Planning for Utility-Scale Solar Energy Facilities

BERKLEY GROUP

APA webinar

August 21, 2020

The Berkley Group

Darren Coffey, AICP

Co-founder and Principal

Denise Nelson, P.E., CFM

Environmental Engineer

Rebecca Cobb, CZA

Senior Planner

Agenda

- Introduction to the solar industry
- Land use impacts and recommendations
- Policy issues and recommendations
- Q&A

APA

American Planning Association
Planning Advisory Service
Creating Great Communities for All

September/October 2019

PAS MEMO

Planning for Utility-Scale Solar Energy Facilities

By Darren Coffey, AICP

Solar photovoltaics (PV) are the fastest-growing energy source in the world due to the decreasing cost per kilowatt-hour—60 percent to date since 2010, according to the U.S. Department of Energy (U.S. DOE n.d.)—and the comparative speed in constructing a facility. Solar currently generates 0.4 percent of global electricity, but some University of Oxford researchers estimate its share could increase to 20 percent by 2027 (Hawken 2017). Utility-scale solar installations are the most cost-effective solar PV option (Hawken 2017).

Transitioning from coal plants to solar significantly decreases carbon dioxide emissions and eliminates sulfur, nitrous oxides, and mercury emissions. As the U.S. Department of Energy states, "As the cleanest domestic energy source available, solar supports broader national priorities, including national security, economic growth, climate change mitigation, and job creation" (U.S. DOE n.d.). As a result, there is growing demand for solar energy from companies (e.g., the "RE100," 100 global corporations committed to sourcing 100 percent renewable electricity by 2050) and governments (e.g., the Virginia Energy Plan commits the state to 16 percent renewable energy by 2022).

Federal and state tax incentives have accelerated the energy industry's efforts to bring facilities online as quickly as possible. This has created a new challenge for local governments, as many are ill-prepared to consider this new and unique land-use option. Localities are struggling with how to evaluate utility-scale solar facility applications, how to update their land-use regulations, and how to achieve positive benefits for hosting these clean energy facilities.

As a land-use application, utility-scale solar facilities are processed as any other land-use permit. Localities use the tools available: the existing comprehensive (general) plan and zoning ordinance. In many cases, however, plans and ordinances do not address this type of use. Planners will need to amend these documents to bring some structure, consistency, and transparency to the evaluation process for utility-scale solar facilities.

Figure 1. Utility-scale solar facilities are large-scale uses that can have significant land-use impacts on communities. Photo by Flickr user U.S. Department of Energy/Michael Faria.

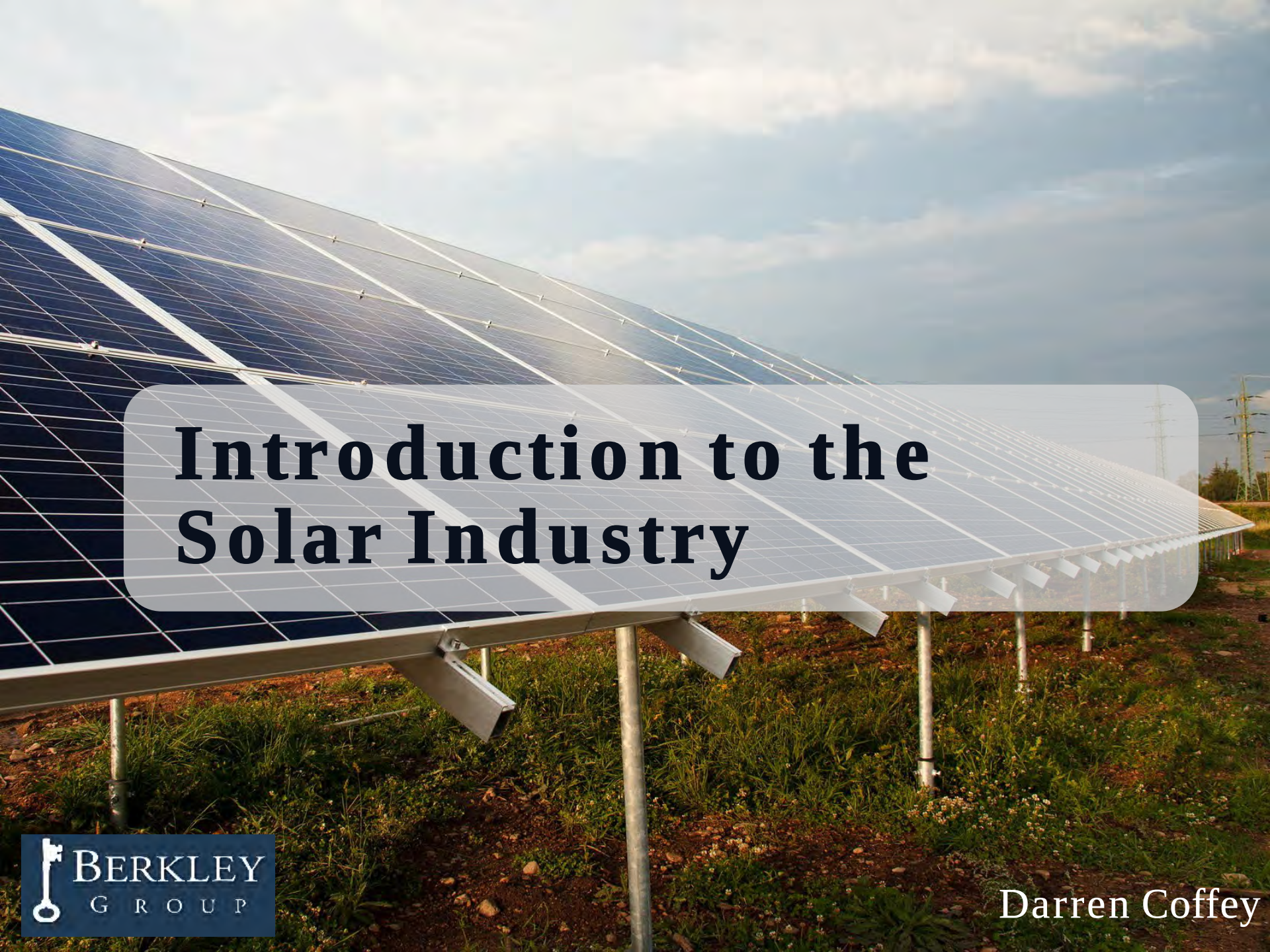
Unlike many land uses, these solar installations will occupy vast tracts of land for one or more generations; they require tremendous local resources to monitor during construction (and presumably decommissioning); they can have significant impacts on the community depending on their location, buffers, installation techniques, and other factors (Figure 1); and they are not readily adaptable for another industrial or commercial use, hence the need for decommissioning.

While solar energy aligns with sustainability goals held by an increasing number of communities, solar industries must bring an overall value to the locality beyond the clean energy label. Localities must consider the other elements of sustainability and make deliberate decisions regarding impacts and benefits to the social fabric, natural environment, and local economy. How should a locality properly evaluate the overall impacts of a large-scale clean energy land use on the community?

This *PAS Memo* examines utility-scale solar facility uses and related land-use issues. It defines and classifies these facilities,

Learning Objectives

- See how local and state governments are classifying utility-scale solar generation and storage facilities.
- Identify key parameters to analyze for land-use impacts and develop conditions to mitigate impacts.
- Identify language to incorporate in comprehensive (general) plans and ordinances to guide evaluation of proposed projects.



Introduction to the Solar Industry

BERKLEY GROUP

Darren Coffey

The Fastest Growing Energy Source

Solar photovoltaics (PV)

Benefits

- Pollution reduction
- Climate change mitigation
- Job creation
- Decentralization / redundancy / resilience

Scalable!

Utility-Scale Solar

Public or private energy generating facility

Connected to grid

~ >2 acres

~ >1 MW

Utility-Scale Solar Facilities

Solar PVs

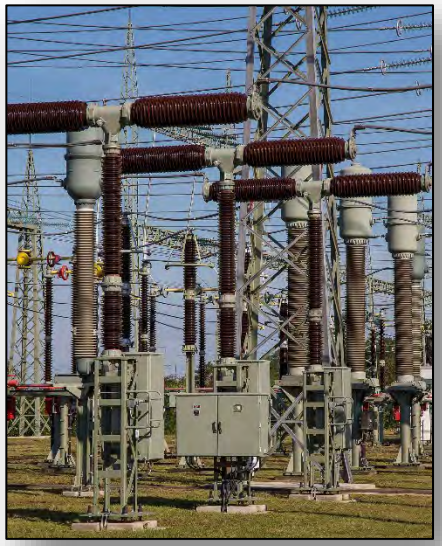
Inverters

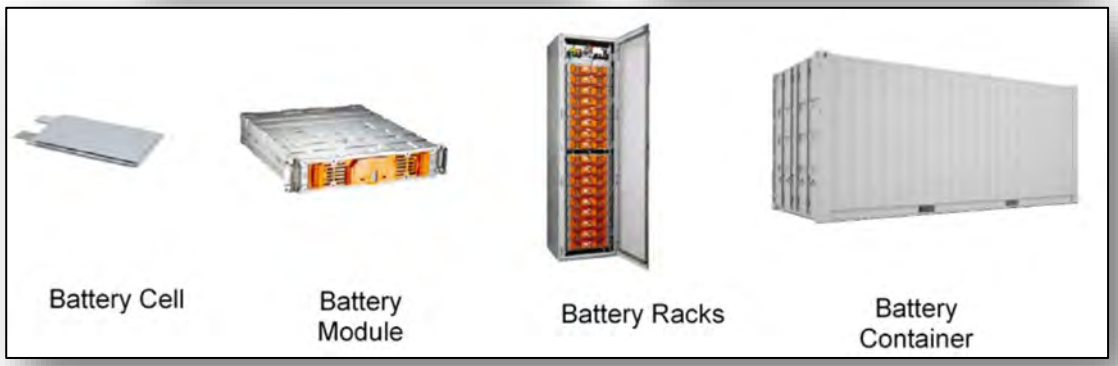
Substation

Switchyard

Generator lead lines (gen-tie lines)

