



**NC SUSTAINABLE  
ENERGY ASSOCIATION**

**Maggie Clark**

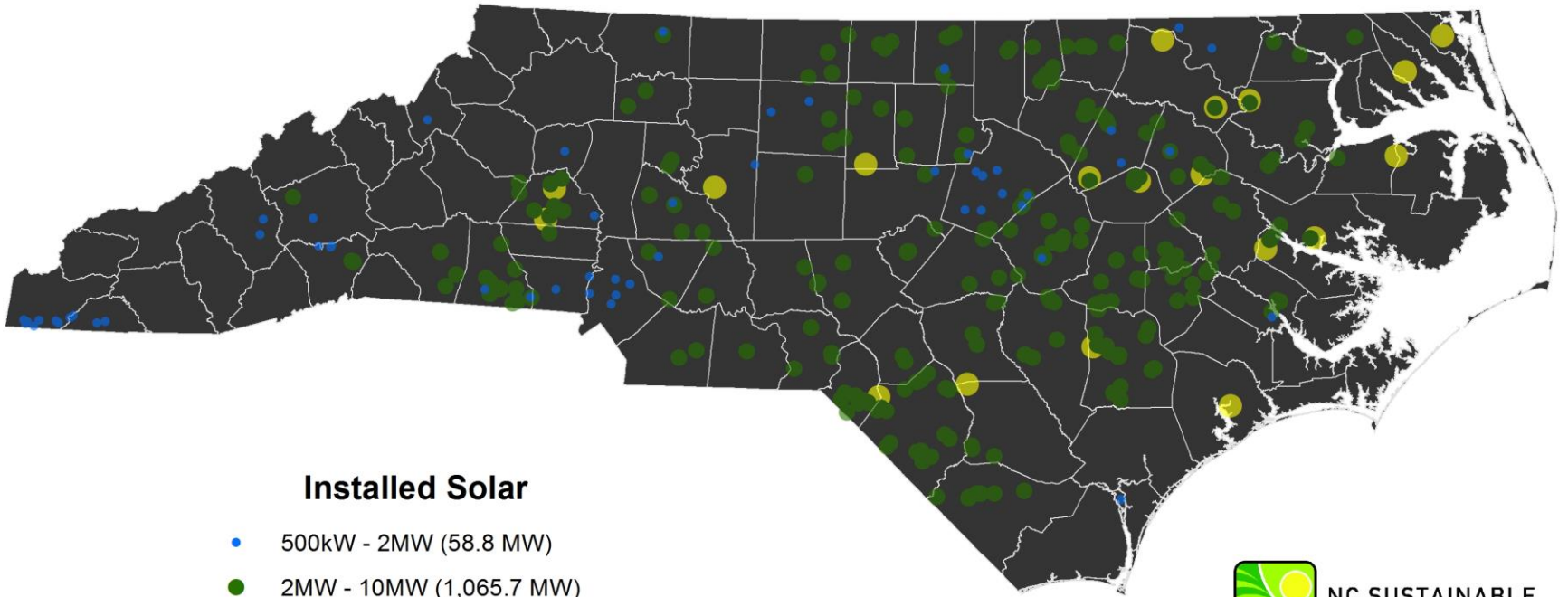
Interim Director of Government Affairs



# Asked to Address Three Topics:

- Information on current decommissioning processes
- How solar decommissioning is set out in contracts
  - See handout
- Quality control of solar panels manufactured by suppliers

