



Beth Esser and Stanley Minnick

Utility Scale Solar: Challenges and Opportunities

2MWac Stockton Solar, Winona MN

Agenda

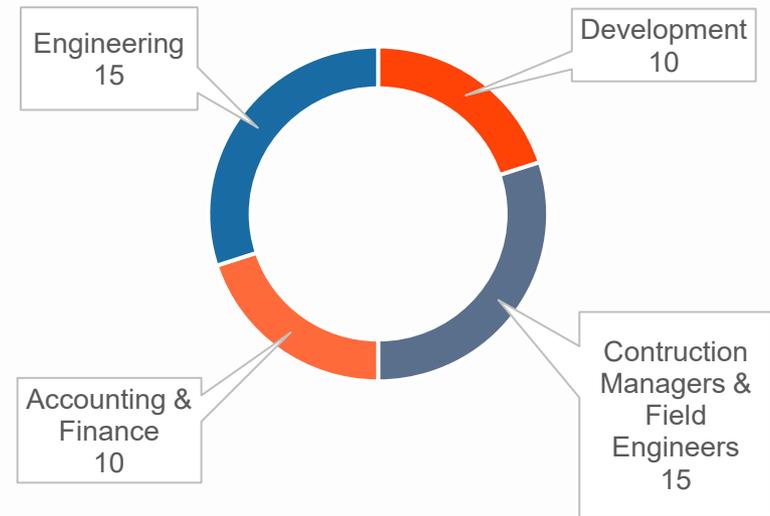
- About OneEnergy
- Overview utility scale solar
- Technological advancements
- Economic considerations
- Policy and trade landscape



2MWac Stockton Solar, Winona MN

About OneEnergy

- OneEnergy Renewables is an independent developer of community-scale energy projects
- Our Madison office develops, engineers, constructs and operates projects throughout the Midwest
- Emphasis on projects that interconnect with the distribution grid and serve local loads
- As a Public Benefit Corporation, we pursue public benefit and operate in a responsible and sustainable manner, in addition to traditional business objectives.



OneEnergy in the Midwest

- 79 Projects constructed over last 8 years
- 330MW
 - Able to power ~65,000 average Midwest homes
- 22 projects planned for construction in 2026 throughout MN, WI, and IA (not mapped at right)

IOWA

1. Forest City
2. Maple City
3. Douglas
4. Little Cedar

MINNESOTA

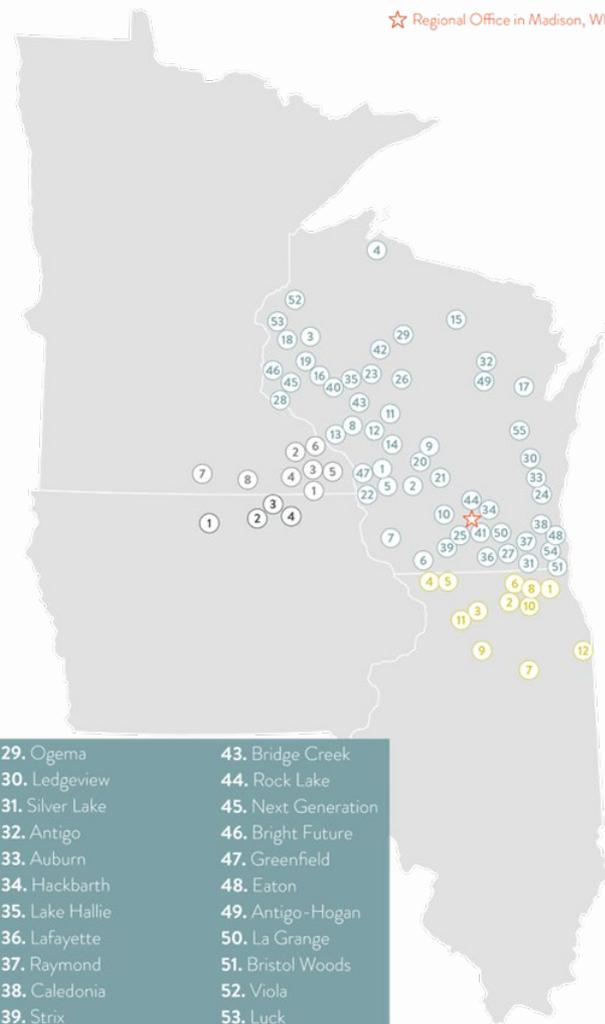
- | | |
|----------------|---------------------|
| 1. Lanesboro | 5. Rushford Village |
| 2. St. Charles | 6. Stockton |
| 3. Hazel | 7. Bancroft |
| 4. Fountain | 8. Grand Meadow |