Battery storage





Resources

ENERGY.GOV

www.energy.gov

eia Independent Statistics & Analysis U.S. Energy Information Administration

www.eia.gov

SEIA Solar Energy Industries Association®

www.seia.org

ESA Energy Storage Association

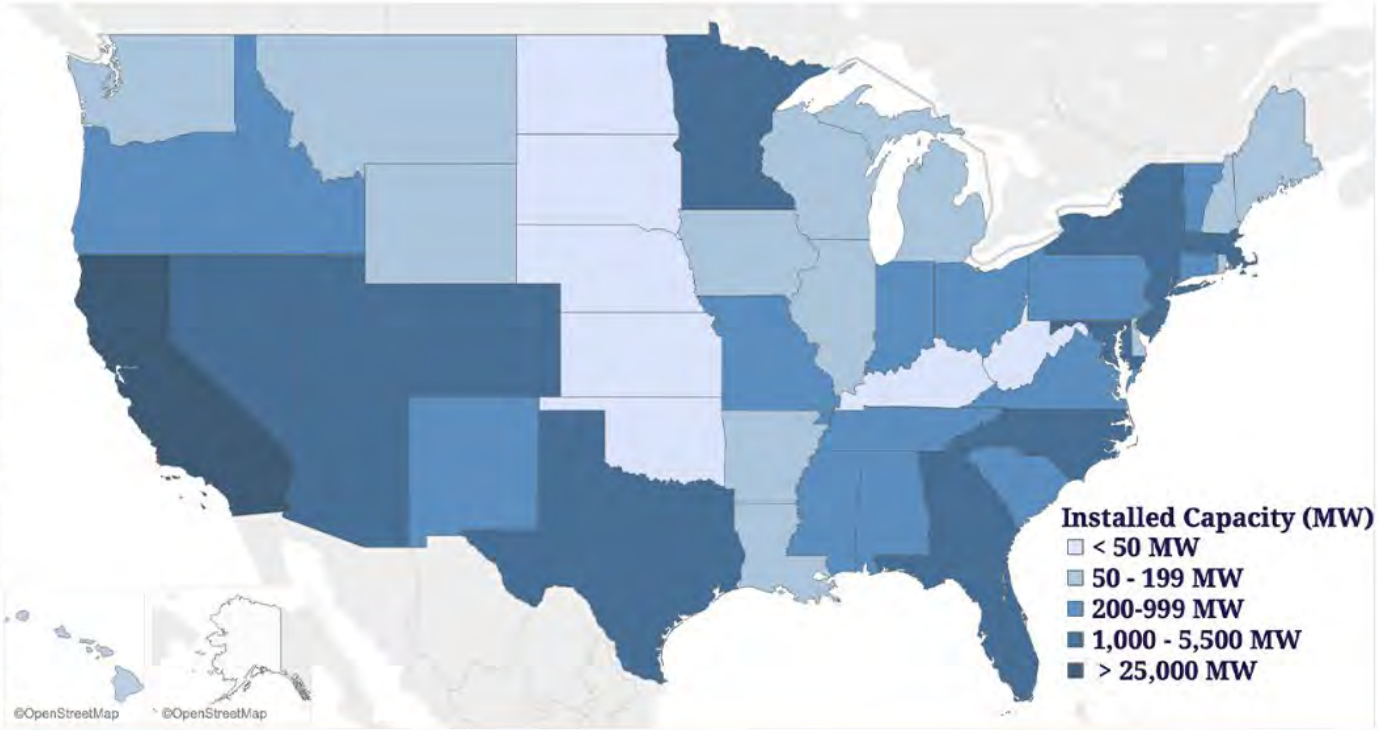
https://energystorage.org/

NC CLEAN ENERGY TECHNOLOGY CENTER

https://nccleantech.ncsu.edu/

Utility-Scale Solar Nation-Wide

Top 10 States	
California	25,016 MW
North Carolina	5,467 MW
Arizona	3,788 MW
Nevada	3,452 MW
Florida	3,156 MW
Texas	2,957 MW
New Jersey	2,829 MW
Massachusetts	2,535 MW
New York	1,718 MW
Utah	1,661 MW
Georgia	1,572 MW



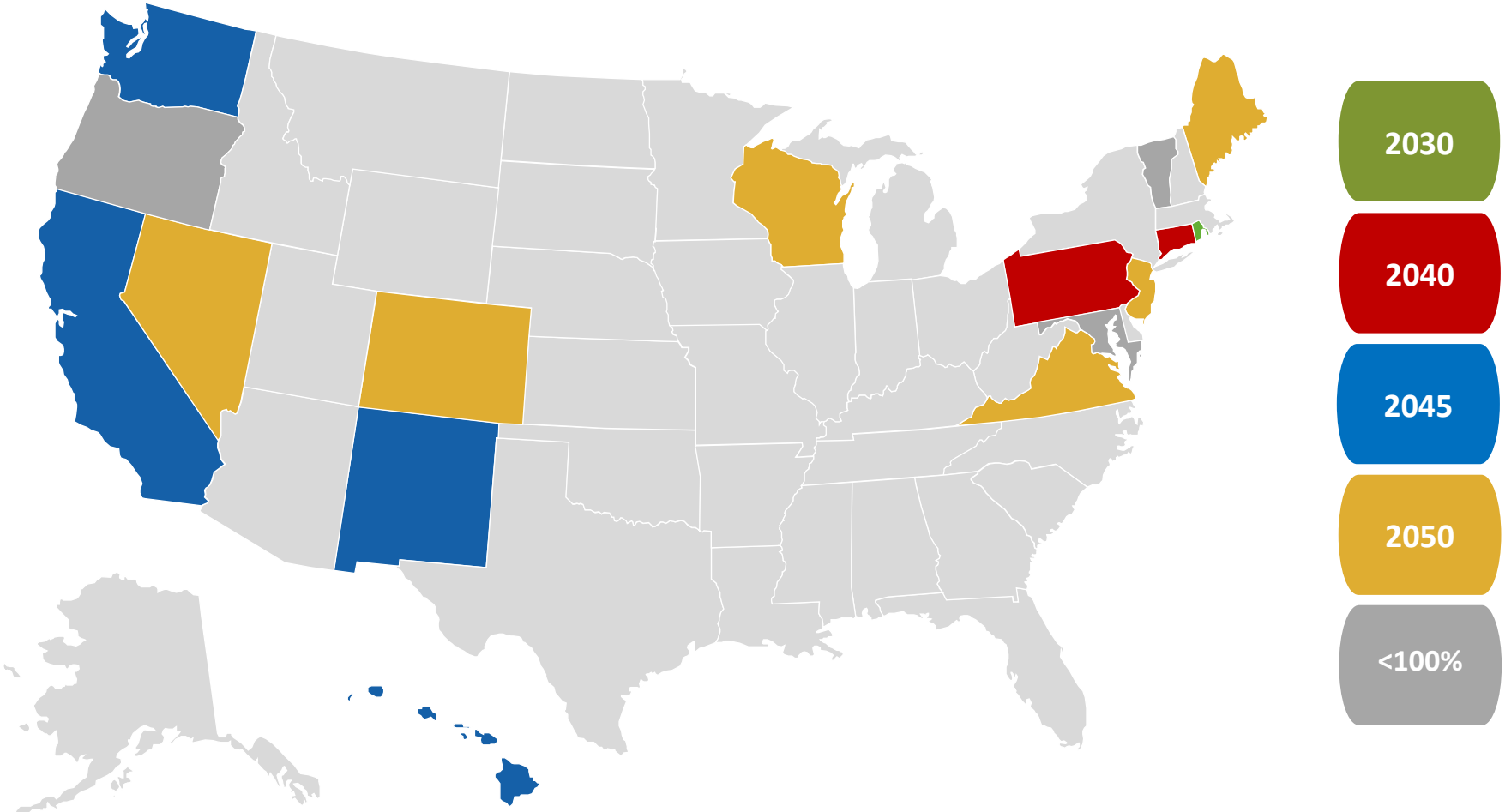
Wood Mackenzie POWER & RENEWABLES

SEIA Solar Energy Industries Association®

Private Demand for Clean Energy

These 100 companies have agreed to go to 100% green energy.

Public Demand for Clean Energy



These states have agreed to go to 100% green energy.

