

Solar Energy Leasing on the Farm

UMD Agriculture Law Education Initiative

Solar Energy Leasing Webinar

June 27, 2016



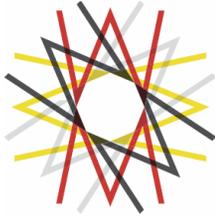
Dr. Shannon L. Ferrell
Associate Professor, Agricultural Law
Oklahoma State University

Photo source: www.greenbuildingadvisor.com

Tonight's program

- Basics of the solar power industry
- Five questions every landowner should ask:
 - Impacts to land use
 - Duration of agreement
 - Landowner's obligations
 - Compensation
 - Cleanup
- Other issues in solar power development





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Basics of the solar power industry

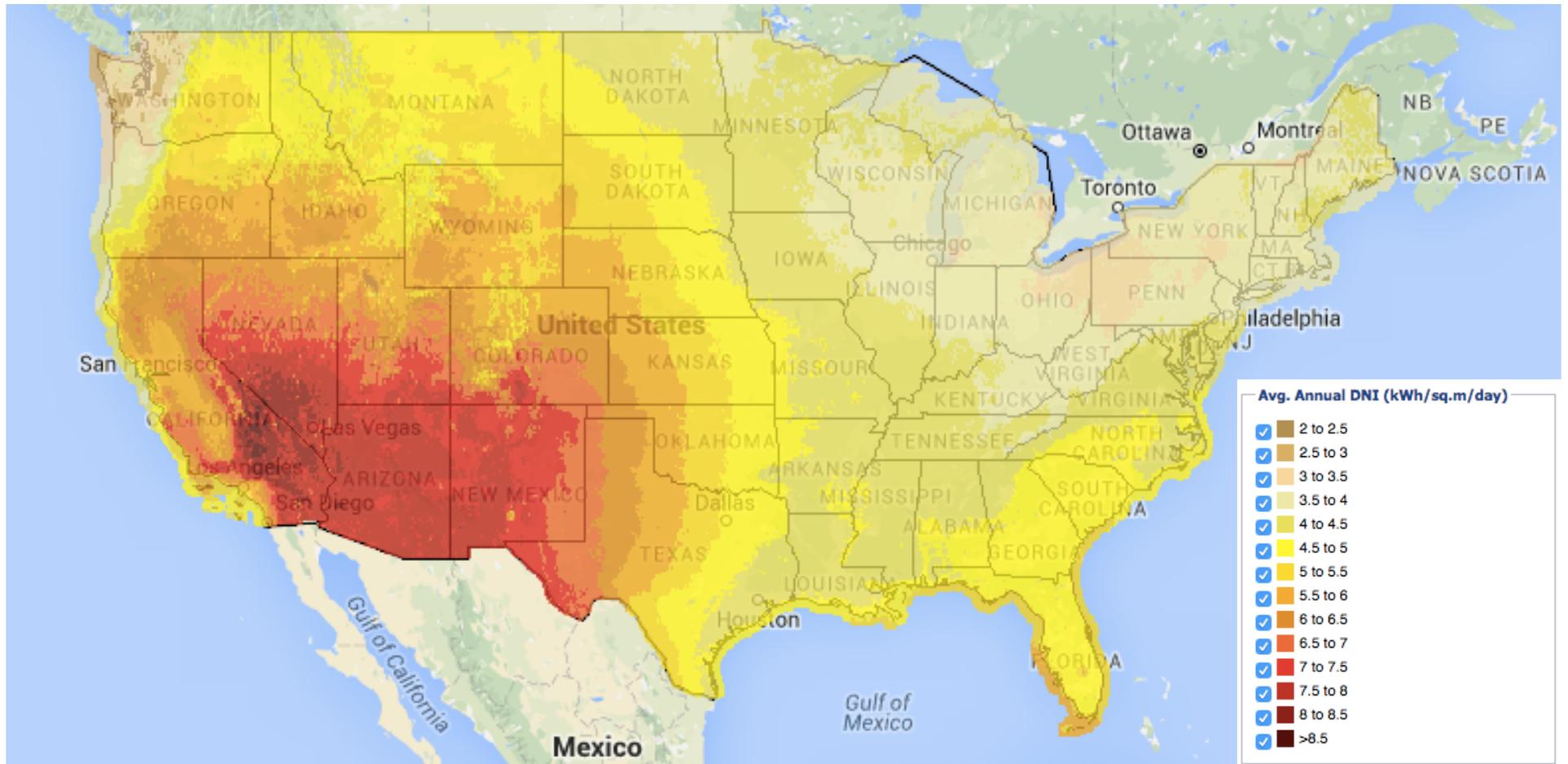


Major Projects List

[About this map](#)



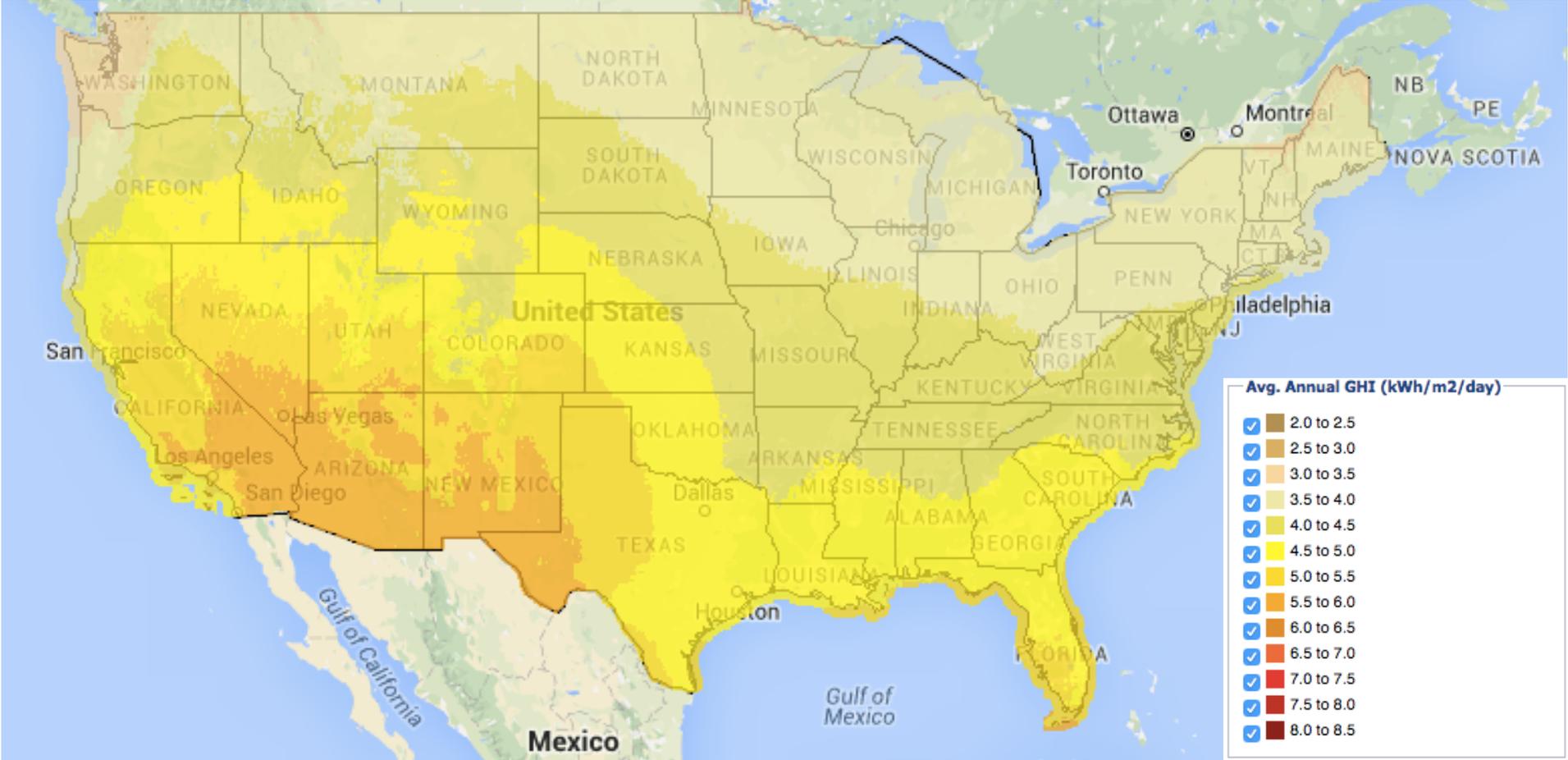
The U.S. solar resource Direct Normal Irradiance (DNI)