ILLINOIS

- | | |
|----------------|-----------------|
| 1. Armstrong 2 | 7. Tully |
| 2. Blazingstar | 8. Armstrong 1 |
| 3. Sauger | 9. Agalinas |
| 4. Agrimony 1 | 10. Groundhog |
| 5. Agrimony 2 | 11. Lupine |
| 6. Lobelia | 12. Thorn Grove |

WISCONSIN

- | | | | |
|-----------------------|-----------------------|-----------------------|----------------------|
| 1. Endicott | 15. Hodag | 29. Ogema | 43. Bridge Creek |
| 2. Elroy | 16. Walleye-SunDEC3 | 30. Ledgeview | 44. Rock Lake |
| 3. Cumberland | 17. Bonduel | 31. Silver Lake | 45. Next Generation |
| 4. Ore Dock | 18. Georgetown | 32. Antigo | 46. Bright Future |
| 5. Cashton | 19. Hay River-SunDEC2 | 33. Auburn | 47. Greenfield |
| 6. Argyle | 20. Webster Creek | 34. Hackbarth | 48. Eaton |
| 7. Fennimore | 21. Lemonweir | 35. Lake Hallie | 49. Antigo-Hogan |
| 8. Arcadia | 22. Bluff Prairie | 36. Lafayette | 50. La Grange |
| 9. New Lisbon | 23. Wolf River | 37. Raymond | 51. Bristol Woods |
| 10. Middleton Airport | 24. Jackson | 38. Caledonia | 52. Viola |
| 11. Strobus | 25. Tyto | 39. Strix | 53. Luck |
| 12. Blue Prairie | 26. Popple Creek | 40. Elk Mound-SunDEC4 | 54. Strawberry Creek |
| 13. Stromland | 27. Spring Prairie | 41. Spring Brook | 55. Perch |
| 14. Shamrock | 28. Trimbelle | 42. Hannibal | |



