Local Land Use Law and the Rise of Agrivoltaics

Tyler Klein, AICP, Senior Planner Frederick County, Virginia

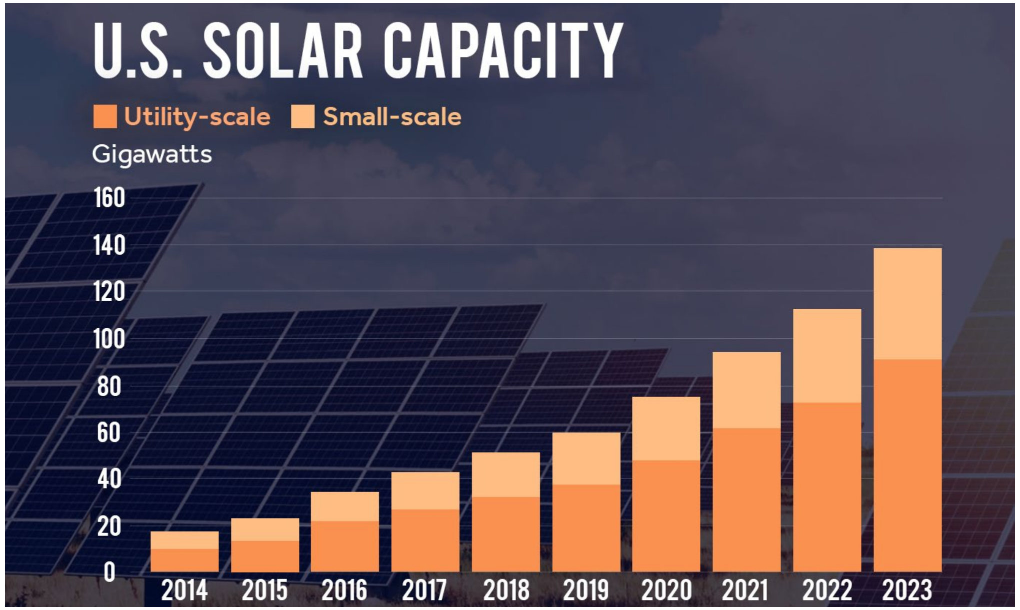
Jesse J. Richardson, West Virginia University College of Law

What we'll cover

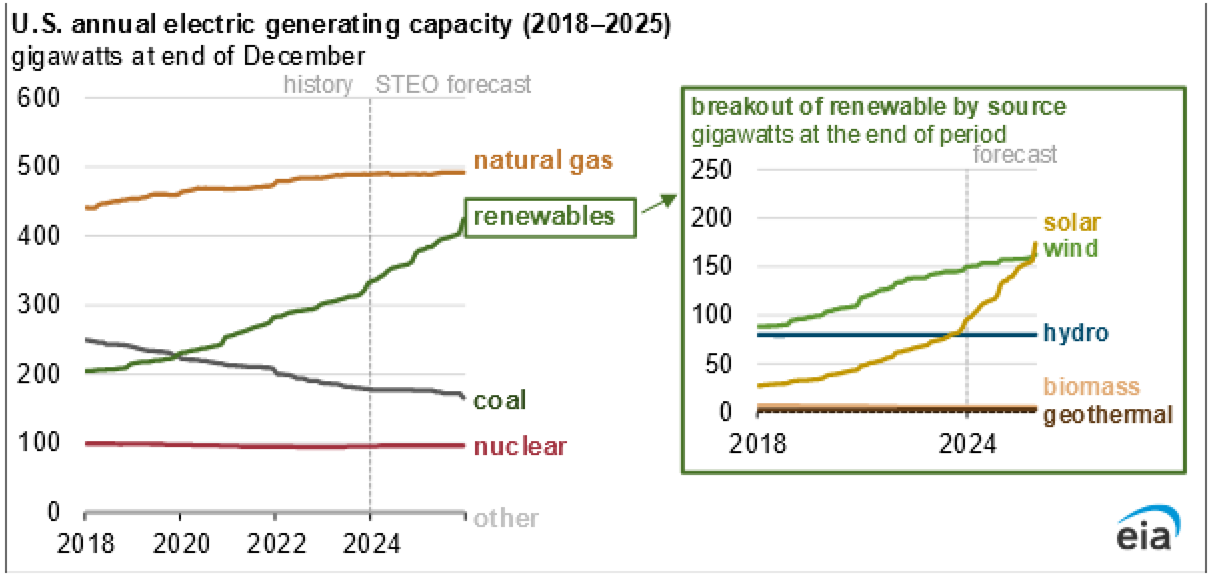
1. Why are we talking about agrivoltaics?
   - Solar development in the U.S.
   - The tension between agriculture and solar development.
   - Is agrivoltaics a solution to the tension?
2. Zoning strategies for agrivoltaics
3. Local implementation in Frederick County, Virginia

Why agrivoltaics?