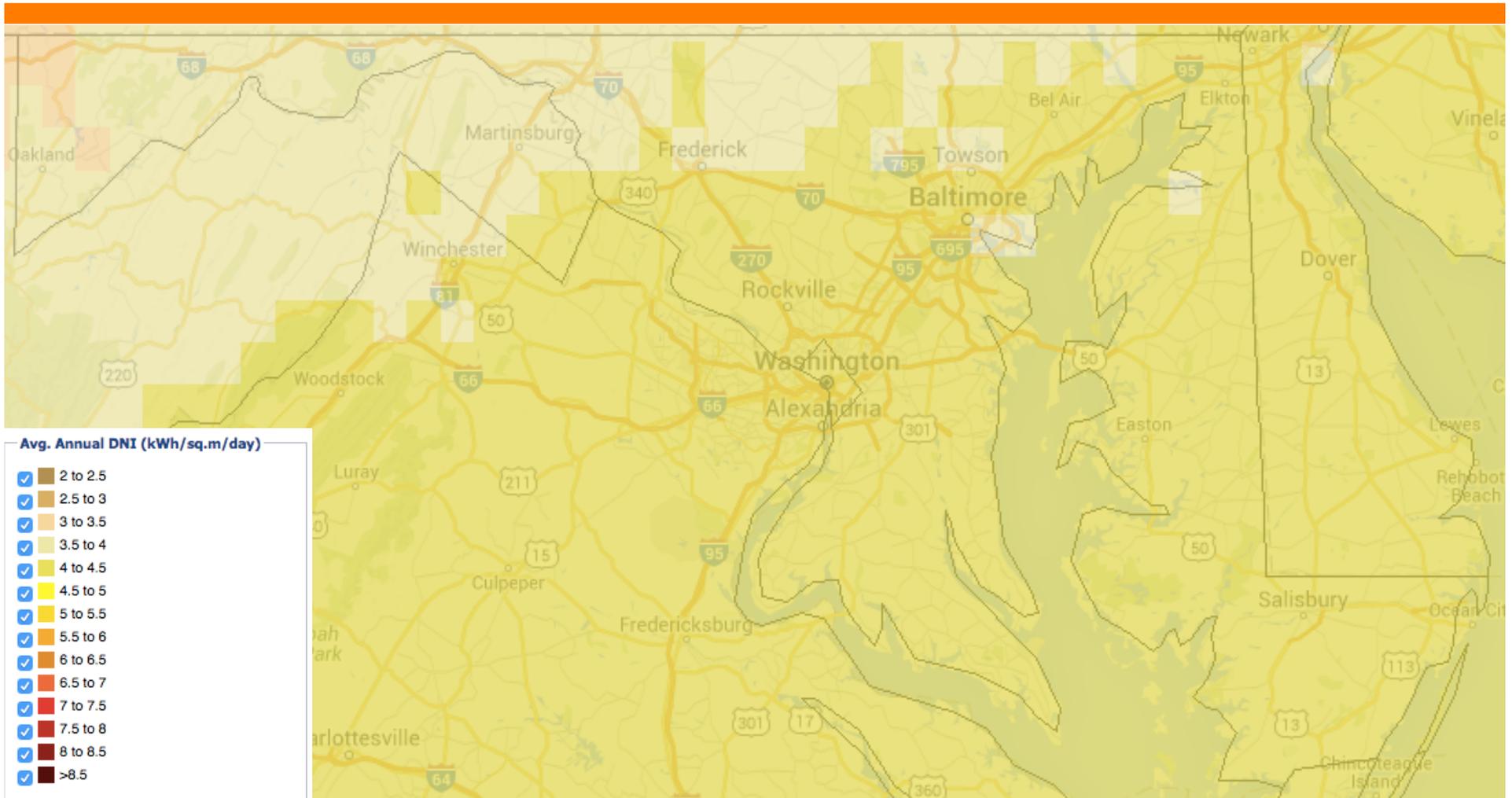
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The U.S. solar resource Global Horizontal Irradiance (GHI)



Maryland solar resource Direct Normal Irradiance (DNI)