Clean Energy Demand in Virginia

Installed solar capacity

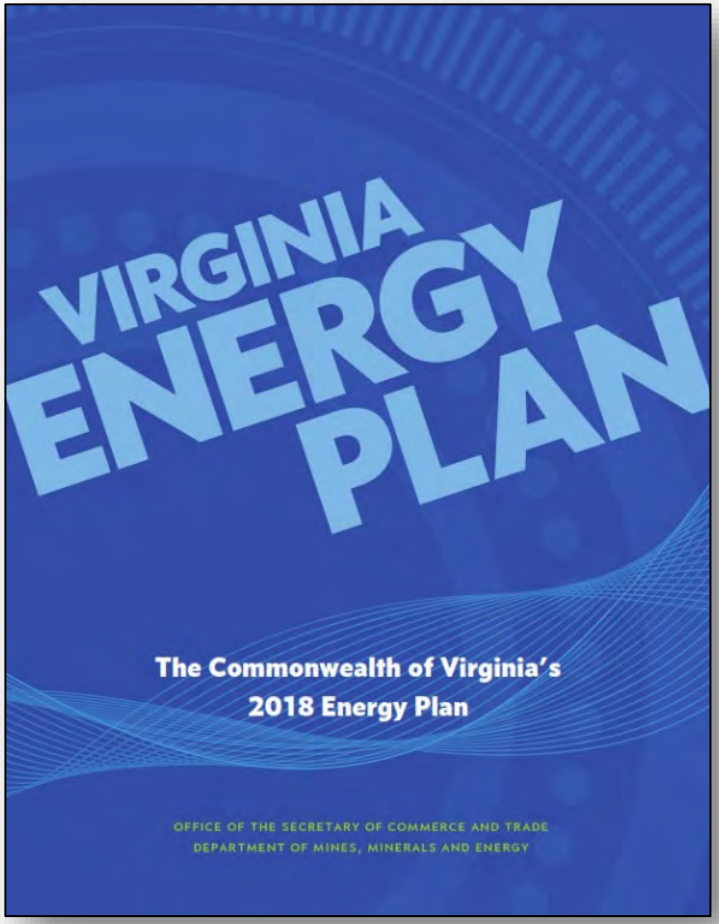
- 17 MW by 2014
- 470 MW by 2020

Solar and on-shore wind targets

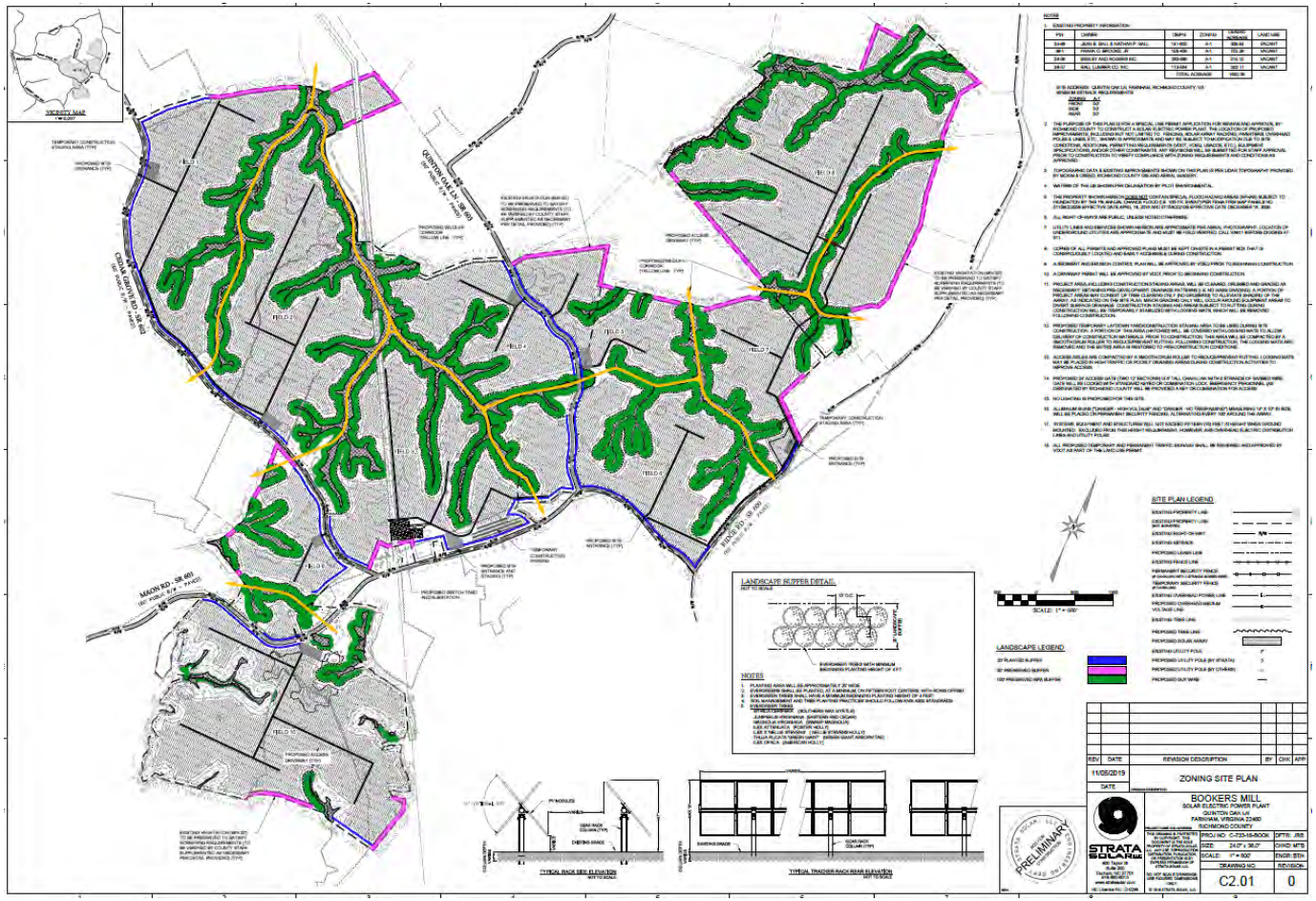
- 3,000 MW by 2022
- 5,500 MW by 2028

Storage target

- 3,100 MW by 2035



Planning for Utility-Scale Solar



Land Use Impacts and Recommendations

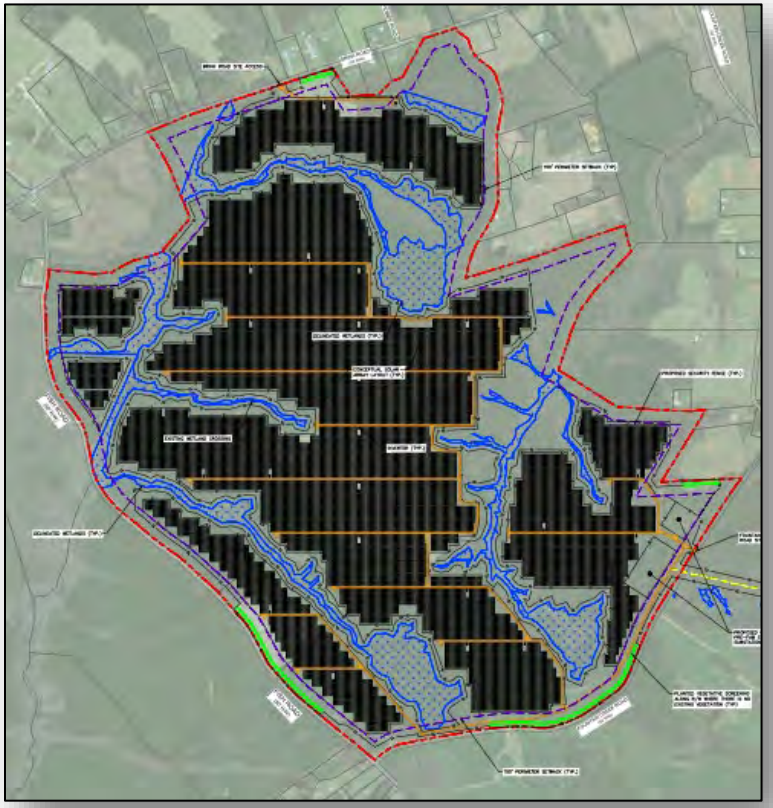
BERKLEY GROUP

Denise Nelson

Local Development

Solar developers work at the local level

- Identify potential sites
- Contact landowners
- Prepare development application

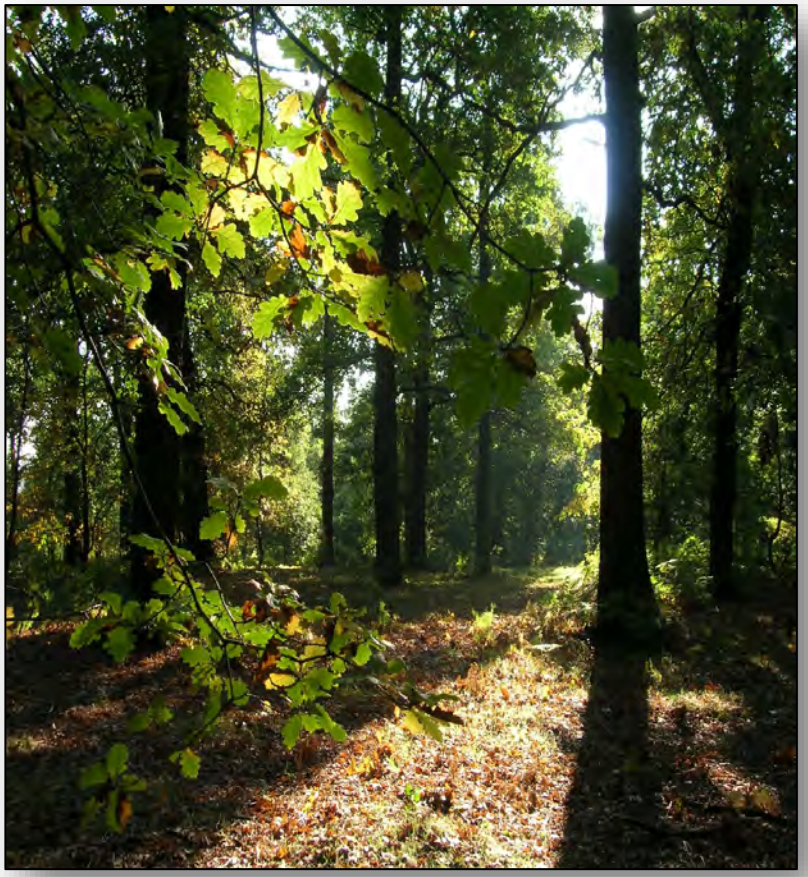


Land Use Impacts

- Changes in land use
- Location
- Size
- Concentration of uses
- Visual impacts
- Decommissioning
- Environmental impacts
- Economic impacts

