From: Richard Genaille <richardgenaille@gmail.com>
Sent: Sunday, December 2, 2018 3:15 PM
To: Thomas G. Benton; Paul D. Trampe; Chris Yakabouski; Kevin Marshall; Timothy J. McLaughlin; David Ross; Gary Skinner; grenewpc@gmail.com; 2012sheriffsmith@gmail.com; berkeleymaddox@gmail.com; spotsysalem@gmail.com; Jay Cullinan
Cc: Judy Genaille; Wanda Parrish; Patrick White
Subject: Fwd: EXTREMELY IMPORTANT - Additional Information On Solar Facility Fire and Electrocution Hazards

Supervisors, Commissioners,

This email concerns Mr Charlie Payne's unsolicited response (see below) to my communication to you regarding PV solar facility fire and electrocution hazards.

The thrust of Mr Payne's email is that the project design will utilize standard solar industry equipment and design standards. I would expect nothing less. But as we all know, tragic accidents occur in spite of best efforts to prevent them from happening. In this regard, I am not reassured by a simple statement from SPower's lawyer that "we and the county will be prepared in the unlikely event of a worse case scenario." Nor am I encouraged by the very simplistic and generic emergency response plan dated September 24, 2018 SPower/Swinerton submitted to the county.

Clearly, Mr Payne and I have very different concerns regarding PV solar fire safety issues. His concern is to insure the SUPs are approved with a minimum of encumbering conditions. Mine is to insure my wife and I can enjoy a long and happy retired life at Fawn Lake. I am sure you agree that even one fire event that takes lives, causes injuries, and destroys property is one too many.

My extensive search of relevant literature available online revealed that DC arc faults/flashes/blasts, while rare, are becoming a greater concern as utilization of PV solar power expands. Numerous articles written by electrical engineers, risk consultants, Insurance companies and state agencies on the subject have appeared in a variety of professional journals. A representative article titled "PV Solar Plants" in the June 12, 2017 issue of the International Association of Electrical Inspectors Magazine contains the following noteworthy paragraph:

"In actuality, arc-faults are only one of several ways a fire could start on a large-scale PV facility. Another reason for fires includes hot work (NFPA 51B) related to construction or repair work. Regardless of how a fire starts, an active fire mitigation plan is far more beneficial to preventing the hazard and damage associated with fires than only relying on arc-fault detection. The last thing any community wants is for a power plant to start a wildfire that could spread outside the facility. Simply employing arc-fault detection is insufficient to prevent this event. Additional measures such as fire breaks, on-site fire suppression, and coordination with any local fire service resources are crucial for overall fire safety."

I have included the author's (Bill Books) background information at the end of this email FYI.

It is also important to remember that the causes of DC arc faults/flashes/blasts can not be completely controlled or eliminated. The most frequently cited causes of DC arc faults/flashes/blasts are as follows.

1. Solar panel manufacturing defects

2. Loose connections due to installation errors or poor quality installation

3. Corrosion of joints/connections over time

4. Insulation degradation over time due to UV exposure

5. Insulation cracking over time due to changes in temperatures

6. Degradation of insulation due to aging

7. Damage to insulation by rodents, insects and birds

8. Damage to insulation during installation

9. Damage to insulation by future construction, system modification/upgrades, or site maintenance

10. Water ingress to cables and conduits

11. Water ingress to DC isolators due to faulty/poor quality installation

12. Water ingress to DC isolators due to degradation of seals over time

13. Water ingress to inverters

14. Water ingress to solar module junction box

I appreciate the information provided in Mr Payne's email regarding designed-in lightning strike protection. Again, I expect nothing less. However, my research on lightning strikes indicates that they are very unpredictable. Lighting is not always attracted to the tallest or most electrically conductive structures. Climate scientists and meteorologists do know that large open isolated areas with high temperature and high humidity attract lightning strikes. (Note: The heat island effect from 1.8 million solar panels will exacerbate the problem). Lightning is also known to jump from one structure (man made or natural) to another. It is well documented that lightning causes 20% of all wildfires in the US.

Given the number of thunderstorms we have in our area every year, and the presence of more than 2850 acres of remaining wooded/natural areas on the sites, it is naive to believe that there is a very low probability of lightning caused wildfires at the proposed mega solar facility during construction and expected 30 year operational lifetime.

As I have mentioned in previous verbal and written communications, the potential hazards from fire at the sites is greatly elevated by several factors.

1. The total area of the three sites is the same size as the city of Fredericksburg.

2. The nearest fire stations are 5-7 miles away from the closest access points to the sites. These distances do not include the distance from the site entrances to the fire location which could be as much as 2 additional miles in Site A.

3. The approach to the sites is via narrow, curvy country roads that will limit the speed of fire vehicles and increase response times.

4. There are a very limited number of access points to the sites that may not be close to the specific fire location.

5. The gravel roads and natural surface aisles between the solar arrays are not wide enough nor do they have the weight bearing capability to allow passage of large, heavy firefighting vehicles.

6. There will be no hydrant system on the sites.

7. PV solar panels continue to generate high voltage DC electrical power as long as some natural or artificial light source is available.