# NC Installed Solar PV



## Installed Solar

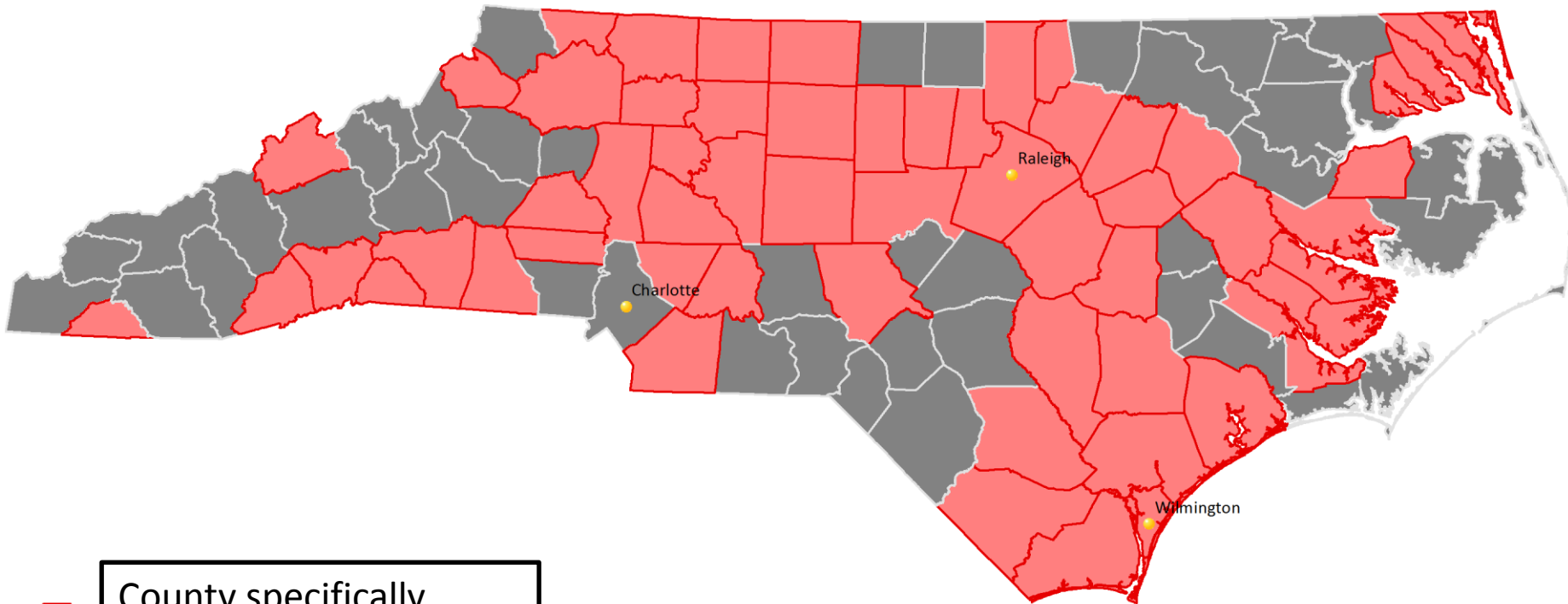
- 500kW - 2MW (58.8 MW)
- 2MW - 10MW (1,065.7 MW)
- 10MW and Greater (493.1 MW)

Data as of Feb. 1, 2016



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# NC Solar Regulation by County



County specifically  
addresses solar  
development in zoning  
code

Data as of 8/2015



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# NC Template Solar Ordinance (2013) – Working Group Participants



**Dominion**



**NC STATE UNIVERSITY**  
DEPARTMENT of  
FORESTRY and  
ENVIRONMENTAL  
RESOURCES  
[www.cnr.ncsu.edu/fer](http://www.cnr.ncsu.edu/fer)



Not pictured: NC Solar Industry Representatives



# Sample Decommissioning Language

- Courtesy of Strata Solar

End of Term. Upon the expiration or earlier termination of the Term, Tenant shall remove Tenant's Property, **vacate the Premises and restore the Premises to substantially the condition in which it existed as of the Rent Commencement Date**, subject to any alterations that are unrelated to Tenant's use or occupancy of the Premises and any clearing and grubbing of the Premises; provided, that upon at least ninety (90) days' advance written request by Landlord to Tenant, Tenant shall not remove those electrical lines and connections identified by Landlord.