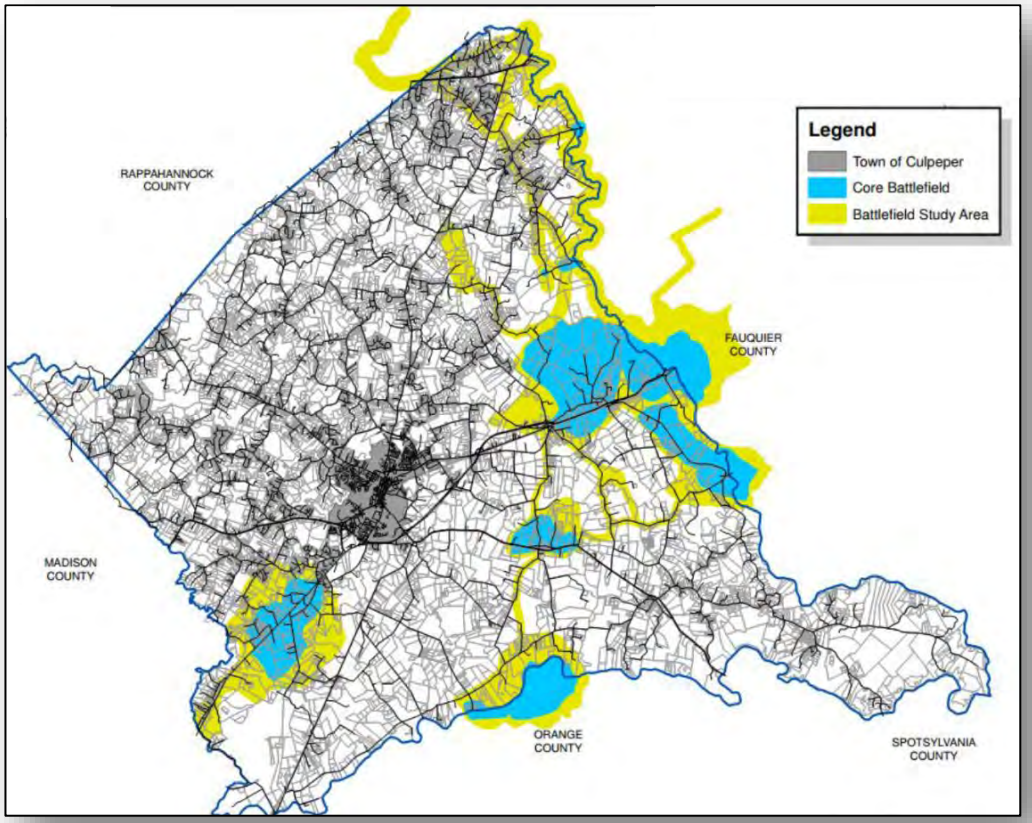
Changes in Land Use

- Agricultural and forested
- Residential
- Industrial



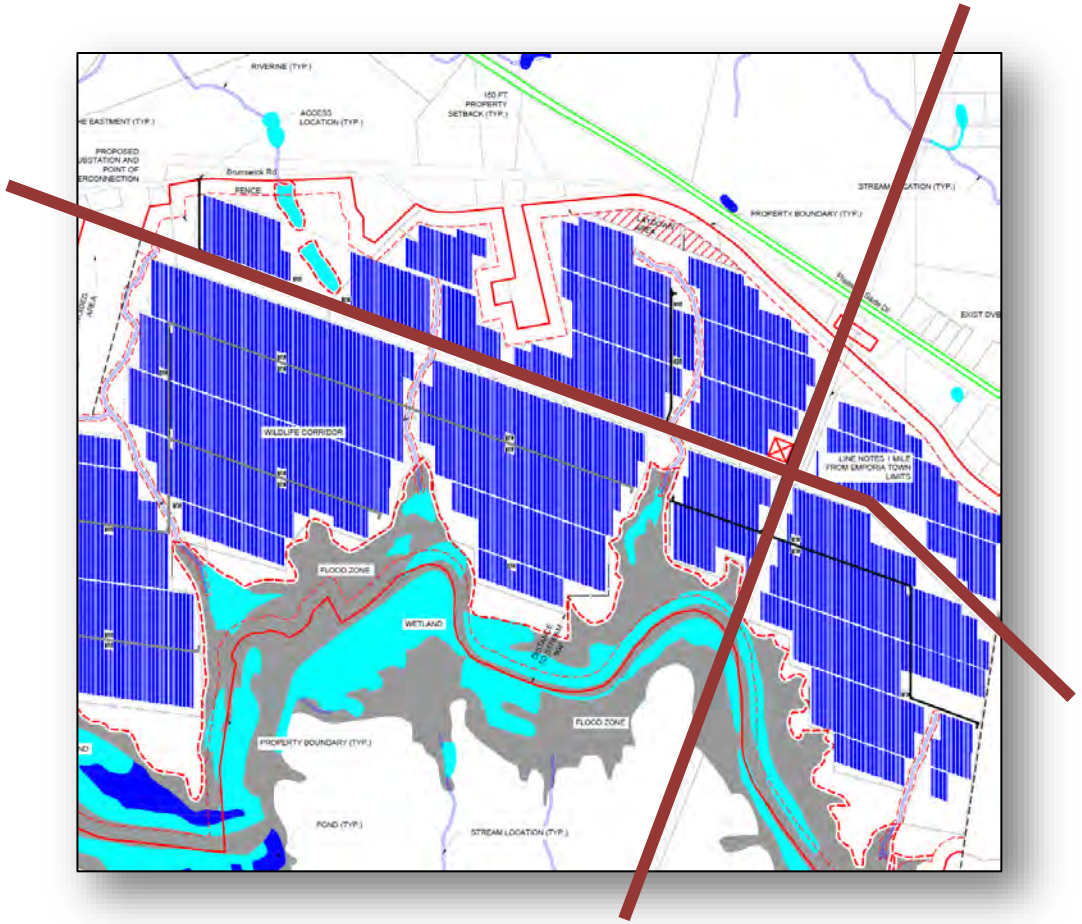
Locations to Avoid

- Growth areas
- Prime farmland
- Ecologically-sensitive sites
- Historical sites
- Adjacent residences or businesses



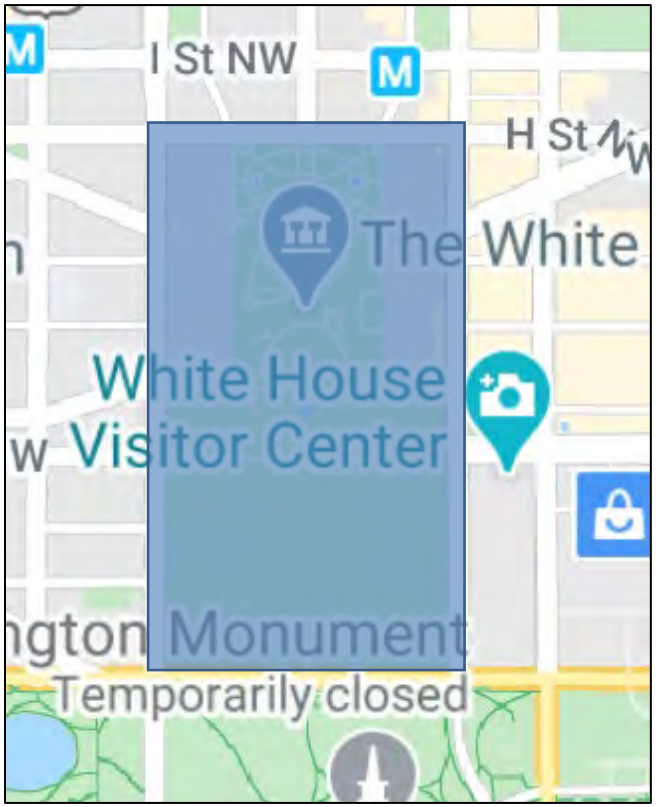
Locations to Consider

- “Invisible” areas
- Undesignated areas
- Brownfields
- Capped landfills
- Near transmission