8. Fires involving DC arc faults/flashes/blasts can not be extinguished with water or foam retardants. Furthermore, the water or foam would become electrified jeopardizing the lives of firefighters and nearby residents.

I apologize for the very long email, but the potential for wildfires originating at the sites is a very serious problem that must be mitigated with SUP conditions to protect citizens' lives and property in a worst case scenario.

Very Respectfully,

Richard Genaille

Bill Brooks

Bill Brooks has worked with utility-interconnected PV systems since the late 1980s. He is a consultant to the PV industry on a variety of performance, troubleshooting, and training topics. Over the past 18 years, these training workshops have helped thousands of local inspectors and

thousands of electricians and installers understand PV systems and how to properly install them. His field troubleshooting skills have been valuable in determining where problems occur and to focus training on those issues of greatest need. Mr. Brooks has written several important technical manuals for the industry that are now widely used in California and beyond. His experience includes work on technical committees for the National Electrical Code, Article 690, and IEEE utility interconnection standards for PV systems. In 2008 he was appointed to Code-Making Panel 4 of the National Electrical Code. Mr. Brooks holds Bachelor and Master of Science degrees in Mechanical Engineering from N.C. State University and is a Registered Mechanical and Electrical Professional Engineer in North Carolina and California.

Sent from my iPhone
Begin forwarded message:

> **From:** Charlie Payne <cpayne@hirschlerlaw.com>
> **Date:** December 1, 2018 at 10:23:24 AM EST
> **To:** "'richardgenaille@gmail.com'" <richardgenaille@gmail.com>
> **Cc:** "Greg Benton (GBenton@spotsylvania.va.us)" <GBenton@spotsylvania.va.us>, "Paul D. Trampe" <PTrampe@Spotsylvania.va.us>, "Chris Yakabouski (cyakabouski@spotsylvania.va.us)" <cyakabouski@spotsylvania.va.us>, "kmarshall@spotsylvania.va.us" <kmarshall@spotsylvania.va.us>, "'Timothy J. McLaughlin'" <McLaughlinTJ@Spotsylvania.va.us>, "david.ross@spotsylvania.va.us" <david.ross@spotsylvania.va.us>, Gary Skinner <GSkinner@spotsylvania.va.us>, "'grenewpc@gmail.com'" <grenewpc@gmail.com>, "Howard Smith (2012sheriffsmith@gmail.com)" <2012sheriffsmith@gmail.com>, "'berkeleymaddox@gmail.com'" <berkeleymaddox@gmail.com>, "Mike Medina (Michael) (Michael.medina@norfleetquality.com)" <Michael.medina@norfleetquality.com>, "Daniel Menahem (dmenahem@spower.com)" <dmenahem@spower.com>, 'Patrick White' <PWhite@spotsylvania.va.us>
> **Subject: FW: EXTREMELY IMPORTANT - Additional Information On Solar Facility Fire and Electrocution Hazards**
>
> Mr. Genaille,
>
> I hope this finds you well. As you may be aware, I represent s Power and was forwarded your email to address. We appreciate your continuing input and want to ensure you the proposed facility will be safe and reliable, and that we and the county will be prepared in the unlikely event of a worse-case scenario. I'm also available at any time to further discuss and address any concerns you may have. I look forward to speaking with you.

Please note the following:

- The project design will utilize standard solar industry equipment and design standards including IEC 62305 Standard - *Protection against lightning, provides general principles to be followed for protection of structures against lightning, including their installations and contents, as well as persons.* The PV racking, all related equipment and systems, including the fence are grounded as required for protection. All structures shall be connected to the common grounding network, and this will provide a low resistance path for the strike to the ground as the common grounding network will have more than several miles of connected buried bare copper conductor.

SCADA control and monitoring of any faults

- The SCADA system is designed to immediately report all faults and failures to the sPower Control Center, which is staffed and monitored 24/7. When these faults and failures are received, sPower Control Center Operators respond by notifying on-site personnel or local emergency responders, as necessary. Given the potential risk introduced by DC power, a variety of protection and SCADA-based notification measures are incorporated into plant design. The solar inverters, which convert the DC power from the solar array to AC power to be delivered to the grid, incorporate extremely sensitive ground-fault sensing technology. Ground faults include any circumstance where current from the solar array is flowing anywhere but to the inverters, such as through a damaged wire to ground. When such a fault occurs, the inverters respond by immediately shutting the inverter down and ceasing current flow from the solar array to the inverter. Additionally, the inverters through a fault that causes alarms to be raised immediately in the sPower Control Center. In addition to the inverter-based ground fault protection, there are fuses in the inverter and within the solar array string combiner boxes that are sized to blow any time there is excessive current draw, such as during a short to ground or other equipment.
- To mitigate risk associated with AC power, sPower relies on multiple levels of protection systems in the project substation and at the inverters. When AC faults occur, these protection systems trip instantly to electrically isolate equipment and remove all fault current. When these protection systems activate, alarms are raised immediately is sPower's Control Center and operators respond by notifying on-site personnel or local responders, as necessary. As an additional safety measure, sPower configures its protection systems so that manual intervention by sPower personnel is required to return equipment to service after AC trips occur. This is safer than the approach taken with a lot of utility-owned equipment that can automatically close back in after a fault.