Webster Creek



1.5MWac, New Lisbon, WI

Rushford Village



1 MWac, Rushford Village, MN



Ledgeview Solar



5MWac, Fond du Lac, WI

Maple City Solar



1.5MWac, Osage, IA

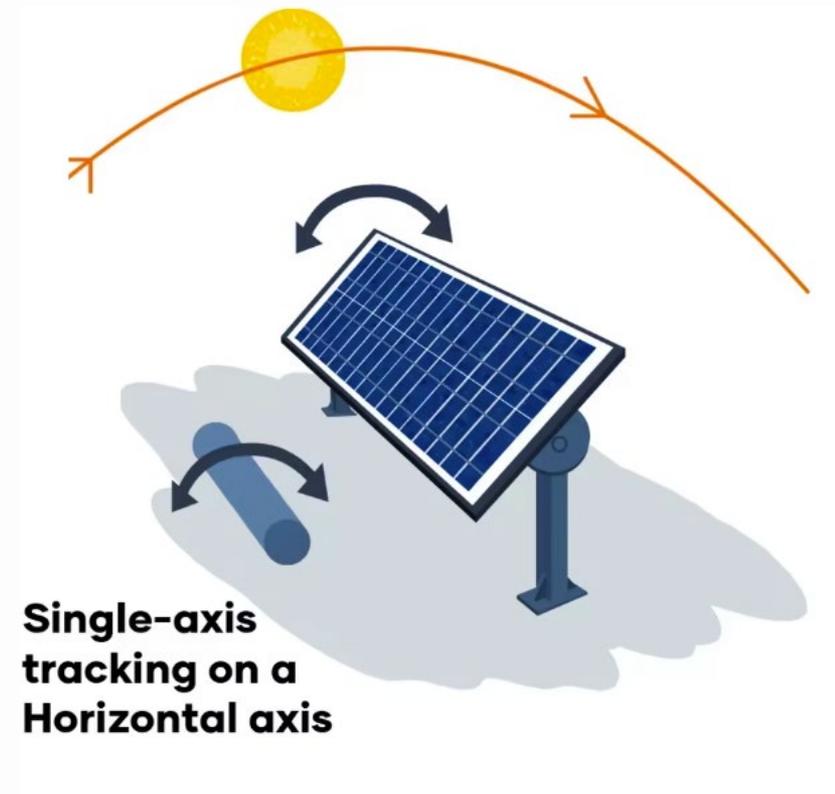
Auburn Solar



5MWac, Campbellsport, WI

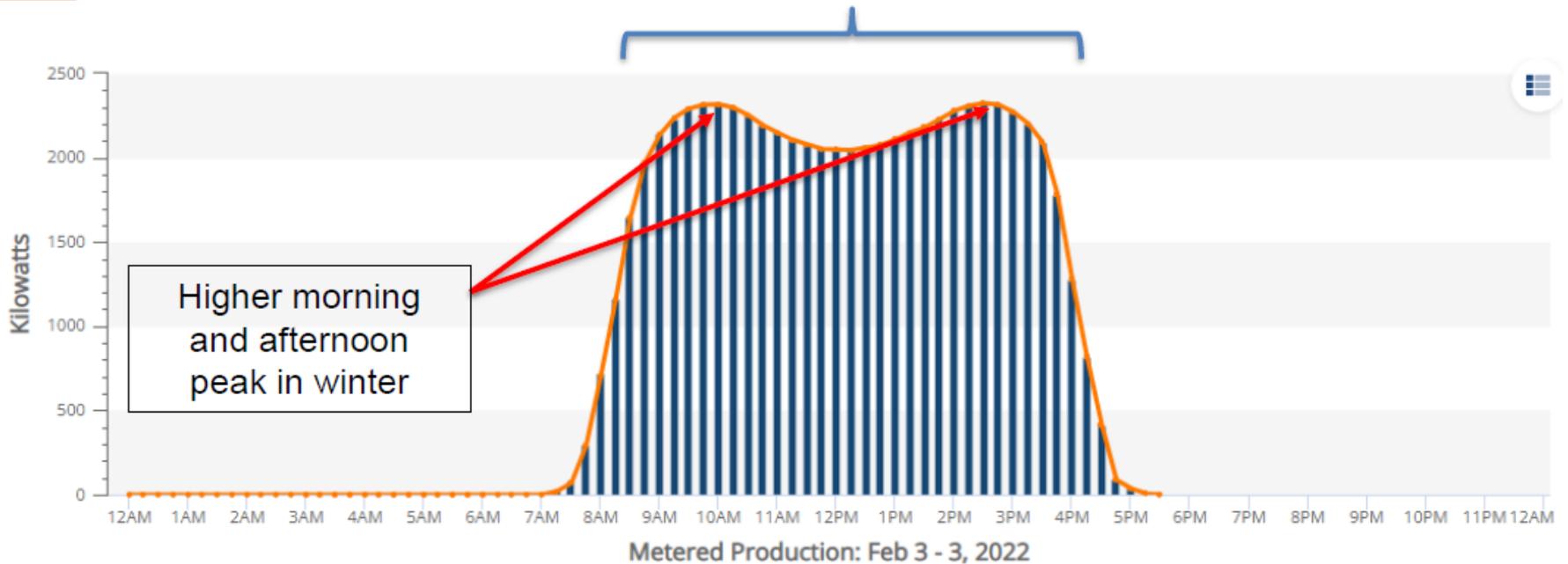
Technological Advancements

- Bifacial panels
- Increased panel efficiency
- Single Axis Tracking



Technological Advancements

Broader Production Window in Winter



- Bifacial panels are disproportionately beneficial in areas with more days with snow cover
- Expected production in La Crosse area:
 - Monofacial panels: ~22%
 - Bifacial panels: ~23.5% (7% above monofacial)

