



juwi solar Inc.

Rocky Mountain Land Use Institute Conference – Siting Renewable Energy

2013

Topics



juwi solar Inc (JSI)

Siting Renewable Energy

Solar vs. Wind Land Use

Solar Farm Impacts/Land Use

Project Examples

Land Use/Zoning Mistakes

Appropriate PV/Wind Land Use/Zoning



juwi solar Inc. (JSI) – Corporate Overview



juwi solar Inc.	
Based in:	Boulder, Colorado
Employees:	60+
Business Unit:	Solar Photovoltaic (>90 MW)

Majority Shareholder: juwi Holding AG	
Based in:	Wörrstadt, Germany
Founded/ CEOs:	1996, Fred Jung and Matthias Willenbacher
Employees:	>1,750 for all divisions
Business Units:	<ul style="list-style-type: none">• Wind (950 MW)• Solar PV (1 GW)• Bioenergy (2 MW)

- PV plant developer and engineering, procurement and construction (“EPC”) contractor
- Track record of working successfully with major utilities across the U.S.
- 90+ MW of Solar PV Power Plants in the US since 2009
- Over \$335mm of Project Financing
- JSI and juwi AG have over 1,500 installations and 1 GW of solar PV plants



North American Projects

>90 MWs Installed between 2009 and 2012



Concentrating Solar Power (CSP)

- Power Tower
- Parabolic Trough
- Dish Sterling



Small Scale Renewable Considerations



- Solar access
- Solar aspect
- Community programs for rooftop PV
- Small scale wind in residential zones



Siting Renewable Energy Projects

Considerations

- **Technology** wind, solar (concentrating, photovoltaic fixed/tracking), or geothermal
- **Interconnection** to the electrical grid, access to distribution or high voltage transmission lines
- **Size/capacity** of project (i.e. residential, commercial or utility scale)
- **Site conditions** resource, topography, greenfield/brownfield, zoning/land use, wetlands/washes/streams, floodplain, vegetation, endangered threatened species



Solar vs. Wind Land Use

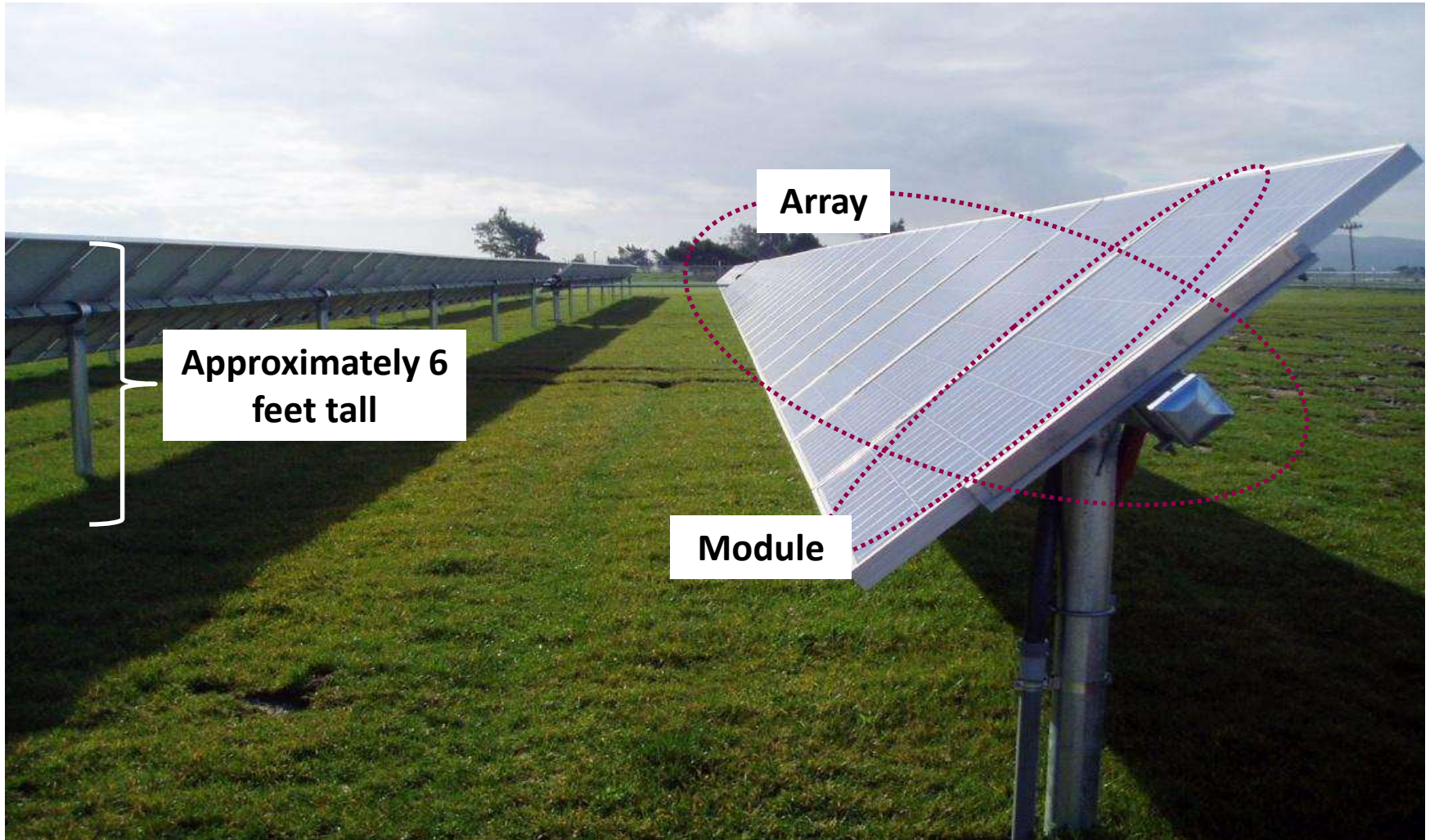


Different renewable technologies have different impacts on project site and community:

