

December 18, 2013

Dear members and communities across North Carolina,

North Carolina is quickly moving up the ranks of states leading in solar energy. By the end of the year we are expected to have more solar photovoltaic (PV) capacity installed in NC than in 45 or 46 other states. The majority of this rapid growth is occurring in utility-scale ground mounted PV systems covering 5 to over 100 acres per system; however, installations on residential and commercial rooftops are also increasing. The recent sprouting of these solar farms means that many communities across our state are being asked to address solar-related land use permitting issues for the first time.

To address this challenge, the North Carolina Sustainable Energy Association and the North Carolina Solar Center initiated a project to engage stakeholders in the creation of a template solar development ordinance intended for local governments to adapt to their particular needs. Today the final product is available.

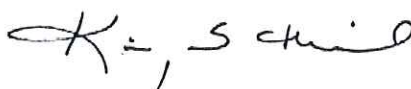
A broad range of stakeholders were involved in an open consensus drafting process--including local planners, state and federal agencies, power companies, agriculture, and environmental groups. The template is based on existing NC solar ordinances and leading national model solar ordinances and is intended as a balanced approach to solar development with sufficient flexibility for communities to tailor it to their local needs. In addition to the ordinance itself, there are numerous appendices with valuable information and resources on solar energy for local governments in North Carolina.

We encourage you to review these materials and hope that they will serve as a useful starting point for those communities that wish to create or update a local solar development ordinance.

Sincerely,



Johanna H. Reese  
Director of Government Relations  
North Carolina Association of  
County Commissioners



Kimberly S. Hibbard  
General Counsel  
North Carolina League of  
Municipalities



Ben Hitchings, AICP, CZO  
President  
North Carolina Chapter of the  
American Planning Association



## APPENDIX L: Template Solar Ordinance Working Group Participants

Argand Energy, Rob Lease  
Black and Veatch, Paul Brucke  
Buncombe County Planning Department, Josh O'Conner  
Carolina Solar Energy, Richard Harkrader  
Catawba County Planning Department, Susan Ballach  
Cleveland County Planning Department, Chris Martin  
DENR- Division of Water Quality, Bill Diuguid  
Dominion Power, Michael Thompson  
Duke Energy Progress, Bruce Barkley  
Federal Aviation Association, Peter Hughes  
Federal Aviation Association, Dana Perkins  
Governor's office military affairs, John Nicholson  
Granville County Planning Department, Dervin Spell  
Guilford County Planning Department, Les Eger  
HelioSage LLC, Kyle West  
Institute for Emerging Issues, Diane Cherry  
Keyes, Fox, Weidman, Laurel Passera  
Mathis Consulting, Ben Edwards  
National Renewable Energy Corporation (Narenc), Dennis Richter  
NC Association of County Commissioners, Kevin Leonard  
NC Association of County Commissioners, Johanna Reese  
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NC Chapter of American Planning Association, Ben Hitchings  
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NC Commerce Dept. - Community Planning, Betsy Kane  
NC Commerce Dept. - Community Planning, Oliver Bass  
NC Conservation Network, Nadia Luhr  
NC DENR - Military Affairs and Strategic Planning, Chris Russo  
NC Dept. of Agriculture - Agribusiness Development, Ron Fish  
NC Dept. of Agriculture - Environmental / ADFP Programs, Dewitt Hardee  
NC Dept. of Environment & Natural Resources (DENR), Trina Ozer  
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NC Forestry Association, Bob Schaefer  
NC League of Municipalities, Kim Hibbard  
NC Regional Councils, Betty Huskins  
NC Sierra Club, Dustin Chicurel-Bayard  
NC State University Cooperative Extension, Mary Lou Addor  
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Nicholas Institute for Environmental Policy Solutions, Larry Shirley  
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PCG Solar, John Galloway  
PCG Solar, William Lee  
Progress Energy, Kendal Bowman  
Public Staff - North Carolina Utilities Commission, Jay Lucas  
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SEPI Engineering and Construction, Jerry Beckman  
Smith Moore Leatherwood LLP, Beth Trahos  
Southern Alliance for Clean Energy, Charlie Coggeshall  
Southern Energy Management, Bob Kingery  
Southern Energy Management, Will Etheridge  
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USMC, Michael Evers  
USMC, MCIEAST, Paul Friday  
Warren County Planning Department, Ken Krulik  
Waxhaw Planning Department, Lisa McCarter

## APPENDIX G: Example Decommissioning Plan

This is a simple example decommissioning plan:

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Decommission Plan for Big Bright Solar Farm, located at  
123 Edge-of-Town Rd.  
Piedmont-ville, NC 21234

September 10, 2013

Prepared and Submitted by Solar Developer ABC, the owner of Big Bright Solar Farm

As required by the Town/County of \_\_\_\_\_, Solar Developer ABC presents this decommissioning plan for Big Bright Solar Farm (the "Facility").

Decommissioning will occur as a result of any of the following conditions:

1. The land lease ends
2. The system does not produce power for 12 months
3. The system is damaged and will not be repaired or replaced

The owner of the Facility, as provided for in its lease with the landowner, will do the following as a minimum to decommission the project.

1. Remove all non-utility owned equipment, conduits, structures, fencing, and foundations to a depth of at least three feet below grade.
2. Remove all graveled areas and access roads unless the owner of the leased real estate requests in writing for it to stay in place.
3. Restore the land to a condition reasonably similar to its condition before SES development, including replacement of top soil removed or eroded.
4. Revegetate any cleared areas with warm season grasses that are native to the region (~~Mountains,~~ Piedmont, ~~Sandhills or Coastal Plain~~ regions), unless requested in writing by the owner of the real estate to not revegetate due to plans for agricultural planting.