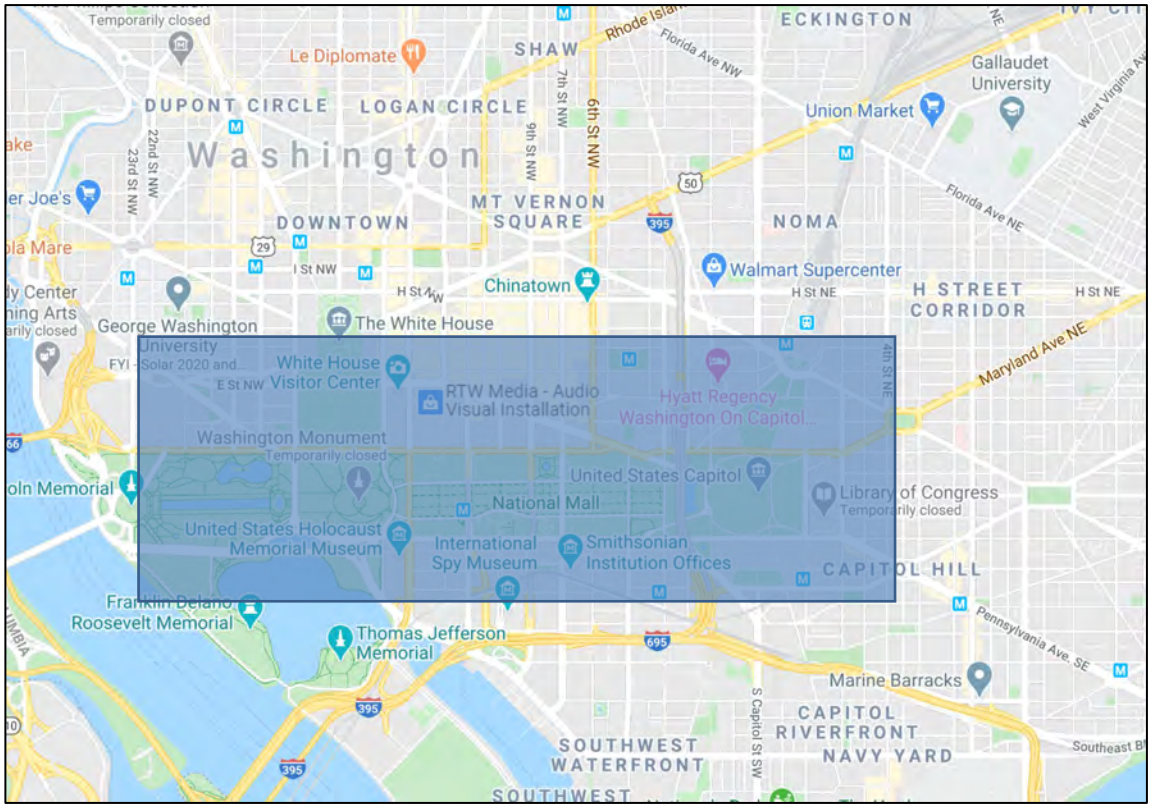


Size

2 MW / 20 ac

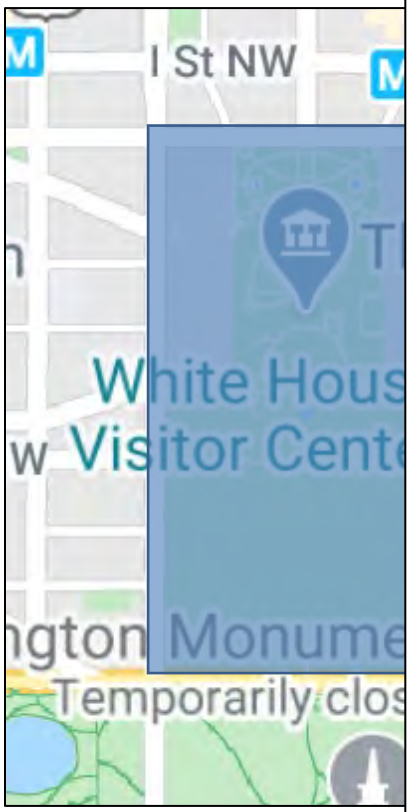


500 MW / 5,000 ac



Size

2 MW / 20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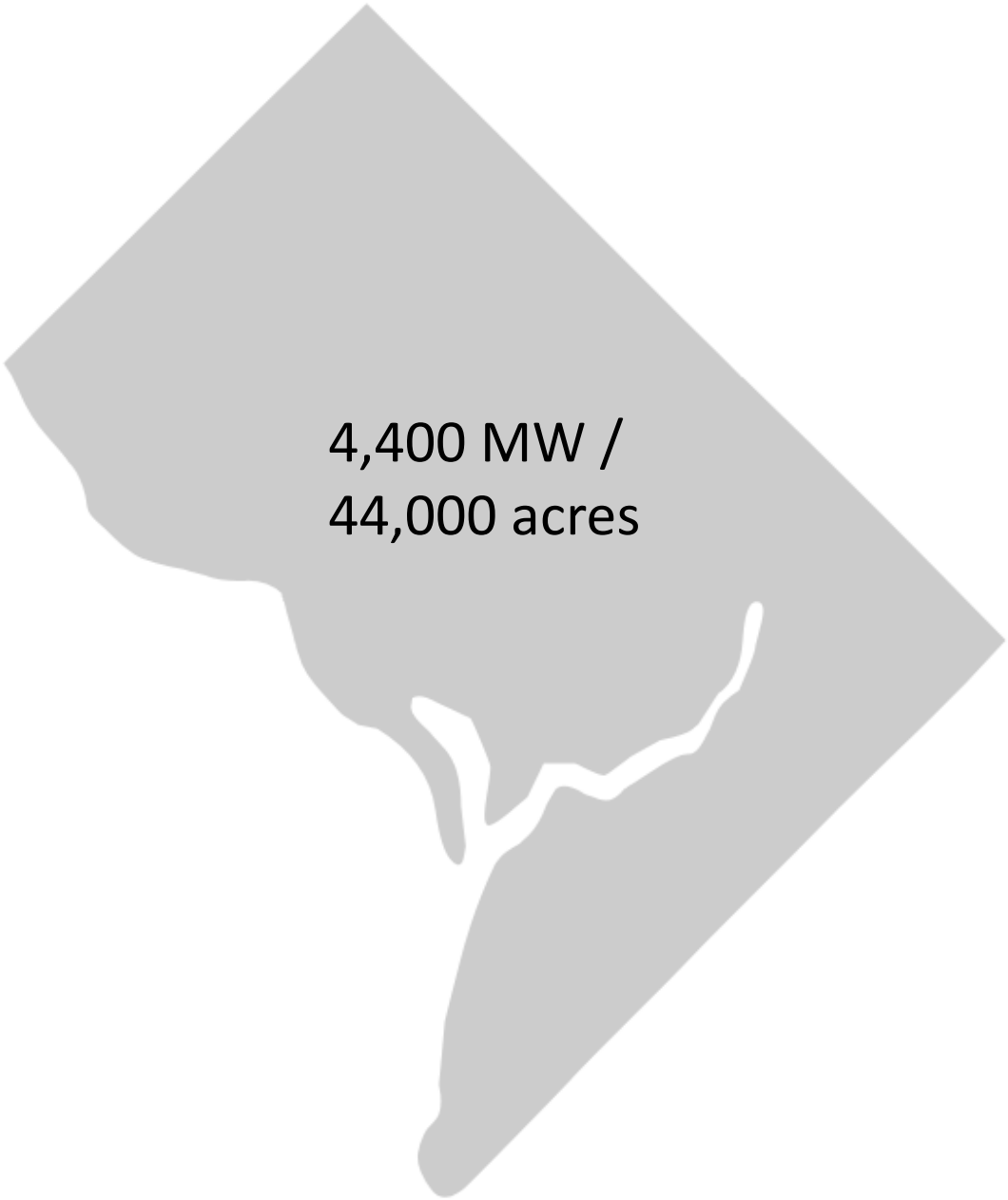

4,400 MW /
44,000 acres

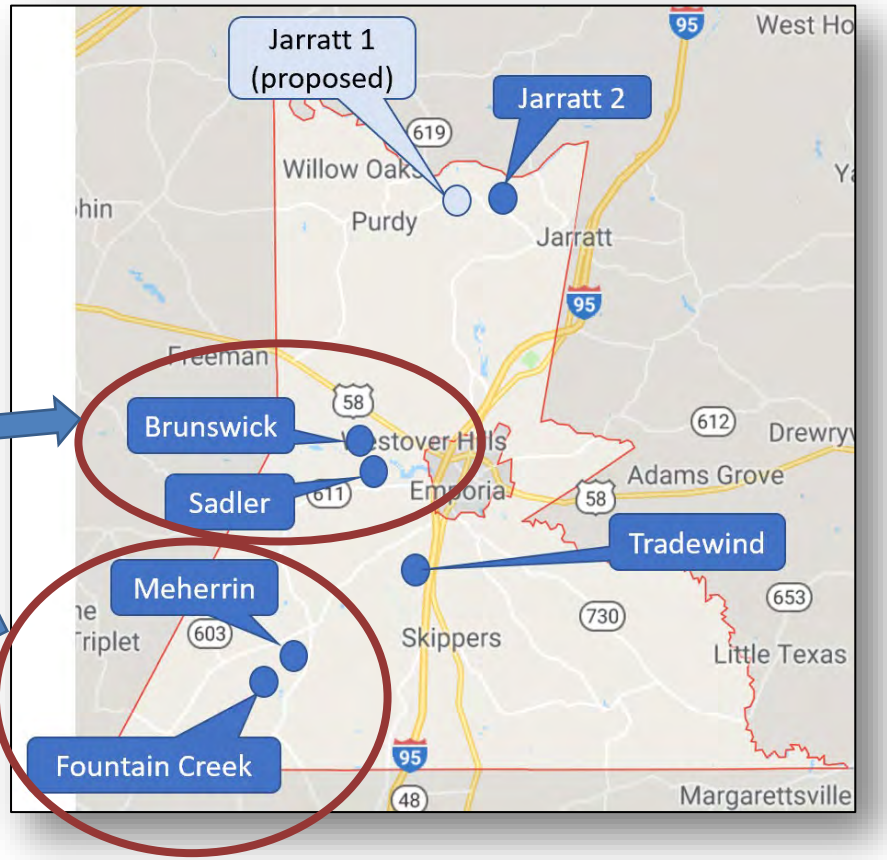

Gallaudet University
Florida Ave NE
H STREET CORRIDOR
H St NE
Maryland Ave NE
Library of Congress
Temporarily closed
Pennsylvania Ave, SE
Marine Barracks

Concentration of Facilities

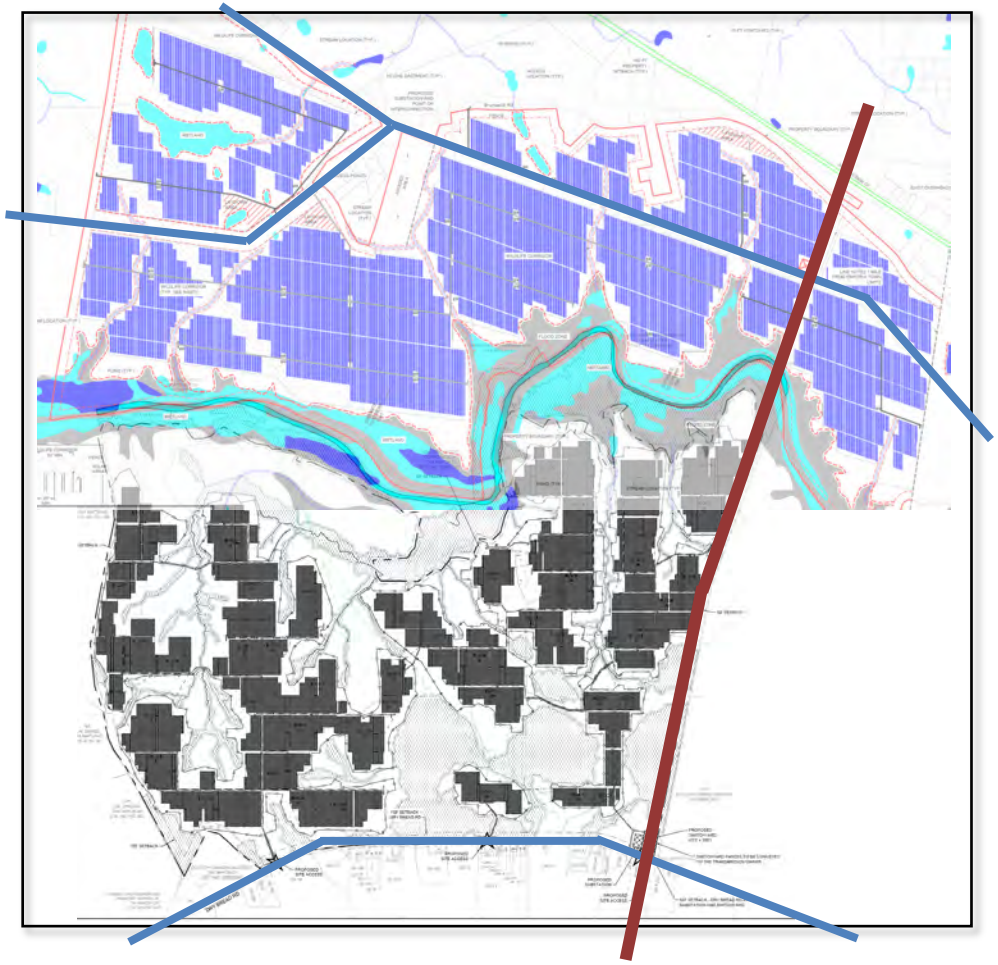
Greensville County (190,080 ac)

- 6 facilities
- 519 MW
- 6,200 ac (3% of county)

Concentration



Concentration of Facilities



Brunswick Solar

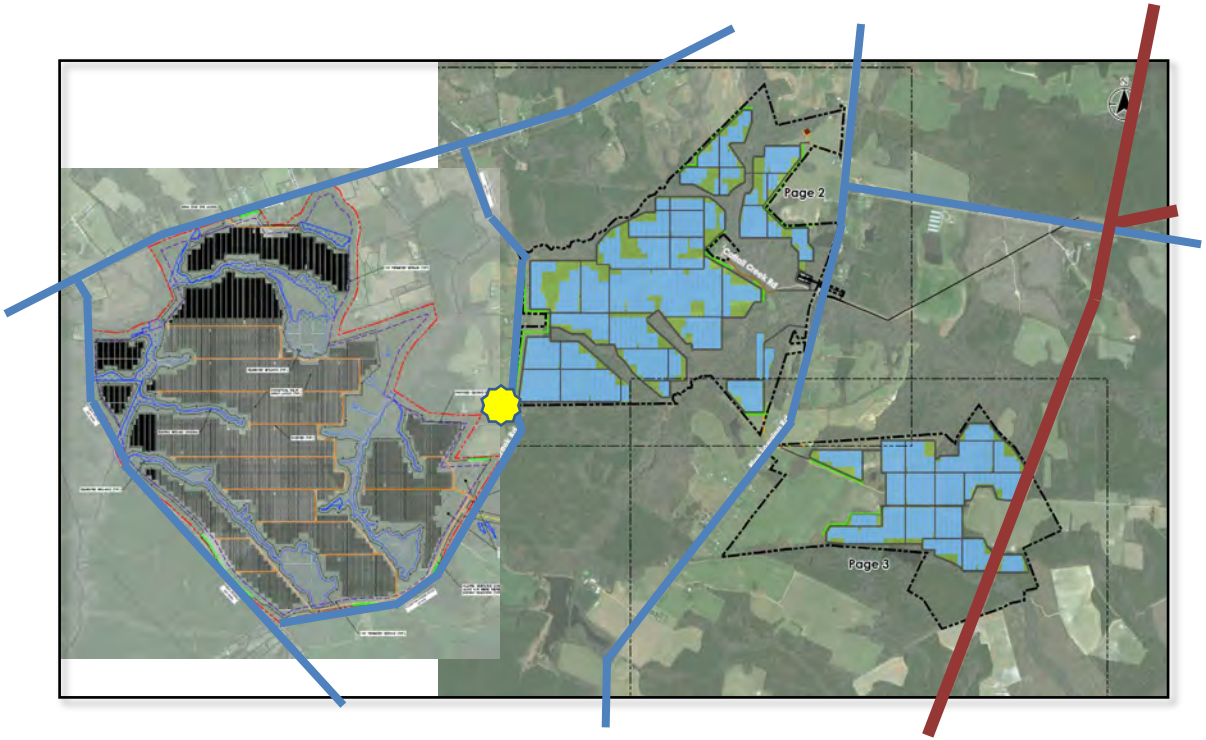
- 150 MW on 1460 ac

Meherrin River

Sadler Solar

- 100 MW on 1490 ac

Concentration of Facilities



Fountain Creek Solar

- 80 MW on 800 ac

Meherrin Solar

- 60 MW on 900 ac

Rectangle is 5200 ac

- 60 MW on 900 ac

This area will have 30% of the land converted from agricultural use to solar.

