IAFSM Storm Water Management for Solar Farms

March 2019

BAXTER & WOODMAN Consulting Engineers

Introductions

- Steve Amann, PE, CFM
- Municipal Services Department Manager

- Scott Killinger, PE
- Chief Subdivision Engineer, Will County, Illinois

Purpose

- Present what Will County is requiring for flood plain and storm water management of solar farms
- Review other agencies' similar efforts
- Discuss what other agencies are doing

Legislative Background

- 2016 Future Energy Jobs Act created economic incentives for energy generation
- Utilities obligated to buy renewable energy
  - Projects need to have been submitted to Illinois Power Authority by February 13, 2019
  - IPA reviews projects for incentives by March 15, 2019
  - List of awarded incentives published by March 31, 2019

Legislative Background (continued)

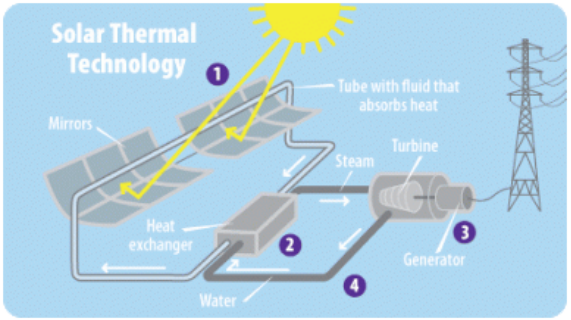
- 2018 Renewable Facilities Agricultural Impact Mitigation Act protects agricultural land
  - Requires decommissioning bond to be held by County authorities
- Neither legislation affected local agencies' abilities to regulate site development.

Technical Background- generation

- Three types of solar energy generation:
  - Concentrated solar – mirrors, lenses to create heat/steam powering a turbine. . . Not used in the Midwest

Technical Background- generation

Solar thermal….. Produces hot water



Technical Background- generation

- ***Solar photovoltaic – produces electricity***

Technical Background- distribution

- Three types of solar energy distribution:
- Distributed generation- panels on a house

Technical Background- distribution

- Community solar – single generator source, < 2 MW used at multiple locations

Technical Background- distribution

- Utility scale solar- system greater than 2 MW; sold back to the electric utility and distributed on the grid

Background- Timeframe

- Feb. 13, 2019: Deadline for submission of projects to Illinois Power Agency
- Feb 14 to Mar 15, 2019: IPA reviews projects for incentives
- March 31, 2019: end of IPA review and lottery

Background- Timeframe

- Apr-May 2019: Adjustments made to incentive awardees
- Jun- Aug 2019: Building and site development permit reviews by local agencies
- Sep 2019 – Jan 2020: construction

Storm Water Concerns

- Installations in SFHA
- Wetland impacts
- Runoff volume/rate increases
  - Impervious panels
  - Soil compaction
- Runoff concentration or diversion
- Soil erosion

Storm Water Concerns

- Turbid runoff during construction

How did we become involved?

- Solar developers approached Will County: solar leases 4X revenue of beans or corn
- Will County Land Use staff needed regulations in order to answer developers questions
- Developers argue “disconnected impervious”

What Will County Did: Research

- We did not want to reinvent the wheel- what is already out there?
- Contacted IDNR and other Illinois Counties

Research- other Counties in Illinois

- DuPage County
- Cook County
- McHenry County
- Lake County

Research- Illinois and other states

- Online Search:
  - Only a few States have regulations
  - Illinois is silent
  - New Jersey exempts solar PV panels in calculations for stormwater permiting

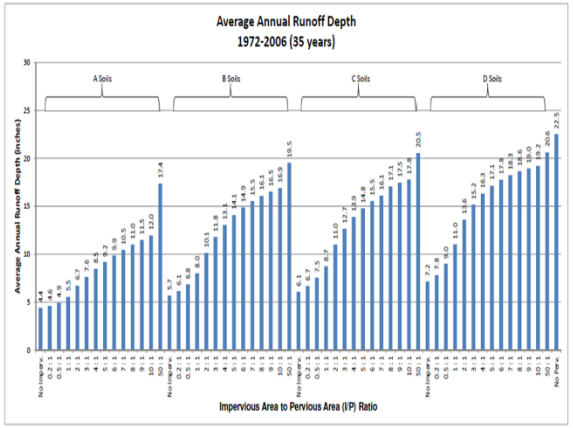
Research- states with criteria

- Massachusetts, North Carolina, Pennsylvania and Maryland: PV panels are pervious if:
  - Minimize earth disturbance
  - Natural vegetative cover
  - Slopes no greater than 5 to 10%
  - Panel spacing is controlled
  - Panels high enough to promote vegetative growth under the panels, but no more than 10 feet

Bad- vegetation not maintained

Research- Minnesota

- Minnesota Pollution Control Agency (MPCA) allows for a volume credit
- Provides Excel based Solar Panel Calculator on their web site