All said removal and decommissioning shall occur within 12 months of the facility ceasing to produce power for sale.

The owner of the Facility, currently Solar Developer ABC, is responsible for this decommissioning. Nothing in this plan relieves any obligation that the real estate property owner may have to remove the facility as outlined in the Special Use Permit in the event the operator of the farm does not fulfill this obligation.

The owner of the Facility will provide Town/County planning department and the Register of Deeds with an updated signed decommissioning plan within 30 days of change in the Facility Owner.

This plan may be modified from time to time and a copy of any modified plans will be provided to the planning staff and filed with the Register of Deeds by the party responsible for decommissioning.

SES Owner Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Landowner (if different from SES Owner) Signature: \_\_\_\_\_

Date: \_\_\_\_\_



## Solar Photovoltaic Systems Emissions Introduction

Tommy Cleveland, PE, Renewable Energy Project Coordinator,  
NC Clean Energy Technology Center at NC State University

Overall, per kWh of electricity produced, solar photovoltaic (PV) systems are orders of magnitude cleaner and healthier for our planet and all its inhabitants than traditional fossil fuel fired electricity production.<sup>1</sup> The solar systems do not release any emissions into the local air, water, or soil. The energy required to create the PV systems (including mining, processing, manufacturing, transporting, and installing), is generated by the PV system in about one year.<sup>2</sup> This leaves the remaining 24 to 49 years of the system's life to generate practically emission-free electricity (some operations and maintenance, including site visits by automobile and inverter replacements, are required).

At the end of the life of the system, the site needs to be decommissioned and the equipment properly disposed of. Ideally, the vast majority of the site materials will be recycled. Few PV panel recycling options exist in the US today, but are widely expected as the industry continues to grow and mature, and as early PV systems start to reach their end of life, thus generating a material stream of adequate size to cost effectively support such a market. Europe, who's solar development market had a 5 to 10 year head start on the US, has a pan-European scheme called PV Cycle that cost effectively offers PV collection and recycling services to panel producers.<sup>3</sup> Until the US PV recycling industry matures, there are still some obvious recycling pathways for many of the materials in a PV system, such as the copper and aluminum wire, and the steel and aluminum racking systems. The other key system components are the solar panels, the inverters, and the transformers. The modern transformers, unlike many of the legacy utility transformers in substations and by homes and businesses, do not contain a toxic oil. In fact, they contain very benign mineral oil or a food-safe vegetable oil. Many inverters meet the strict European Restriction of Hazardous Substances Directive (RoHS) which restricts (with a few exceptions) the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment. The inverters can be recycled in the existing US e-waste recycling industry because they are not unlike other power and consumer electronics in their makeup.

The majority of PV panels use a crystalline silicon PV cell. The PV cell consists only of non-toxic materials, however many of these panels use small amounts of lead-based solder and metallization pastes to wire together the many cells in a module. Lead is a toxic heavy metal that is in widespread use, but less than 0.5% of lead put into use in the US each year is for solder, of which only a very tiny fraction is for solder in PV panels. The primary use of lead is in lead acid batteries, ammunition, and in glass and ceramics.<sup>4</sup> While most PV panels use silicon cells, there is use of Cadmium Telluride (CdTe) panels in North Carolina. These cells are much thinner than silicon cells, and thus contain very small amounts of the toxic cadmium per module. Based on testing by a number of organizations on CdTe panels, there is not concern of release of cadmium from these panels during their life.<sup>5</sup> The only significant manufacturer of CdTe panels is the US company First Solar, who has a very robust collection and recycling program, even requiring in their sales contracts that they be contacted to assist in recycling of any of their modules taken out of use.<sup>6</sup> Finally, the majority of PV panels (silicon and CdTe alike) are considered non-hazardous due to successfully passing the required EPA Toxicity Characteristic Leaching Procedure (TCLP), which requires crushing the PV panel and putting it in simulated landfill conditions where its emissions to leaching water is measured.<sup>7</sup>

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<sup>1</sup> Environmental Impacts from the Installation and Operation of Large-scale Solar Power Plants, Brookhaven National Laboratory, [www.bnl.gov/pv/files/pdf/229\\_rser\\_wildlife\\_2011.pdf](http://www.bnl.gov/pv/files/pdf/229_rser_wildlife_2011.pdf)

<sup>2</sup> PV ENERGY ROI, Tracks Efficiency Gains, Solar Today June 2012, [www0.bnl.gov/pv/files/pdf/240\\_SolarToday%20June12\\_c.pdf](http://www0.bnl.gov/pv/files/pdf/240_SolarToday%20June12_c.pdf)

<sup>3</sup> [www.pvcycle.org/](http://www.pvcycle.org/)

<sup>4</sup> <http://minerals.usgs.gov/minerals/pubs/commodity/lead/>

<sup>5</sup> Emissions and Encapsulation of Cadmium in CdTe PV Modules During Fires, [www0.bnl.gov/pv/files/pdf/abs\\_179.pdf](http://www0.bnl.gov/pv/files/pdf/abs_179.pdf)

<sup>6</sup> [www.firstsolar.com/en/technologies-and-capabilities/recycling-services](http://www.firstsolar.com/en/technologies-and-capabilities/recycling-services)

<sup>7</sup> [www.seia.org/policy/environment/pv-recycling](http://www.seia.org/policy/environment/pv-recycling)