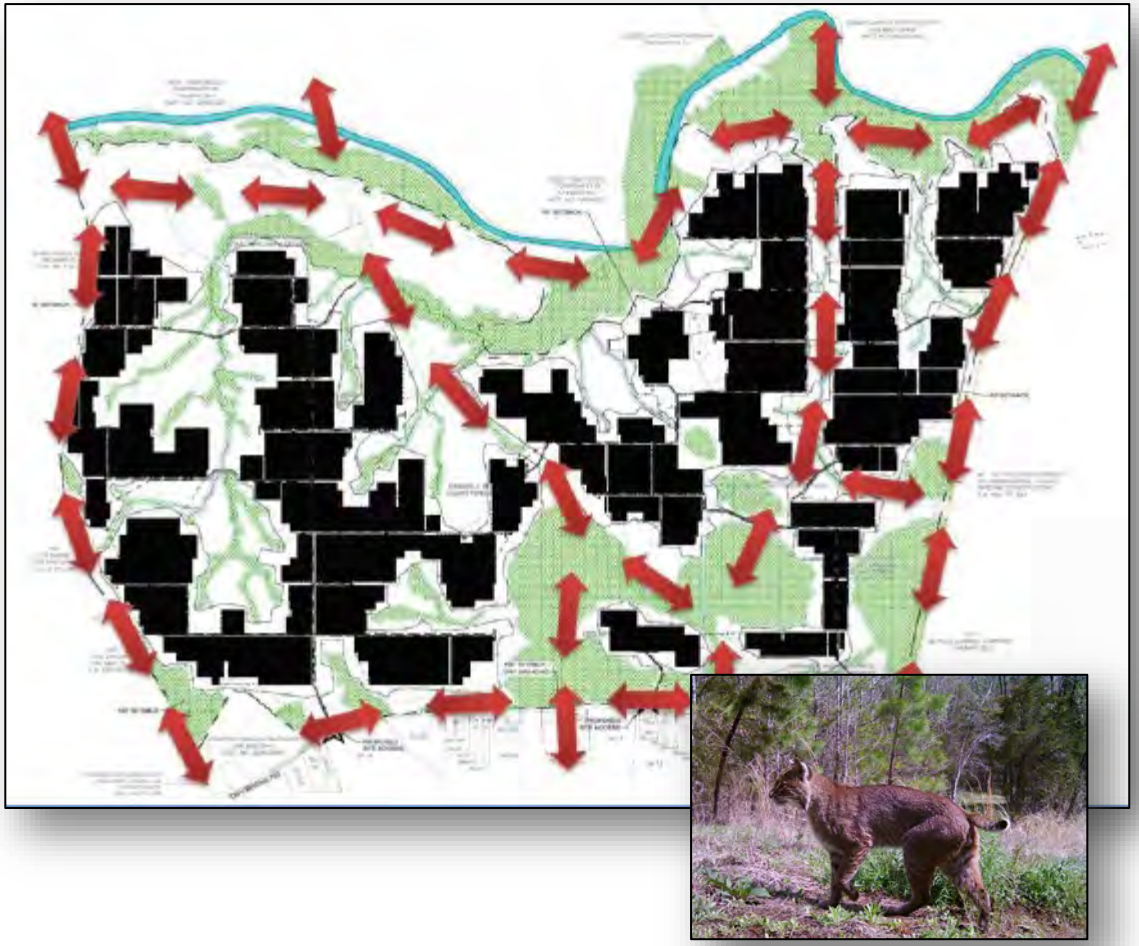
The projects are 600 feet apart at one point.

Visual Impacts

Post-construction

6 years later

Environmental Impacts



Decommissioning

Fiscal Impact

- Revenues
  - Real estate tax
  - Machinery and tools tax
  - Sales tax
  - Proffers
    - ❖ Financial incentives
- Employment

Southern VA - Economic Impact

Solar Facility

- 75 MW on 1500 ac
- Investment of $150 M

Economic impact during construction

- 150-200 jobs for 12-18 months

Economic impact during operations (first year)

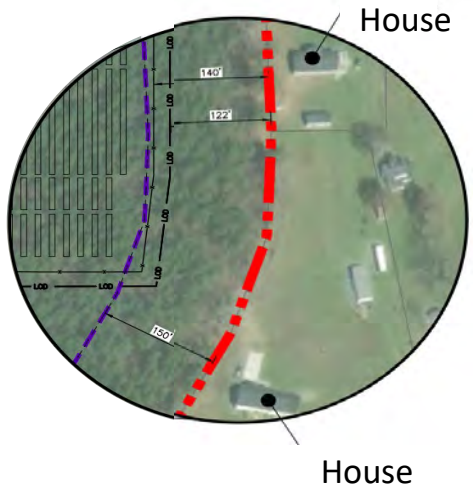
- Real estate tax = $36,000
- Machinery and tools tax = $140,000
- Voluntary payments = $50,000

$6.5 M
over
35 years

Public Concerns

Property owner

- Supporting clean energy goals
- Selling or leasing land ($)
- Individual property rights



Neighbor

- Visual impacts
- Toxins and radiation
- Noise and glare
- Taxes and electric bill increasing
- Property value decreasing
- Water pressure decreasing
- Wells going dry
- Construction traffic
- Tree removal and burning stumps

Stakeholder Engagement

- Residents and absentee landowners
- Farmers working the land
- Development, plan review, stormwater, and ESC staff
- Planning Commission
- Governing Body
- Developers
- Regional power provider

Start education and outreach now!

Greensville County - Stakeholder Engagement

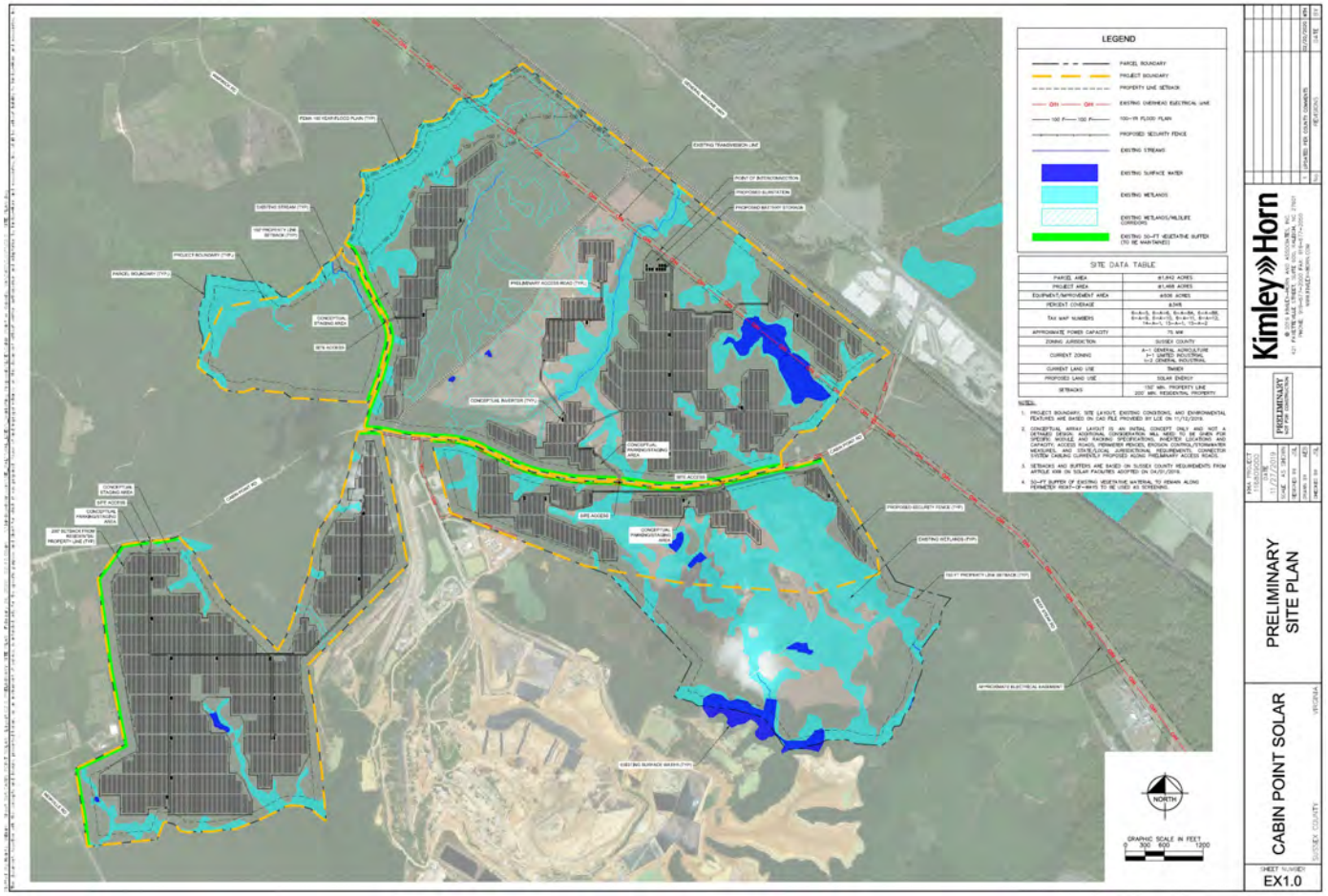
Discussed

- Top opportunities/benefits
- Top challenges

To propose

- County's vision for utility scale solar
- County's goals for implementing vision

Planning for Utility-Scale Solar



Policy Issues and Recommendations

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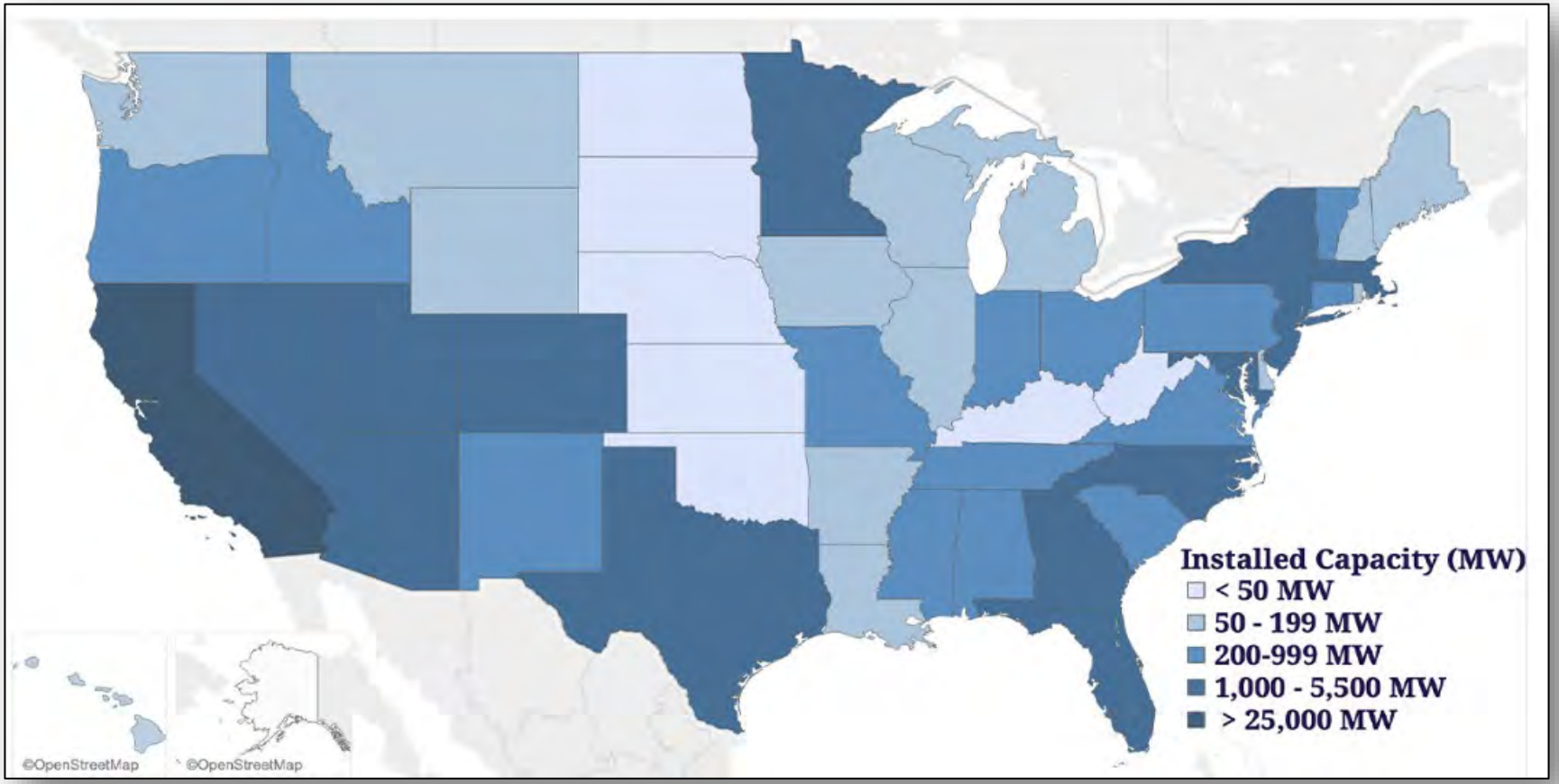
Rebecca Cobb