Solar vs. Wind Land Use Comparison

Technology:	Wind	Solar
Land Type	Flat or mountainous terrain with strong wind resource	Flat land
Area Requirement	1MW per 1/3 acre with 20-40 acres between turbines	1MW per 4-8 acres
Complementary Land Use	Yes – ranching, farming can occur	No – 100% of project site used for project (sheep grazing is possible)
Resource Siting Requirements	Micro-sited projects to secure the best wind resource	Macro-sited projects in regions with strong resource or driven by policy
Visual Impact	Projects visible from many miles away	PV arrays under 8' in height, use non-reflecting glass
Regional Areas of Concentration	West Texas; Midwest	Southwest, California, New Jersey

Solar Farm Visual Impact



Reflectivity



- PV modules absorb light
- Thin-film module shown here absorbs 90% of incident light on panels.
- PV modules similar to smooth water in reflectivity
- Tracking and fixed-tilt systems constructed at airports, indicating no hazard of glare or blinding to pilots
- juwi solar installation shown here on airport property on Wyandot County airport, approved by FAA



Photovoltaic modules are less reflective than structural glass

Solar Farm Facts



No traffic

- No on-site employees. Several maintenance vehicle trips per week.

Non-toxic

- Recyclable PV modules, enclosed in glass, do not cause exposure to toxic materials

Low voltage

- Far lower voltage than transmission lines. EMF comparable to household appliances (at 10' from inverters).

Residential Compatibility

juwi Ground Mounted Systems



Mars Solar Garden, Hackettstown, NJ

- 2.2MW system adjacent to numerous residential properties to the east has experienced no complaints.



Mars Solar Garden

Blue Wing Solar, San Antonio, TX

- 16MW fixed-tilt, thin-film system faces slightly west of south, toward a neighbor's residence.
- Neighbor has no issues with glare, was glad to have solar farm built as previous owner sought to build a trailer park.



Blue Wing Solar

Noise

Inverters/power stations may generate a low hum of 45 decibels at 10 meters (less than a refrigerator)



Solar Farm Community Benefits



- ➔ **Employment** – For large plants, 120+ workers on-site during peak construction times; more than 100,000 construction labor hours
- ➔ **Economic Development** – More than \$2,000,000 in local purchases during construction in addition to local wages paid
- ➔ **Air Emissions** – Produces **ZERO** air emissions
- ➔ **Water** – PV plants require no water to operate and produce **ZERO** wastewater
- ➔ **Stormwater** – precipitation can pass between modules and support vegetation beneath the arrays. PV plants generally have a neutral-to-positive impact on stormwater runoff at a site
- ➔ **City/Fire services** – PV plants have no on-site employees or traditional buildings and require very limited city services and impact on public infrastructure



Blue Wing Solar – Project Example

16.0MW DC San Antonio, TX, USA



Construction Period: 1Q10 – 4Q10; 215,000 ground-mounted solar modules on 115 acres



Land Use/Permitting Highlights

- Zoned Farm and Ranch (FR)
- No consideration for solar in zoning code
- City Planning Dept. wrote Rule Interpretation Decision allowing ground-mount PV within certain zoning districts, including FR

Challenges

- 1/3 within City of San Antonio, 2/3 in unincorporated Bexar County, but within Extra-Territorial Jurisdiction
- Landscape buffering

Badger 1 Solar – Project Example

19.3MW DC Tonopah, AZ, USA



Construction Period: 1Q13 – 4Q13; single-axis tracking on 118 acres, of 172 acre site



Land Use/Permitting Highlights

- Within Maricopa County – allows solar within most zoning districts with Special Use Permit
- Comprehensive Plan requires Industrial land use designation
- Rural-43 zoning (residential)

Challenges

- 12 months for zoning/land use approvals, then 2+ months for building permits
- Comprehensive Plan Amendment
- Toilets (water supply) required

Land Use & Zoning Mistakes



Solar and Wind Farms \neq Industrial Land Use

Industrial zoning and land use characteristics:

- Access to major transportation corridors, water, sewer = EXPENSIVE
- Often urban, smaller parcels = EXPENSIVE, too small
- Employment
- Nuisances (noise, traffic, pollution)

Tonopah/Arlington Area Plan:

- INDUSTRIAL: “major employment centers,” Uses permitted in this category include warehousing, storage, distribution activities, and manufacturing

PV should not be restricted to **Public Utilities zoning**

Solar farm \neq traditional power plant, PV does not need:

- Massive amounts of water for cooling
- On-site personnel
- Fuel delivery via rail or road



Appropriate PV/Wind Zoning/Land Use



Requiring change of land use/zoning for solar amounts to spot zoning

Avoid “stranded” industrial zoned land out of conformance with comp plan

PV is a good neighbor, temporary land use, not an industrial land use

Allow PV and wind in most zoning and land use designations (particularly agricultural and rural) with:

- ➔ **Special use permit,**
 - ➔ **Conditional use permit,**
 - ➔ **Solar/Wind overlay district,**
- OR similar**





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