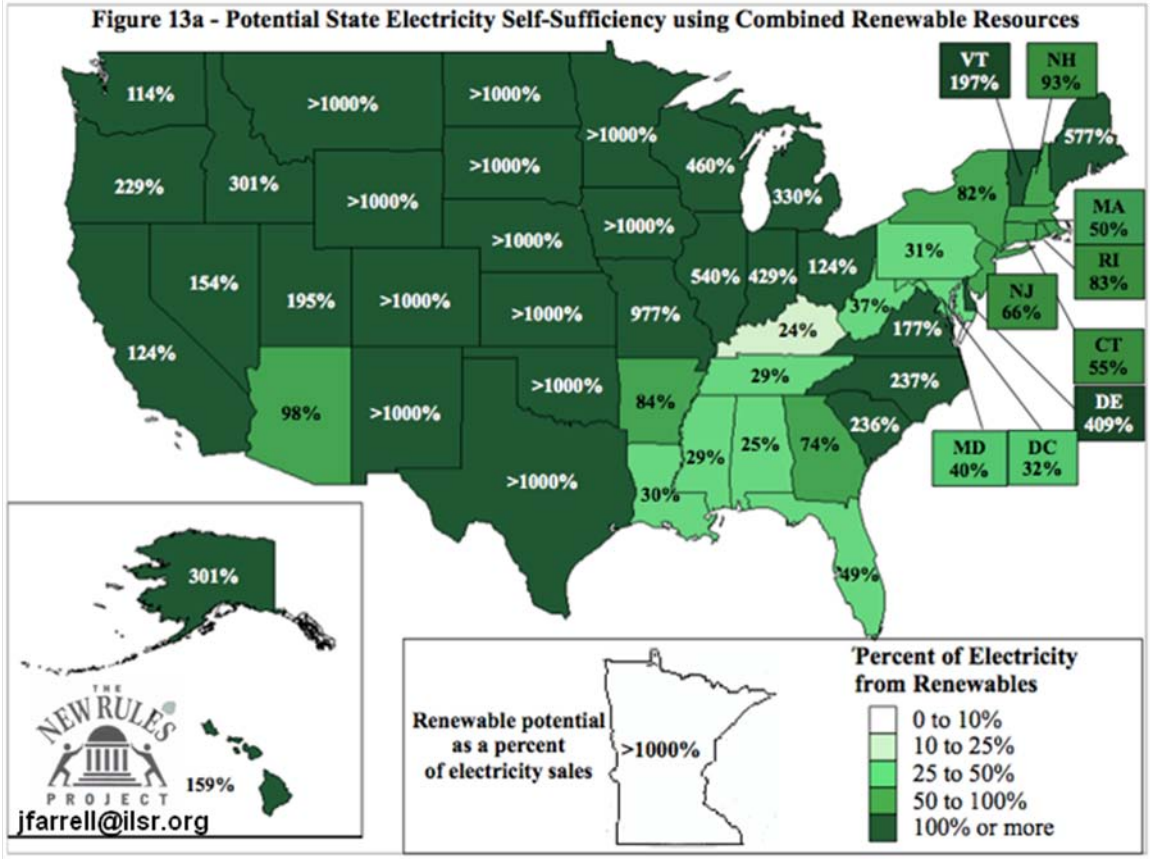
Maryland can meet 40 percent of its energy needs from land-based renewable energy resources, according to a report from The Institute for Local Self Reliance released in October 2009, authored by John Farrell, titled, "*Self Reliant States*."[8]

Following is an excerpt from the Executive Summary Conclusion:

"All 36 states with either renewable energy goals or renewable energy mandates could meet them by relying on in-state renewable fuels. Sixty-four percent could be self-sufficient in electricity from in-state renewables; another 14 percent could generate 75 percent of their electricity from homegrown fuels. Indeed, the nation may be able to achieve a significant degree of energy independence by harnessing the most decentralized of all renewable resources: solar energy. More than 40 states plus the District of Columbia could generate 25 percent of their electricity just with rooftop PV. In fact, these data may be conservative. The report does not, for example, estimate the potential for ground photovoltaic arrays – although it does estimate the amount of land needed in each state to be self-sufficient relying on solar – even though common sense suggests that this should dwarf the rooftop potential..... It is at the local level that new technologies like smart grids, electric vehicles, distributed storage, and rooftop solar will have their major impact."