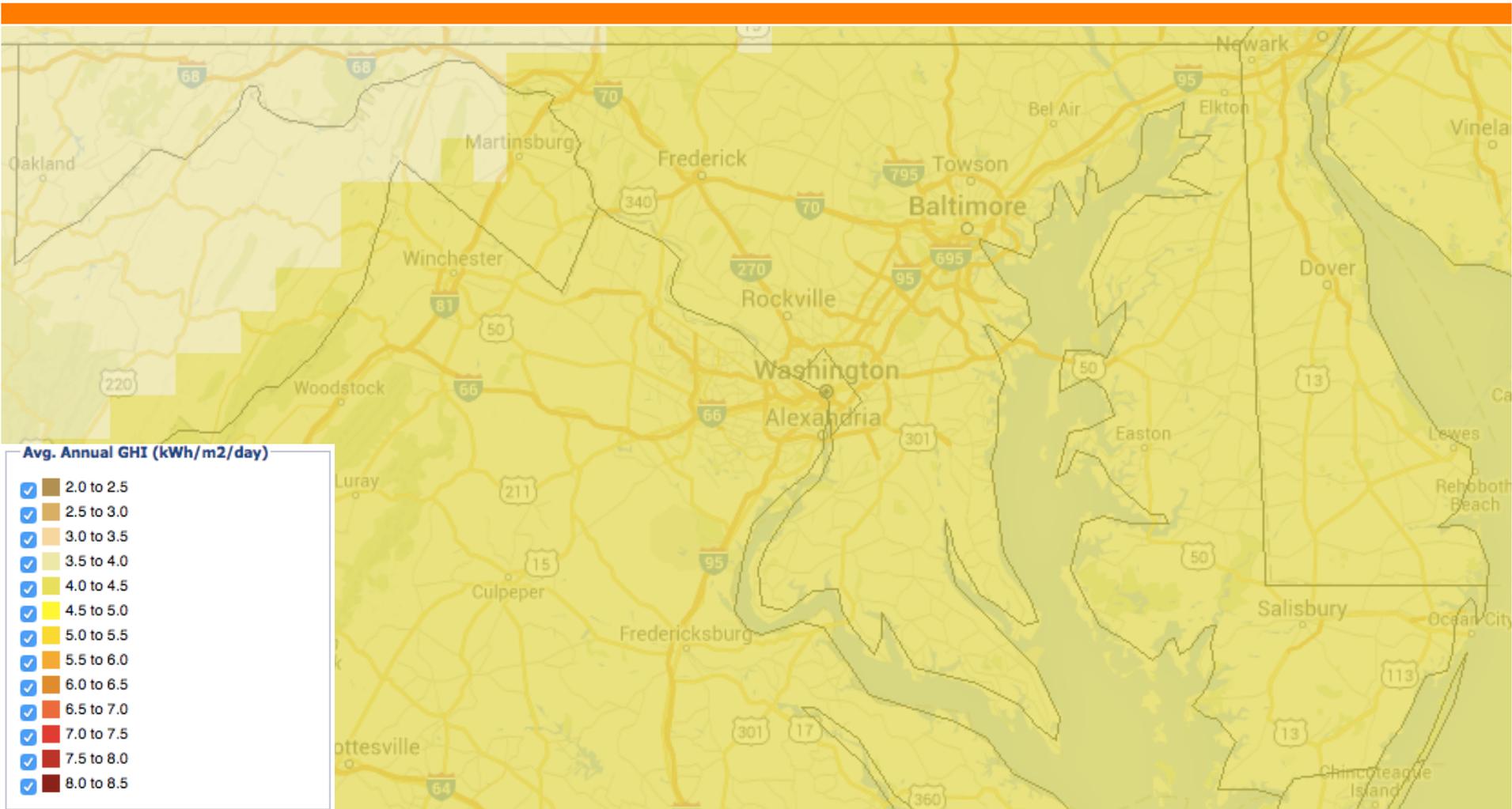


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Maryland solar resource

Global Horizontal Irradiance (GHI)



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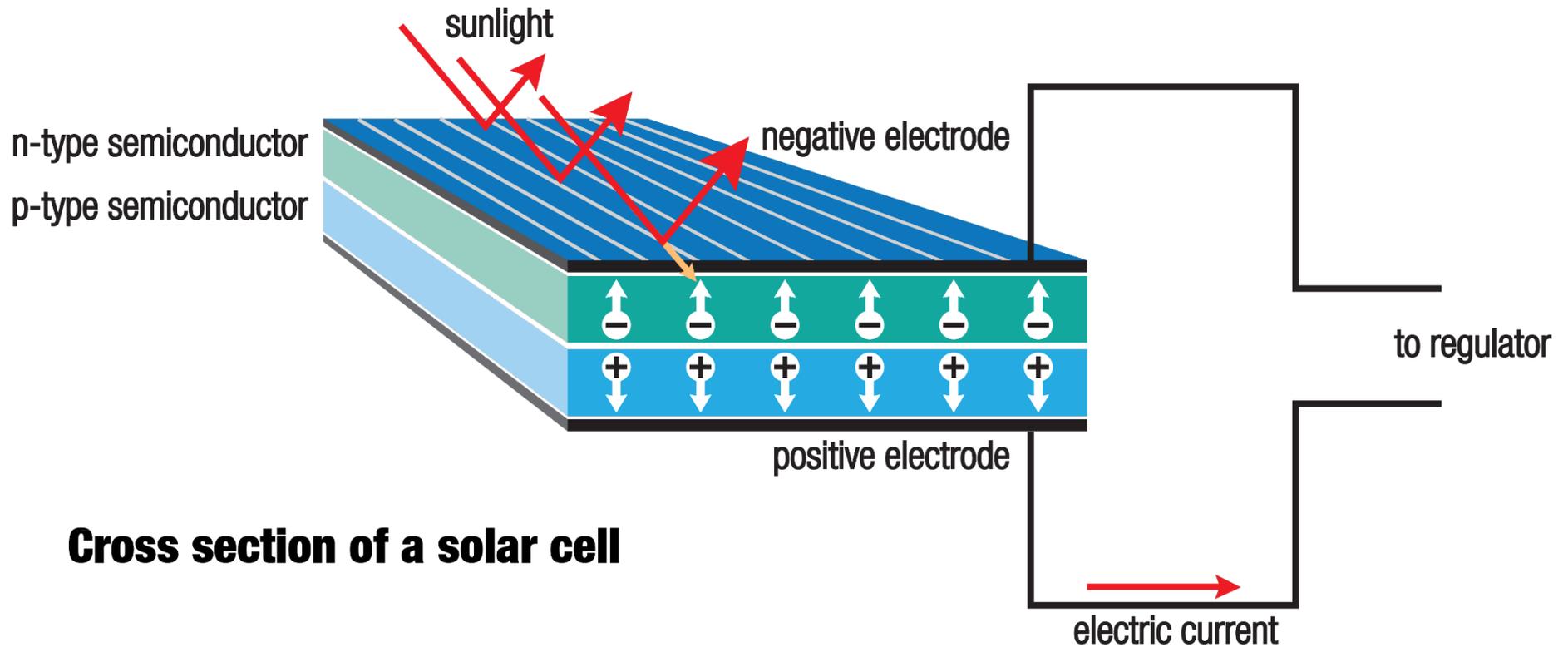


Site selection for solar projects

- SUN!
 - Hours/year of unobstructed sunlight
 - Cloudcover
 - Terrestrial shadow creators
- Unobstructed land
- Proximity to transmission (at needed scale)
- Proximity to demand
- Land use restrictions