**The removal of Tenant's Property and restoration of the Premises shall be completed in a manner that does not unreasonably and adversely affect the suitability of the Premises for farming purposes.** If Tenant fails to vacate the Premises in accordance with this Section 12, Landlord shall be entitled to holdover rent in the amount equal to one hundred twenty-five percent (125%) of Rent for the final year of the Term, prorated on a daily basis, for each day that Tenant fails to so vacate the Premises.

Note: "Tenant" = solar developer; "Landlord" = landowner



# Quality Control

- “Bankability Guidelines”
  - Longevity and performance of modules are critical to financial partners to realize their anticipated equity returns
- Tier classification system
  - FLS Energy only uses Tier 1 panels
    - Multiple engineering reports and third party vetting sources are used to verify module quality
    - Standard 20-year warranty for quality and performance
    - Banks that finance these projects are meticulous in scrutiny of financial and quality control

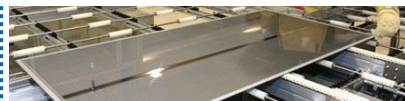


# First Solar's Recycling Business

# History of Leadership in Cost, Scale, and Sustainability



1<sup>st</sup> global module recycling program



1<sup>st</sup> to break \$1/watt cost barrier  
1<sup>st</sup> to produce 1GW in single year



World record 21.5% cell

World record 18.2% module

1999 ... 2005 ... 2007 2008 2009 2010 2011 2012 2013 2014 2015



Acquired EPC & project DEV



Financed ~11B solar plants



World's largest PV plants



Industry leading tracker technology



Proprietary plant controller



State-of-the-art Operations Center



Acquired disruptive x-Si technology



Integrating into the global energy mix

# State-of-the-art recycling technology and business model

- Technology based on crushing panels with shredder-hammermill and leaching with sulfuric acid and peroxide
- High yield (~90%) recovery of glass and semiconductor material for reuse in new glass and PV products and can process ~26,000 metric tons per year
- Continuously improving processes and technology and reducing operational costs
- Cost-effective contracts with 2-year termed renewable pricing and no up-front fees: “pay as you go” model using later year project cash flows
- Easily integrated into O&M, EPC, PV power plant and module sales agreements
- Increased volumes and rising disposal costs will lead to recycling becoming a commercially attractive business



# Product Safety and Durability of Thin Film CdTe PV

- CdTe is not Cd. CdTe is a highly stable semiconductor compound encapsulated in two layers of glass.
- There is very little CdTe in a PV panel. The semiconductor layer has half the thickness of a red blood cell.
- CdTe PV panels can be recycled at end-of-life. Over 140,000 metric tons of panels have been recycled through 2015.
- CdTe PV technology is proven. Over 100 million modules have been installed worldwide, and its safety and benefits have been confirmed by research institutes such as Brookhaven National Laboratory and the National Renewable Energy Laboratory<sup>1</sup>.
- At end-of-life, CdTe PV panels are non-hazardous according to the Method 1311 Toxicity Characteristic Leaching Procedure (TCLP).

Certification	Purpose
ISO 14001; ISO 9001; OHSAS 18001	Environmental management; Quality & Design; Occupational Health and Safety
IEC 61646; IEC 61730; IEC 61701; IEC 60068	Design qualification & approval; Safety qualification; Salt mist corrosion; Desert sand resistant
UL 1703	PV Module Safety and Reliability
UL; CEC; Golden Sun; MCS; JET	Regional standards: North America, Australia, China, U.K., Japan
Thresher Test & Long-Term Sequential Test	Long-term reliability under prolonged exposure to harsh environments
Atlas 25+ Durability Testing	Combined long-term environmental degradation stresses for PV modules
VDE Quality Tested	Certifying entire PV power plant systems for quality and reliability
Fraunhofer PV Durability Initiative	Durability benchmarking program confirming best-in-class long-term PV module durability