Research- Minnesota

- Solar PV facilities can expect a 50% to 85% reduction of required detention

Additional Research

- *ASCE Journal Article: Hydrologic Response of Solar Farms, May 2013 Journal of Hydrologic Engineering, Cook & McCuen*

Research- ASCE

Authors conclude:

- Placing solar PV panels over a grassy field does not significantly impact runoff volume, peak discharge or time to peak:
  - Spaces between panel rows need to be well-maintained vegetation and at least as wide as panels;
  - Or, downstream vegetated buffer is provided, at least 1/6 the flow length of all panels
- Impact varies with soil types: 7.5% more increase in runoff depth from B to C soils
- Hard surfaces between panels increase runoff by 72% to 100%
- Energy dissipation is needed at the drip line of the panels

Research- Maryland

- Maryland DOE says only the foundations are considered impervious
- Vegetative area must be at least equal to the width of the panels
- Slopes not greater than 5%
- Maintain groundcover in good condition

Good community scale, PV facility

Research- Will County Code

- This is “emerging technology” and unlikely to go away
- Will County adopted an ordinance in January 2018
- Chapter 155-9.245 of the Code says…

Research- Will County Code

- Top soils shall not be removed
- Locate drain tiles on site
- Perennial vegetative ground cover must be maintained
- Must have a security fence at least 7 feet high. This fence would impede flow in the floodplain/floodway

Good community scale, PV facility

Research- Will County Code

- Will County Code 164.062(A)(8) not appropriate use in floodplain or flood way

Research- Will County Code

- Requires a decommissioning plan
- 2018 Renewable Facilities Agricultural Impact Mitigation Act (RFAIMA) requires decommissioning bond to be held by County authorities

Research Leads To Action

- Maryland seemed to have the best-balanced regulations
- Will County applied Maryland guidelines

Action- Will County staff

Will County Memo:

- Addresses the concept of connected vs disconnected impervious
- Provides Maryland diagrams
- Provides review staff with 3 criteria to determine if the panels are disconnected…
    1) Groundcover is vegetation
    2) Total impervious surface on the ground limited to 25,000 SF
    3) Open space between rows of panels