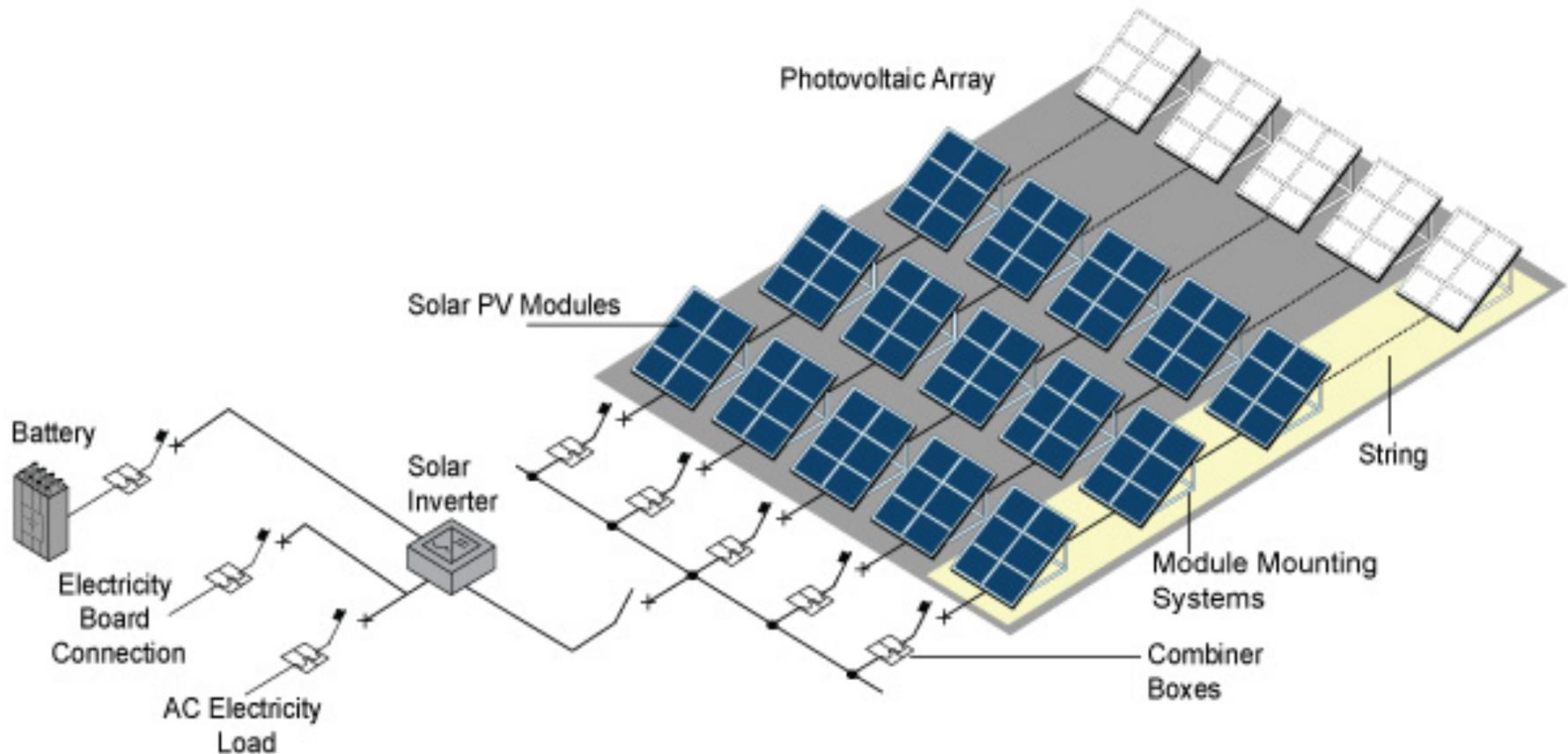


Photovoltaic (PV): The basic idea



Cross section of a solar cell

Photovoltaic (PV): The basic idea



Source: Sunipod



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Photovoltaic (PV) in action



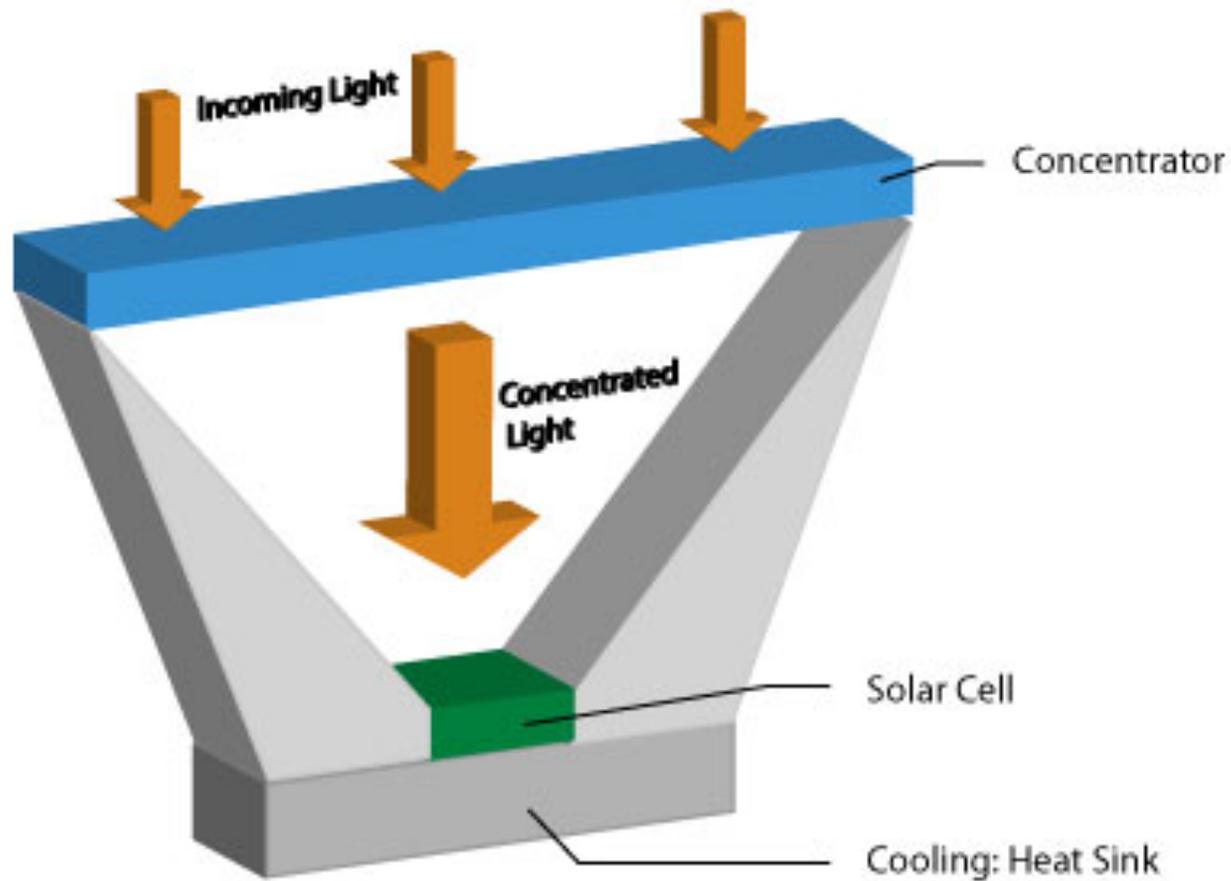
Source: Ceinturion



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Concentrated Photovoltaic (CPV): The basic idea



Source: Green Rhino Energy



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Concentrated Photovoltaic (CPV) in action