[8] JNT000007

A map from the report is excerpted below. Note that this map and the estimate that Maryland could provide 40% of its power from renewable resources does not include any contribution from offshore wind for Maryland. In a brief August 16, 2011 update posted on the Institute's website, the authors take note of the University of Delaware study cited above and conclude that Maryland could generate 107% of its power needs from in-state and offshore renewable resources.



In a 2007 study, Energy Transition Report Prepared for Governor Martin O'Malley, "Maryland enacted a Renewable Portfolio Standard (RPS) in 2004. This law, the lowest RPS of any state that has one, requires 2.5% (and increasing to 7.5% by 2020) of the state's electricity to come from renewables. The RPS, however, has defined renewables broadly and included facilities located in the PJM grid area plus one state. This wide geographic area, particularly with the ever expanding size of PJM, has resulted in over 2000 existing facilities qualifying for the Maryland RPS. There is ample supply of current out-of-state resources to supply Maryland's RPS need through 2019, without constructing a single in-state facility."[9]

The Maryland 2010 Outlook states that Maryland's Renewable Portfolio Standard (RPS) requires that 20% of Maryland's electricity be generated from renewable energy sources by 2022, including 2% from solar energy. Maryland has made remarkable progress toward achieving the peak demand reduction target set by EmPOWER Maryland. Utilities have committed to reduce peak demand by 1,933 MW in 2011 and by 2,850 MW in 2015. If realized, these reductions will, in fact, surpass the EmPOWER Maryland target. Maryland is working actively to promote renewable energy generation within the State. Grants to residential consumers for solar, wind, and geothermal heat pumps have soared from a few hundred last year to over a thousand expected to be awarded in fiscal year 2010. The Clean Energy

[9] JNT000008

Production Tax Credit offers a State income tax credit for electricity generated from qualified renewable sources. The State and the University of Maryland announced a long term power purchase agreement with four developers to jumpstart commercial scale renewable energy production, including on-shore wind, offshore wind, and solar. The State has also launched a technical study in 2009 of the potential for offshore wind and released a Request for Expressions of Interest and Information (RFI) from wind energy developers interested in developing wind energy generation facilities in Maryland's offshore waters. Maryland also spearheaded a Mid-Atlantic Off-Shore Wind Memorandum of Understanding (MOU) with Virginia and Delaware to work collaboratively to develop our shared coastal resources.[10]

The cost of solar power, particularly photovoltaics, has been dropping sharply over the past few years. A 2010 report titled *Solar and Nuclear Costs—The Historic Crossover* compares the declining costs of solar photovoltaics to the rising estimated costs of nuclear power and concludes that for North Carolina—which has only slightly better solar potential than Maryland[11]—solar became cheaper than nuclear in 2010 and the trendlines indicate that the cost gap will only widen.[12]

As the costs for solar photovoltaics are now competitive, and in many cases already cheaper than other forms of electricity generation, it is rational and logical to assume that more and more large electricity end-users will install solar PV systems

[10] JNT000009
[11] See JNT000016
[12] JNT000012 see especially chart on page 3.

in Maryland, as Perdue,[13] General Motors,[14] and the Washington Redskins[15] are doing or already have done in Maryland.

A March 2010 study by SolarTown shows huge potential for solar in Maryland.[16] It concluded that over 450 million square feet of roof space would be suitable for solar panels in the State of Maryland. The space that is available for solar panels would add over 5,000 megawatts of capacity to the State—far, far greater than the 75 MW credit granted in the FEIS. SolarTown estimates that if solar energy systems on the roof space eligible on these homes were installed, 24% of the residential needs of the State would be met.

Recent experience shows that this kind of potential is quickly becoming reality. For example, see the attached list of recently completed projects of just two regional solar companies, Sun Edison and Standard Solar, provided to this author directly from the companies.[17] These total 16,422 KW, or 16.4 MW in Maryland (including PJM states Delaware, New Jersey, Pennsylvania, and Washington DC, these two companies alone recently have installed 43,110 KW, or 43.1 MW). This indicates that a potential solar photovoltaic contribution of well above 75 MW is well within reach, particularly given the rapidly declining costs of this technology. Indeed, it is likely that the 75 MW threshold of the FEIS will be exceeded before Calvert Cliffs-3