Distributed vs. Large Scale

- High voltage: 50MW-300MW+
 - \$ 2,200 - \$2,500 / kWac
 - \$ 60 - 80 MWh
- Distribution voltage: 1-20MW
 - \$ 2,200 – 3,000 / kWac
 - \$ 60 - 90 / MWh
- Behind the consumer's meter: 4kw - 500kw
 - \$ 3,000 – 4,000 / kWac
 - \$ 100 - 160 / MWh



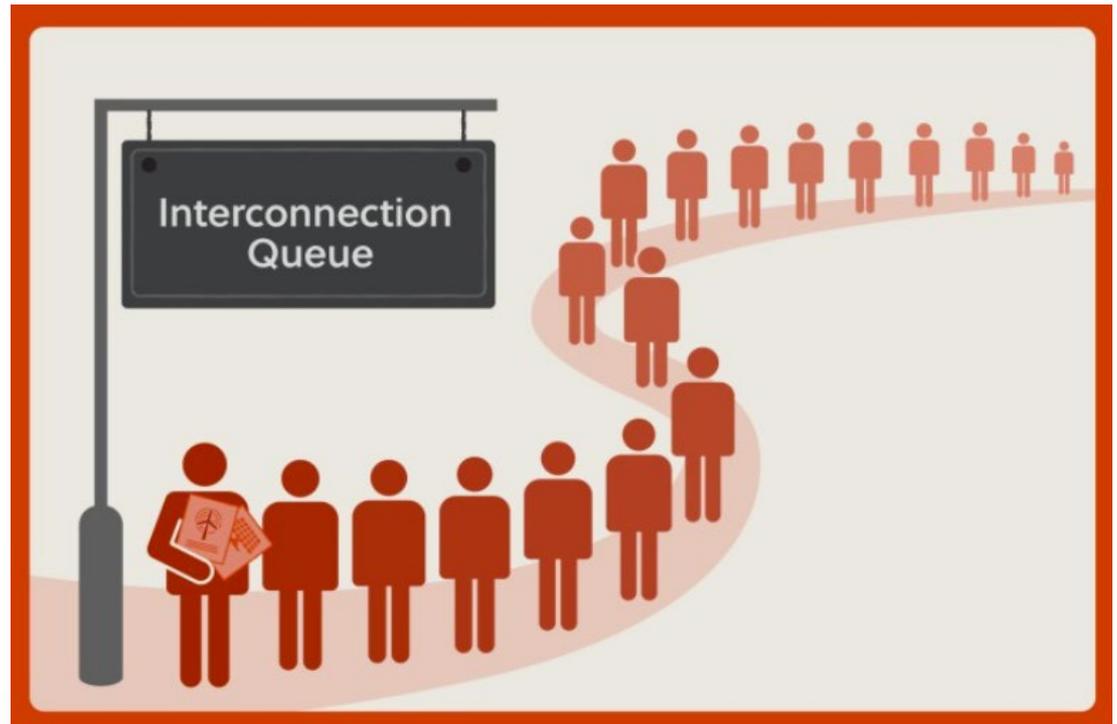
Economic Considerations

- Hassle Factor
 - Big projects = Big challenges
 - Small projects = Big challenges
- Economies of scale
 - More expensive to build and maintain
- Financing / due diligence costs are high
- Debt and tax equity are more expensive

Partially mitigated by portfolio approach

Economic Considerations

- **Avoid MISO Queue**
 - Project development cycle: 1-2 years
- **Use existing infrastructure**
 - Doesn't require new high voltage transmission, substations etc.
- **Easier to site non-controversially**
 - 10-80 acres vs. 300-3,000 acres
 - Usually single landowner
- **Transmission savings**
 - Potential peak savings
 - Losses