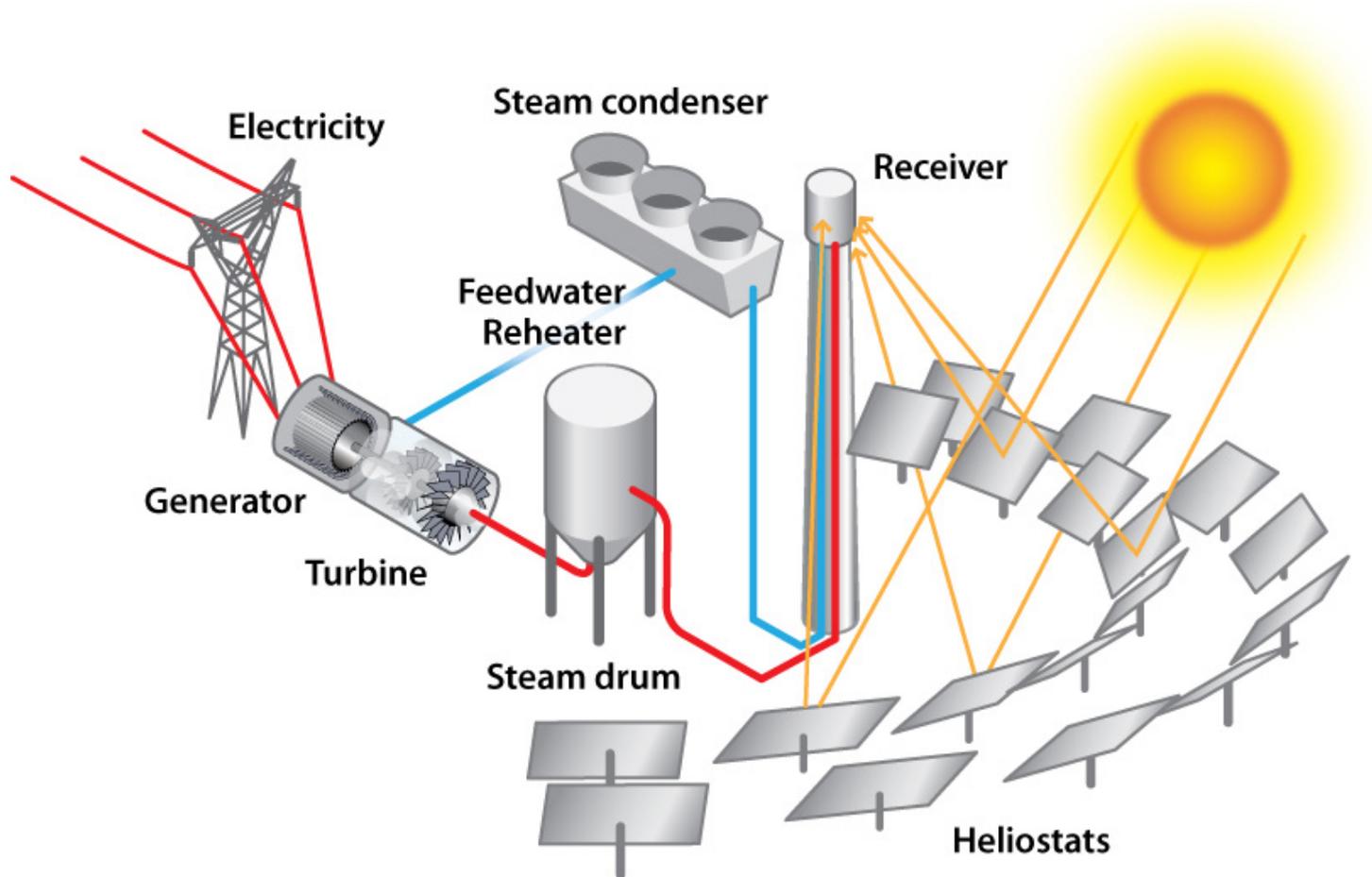
Source: Solar Novus Today, Amonix



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Concentrating Solar Power (CSP): The basic idea



Source: U.S. DOE, Office of Energy Efficiency and Renewable Energy



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Concentrating Solar Power (CSP) in action



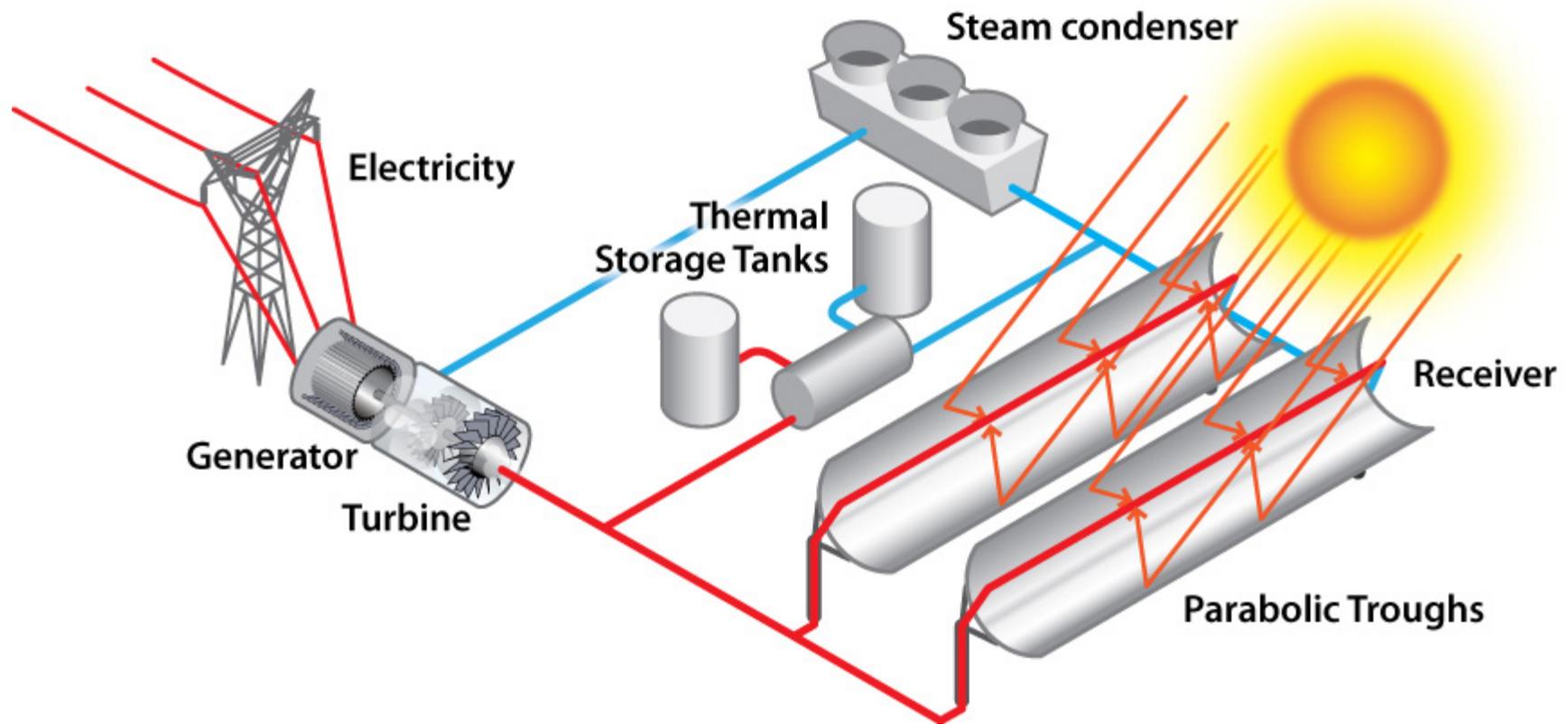
Source: U.S. DOE, Office of Energy Efficiency and Renewable Energy



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Concentrating Solar Power (CSP) – parabolic trough



Source: U.S. DOE, Office of Energy Efficiency and Renewable Energy



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Concentrating Solar Power (CSP) parabolic trough in action



Source: Solar Millennium, AG



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Water and solar-thermal projects

- What will the water requirements be?
- Who holds rights to surface and ground water nearby?
- Are the water rights transferable?
- What is water worth?
 - On the open market?
 - To your operation?