[13] NRC000037
[14] NRC000038
[15] JNT000020
[16] JNT000013

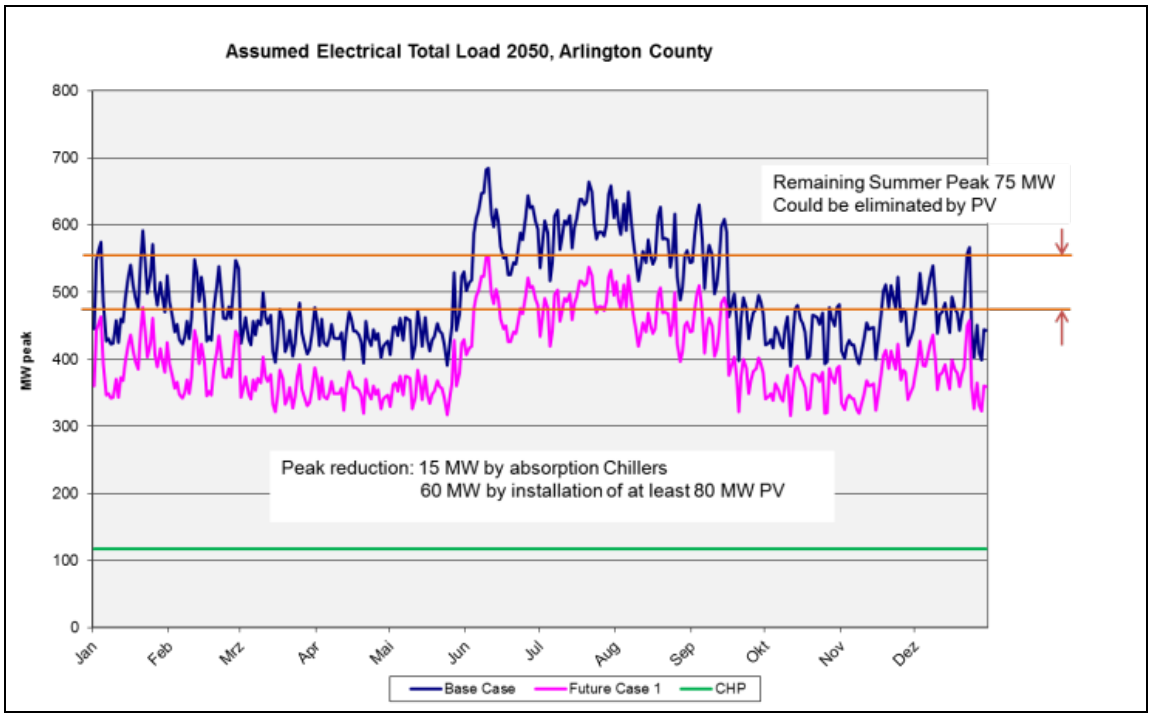
[17] JNT000014 and JNT 000015

could even be licensed and its reactor design certified, much less built and operating.

The best value solar can achieve is reducing the midday energy loads which are the highest cost power and when most people, businesses and institutions use electricity. The chart below from Arlington County, VA, just across the Potomac River from Maryland, plots electric power contributions from solar photovoltaics and combined heat and power.

Line losses are also not considered in the EIS calculations/ The Analytics of Valuing Time-Varying Solar PV Power. Assuming the solar PV power is both produced and consumed at the end-user's site, the value of that power is the cost of the alternative technology for delivering electricity to the end user: the marginal cost of central station generation adjusted for the electricity losses in the transmission and distribution of the power. In a competitive wholesale electricity market, the market price at any point in time will reflect the marginal cost of generation in that hour. Transmission and distribution line losses also vary over time. The standard engineering approximation of these losses is that they are proportional to the square of the flow on the lines. Actual losses in transmission and distribution to any one specific end user will, of course, vary with the location of the generation and end user on the grid. In aggregate, about 7% of power generation in the electricity grid is dissipated through line losses in the transmission and distribution system.[18]

[18] JNT000017



Solar photovoltaics can conservatively offset 1 GW of midday electric power and offshore wind power can easily meet 500 MW of early evening through early morning electric power. These are conservative estimates and these offset the Calvert Cliffs reactor without radioactive waste or concerns on nuclear terrorism. Combined heat and power, landfill gas and biomass electric, and marine energy (freeflow hydropower, wave, tidal, and ocean currents) can easily provide 3 GW of electric power in Maryland at prices under that of nuclear power.

Q.10. Can solar and wind power provide "baseload" power?

An underlying fallacy of the EIS and Applicants' Environmental Report is that technologies like solar and wind power cannot provide "baseload" power and thus should be substantially discounted as to their potential contribution to the electrical needs of a state or region.

This line of argument may have been relevant some years ago; it is much less relevant in 2011. The notion of "baseload" power has changed radically from the late 20th century.

