LeeCOLAEISComments Resource

From: Daniel Gamble [dan@invirodesign.com]
Sent: Tuesday, March 06, 2012 11:50 PM
To: LeeCOLAEIS Resource
Cc: Mussatti, Daniel; Doub, Peyton; Kugler, Andrew
Subject: Draft EIS Public Comment NUREG-2111
Attachments: NUREG-2111-Comment.pdf

Please see attached:

Federal Register Notice: 76FR79228
Comment Number: 80

Mail Envelope Properties (dff629d3e834cd5ee1c20925453db7ec)

Subject: Draft EIS Public Comment NUREG-2111
Sent Date: 3/6/2012 11:49:43 PM
Received Date: 3/6/2012 11:49:39 PM
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Files	**Size**	**Date & Time**
MESSAGE	24	3/6/2012 11:49:39 PM
NUREG-2111-Comment.pdf	90309	

Options
Priority: Standard
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Expiration Date:
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Officers of the NRC,

Please consider the data presented below in your deliberations:

I emphatically propose that there is an environmentally preferable alternative to the William States Lee III nuclear station. This alternative could replace any nuclear power plant, however it is particularly compatible with being installed at this very same site along the Broad River in Gaffney, SC.

This alternative is popular with the electorate, and far less controversial than nuclear, coal, or even natural gas. This alternative harnesses the same, virtually unlimited energy source that has reliably powered our planet for billions of years. Every human being recognizes its potency and can attest to its reliability. I propose that we harness the power of the sun, using industry tested and proven methods that have become newly affordable in 2011 with the massive increase in the global production capacity of both crystalline silica and pre-assembled Photovoltaic Modules.

Solar Alternative for New Baseload Development: Categorical Justifications

Waste
Solar PV generates no nuclear waste, and minimal landfill material. It has no ongoing mining or transportation of fuel, and no need to process effluent. As such, it is incomparably superior to any conventional means of electrical power production.

Availability of modules
Solar Photovoltaics are a mature technology, with global acceptance and a growing list of manufacturers, together producing around 30 Gigawatts of modules annually. The photovoltaic effect has been a recognized means of producing electricity since the 19th century, and has been successfully used for power production throughout the past 50 years in such extreme conditions as the Sahara desert, Antarctica and the vacuum of space. Finally, in 2011, solar PV has surpassed the initial investment costs of building new nuclear reactors (per MW nameplate rating). Thus, solar power will likely dominate the 21st century as the only cost-effective power source limited neither by fuel prices and availability (like all conventional power sources) nor by specialized geographical phenomena (like wind, hydro and tidal energy).

Cost
Solar PV is cost competitive. The Lee Nuclear Station will produce 2.2 Gigawatts for a cost of 14 billion dollars (6.36 dollars per watt). This is expensive when compared with solar power, at an installed market price of $3.00 per watt[1] (as of mid-2011), 14 billion dollars = 4.67 Gigawatts. Given the statistical hourly availability factor of 25%[2], or even the more conservative 20% availability in this area adjusted for statistical weather events

[1] HTTP://SOLARCELLCENTRAL.COM/COST_PAGE.HTML
[2] NUREG-1437

and a 5 degree low profile array tilt,[3] this is the equivalent of a 1 Gigawatt plant running 24/7.

Furthermore, given the falling cost of solar and rising cost of nuclear, we can project the cost of a solar facility that would come online by 2023, the completion date proposed for the second reactor at the Lee Nuclear station. Due to the relatively quick deployment time of solar (China put 2 gigawatts online in 2011 alone),[4] and the 15% annual decrease in price,[5] [6] we can project that a 10 Gigawatt solar plant (equivalent annual kWh output to a 2.2 Gigawatt Nuclear facility) would take 5 years to complete and cost around 11 Billion dollars if begun in 2018.

Other factors further improve the case for solar, as these up-front costs do not account for either cost of upkeep (Fuel costs, maintenance, personnel, etc) or return on investment (Deployment time, interest payments, disaster insurance, waste storage). For a nuclear facility, these expenses equal hundreds of millions annually, while for solar these costs are near zero.

Water

Since the purpose of the Draft EIS is to evaluate environmental issues and not financial data, let us regress to the topic of water. The NRC is in a unique position to conserve water, our most precious resource, by denying Duke Energy the chance to build this new nuclear station. Water is valued by the general public more highly than petroleum, electricity, or even food. Any design of power plant that so blatantly wastes our limited water resources is unacceptable. During the 40 year operating life of the William States Lee Nuclear Station, it would evaporate 600 Billion gallons of fresh water.

The proposed nuclear power plant may as well be fueled by clean drinking water - evaporating up to 43 million gallons per day, consuming more than 3/4 of a gallon for each kWh produced. Such consumption is irresponsible, environmentally unsound, and a threat to the health and well being of the downstream population. This is three times more fresh water than the entire populations of South Carolina (4.7 million) and North Carolina (9.65 million) combined will drink each day. If a 250kW Chevy V8 (335 horsepower) were fueled by water instead of gasoline, running wide open at 10 mpg, it would only consume 0.048 gallons per kWh, less than one tenth of what this proposed plant would burn. At the current cost of bottled water, the proposed 2.2 gigawatt facility would evaporate somewhere between 50 million dollars (sold in gallon jugs) and 400 million dollars (sold in small, fancy packages) worth of drinking water each day!