Land acquisition: Easements

- Right to make defined, limited use of the land of another
- Can have defined (or perpetual) duration
- Can be non-exclusive
- Cannot be unilaterally revoked without cause
- Person receiving easement not responsible for liabilities beyond scope of the easement



Site selection considerations

- Utility scale CSP, PV: large, flat areas
 - $<1\%$ slope for CSP
 - CPV may use rougher terrain
- Rooftop solar: where there are roofs and suitability for distributed generation (DG) applications



Land acquisition: Leases

- Right to complete possession of the land of another for a limited period of time
 - Assumed to be exclusive; landowner must reserve right of entry and/or any other uses
 - With great possession comes great responsibility
- Can have defined term or made to automatically renew
- General presumption is that purchaser takes land subject to lease, but lease can override this rule



Land Acquisition

- Almost always through easement or lease
 - Land cost tax-deductible, whereas purchase is not
 - Potential exception for utility scale CSP (economic, water rights advantages)
- Easements: Used by rooftop PV and small-scale ground-mounted systems where property use is shared with another
- Lease: Used by large-scale PV, CPV, CSP

The developer's dilemma:



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The Top 5 Questions to Ask about Wind Leases

1. How will property use be affected?
2. How long will agreement last?
3. What the landowner's obligations?
4. How will landowners be compensated?
5. What happens when the project ends?





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How will my property use be affected?

Land and project access

- Developer/operator needs
 - Ability to assess resource, survey area, prepare for construction
 - Access to property during construction (most intensive phase of project)
 - Access to property for operation and maintenance
 - Rooftop applications – may need access outside of normal business hours
 - Right of way for connection / transmission lines
 - Access to unobstructed sunlight





Total field area: 156.88 ac

© 2016 Google

Google earth

Imagery Date: 12/2/2013 lat 35.561851° lon -98.760515° elev 0 ft eye alt 4498 ft



Total field area: 156.88 ac
Total obstructed area: 3.85 ac
Use ratio: 2.46%

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Imagery Date: 12/2/2013 lat 35.561851° lon -98.760515° elev 0 ft eye alt 4498 ft



Total field area: 15.51 ac



Total field area: 15.51 ac
Total obstructed area: 6.81 ac
Use ratio: 43.92%

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Imagery Date: 9/10/2015 lat 39.567045° lon -77.721428° elev 0 ft eye alt 1473 ft

Land use requirements for PV and CSP projects in the U.S.

Technology	Direct Area		Total Area	
	Capacity-weighted average land use (acres/MWac)	Generation-weighted average land use (acres/GWh/yr)	Capacity-weighted average land use (acres/MWac)	Generation-weighted average land use (acres/GWh/yr)
Small PV (>1 MW, <20 MW)	5.9	3.1	8.3	4.1
Fixed	5.5	3.2	7.6	4.4
1-axis	6.3	2.9	8.7	3.8
2-axis flat panel	9.4	4.1	13	5.5
2-axis CPV	6.9	2.3	9.1	3.1
Large PV (>20 MW)	7.2	3.1	7.9	3.4
Fixed	5.8	2.8	7.5	3.7
1-axis	9.0	3.5	8.3	3.3
2-axis CPV	6.1	2.0	8.1	2.8
CSP	7.7	2.7	10	3.5
Parabolic trough	6.2	2.5	9.5	3.9
Tower	8.9	2.8	10	3.2
Dish Stirling	2.8	1.5	10	5.3
Linear Fresnel	2.0	1.7	4.7	4.0

Source: NREL, 2013



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Shared land use

- Generally developer wants sole occupancy and use of land
 - Much more intensive occupancy
 - Contrast with wind projects
- Control of access, no need for notice to entry, restrict 3rd party entry



Livestock and turbines



Source: Apex Wind Energy – kingfisherwind.com



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Sheep and modules



Source: Green Building Advisor, Solar Novus Today



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Shared land use



- Limited use possible for sheep grazing with above-ground mounted PV
- Much broader uses with rooftop-mounted PV
- Be sure shared uses are explicitly protected in written agreement

Source: Stoel Rives, 2013

Consequences of land use intensity (leased land)

- Developer – wants to maximize area subject to control
 - Increased siting flexibility for collectors and support systems
 - Setbacks to protect against dirt, debris, and damage by third parties



Consequences of land use intensity (leased land)

- Landowner – wants to minimize area subject to developer control
 - Complete loss of land use ► increase in rent needed
 - May lead developers to seek out lands with lower alternative use values, all other things equal
 - Closely defined areas under developer control



Alternatives for balancing land use interests

- Minimum annual rent for exclusively-occupied land (may be based on agricultural use, but suggest higher)
- “Royalty” payment (negotiated % of power sale revenues if that amount exceeds rent)
- Requirement for consultation with landowner in siting and configuration (must have some binding effect)
- “Phased” development with land not actively used released back to landowner



Field Geometry and Land Use



Access Easement: An easement allowing the developer to travel across the property to reach the turbine areas



Source: Google Earth

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Google earth

Imagery Date: 9/10/2015 lat 39.563833° lon -77.728979° elev 0 ft eye alt 1287 ft

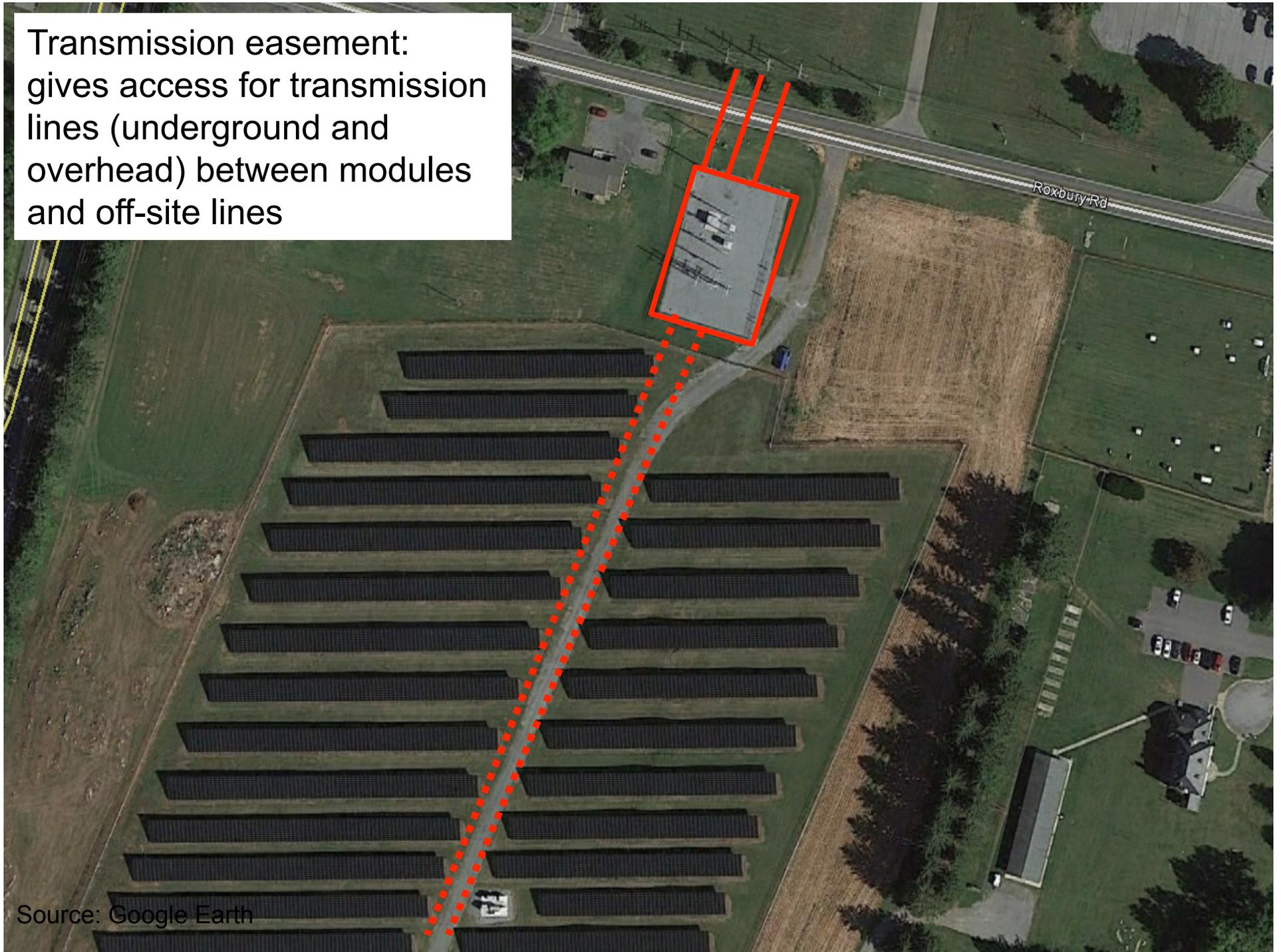
Access Easement: An easement allowing the developer to travel across the property to reach the project equipment areas