Solar energy development in the U.S.



Source: U. S. Energy Information Administration via climatecentral.org



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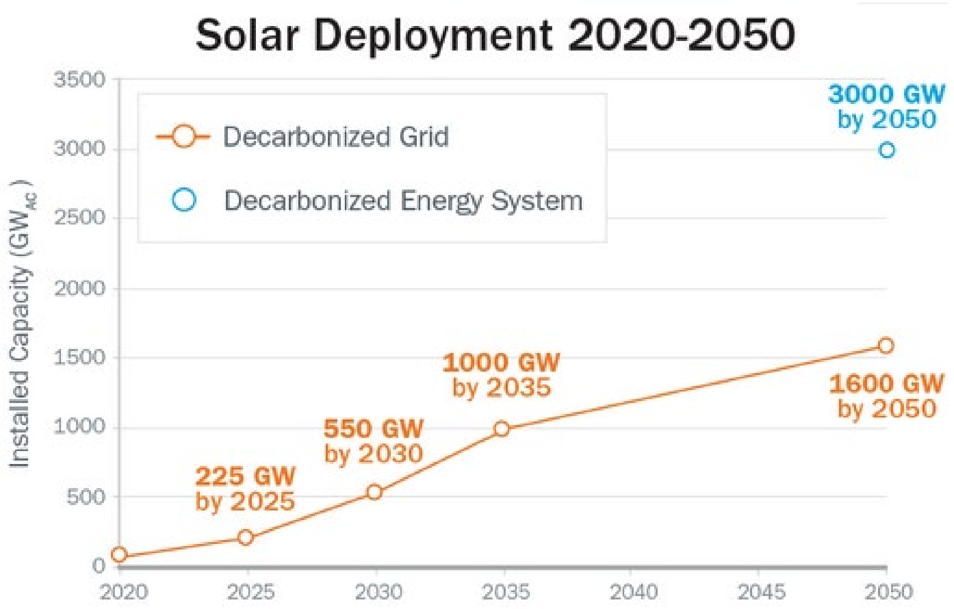


Source: U. S Office of Energy Efficiency & Renewable Energy

The tension between agriculture and solar development

Solar developers prefer farmland

- Due to level terrain, existing land disturbance, decreased likelihood of endangered or threatened species, proximity to transmission and substations.
- Easier to negotiate with farmers than governmental entities.
- Easier to lobby for local land use changes than deal with permitting and environmental review processes.

Solar development has met resistance in rural areas and concerns for farmland protection.

- Loss of agricultural land for production, especially prime soils.
- Concern for effects on local agricultural economy and infrastructure.
- Loss of rural landscape.
- Effect on property values?
- NIMBYism.

The tension: federal policies

Several federal proposals currently address solar development on farmland, with more proposed in Farm Bill.

- SUNRAY for Energy Act – H.R. 7391– NRCS best practices for protecting soil health for solar on agricultural land, USDA research on agrivoltaics.
- Preserving America's Farmland Act – H.R. 8277 – USDA study on effects of solar on prime, unique, or locally important farmland.
- Agriculture Resilience Act – H.R. 1840 – USDA research and assessments on agrivoltaics.

The tension: land use regulation

- Inconsistent or conflicting state and local regulations.
- Some states have preempted local regulations, in part or in whole.
  - Michigan gave siting authority to the Michigan Public Service Commission.
  - In Maryland, the state holds most of the authority.
  - Ohio granted broad control to counties to prohibit large scale solar development over 50 MW.

Agrivoltaics: can we have our cake and eat it too?

- Agrivoltaics is the "co-location" or "dual-use" of land for solar arrays and agricultural production.
- Agricultural production can be livestock or crop production or pollinator habitat.
- Two types of systems:
    - Production beneath elevated panels, utilizing shade and reducing water needs.
    - Production between rows of panels.

Source: Jack's Solar Garden

Agrivoltaics: what do we know?

Production research is still underway …
and lags behind solar development.

Source: Ohio State University

Crop production issues

Between panels: some success with forages -- lack of data on commercial alfalfa and cool season hay crops.

Beneath panels: success with kale, peppers, swiss chard, broccoli, celery, winter wheat, clover, potatoes.

Lack of research on shade intolerant crops.

Fruit trees usually not compatible with solar.

Livestock production issues

Most success is with sheep – open ewes, stocker lambers, ewes with lambs at least a few weeks old.

Chickens, ducks and geese may be successful – panels must be high to prevent roosting.

Goats are not generally successful - jump and climb on panels.

Some success with cattle – requires raising and reinforcement.

Pigs, and horses are also not recommended.