If the proposed power plant is truly safe, then it should be built in Downtown Charlotte, where the waste heat of cooling the reactors can be put to good use, heating homes and

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[3] http://rredc.nrel.gov/solar/calculators/PVWATTS/version2/pvwattsv2.cgi

[4] http://www.reuters.com/article/2011/11/11/us-china-power-solar-idUSTRE7AA4CR20111111

[5] http://solarcellcentral.com/cost_page.html

[6] http://energync.org/publication/levelized-cost-of-solar-photovoltaics-in-north-carolina

businesses in the winter and cooling them in summer with evaporative chillers. Unfortunately, the wide radius of the emergency planning zones outlined by the NRC makes any practical use of the waste heat impossible, as thermal losses preclude transmitting steam across a distance of so many miles. Perhaps instead we should condense the water evaporated by the power plant cooling towers and sell it in bottles labeled "Diluted Nuclear Power Plant Effluent" at the local convenience store.

Solar Photovoltaics do not evaporate any water during normal operation, and could even be used to harvest rainwater for agricultural or municipal distribution, using integrated gutter systems. The 2000 acre Lee site alone could collect 54 million gallons of water for each inch of rainfall, or approximately 2.5 billion gallons per year,[7] enough to fill "pond A" 6 times annually.

Storage

Water is more than just the fundamental unit of all life on earth. It can also the answer the question of storing solar energy, so that it will be available 24/7. Duke Energy Carolina currently operates 1.8 Gigawatts of pumped storage hydroelectric facilities less than 100 miles away.[8] Currently, these pumping stations are being used to store waste energy from existing base-load plants, which have significant excess capacity. If there is truly need for building additional base-load generation for 2023, as the proposed nuclear station pre-supposes, then these pumping stations will be obsolete in their current occupation, as there will be no significant waste energy to be stored. Thus, these pumping stations must be repurposed as storage facilities for renewable energy, creating a battery that can be charged during daylight hours to make solar energy available even at night. Repurposing these existing facilities is certainly the most cost-effective storage solution, as they are already connected to the 525-kV Oconee-Newport line intended for use by the proposed Lee site.

If on-site storage is a necessity, two notable battery technologies exist that are currently operating in utility-scale projects: Sodium Sulfur and Zinc-Bromine.[9] [10] Sodium Sulfur batteries, the most affordable non-toxic technology to date, at this scale would add approximately 300 million dollars per GWh of storage capacity to the project cost. These are commercially available from NGK corporation of Japan, and are being used in systems from 3 MWh to 2 GWh in Japan, France and the U.A.E. [11]

In order to satisfy the future need for base load development, it is clear that one of the above, industry proven technologies will need to be included in this project. In combination with solar PV, either pumped water storage or sodium sulfur batteries will

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[7] www.factfinder.scacog.org/factsheets/gaffney.pdf, NOAA statistic

[8] http://www.duke-energy.com/power-plants/pumped-storage-hydro.asp

[9] http://energystoragenews.com/Zinc%20Bromine%20Flow%20Batteries%20For%20Large%20Scale%20Stationary%20Electricity%20Storage.html

[10] www.redflow.com/

[11] http://energystoragenews.com/NGK%20Insulators%20Sodium%20Sulfur%20Batteries%20for%20Large%20Scale%20Grid%20Energy%20Storage.html

satisfy South Carolina's definition of "base load" as a facility "greater than 350MW and having at least 70% availability".[12]

Let us address the one remaining impediment to massive deployment of solar energy: the question of acreage. The environmental impact of installing solar PV on thousands of acres of land would be tremendous if it were to replace forests, wetlands or agricultural fields. Using virgin land for solar farms on this scale would be absurd. Fortunately for solar, our society has already turned millions of acres into barren wastelands ripe for the planting with solar panels. In the United States public road systems alone, there are over 12 million acres of pavement (assuming 12 ft wide lanes, not including medians)[13]. Privately owned rooftops and parking lots account for millions more.

Based upon the SRCC's national average minimum solar irradiation of 1000 BTU/sq ft/day,[14] 12 million acres of road adsorbs 540 trillion BTUh per day (less 3-5% reflectance), contributing significantly to climate change vs. more highly reflective natural landscapes. If less than half of these roads were to be covered with PV, it would provide 100% of our nation's annual kWh needs. While there are many strategies for distributed generation using solar PV, I advocate using public roads for these reasons:

- Harvest rainwater and eliminate stormwater runoff
- Use existing easements
- Simplify maintenance access
- Extend life of roads (UV and freeze-thaw protection)
- Increase safety of driving (eliminate water on roads)
- Built in electrical distribution network that is proportional to population density and adjacent to points of use
- Make new jobs where they are needed most – in places of high population density
- Employ existing maintenance crews and equipment

Other popular land management strategies include pastureland amongst pole-mounted PV arrays, rooftop solar arrays and solar parking structures. If Solar is installed on the proposed Lee Site, the 2000 acre site can accommodate 1 Gigawatt capacity of the most affordable commercially available solar modules, given a 5 degree south-facing tilt. (30%-40% higher energy densities are available from SunPower Corp. for a significant cost increase). A 5 degree tilt will increase summer production, while decreasing winter production, for a total annual kWh loss of 8.5% vs. the "ideal" latitude tilt of 35 degrees.[15] However, this small sacrifice is more than justified considering the increased energy density and reduced land disturbance. In recent years, low tilt systems have become the industry standard for large-scale rooftop installations.

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[12] SC Code Ann. 58-33-220, NUREG-2111: 9-7 (lines 10-12)

[13] http://www.bts.gov/publications/national_transportation_statistics/html/table_01_06.html

[14] http://www.solar-rating.org/certification/ogdocuments/RM-1.PDF

[15] http://rredc.nrel.gov/solar/calculators/PVWATTS/version2/inputv2.cgi?Cell_i_d_=0253386&Latitude=35.146&longitude=-81.548&State=South%20Carolina&Electric_r=8.286

Thank you for your consideration,

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