Policies

- State requirements
- Comprehensive (General) Plan
- Zoning Ordinance
- Conditional or Special Use Permit / Special Exception Permit
- Construction agreements

State Requirements



Local Requirements

Localities process the application

- Planning department review
- Public hearing and Planning Commission approval
- Public hearing and Governing Body approval

Comprehensive (General) Plan

Review

- Does it address solar?
- Does it address solar adequately?
- Vision, goals, objectives
- Current and future land uses
- Decision guidance

A Guide

Comprehensive (General) Plan

Amend to describe preferred solar project features

A Guide

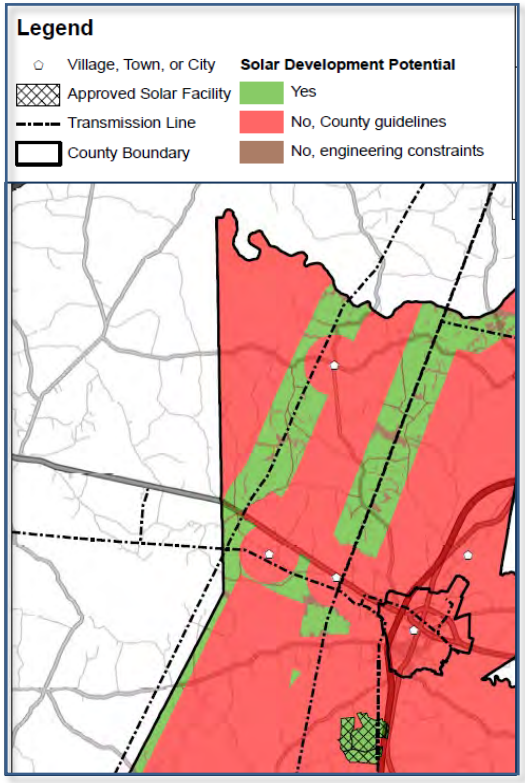
Utility-scale Solar Facilities (>1MW)

- Agriculture, brownfields, landfills
- Avoid prime farmland, forests, development areas
- Consider proximity to residences; historic, cultural, recreational, or environmentally-sensitive areas; and scenic viewsheds

Comprehensive (General) Plan

Amend to include relevant maps

A Guide



Existing Land Use Map

- Prime Farmland
- Brownfields
- Capped landfills

Major Electrical Facilities

- Transmission lines
- Transfer stations
- Generation facilities (including solar)

Zoning Ordinance

Review

- Does it address solar?
- Does it address solar adequately?
- Definitions
- Zoning districts and permitted uses
- Conditional use permit requirements

A Regulation

Zoning Ordinance

Amend to include definitions

A Regulation

Solar facility, small-scale

- <15 kW and <1 ac or on existing structure

Solar facility, medium-scale

- <999 kW to reduce onsite consumption

Solar facility, utility-scale

- >1 MW electricity to provide electricity to a utility provider

Zoning Ordinance

Amend to include a solar article

A Regulation

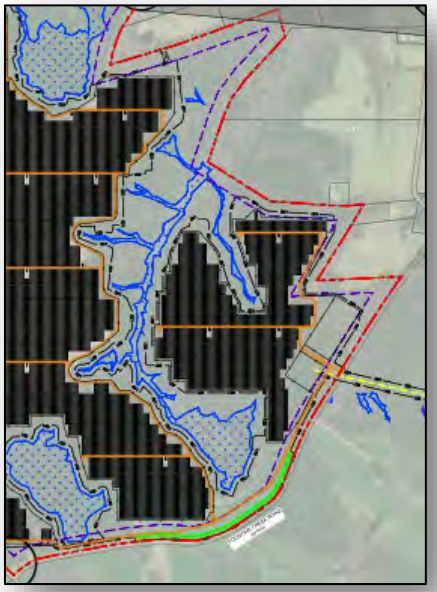
- Intent
- Applicability
- Zoning districts
  - Small-scale solar facilities: by-right in all districts
  - Medium-scale solar facilities: by-right in commercial and industrial districts
  - Utility-scale solar facilities: CUP in A-1, brownfields, or landfills

Zoning Ordinance – Solar Article

Applications and procedures

- Pre-application meeting
- Comprehensive Plan review
- Permit application
- Concept plan and concept plan compliance
- Traffic study
- Construction schedule
- Surface water and floodplain inventory
- Environmental inventory
- Visual impact analysis

A Regulation



Zoning Ordinance – Solar Article

Applications and procedures

- Neighborhood meeting
- Decommissioning plan
  - Procedures
  - Cost estimate
  - Schedule for updating plan

A Regulation

Zoning Ordinance – Solar Article

Applications and procedures

A Regulation

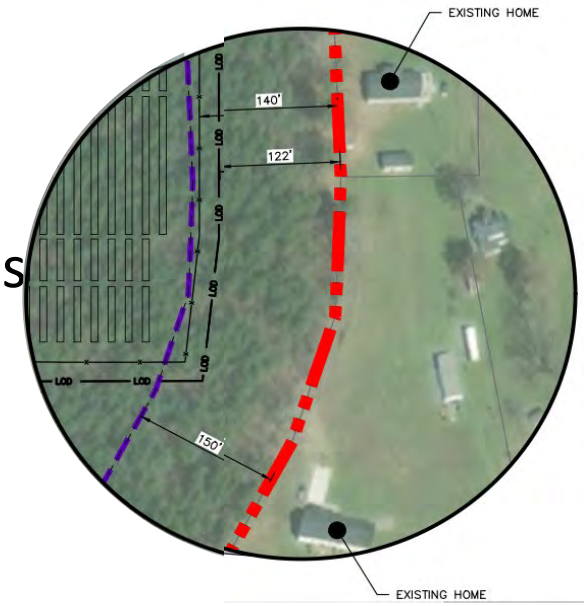
- Security - Escrow, Surety, Letter Of Credit
  - Decommissioning salvage value
  - E&S
  - Maintenance
- Application fee
  - Time
  - Third-party expenses

Zoning Ordinance – Solar Article

Minimum development standards

- Area <1,500 ac
- Distance to other solar facilities
- Setbacks
    - >200 ft from residential property lines
    - >150 ft otherwise

A Regulation

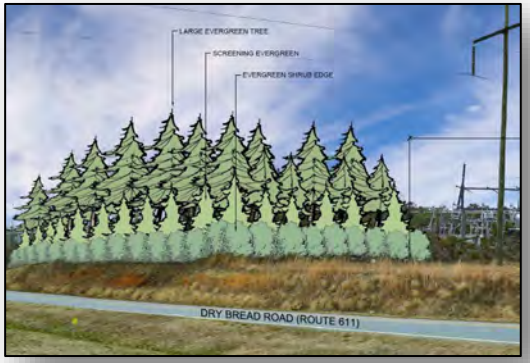


Zoning Ordinance – Solar Article

Minimum development standards

- Height <15 ft (10’ max drip line)
- Buffer/screen >100 ft vegetated
- Fence >7 ft and on interior of buffer
- Wildlife corridors
- Native vegetation
- Minimize lighting nuisance

A Regulation



Zoning Ordinance – Solar Article

A Regulation

Other conditions

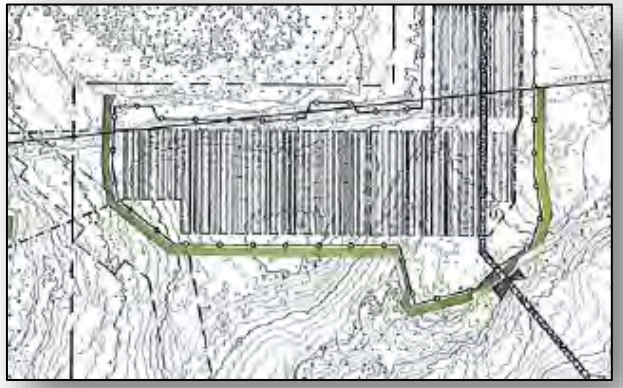
- Battery storage
- Acquire building permit within 24 months
- Change of owner notification (30 days)
- Offset burdens

Use Permit


Hughesville Pond
Webbs Pl
Gallant Green Rd
5
Box Elder Ct
Box Elder Ct
Bittersweet Dr

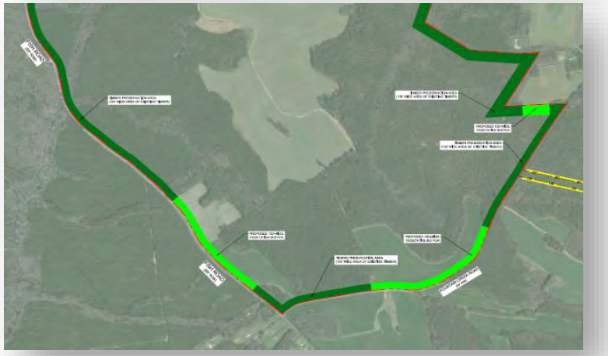
Use Permit (CUP, SUP, SEP) Application

- Application form
- Tax map
- Adjacent owners list
- Statement of intent
- Draft conditions
- Conceptual site plan
- Project screening and buffers
- Economic impact analysis
- Decommissioning plan



Conditions

- Plan submittal
- Operations
- Buffers
- Traffic
- Decommissioning
- Security
- Training
- Violation of conditions



Agreements

Consider capacity and fees for

- Environmental site plan reviews (one or multiple)
- Land disturbance (ESC) inspections (on-going during construction)

Consider limiting clearing and grading limits. Permit additional clearing and grading when the area is stabilized.

A 1500-acre site…

has 31 miles of silt fence and

requires 2 full time inspectors!