from Maryland DOE

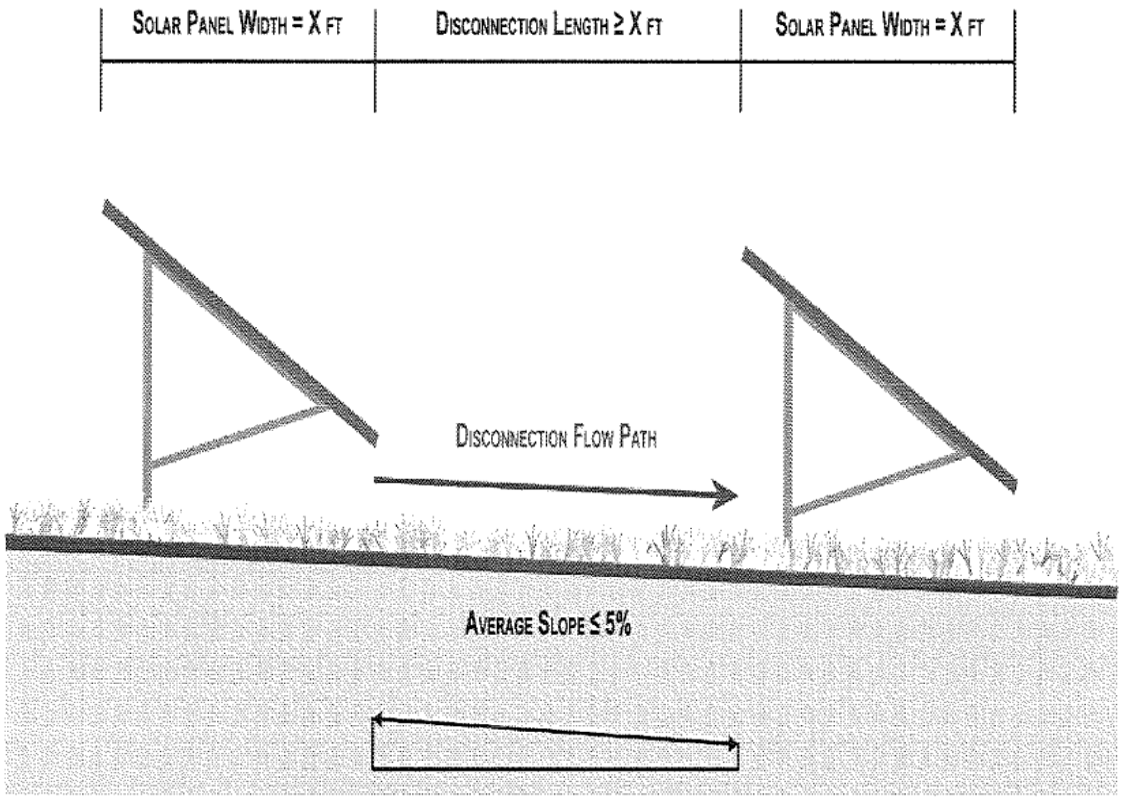


Figure 1. Typical Installation - Slope ≤ 5%

from Maryland DOE

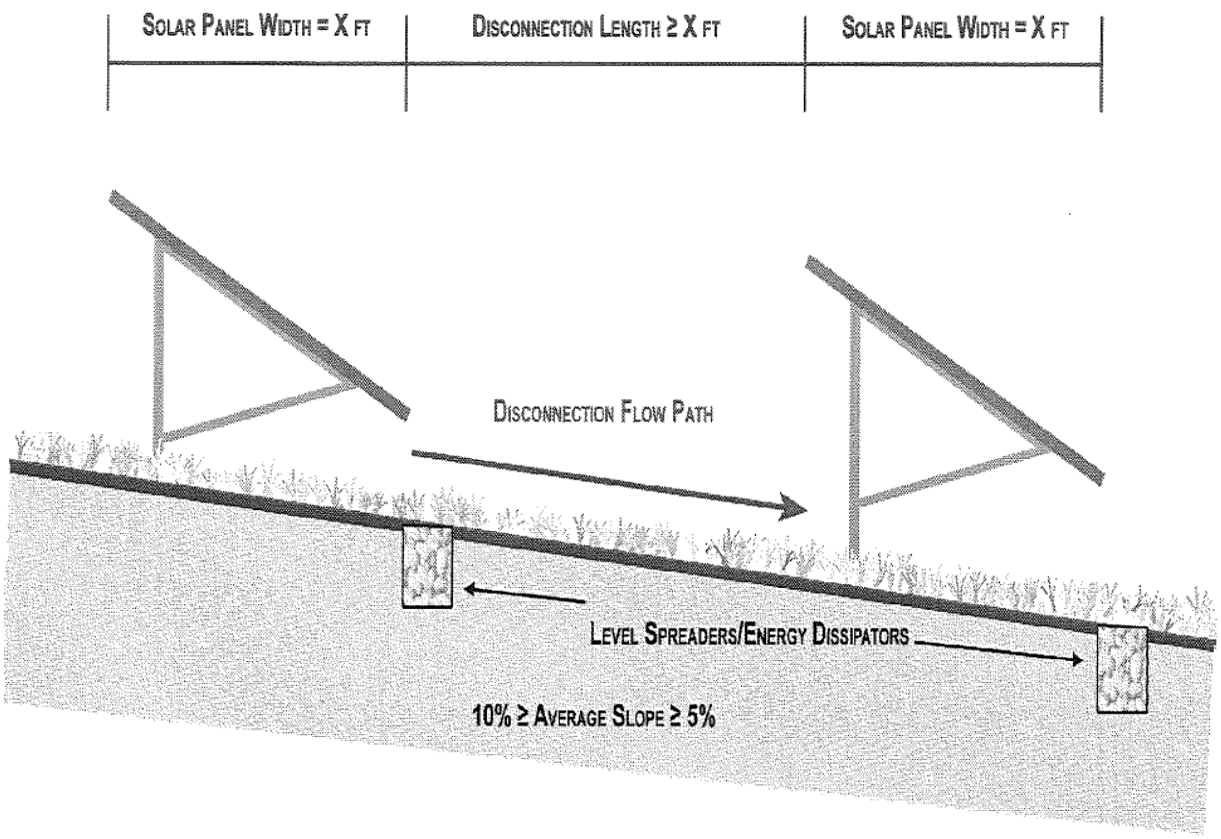


Figure 2. Typical Installation – Slope ≥ 5% but ≤ 10%

Action- Will County staff

- Requires the use of BMPs
- Reiterates the concerns of OWR with facilities in the floodplain/floodway

Good utility scale, PV facility

What Else Can We Do?

- Critical facilities can't be in 500-year floodplain – use of power is difference:
  - on-site only
  - on-site to critical facility
  - off-site to electrical grid
- Natural vegetative cover- need for controlled burn?

Action- Will County staff

- Discussed the memo at Storm Water Committee
- Include in Technical Guidance Memo?

What Can We Do?

- In order to be able to regulate the stormwater management of solar farms, communities should have a policy by June 2019
- Many Illinois counties can or will be able to regulate storm water:
  - Existing ordinances: Cook, Lake, DuPage, etc.
  - Referendum required: all other Counties containing all or part of an ‘urbanized area’

DISCUSSION

- IDNR-OWR: Not in my floodway; flood fringe if protected and not obstructing flood flows
- Grundy County – strong interest; evaluate on case-by-case basis
- Cook County – only one applicant; denied floodway permit
- MWRDGC – see above; no set policy
- DuPage County – little interest; panels count towards impervious thresholds for detention
- Lake County – evaluate on case-by-case basis
- McHenry County – hydrologic disturbance requires detention, unless under 1 acre and 10% of property, or under 5% of property and conservation easement over other 95%

Utility Scale PV Facility

Community Scale PV Facility

Utility Scale PV Facility

Utility Scale PV Facility

Utility Scale PV Facility

DISCUSSION

What are other agencies seeing and doing?

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