It is stated that Calvert Cliffs-3 is intended to be a "baseload" power plant. However, because of electricity deregulation, the operators of Calvert Cliffs-3 can only sell their electricity to those entities that wish to purchase power from Calvert Cliffs-3. This reactor could only be a "baseload" power source to the extent that there are willing power purchasers for its electricity.

Moreover, as a merchant plant in a deregulated marketplace proposed by a company (UniStar Nuclear) that operates no other power plants of any kind, it is disingenuous to rely upon the "baseload" power argument in the context of Calvert Cliffs-3. The best nuclear power plants typically achieve slightly above 90% capacity factors. Nuclear reactors must periodically shut down, usually for weeks at a time,

for refueling and routine maintenance. Major maintenance typically requires additional shutdown. In addition, there appears to be a learning curve in using new technology and new reactor designs: historically, new nuclear reactors typically average far less than 90% capacity. For example, in 1985, not long after several large new reactors came online, the average U.S. capacity factor of nuclear reactors was only 58%. [19]

History suggests that Calvert Cliffs-3, which is to use a reactor design that has not operated anywhere in the world at this point, could not be expected to achieve a high capacity factor for some years. Since there is no experience or data for this reactor design, it is, in fact, unknown whether Calvert Cliffs-3 could ever achieve a high capacity factor.

In the case of a reactor operated by a major utility, back-up power supplies are typically available and used when necessary to provide electricity when reactors are closed for refueling or maintenance. In the case of Calvert Cliffs-3, this operator has no back-up power—other than from the general grid—available whatsoever. In that sense, Calvert Cliffs-3, as a stand-alone plant with no available back-up source of power, can not possibly meet a hypothetical standard of a "baseload" power source. It cannot and will not operate 24/7/365. And if the general grid has sufficient power to supply the 1600 MW that Calvert Cliffs-3 could (given sufficient power purchase

[19] JNT000019

agreements) provide when operating, then the question re-arises about need for the plant.

Conversely, smaller distributed power sources, such as wind and solar, typically require less backup power and suffer less downtime for maintenance (and, of course, none for refueling). Moreover, while the sun is not out at night, it does in fact rise every morning. And solar thermal plants, using hot heat-transfer oil or molten salt as heat storage, do operate well into darkness. Similarly, while it may not be windy 24/7/365 in any given location, wind does, in fact, blow somewhere at all times. As such, a power system based on distributed "intermittent" renewables (along with other renewables such as sustainable biomass) and increased energy efficiency as sought by Maryland's Empower Maryland Act, could in fact provide electricity more reliably than a large reactor with an average or below average capacity factor and no back-up power supply whatsoever.[20] And reliability is the true goal of "baseload" power.

The simple reality is that wind and solar power, especially coupled with modern grid practices, is far more able to meet Maryland's, and the entire mid-Atlantic's, electricity needs that is given credit for in the Calvert Cliffs-3 FEIS and can provide needed power on a much more flexible basis.

[20] See discussion *How do the competitors' reliability compare with nuclear power's?* pp21-26 of JNT000018 for further explanation of how renewable energy technologies can provide reliable power, and can, in fact, provide power more reliably than supposedly "baseload" nuclear reactors.

In Conclusion

In the context of the FEIS, substantial contribution can also be granted to natural gas (although Joint Intervenors believe no such contribution is necessary). Indeed, Joint Intervenors believe and argue that natural gas should be considered only a back-up power source to renewable power generation (instead of the other way around), which can, and we predict will, meet the needs of Maryland in the time frame in which the proposed Calvert Cliffs-3 reactor would operate. While such back-up power may be needed on occasion, it will be the power of last resort, rather than of first resort.

Joint Intervenors do not contest Applicants and NRC staff views on the future need for electricity in Maryland and the PJM service area, although we believe aggressive energy efficiency programs, such as those instituted by the state of Maryland, and ongoing technological improvements in energy efficiency can and will reduce electricity demand more than given credit for in the FEIS.

The FEIS for the proposed Calvert Cliffs-3 nuclear reactor does not adequately recognize the potential—we believe nearly certain—contributions wind and solar power can and will make to Maryland's and the PJM's electrical supply and thus its discussion of a Combination of Alternatives to Calvert Cliffs-3 fails to provide a legally-defensible picture of the situation. As such, the FEIS must be rejected as

written and must be re-researched, re-written, and re-submitted before the proposed Calvert Cliffs-3 nuclear reactor can be considered for licensing.