Benefits of agrivoltaics

Landowner benefits

- Supplemental and diversified income sources.
- Maintains agricultural use of prime soils.
- Water conservation benefits due to shade and vegetation.
- Yields of some crops maintained or increased.
  - Shade tolerant and heat sensitive plants do well.
- Expands production opportunities in high heat regions (and for minority farmers?)
- Shade for grazing livestock.
- Increases pollinator, native and critical habitats.

Solar developer benefits

- Lower costs for solar developers on farmland
  - Costs to remove vegetation
  - Weeding
  - Dust suppression
- Solar panel efficiency increases
  - Panels become less efficient as their temperatures increase, vegetation keeps temperatures up to nine degrees lower.
- Less community opposition?

Challenges of agrivoltaics

Project design challenges

Must design the project to accommodate agriculture.

Often too late if lease is executed and regulatory process is underway.

Costs and risks for developer

Wider rows, higher panels, sturdier poles, deeper foundations, reinforcements.

Risk of damage to solar arrays from farming activities.

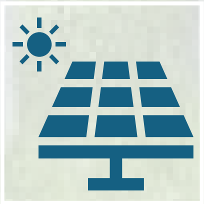
Adoption costs for farmer

Could require transition to different crops--currently not practical with grain crops like corn, soybeans, and wheat.

Equipment and implements must change to accommodate solar arrays.

Are markets available?

Challenges of agrivoltaics



Impact on “agriculture” laws

Are “solar farms” really “farms” for legal purposes?

Does it qualify for differential property tax assessment?

Does it qualify as “agriculture” for zoning purposes?

Is it permissible on conservation or agricultural easement land?

Community issues

Does it affect community acceptance of solar development?

Is it a ploy for community acceptance?

Will farmers who lease for agrivoltaics face community criticism?

Will it affect local property values?

Farmland protection

Still a loss of prime soils.

Still a larger footprint than other energy sources.

Land use strategies for agrivoltaics

Zoning strategies

- Designate areas where agrivoltaics are allowed and others where solar or agrivoltaics are not allowed.
    - Solar arrays often only allowed in industrial zones.
    - Different agricultural districts (A-1, A-2) or overlay zoning.
    - Based on prime farmland soils or other factors.
- Conditional Use Permits
- Different regulations for small-scale v. large-scale.
- Access roads.
- Height.
- Visual screening.

Zoning strategies

- Segment and repurpose topsoil removed during excavation.
- Require drought resistant, native vegetation in non-agricultural portions of the site.
- Setbacks.
- Fencing.
- Lot coverage/impervious surface coverage.
- Decommissioning plan.
- Require bonding or other financial responsibility for decommissioning.

What if you don't have zoning?

- Many rural communities do not have zoning.
- In that situation, solar producers decide when, where, and how much?
- Example: West Virginia
    - Most counties have no zoning.
    - In some West Virginia counties, thousands of acres are under solar lease.
    - Concern about the continued viability of agriculture.

Local Implementation of Agrivoltaics

Lessons Learned from the "Top of Virginia"