Construction Easement: Often co-extensive with Access Easement, but may include additional staging or construction areas that are removed once construction is complete



Transmission easement:
gives access for transmission
lines (underground and
overhead) between modules
and off-site lines

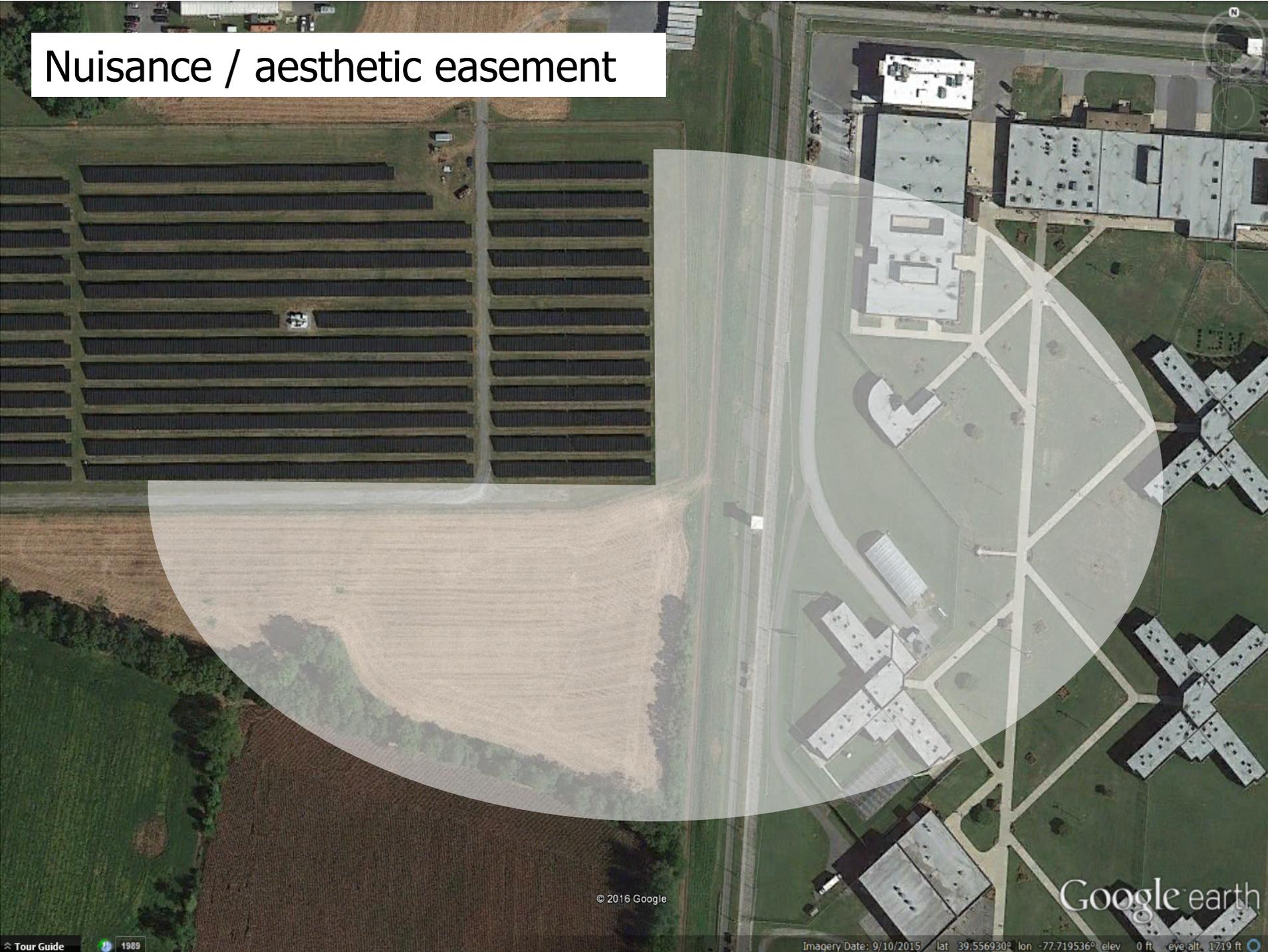


Source: Google Earth

Non-obstruction easement: You agree not to cause any obstruction of sunlight to the property (also asked of neighbors / buffer zones)



Nuisance / aesthetic easement



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Google earth

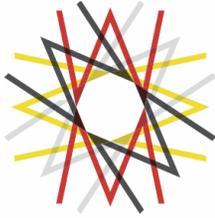
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Dealing with damages

- How does agreement handle damages to growing crops / livestock?
- How does agreement handle “blocking” crop or livestock production for a season?
- Possible tools
 - Set schedule (pre-determined price per head, per acre, etc.)
 - Defined calculations (ex. local market price for comparable animal, nearest cash bid for crop, etc.)





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How long will the agreement last?

How long will the agreement last?

- Frequently 20-30 years
 - Must cover duration of Power Purchase Agreement (PPA)
 - Allow for payback of loans
 - Extract maximum amount from fixed investment
- Option periods?
- Renewal periods?
- Notice of renewal?
- Options to re-open at renewal?





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What are the landowner's obligations?

What are the landowner's obligations?

- Indemnity?
- Property taxes?
- Subordination / property interests
- USDA program compliance (CRP, EQIP, WHIP)?