Mecklenburg County

Comprehensive Plan

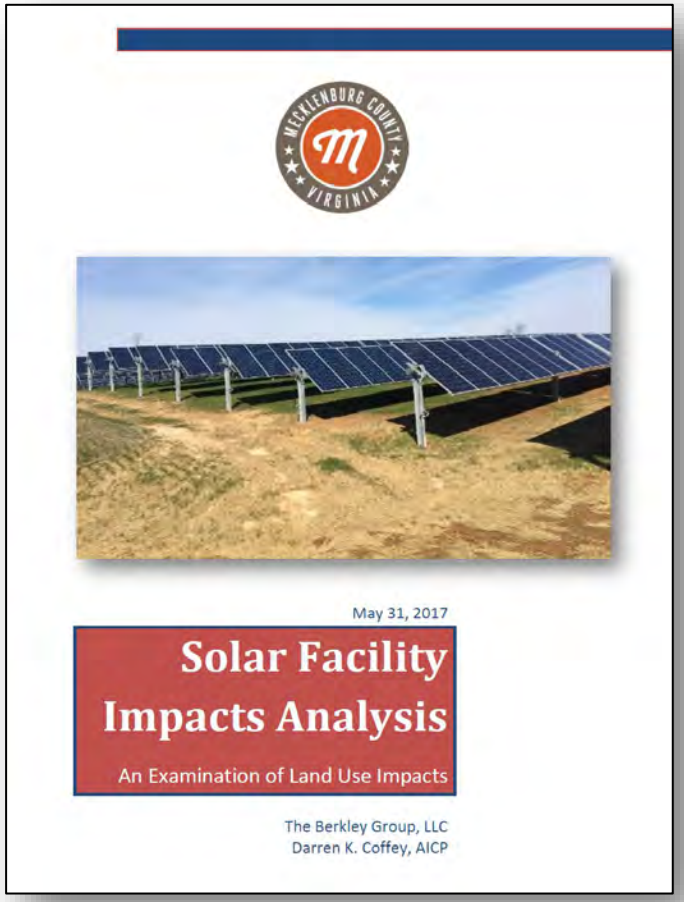
- Silent on solar

Zoning

- Solar article

Update

- Solar parameters in the Comprehensive Plan
- Solar article in Zoning Ordinance defines 3 facility sizes and allows use in 4 districts



Sussex County

Comprehensive Plan

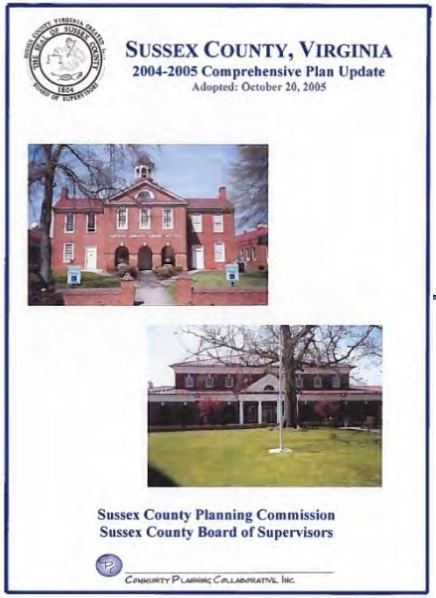
- Silent on solar

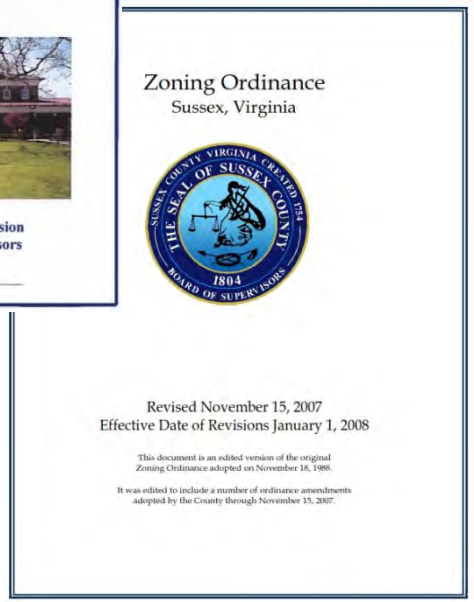
Zoning

- Silent on solar
- Identifies 5 districts for power generation

Update

- Solar parameters in the Comprehensive Plan
- Solar article in Zoning Ordinance defines 3 facility sizes and allows use in 3 districts

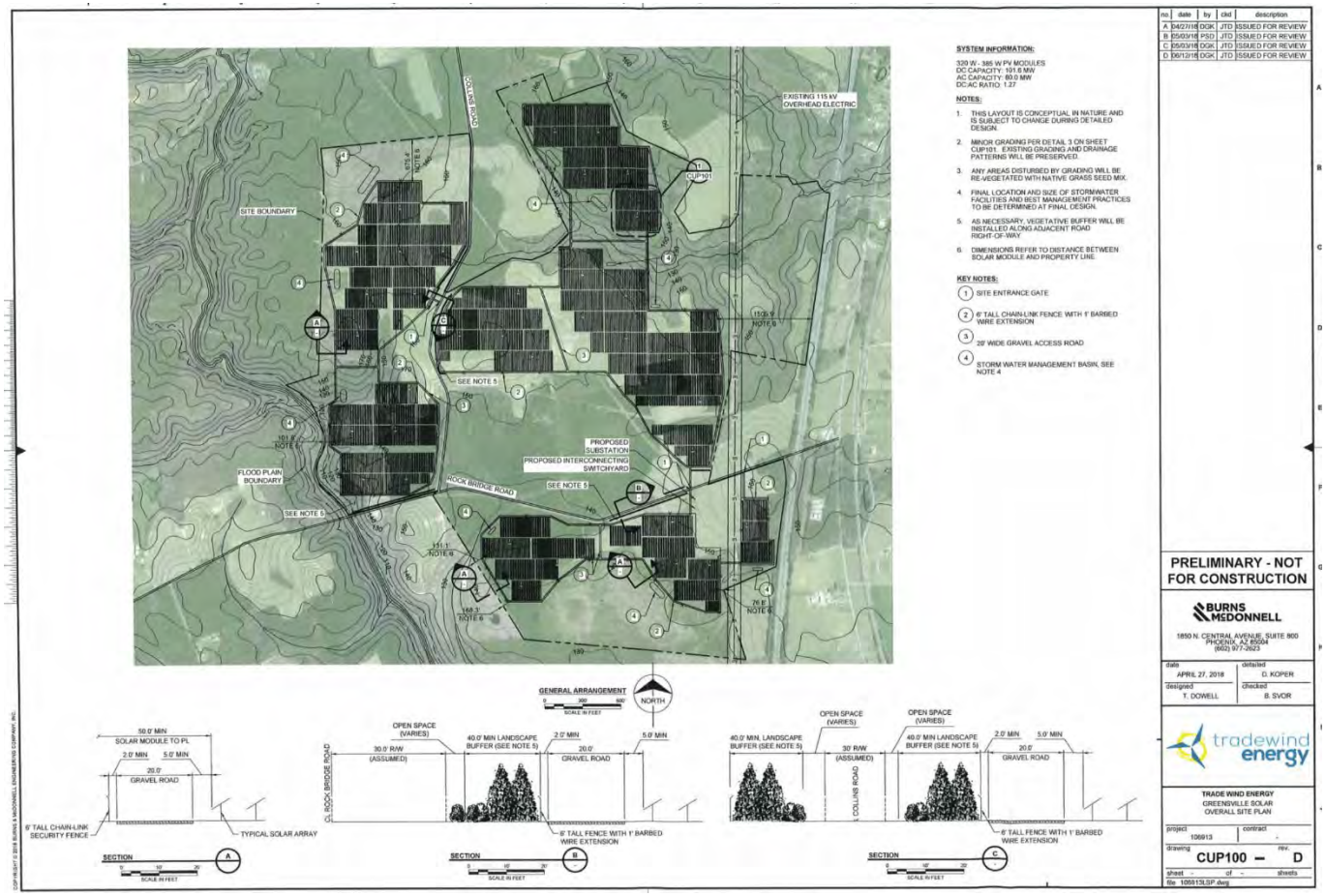




Recommendations

- Review state requirements
- Review and amend the Comprehensive (General) Plan
- Review and amend the Zoning Ordinance
- Evaluate each application based on its own merits
- Consider local government capacity and fees for planning and construction activities
- Learn from others

Conclusion


SYSTEM INFORMATION:
320 W - 385 W PV MODULES
DC CAPACITY: 101.6 MW
AC CAPACITY: 80.0 MW
DC:AC RATIO: 1.27
NOTES:
1. THIS LAYOUT IS CONCEPTUAL IN NATURE AND IS SUBJECT TO CHANGE DURING DETAILED DESIGN.
2. MINOR GRADING PER DETAIL 3 ON SHEET CUP101. EXISTING GRADING AND DRAINAGE PATTERNS WILL BE PRESERVED.
3. ANY AREAS DISTURBED BY GRADING WILL BE RE-VEGETATED WITH NATIVE GRASS SEED MIX.
4. FINAL LOCATION AND SIZE OF STORMWATER FACILITIES AND BEST MANAGEMENT PRACTICES TO BE DETERMINED AT FINAL DESIGN.
5. AS NECESSARY, VEGETATIVE BUFFER WILL BE INSTALLED ALONG ADJACENT ROAD RIGHT-OF-WAY.
6. DIMENSIONS REFER TO DISTANCE BETWEEN SOLAR MODULE AND PROPERTY LINE.
KEY NOTES:
1 SITE ENTRANCE GATE
2 6' TALL CHAIN-LINK FENCE WITH 1' BARBED WIRE EXTENSION
3 20' WIDE GRAVEL ACCESS ROAD
4 STORM WATER MANAGEMENT BASIN, SEE NOTE 4
EXISTING 115 kV OVERHEAD ELECTRIC
SITE BOUNDARY
FLOOD PLAIN BOUNDARY
PROPOSED SUBSTATION
PROPOSED INTERCONNECTING SWITCHYARD
ROCK BRIDGE ROAD
SEE NOTE 5
SEE NOTE 6
GENERAL ARRANGEMENT
NORTH
SCALE IN FEET
50.0' MIN
SOLAR MODULE TO PL
2.0' MIN
5.0' MIN
20.0'
GRAVEL ROAD
6' TALL CHAIN-LINK SECURITY FENCE
TYPICAL SOLAR ARRAY
SECTION A
OPEN SPACE (VARIES)
30.0' R/W (ASSUMED)
40.0' MIN LANDSCAPE BUFFER (SEE NOTE 5)
6' TALL FENCE WITH 1' BARBED WIRE EXTENSION
SECTION B
COLLINS ROAD
SECTION C
PRELIMINARY - NOT FOR CONSTRUCTION
BURNS MCDONNELL
1850 N. CENTRAL AVENUE, SUITE 900
PHOENIX, AZ 85004
(602) 977-2623
APRIL 27, 2018
D. KOPER
T. DOWELL
B. SVOR
tradewind energy
TRADE WIND ENERGY
GREENSVILLE SOLAR
OVERALL SITE PLAN
106913
CUP100 – D
106913LSP.dwg

Q&A

info@bgllc.net
www.bgllc.net

BERKLEY GROUP

Darren Coffey
Denise Nelson
Rebecca Cobb