- We also, in conjunction with county staff and the fire department, will ensure adequate fire breaks. Also, please do not forget the site has many wetland areas and trees will be mostly cleared from the panel areas. We also have provided the county, after consulting with the fire department, an emergency response plan both during construction and operations. Further, unlike traditional fossil fuel operated generation facilities, solar facilities utilize less personnel, equipment, wiring, utility lines, connections, flammable materials, etc., and thus there is much less of a chance for incidents.

Again, please feel free to contact me with any further questions and appreciate your interest in this matter.

Respectfully,

From: Richard Genaille <richardgenaille@gmail.com>
Date: November 30, 2018 at 2:55:36 PM EST
To: <gbenton@spotsylvania.va.us>, <ptrampe@spotsylvania.va.us>, <cyakabouski@spotsylvania.va.us>, <kmarshall@spotsylvania.va.us>, <mclaughlintj@spotsylvania.va.us>, <david.ross@spotsylvania.va.us>, "Gary Skinner" <gskinner@spotsylvania.va.us>, <grenewpc@gmail.com>, <2012sheriffsmith@gmail.com>, <berkeleymaddox@gmail.com>, <spotsysalem@gmail.com>
Cc: Judy Genaille <traveler9722@gmail.com>
Subject: EXTREMELY IMPORTANT - Additional Information On Solar Facility Fire and Electrocution Hazards

Supervisors and Planning Commisioners,

We are deeply appreciative of the time and effort you are putting forth on behalf of citizens' concerns regarding the SPower Special Use Permit applications. We are also very thankful for you responsiveness and openness.

We remain concerned, however, that adjudication of the applications account for worst case scenarios given that the lives and property of so many citizens are at stake. In that vein, we offer the following addition information for your serious consideration.

Information we provided to you previously stated that solar fields are prone to lightning strikes. Lightning strikes are

responsible for approximately 20% of all wildfires in the US. If lighting strikes a tree located in the 2850 acres of wooded/natural area that will remain on Sites A,B and C, the resulting fire could quickly spread beyond the periphery to nearby residences. It is important to note here that SPower proposes to install solar panel arrays 50 feet from property lines.

Site A has been the scene of two tornado events over the past ten years. The tornados cut a large swath through the area. Tornados are capable of breaking solar panels from their mounting brackets and throwing them hundreds of feet from their installed location. As long as light is available, the panels will continue to generate DC electrical current even when separated from their mounts. The resultant arcing could cause an intense fire.

Water intrusion in solar panels, inverters and connecting cables is a well documented cause of DC arc faults/flashes/blasts. There are usually at least a few instances of torrential downpours in our area every year. If an arc fault/flash/blast ensued, 1000 volts or more of DC current could travel through storm water runoff to properties on the periphery of the sites imposing the risk of fire and/or electrocution at nearby residences. Again, it is important to note that SPower proposes to install solar panel arrays 50 feet from property lines.

There is no way to turn off a photovoltaic solar panel. As long as light is available, solar panels will generate DC electrical current. Even twilight, cloudy daylight, or emergency vehicle flood lights are sufficient to generate enough electricity to cause a shock. Individual panels are wired together in arrays. DC electrical current of 1000 volts or more (depending on available light) travels through cables to inverters where it is converted to AC current. There are no switches, circuit breakers or fuses to disconnect electrical power flowing from the solar panels to the inverters. There is a serious risk of fire in a DC system due to what are called arc faults, flashes or blasts. Arc faults reach temperatures of 5400 F and can melt metal which will fall out as molten slag. Arc faults can be explosive spewing shrapnel and molten metal at speeds high enough to penetrate the human body and cause high intensity fires. The most common causes of DC arc faults/flashes/blasts are manufacturing defects, improper installation, water intrusion, lightning strikes, UV deterioration of cable insulation, and rodent bites. There is a significant probability of arc faults given the number of solar panels (1.8 million), inverters, and miles of cables that could be present at the SPower sites. The proposed facility will put nearby residents, their

property, and the lives of our firefighters at elevated risk of fire and electrocution.

For the reasons described above, we strongly recommend the following conditions be included in Special Use Permits.

1. The applicant must provide a dedicated fire detection system and specially trained and equipped firefighters on site 24/7. The fire detection and firefighting capability must be capable of detecting and extinguishing a fire that originates on sites A,B or C before it reaches private residences located around the periphery of the sites.

2. All solar modules, inverters and related/connected equipment must be grounded and surge protected to prevent fires from lightning strikes as described in the 2018, EE publication article, "Lightning and surge protection for free-field solar farms".

3. A 300 foot wide non–combustible fire break must be constructed along the perimeter of sites A, B and C.

Again, many thanks for all you are doing to address citizen concerns.

Very respectfully,

Richard and Judith Genaille

Sent from my iPhone
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This email was Malware checked by UTM 9.
http://www.sophos.com

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