Lien and Encumbrance Issues

- Many agreements require a “subordination” arrangement.
 - Get in line behind developer, and perhaps dev creditors.
 - Frequent lender reaction:
- Preserve access to land equity; ability to sell or encumber the property?
- Landowners (and lenders) need to be sure to separate out interests in property.



Oil and solar

- Intensity of land use may preclude development of other resources within specific area of solar use.
 - Not an absolute bar so long as there are alternative extraction points on property
- Developer takes land subject to existing interests
- Potential for conflicts between surface and mineral estates
- Avoid any representations or obligations for an estate you don't own!
 - Indemnification for obligations dealing with mineral estate



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How will the landowner be compensated?

How will you be compensated?

- What are your payments for easements?
- Market data tough to come by
- What are your lease payments?
 - Per installation, per megawatt, or a “royalty?”
 - Definitions matter!
 - How will accuracy be verified?
 - Metering data access
 - Payment statement
 - Right to audit





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What happens when the project ends?

What happens when the project ends?

- Specify decommissioning requirements
 - disassembly and removal of equipment
 - restoration of grades and soils
 - replacing vegetation
- Seek financial assurance of ability to decommission





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Other issues in solar power development

Mythbusting

- No, they won't suck up the sun
- No, they don't cause cancer
- Property value impacts – no peer-reviewed research found (but still looking)
 - Similar research in wind has found no statistically significant impact on property values

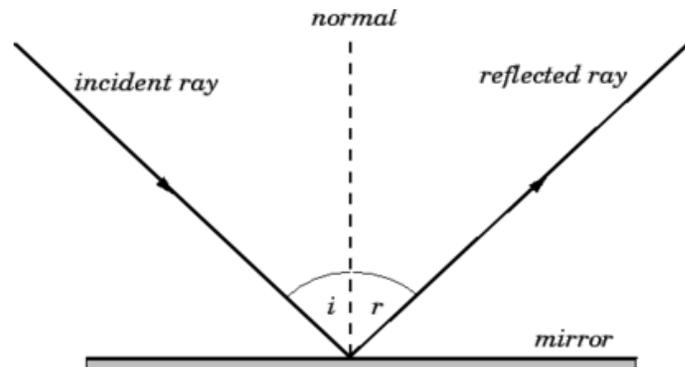


Nuisance issues: Reflection and glare

- Remember that solar panels only make money from the energy they absorb
- Most PV panels use anti-reflective coatings
- Ask
 - Do the solar cells used in the modules have anti-reflective coatings?
 - Is the surface of the solar modules smooth or stippled?
 - Do the solar modules incorporate any type of “light trapping” technology?
 - Is there documentation from the panel manufacturer of the panels’ reflectivity (“albedo”)?
 - What color is the surface in the absence of the solar modules?

Nuisance issues: Reflection and glare

- Actual localized impacts are a function of astronomy (*eek!*), geometry (*gasp!*), and trigonometry (*SCREAM*!)
 - Vertical position (“altitude”) and horizontal position (“azimuth”) of sun relative to the solar module, as well as the relative position of the receptor (you) to the solar module.
- Everything is in motion, and no reflection is permanent
- Siting matters
 - Map planned location of modules, terrain, and potential receptors
 - Run mathematical analysis of reflectance to receptors and duration of reflectance



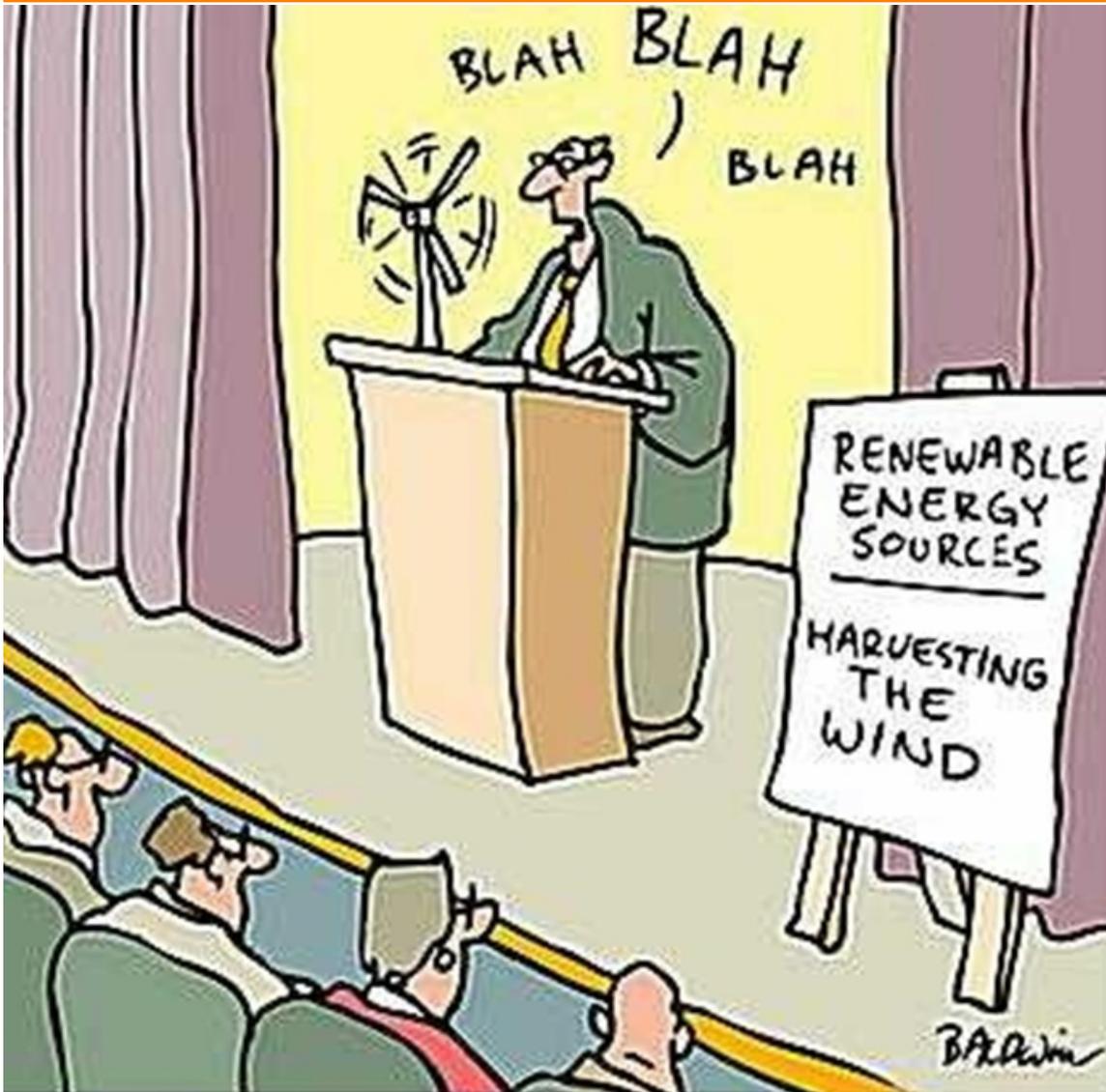
Source: Colton, 2015



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Thanks!



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