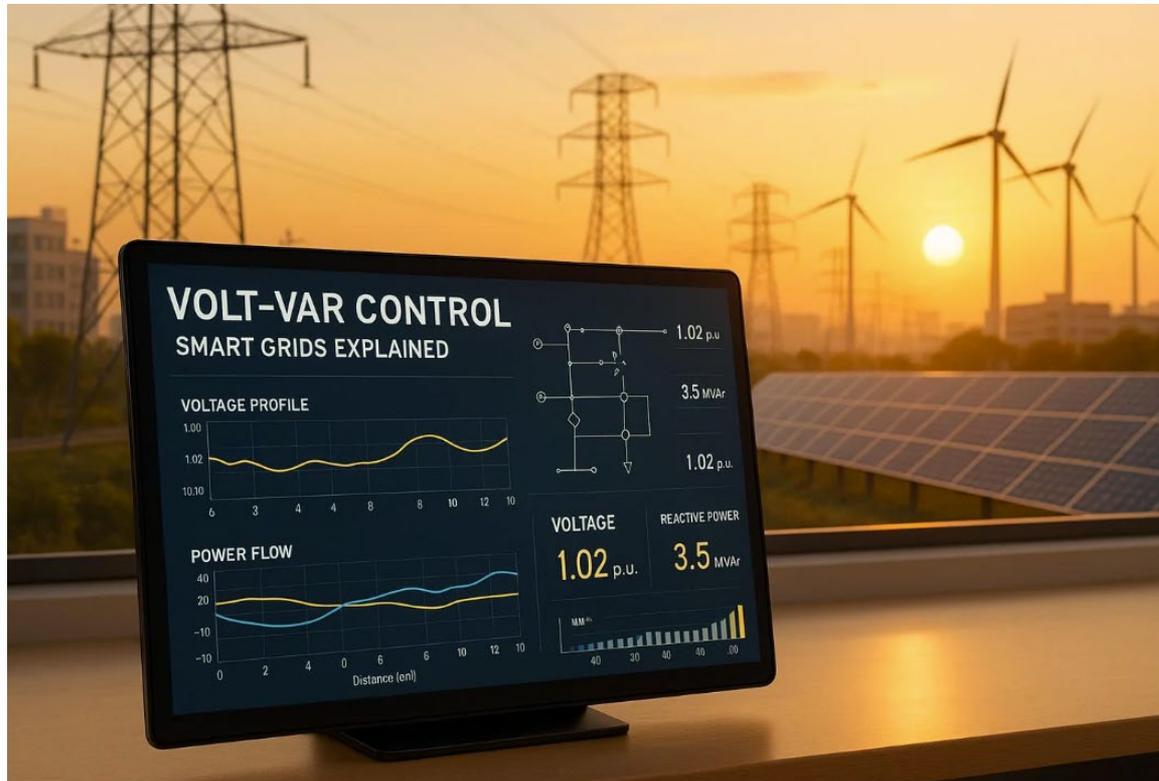
Grid Stabilization

Grid Stabilization using smart grid inverters

- Volt/Var vs specified power factor

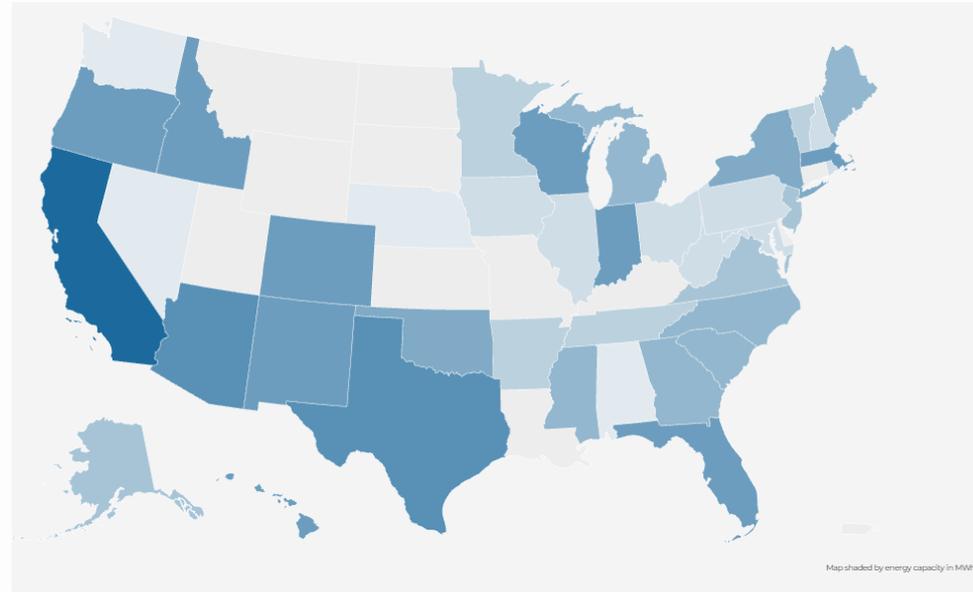
IEEE 1547-2018 default category settings