M. Tyler Klein, AICP, Senior Planner

Frederick County, VA

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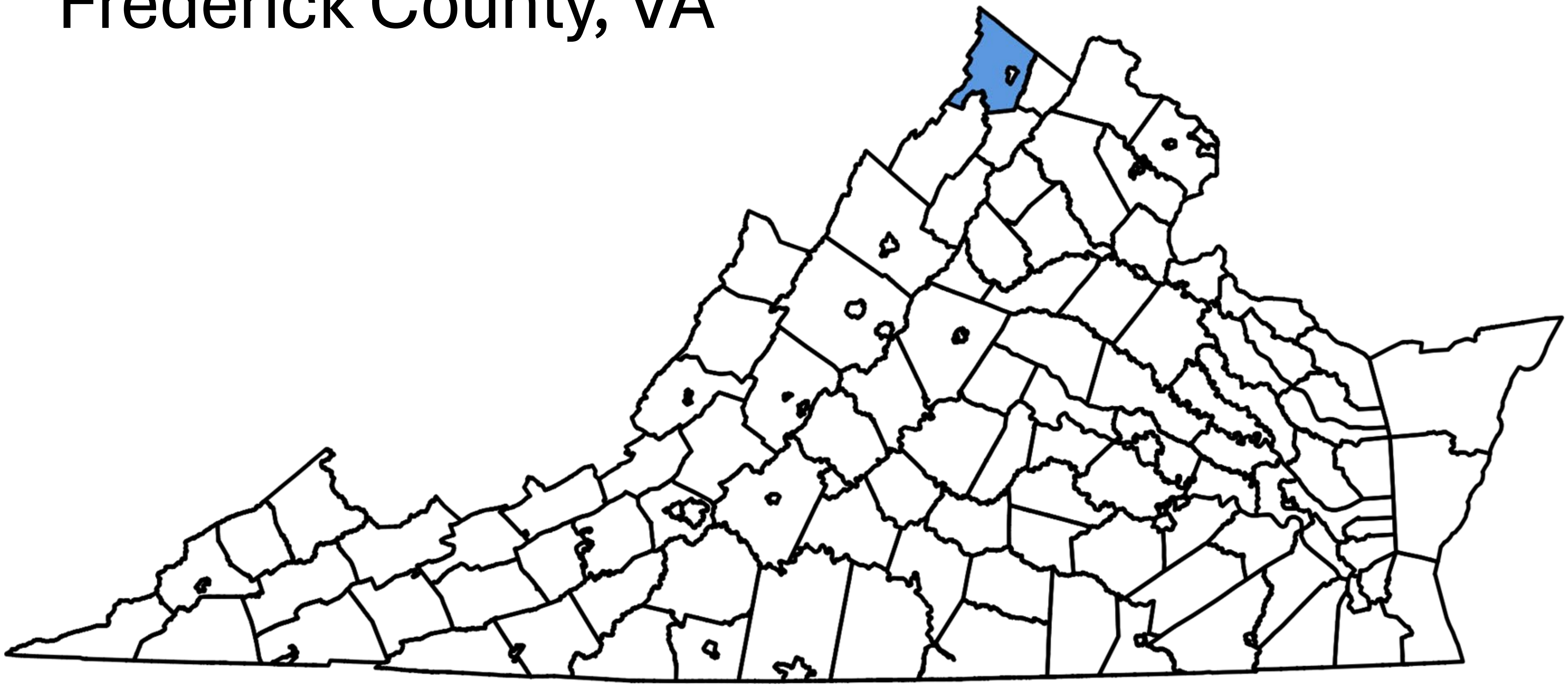

Frederick County, VA

- Comprehensive Plan Policy (2021)
  - *Rural land preservation; diversification of allowed uses for rural property owners; not specific reference to solar*

- Code & Ordinance Requirements
  - *“Public utility” with limited written requirements for “utility-scale solar facilities;” Zoning Administrator determines setbacks akin to other public utilities.*

- Conditional Use Permit (CUP) & Site Plan
  - *Public hearing process for use approval; conditions assigned to regulate use; context sensitive*

Approved Projects

- 4 projects approved in 22-months from ordinance adoption

  - Bartonsville Facility (172 MW) – 889-acres disturbed (1,796 – acres site total)
  - Foxglove Facility (75 MW) – 416-acres (668 – acres)
  - Hollow Road Facility (20 MW) – 83-acres (326 – acres)
  - Red Bud Run Facility (30 MW) – 176-acres (447 – acres)

**1% of county's total land area*

- 2 under construction; 1 other site planned

Are agrivoltaics for rural areas?

- The farming element.
    - *Preserving orchards, grazing, crop land for use by local farmers on-site*.

    - *Use of sheep/goats for weed and pest control*.

- Local ownership with solar leases for land.
    - *Keeps rural lands in hands of local farm families*.

- Enhanced buffers and screening to maintain viewshed.
    - *Supports rural Plan policy*.

- Siting agreements (§ 15.2-2316.7) to address community needs (land preservation, broadband)
    - *Improves rural community and advances Plan goals*.

Public Expectation vs. Reality

- Setting the right expectations
  - *CUP process conceptual in nature, lacks specificity about site details*
- Allowing for flexibility
  - *Geotechnical challenges, storm water management, supplies & materials*
- Monitoring
  - *Damage to roads, storm events, drought & dust*

Lessons Learned

- Front-end effort on codes and ordinances
  - *Restrictive enough but allow flexibility as every solar developer is different.*
- Pre-construction meetings
  - *Include outside agencies – Public Works, Fire Marshal, VDOT*
- Regular inspections to monitor project progress
  - *Allows for appropriate response to adjoining property owner concerns*
- Too much, too fast?

Concluding thoughts… promises and challenges

- Is a win-win possible?
  - Type of agricultural production matters … and might have to change.
  - Location matters -- solar can open new ag opportunities in some locations.
  - Certain projects in certain places might achieve successful co-existence.
  - Zoning can guide development and reduce impacts.
- There can be efficiency sacrifices, both for energy and agriculture.
- Policies and land use may need to choose a priority: energy or ag?
- Coordination between state and local policies is necessary.
- Research will help, but already lags behind development.
- Policy incentives may increase adoption of agrivoltaics.

Can Agriculture and Solar Co-exist?

Exploring the promise and challenge of agrivoltaics

Tyler Klein, AICP, Senior Planner, Frederick County, Virginia
tklein@fcva.us

Jesse J. Richardson, West Virginia University College of Law
jesse.richardson@mail.wvu.edu