Voltage-reactive power parameters	Default settings	
	Category A	Category B
V_{Ref}	V_N	V_N
V_2	V_N	$V_{Ref} - 0.02 V_N$
Q_2	0	0
V_3	V_N	$V_{Ref} + 0.02 V_N$
Q_3	0	0
V_1	$0.9 V_N$	$V_{Ref} - 0.08 V_N$
Q_1^a	25% of nameplate apparent power rating, injection	44% of nameplate apparent power rating, injection
V_4	$1.1 V_N$	$V_{Ref} + 0.08 V_N$
Q_4	25% of nameplate apparent power rating, absorption	44% of nameplate apparent power rating, absorption
Open loop response time	10 s	5 s



Solar and Batteries

- Battery energy storage growing very rapidly in many markets
- Installed battery storage by state (MWh):
 - Texas: 19,006
 - California 48,716
 - Wisconsin: 1153
 - Iowa: 26
 - Illinois: 45
 - MN: 63



The screenshot shows the Xcel Energy Newsroom page. The main article title is "Xcel Energy to meet Minnesota's energy needs with first-in-the-nation distributed capacity procurement". Below the title is a sub-headline: "Company to deploy up to 200 megawatts of distributed battery storage capacity". There is a "SHARE" button. The article text begins with "MINNEAPOLIS (Oct. 6, 2025) — Xcel Energy is making a first-of-its-kind proposal to build out a battery storage network across Minnesota, optimizing the state's energy grid and helping the company meet the growing electricity needs of the communities it serves." It continues with details about the Capacity*Connect proposal and a quote from Ryan Long, president of Xcel Energy-Minnesota, North Dakota and South Dakota. To the right of the article are sections for "MEDIA CONTACT" (with email mediainquiries@xcelenergy.com) and "MORE NEWS" (with a link to an article about conserving energy due to cold weather).

Xcel Capacity*Connect program will deploy 200 MW of 1-3MW batteries that Xcel will own and dispatch at strategic grid locations on it's distribution system hosted by customers (churches, large businesses etc.)

Advantages of distributed batteries:

- More value to the system at similar cost
- **Much faster to deploy given grid delays associated with large BESS**

Policy and Trade

- ITC: Investment Tax Credit
- FEOC: Foreign Entities of Concern
- AD/CDV: Anti-dumping and countervailing duties
- IEEPA Tariffs: International Emergency Economic Powers Act
- Section 232 Cases (Steel, Aluminum, & Polysilicon)



Phaseout Schedule

Solar Phaseout

<u>Required CC Date</u>	<u>Required PIS Date</u>	<u>FEOC Applies?</u>	<u>ITC Eligibility</u>
Before January 1, 2026	CC + 4 Years	No*	Yes
January 1–July 4, 2026	CC + 4 Years	Yes	Yes
After July 4, 2026	By December 31, 2027	Yes	Yes
After July 4, 2026	2028 onward	N/A	No

Agrivoltaics & Research at OneEnergy

- Sheep grazing projects
- Beekeeping
- Hundreds of acres of pollinator habitat
- Research-soils, hydrology



Agrivoltaics Video



Thank You



OneEnergy
RENEWABLES